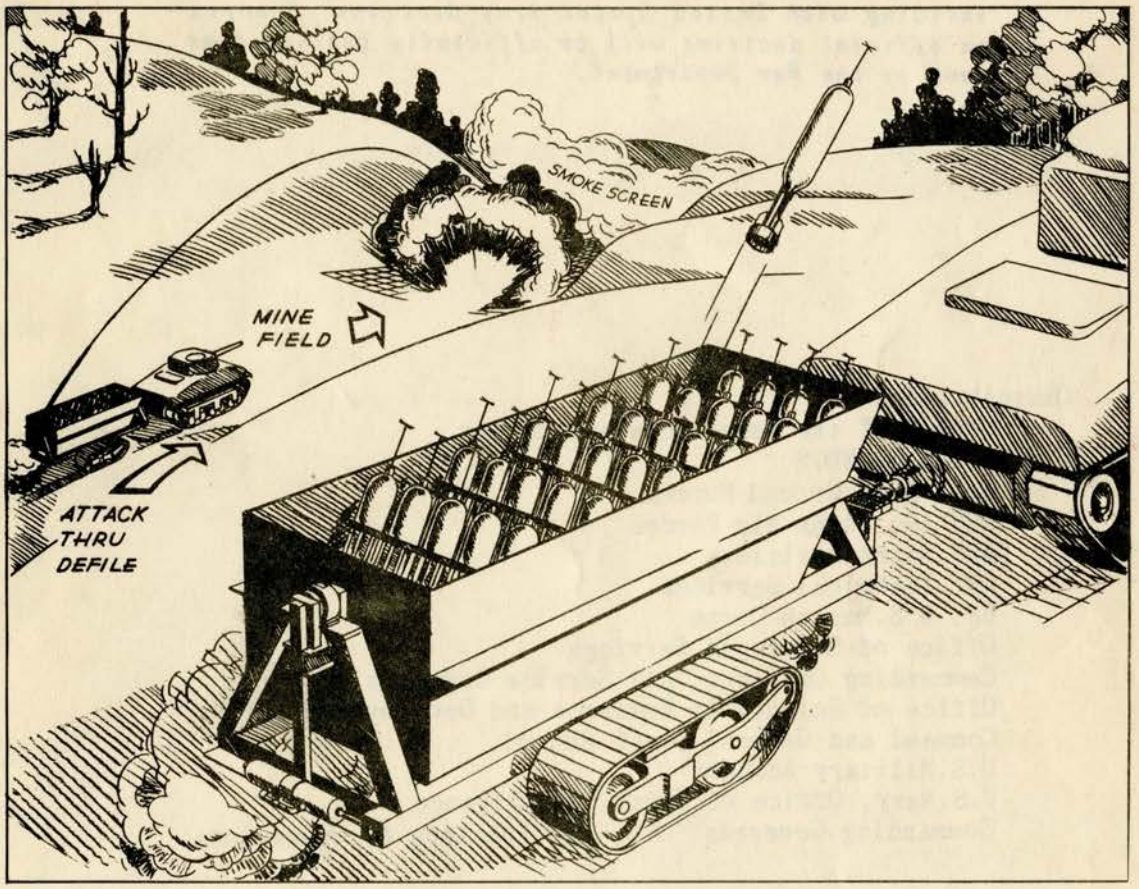
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DETECTION AND CLEARANCE of JAPANESE MINES



Rockets, lobbed over the advancing tank from the towed launcher, clear a path through mine fields. - see page 5.

[redacted]
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24 MAY 1945

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25 May 45

MEMORANDUM FOR COL SCHMAHL:

Subject: "Detection and Clearance of Japanese Mines"

I am inclosing herewith two copies of the above-mentioned pamphlet - Special Technical Intelligence Bulletin No 8 dated 24 May 45 - which is published by Director of Intelligence, ASF.

W. H. VAN DINE
Lt Col, QMC
Dep Exec, C&GSS, Ln

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DETECTION AND CLEARANCE of JAPANESE MINES

Prepared by Army Service Forces Intelligence Division with the assistance of the Corps of Engineers, the Ordnance Department, and the Research and Development Division of ASF.

The Japanese have increased their use of mines to the point where mine detection and clearance has now become a major problem for American forces advancing in the Pacific.

The problem of clearing them is greatly complicated by the fact that some of the Japanese mines encountered have characteristics radically different from those used by the Germans.

These differences affect all present principles of mine clearance. For instance, some Japanese mines are more resistant to explosive charges than the German models; others detonate under much less pressure, or have pin-point detonators which might escape a disk-type mine exploder only to be set off by the tracks of a tank in the same path.

All agencies concerned with this problem have turned their full attention to these problems, and will need the closest cooperation and assistance from the field in order to produce effective equipment for the passage of mine fields.

Development of devices for mine detection and clearance has progressed considerably since publication of Special Technical Intelligence Bulletin No. 1 in August, 1944.

This supplementary bulletin is therefore published to provide interested organizations and commanding officers in the Pacific area with the latest information on the subject in convenient summary form.

Descriptions of some devices still under development and not yet available for use, are included herewith simply to indicate the trends in development and to stimulate development in the field to solve the problems of enemy mines as experienced under combat conditions.

JET PROPULSION
FOR MINE CLEARING DEVICES

A number of jet propulsion units are being designed and developed by the Ordnance Department for projecting Corps of Engineer mine clearing devices over or through mine fields.

Jet Propulsion Unit, T1, is used in conjunction with the Snake, Mine Clearing, Anti-personnel, M-1. An experimental model 3.25" in diameter has been tested by the Allegheny Ballistics Laboratory with satisfactory results. The unit is assembled to the explosive snake and propels it over the mine field. The snake is then detonated.

Jet Propulsion Unit, T2, will propel the Corps of Engineers Amphibious Snake, which

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is being developed for clearing underwater mine fields, beach and river bank mines. The propulsion unit is assembled to the explosive snake and propels it over water for a predetermined distance up to 800 yards. The snake is then detonated, exploding the adjacent mines and clearing a path through the mine field. Several models of this unit using aero-jet propulsion units of various sizes have been tested, but the final size to be employed has not yet been determined. Tests are under way to determine the feasibility of using a series of short time aero-jet units to obtain sufficient thrust to propel the Amphibious Snake a distance of 3,000 feet.

Jet Propulsion Unit, T4, is under development to project a line charge (nylon hose filled with plastic explosive) for a distance of 300 feet. Firings are being conducted in the high and low temperature range with a "U" shaped motor.

Jet Propulsion Unit, T9, propels a prefabricated 13-strand detonating cord cable a distance of 200 to 400 feet. The detonating cable is used for exploding of antipersonnel mines. Pilot models developed to date consist of a "U" - shaped rocket motor 1 1/2 inches in diameter. This model has been successful in engineering tests and now awaits a decision from the Army Ground Forces.

The devices for which jet and rocket propulsion units are designed are being extensively tested by the Corps of Engineers, and are described more fully herewith:

The Amphibious Snake
For Beach and Under-Water Mines

Development of an amphibious jet-propelled assault snake to be launched from LVTs or landing craft 800 yards off shore is in progress by the Corps of Engineers.

The snake itself will be made up as largely as possible from the standard compo-



Amphibious snakes, rocket motor propelled, can be launched at sea from an LVT or other suitable craft to clear underwater obstacles or to detonate beach mines.

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nents of the M-3 demolition snake. The jet propulsion units are mounted on the snake's back. A firing device is provided which will detonate the snake's explosive charge when the snake hits the beach or travels a short distance up the beach. It may also be used to clear a path through underwater mines and obstacles.

Length of the amphibious snake depends on the craft from which it is launched and the type of jet-propulsion unit used.

Investigations to date indicate its maximum length for an LVT is 45 feet and for an LCM about 60 feet.

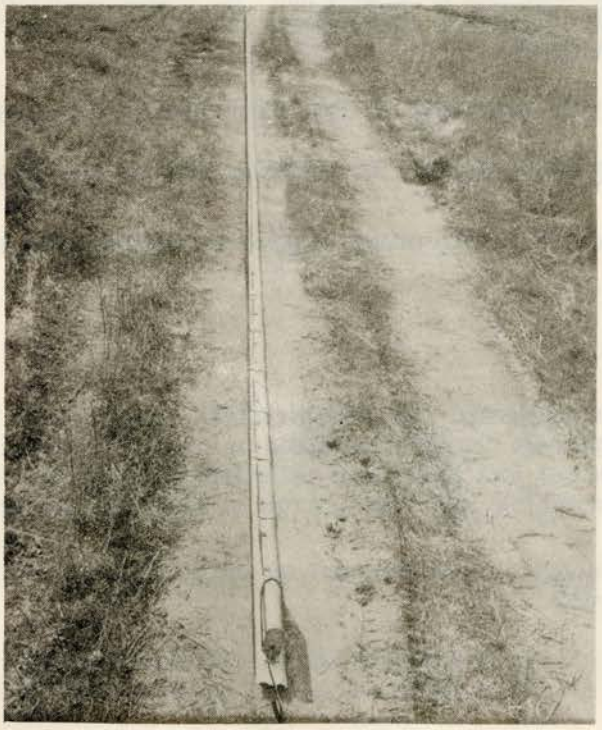
Tests so far conducted have indicated that the amphibious snake, launched from an LVT can be made to travel across 800 yards of water. They also have shown that aero-jet or similar rocket motors developing a 1000 pound thrust for not less than 8 seconds, are suitable for propelling 45-foot sections of amphibious snakes across water, the distance travelled depending on the burning time of the rocket motor.

For longer sections of snake, rockets of greater thrust, or a series of rockets would be required.

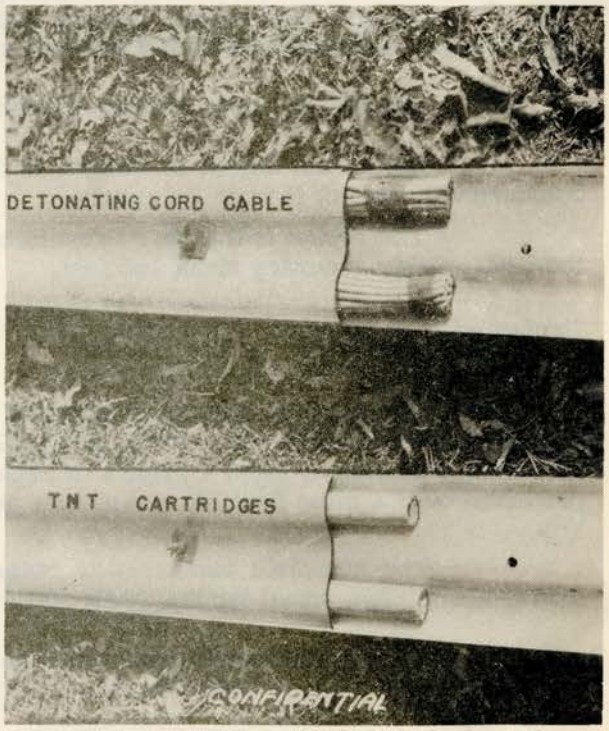
Any field improvisation of a self-propelled snake as described above should give careful attention to the fusing to insure safety precautions adequate for protection of friendly troops or equipment in case the snake is diverted from its course and veers back toward its point of origin.

Snake, Mine Clearing
Anti-Personnel, M-1

A new rocket-propelled explosive snake has been developed by the Corps of Engi-



Snake, Mine Clearing, Anti-personnel, M-1



Two types of explosive loading

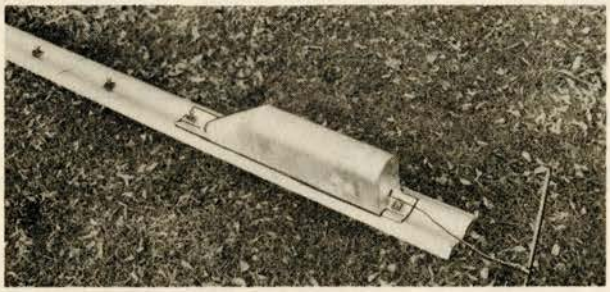
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neers to clear paths through Schumines and other anti-personnel mines for passage of foot troops. The propulsion unit was developed by Ordnance (see Propulsion Unit, Jet, T1 above).

The device is made up of corrugated magnesium plates lapped and bloted together forming two parallel tubes which are filled with explosive. The explosive charges consist of TNT cartridges 1 inch diameter by 8 inches long. If standard cartridges are not available, 21 strands of detonating cord can be used.

The detonating device is a standard M2 weatherproof fuse lighter with a special pull-pin and a standard firing device base coupling having a non-electric blasting cap crimped to it. A



Tail, with firing device housing in place



Nose, with rocket motor in place

150 foot nylon cord, contained in the firing device housing, has one end attached to the firing pin. The other end is staked to the ground so that when the snake has travelled the entire length of the cord, the pin is pulled and the snake is detonated. The distance covered by the snake is controlled simply by the length of cord allowed to remain in the firing device housing.

Loaded with the TNT cartridges issued with the snake, the device clears a 20-foot path through Schumines; and 1-foot wide through mustard pot mines and "S" mines or Japanese Type 3 (Flowerpot) land mines directly under it. However, camouflage and soil is stripped away from any such mines within 2 1/2 feet of the snake.

Detonating cord charges produce a path averaging 25 feet wide through Schumines.

Use of the device is limited to fairly level terrain, as obstacles such as stumps and boulders will deflect it from its course.

The rocket motor Jet, Propulsion Unit, T-1, will propel it several hundred feet, with the limit of fair accuracy about 150 feet.

Projected Line Charge
For Detonating Mines

Development has been initiated on a projected line charge which consists of a 300 foot linear charge made of a series of plastic explosive charges contained in a nylon cloth casing providing a loading of about 4 pounds of explosive per foot flaked in a palletized carrying box and projected over a mine field by means of a jet propulsion unit. The charge is detonated electrically.

The complete assembly is being designed to be mounted on and fired from trucks, armored vehicles, small landing craft or the ground.

Tests to date indicate that a linear charge of 4 pounds per foot of explosive may not be sufficient to clear a path through the blast resistant Japanese mines, such as the Type 3, "Flowerpot" land mine.

Although the final design of the charge and the propulsion unit have not yet been de-

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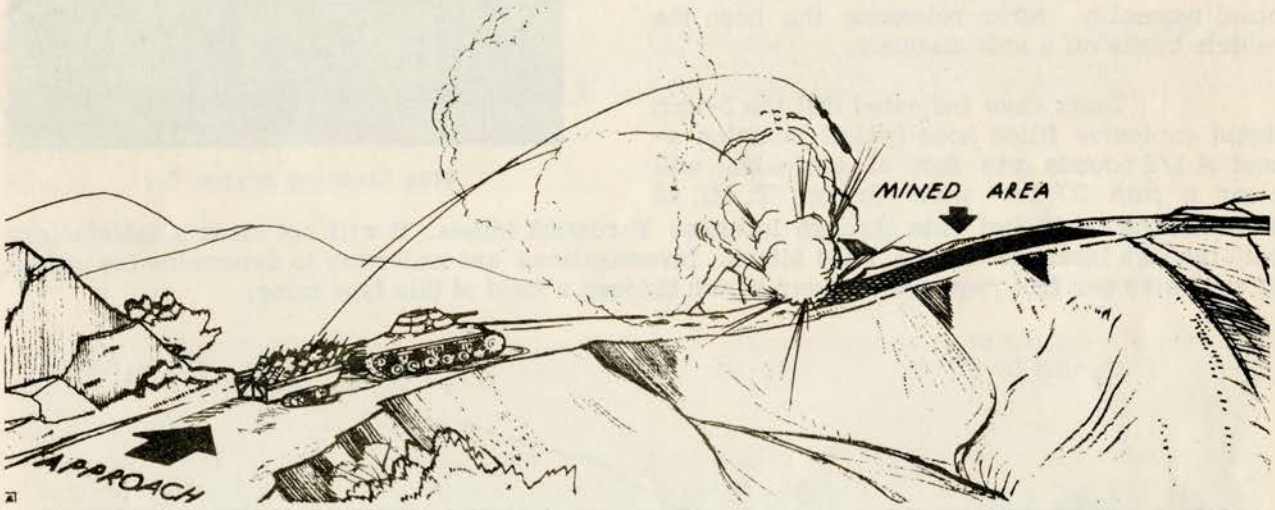
termined, preliminary tests indicate that the Projected Line Charge is the most promising mine field clearing device under development to date.

Mine Clearing Rocket, 10.75"
T-91 and Launcher T-59

Development of mine clearing methods using rockets and rocket launchers has also been initiated by the Ordnance Department at the request of the Corps of Engineers.

The 10.75" Multiple Rocket Launcher, T59; the 10.75" HE Rocket, T91; the 3.25" Rocket, T94; and the 3.25" Rocket Launcher, T80; are under development.

Tests of the pilot model of the mine clearing rocket launcher gave promising results. The device is a towed vehicle rocket-launcher loaded with 30 rockets 10.75" in diameter.



Drawing illustrates how tank, towing rocket launcher, blasts a path for itself through enemy mine field.

The firing of the rockets is individually controlled from within the towing tank. As the tank moves forward to the mine field, the rockets are fired individually, lobbing over and exploding on impact 75 feet in front of the tank. A nose extension on the fuze prevents serious cratering. A path in excess of 40 feet wide is cleared. The rockets are set off while the tank is in motion at intervals of approximately 15 feet.

A preliminary report of tests by the Engineer board concluded that "the mechanism now designated by Ordnance as Rocket HE 10.75", T91, and Launcher Rocket, Multiple, 10.75", T59, can be towed by a tank and fired in motion, and will clear a lane over 40 feet in width through fields of T. Mi. 43 Indicator mines." However, more recent tests indicate that the T91 Rocket will only detonate Japanese Type 3 Land Mines within a 16 foot radius.

The device has the disadvantage that the launcher full of rockets though protected from fragments and small arms fire, might be exploded by a direct enemy artillery hit, destroying the towing tank and any other vehicles nearby.

Ordnance Department is procuring one additional launcher for further service tests. This will be available in the near future.

The 10.75" Rocket, T91, consists of a 10.75" shell with a 4.5, T38 Rocket motor, both a point-detonating and base detonating fuze, a straight nozzle plate, and fixed fins. Two thousand rounds are under procurement for test purposes.

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Mine Clearing Dragon Projected Over Field

This device consists of a 500-foot length of 3-inch diameter neoprene-coated fibre-glass hose projected by rocket over a minefield, filled with liquid explosive and then detonated. The liquid explosive used is a desensitized nitroglycerine developed by NDRC. The explosive is contained in a metal tank installed in an armored vehicle and is forced into the hose by pressure. The hose is flaked in a box and is projected over the minefield by means of a 3.25" Rocket, T94, using a Launcher, T80. After the hose has been projected out, it is filled with liquid explosive, disconnected from the explosive container, and is detonated by a time-fuzed assembly. After releasing the hose the vehicle backs off a safe distance.



Mine Clearing Dragon T-1

Tests have indicated that the 3-inch liquid explosive filled hose (which contains about 4 1/2 pounds per foot of explosive) will clear a path 20 feet wide through T. Mi. 43 Tellermines or 16 feet wide through Japanese Yardstick Mines. It will not clear a satisfactory path through Japanese Type 3 Land Mines. Investigations are underway to determine the weight of explosive per foot required to clear a path through a field of this type mine.

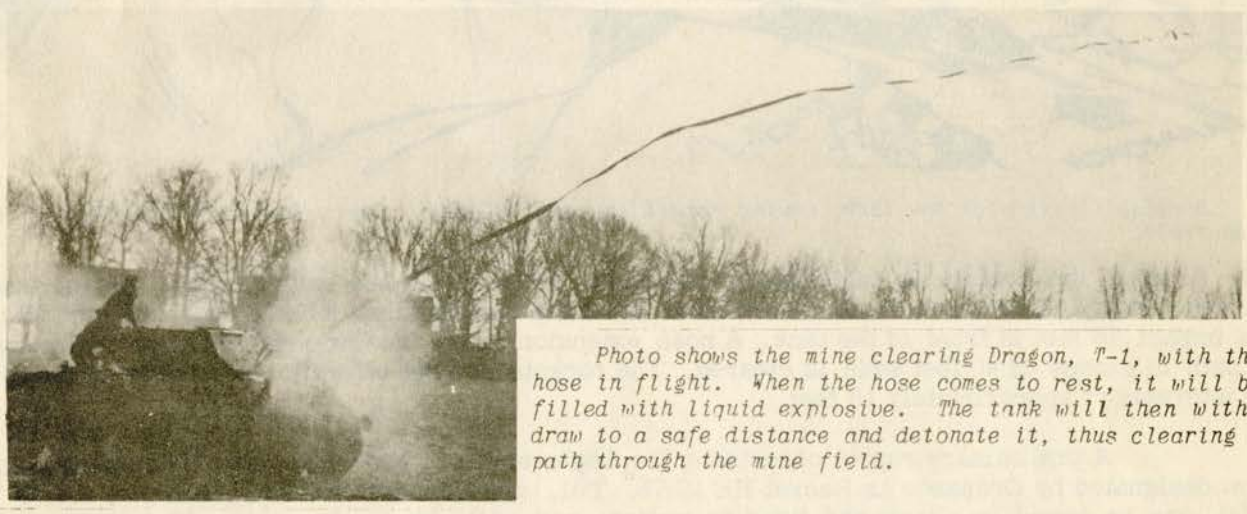


Photo shows the mine clearing Dragon, T-1, with the hose in flight. When the hose comes to rest, it will be filled with liquid explosive. The tank will then withdraw to a safe distance and detonate it, thus clearing a path through the mine field.

Snake Explosive Mine Detonator (Snake, Demolition, M-3)

A new demolition snake, the M-3, has been developed and standardized and is available in quantity to all theaters. The M-3 is constructed with aluminum plates instead of the steel plates of the previous model and is loaded with aluminum explosive cartridges giving 14 pounds per foot of explosive.

This snake, assembled, is 14" wide, 5" high, 400 feet long and weighs 8200 pounds. It is flexible enough to be dragged over uneven terrain, yet rigid enough to be pushed by a tank into position in an area to be cleared of mines or other obstacles. Its blast will clear a path 40 to 60 feet wide of T. Mi 43 German Tellermines and a path about 10 feet wide through small steel and concrete obstacles. The M-3 Snake will clear a path about 20 feet wide of Japanese

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Yardstick mines but only the crater blown can be considered clear of Japanese Type 3 (Flowerpot) Land Mines.

Primacord Rope Mine Detonator

Projection of a 13-strand primacord rope across a mine field and its detonation to clear a path thru Schumines can be accomplished by use of a field modified 105mm base ejection

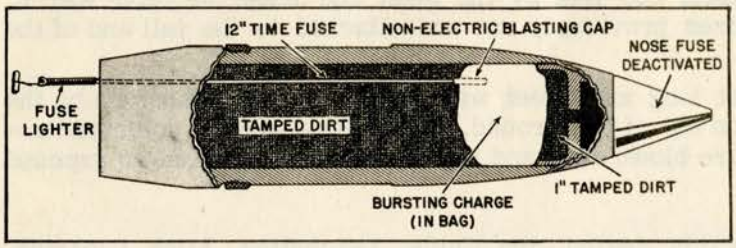


Fig. 1 -- Sectional view, prepared 105mm smoke shell



Fig. 2 -- Wrapping cable

smoke shell and 215 feet of the 13-strand primacord cable. The device is described in a recent edition of OPDIB and in C 13, FM 5-31.

The fuze is detached from the shell and is deactivated by opening the two-side vents and igniting the powder train. Base plates, smoke containers, flash tube, baffle plate and powder bag are removed from the shell and the deactivated fuze replaced. An inch of dirt is tamped



Fig. 3 — Attaching rope to shell



Fig. 4 -- Attaching rope to cable

into the powder bag cavity of the shell to seal the hole leading to the fuze. About 150 grams of powder from forty-four .30 caliber rifle cartridges is wrapped in a piece of cloth and placed in the shell on top of the tamped earth.

A non-electric blasting cap, 12" of safety fuze and fuze lighter are placed as shown in Fig. 1 as a means of later igniting the powder. Moist earth is tamped tightly around the fuze

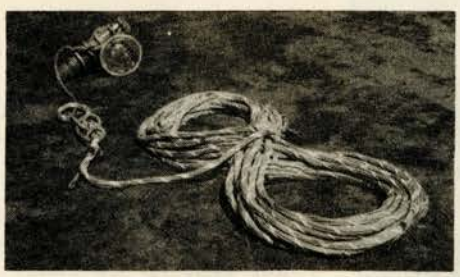


Fig. 5 -- Assembly ready for firing



Fig. 6 -- Path cleared by explosion

to fill the remaining space in the shell. (See Fig. 1). This earth should contain no stones or gravel, as it would endanger operating personnel.

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A 15-foot length of 3/4" rope is used to attach the projectile to the primacord cable as shown in Figs. 3 and 4.

The equipment is arranged for use as shown in Fig. 5 with the shell pointed in the desired direction and angled at about 30 degrees. Both fuzes are lighted and the operator takes safety at a distance of 100 feet.

The projectile is propelled about 200 feet by the blast and drags the cable with it. The cable is then detonated with time fuzes previously set and attached to the full end of the cable.

A path approximately 200 feet long and 4 feet wide is cleared of Schumines by the explosion, provided the Schumines were on top of the ground. "S" mines are not detonated unless they are directly under the cable or are blown away and trip wires are either cut or exposed by the blast.

The manufactured version of this device, the Cable, Detonating, Mine Clearing, Anti-Personnel, M-1 has been approved as a standard article and production will be initiated shortly. A technical bulletin describing it in detail is in preparation by the Engineer School.

Aerial Bombardment Of Enemy Mine Fields

Although tests have shown that a path through a mine field can be obtained by aerial bombing, a heavy concentration of bombs is required and, unless it is a beach, when the shoreline is used, the target must be plainly marked by ground troops.

Recent tests indicate dive bombing tactics may be the more practical method and is more economical in the quantity of bombs required. Tests of this method are still underway.

Spigot Mortar Device is dropped

Efforts to devise a practical method of clearing mines by use of spigot mortars has been discontinued by the Ordnance Department.

The "Galloping Ghost" Mine Exploder T1E4 and T1E6

This mine exploder consists of individually suspended cast-armor steel disks. The suspension has rubber torsion elements which transmit the weight of the surrounding framework to the ground. The entire framework is pivoted to an overhead boom by means of a ball-and-



Photo show the "Galloping Ghost" mine exploder T1E4. The disks, being pulled by the boom instead of pushed as in other types, negotiate uneven terrain and do not tend to bog down.

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socket joint so that it pivots readily for turning as well as for negotiating uneven terrain. The exploding unit is towed so that the disks are assisted out of craters by the upward component of the towing force instead of being pushed into the crater by the downward component of a pushing force as in other disk-type mine exploders. The boom structure is pivoted to the medium tank to facilitate negotiating undulating ground.

The T1E6 is the same as the T1E4 except that it clears a wider path (138 inches compared with the 115 inch path of the T1E4.). Ordnance is procuring 50 of these units.

The use by the Japanese of bombs and shells with heavy explosive loads as mines has opened this whole principle of mine clearing to further study. The limited procurement of a substantial number of this device has been initiated.

Mine Field Clearance Bomb, T-1

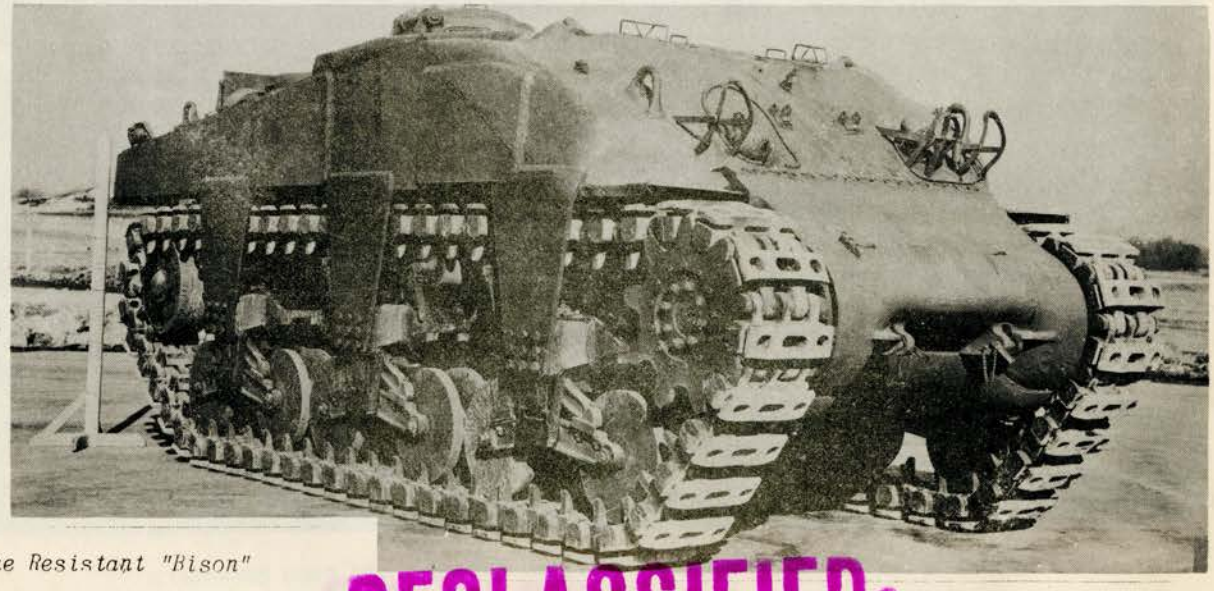
This bomb, filled with an explosive line charge, will be released by a plane over the mine field. Upon release, a parachute attached to the line charge will flake out the line charge over the mine field. Ordnance Department tests have indicated that this method of mine field clearance may be feasible.

The "Rotaflail" Mine Exploder, T3E2

The Rotaflail principle consists of using a rotating drum on which are mounted a series of flails which beat the ground as the drum rotates, very much as one beats a rug with a beater. The drum is mounted so that it is approximately one foot above the ground. In preliminary tests the device has proved more effective than other flail type exploder. Provision will be made to construct a satisfactory automatic control for the height of the rotor above the ground which will cause a minimum of interference with vision and mobility. A power take-off of minimum weight is also required to make this device satisfactory. Two pilot vehicles are to be built, based on M4 series medium tanks.

The "Bison", Mine Resistant Vehicle, T-15 Series

This project involves the development and construction of four pilot model vehicles consisting of Medium Tanks provided with special heavy mine-resistant tracks, suspension, and



Mine Resistant "Bison"

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bellies. The purpose of this project is to provide a mine-resistant vehicle for use as a prime mover for mine-exploding devices so that mines which have been missed or which are coupled to other mines especially under the tracks or bellies will not immobilize the vehicle or cause casualties among the crew.

The pilot model now under test at Aberdeen Proving Ground successfully climbed a 50-percent slope and it is believed would have climbed a 60-percent slope under conditions of better traction. Tests indicate the maximum speed is 15 m.p.h. In general, performance has exceeded that which has been anticipated. At the conclusion of tests on the vehicle proper, with the exception of mine detonation, a jettisonable boom assembly will be mounted on the vehicle and mobility tests run in conjunction with the Mine Exploder, T1E4. Only one pilot has been completed to date.

MINE DETECTION DEVICES

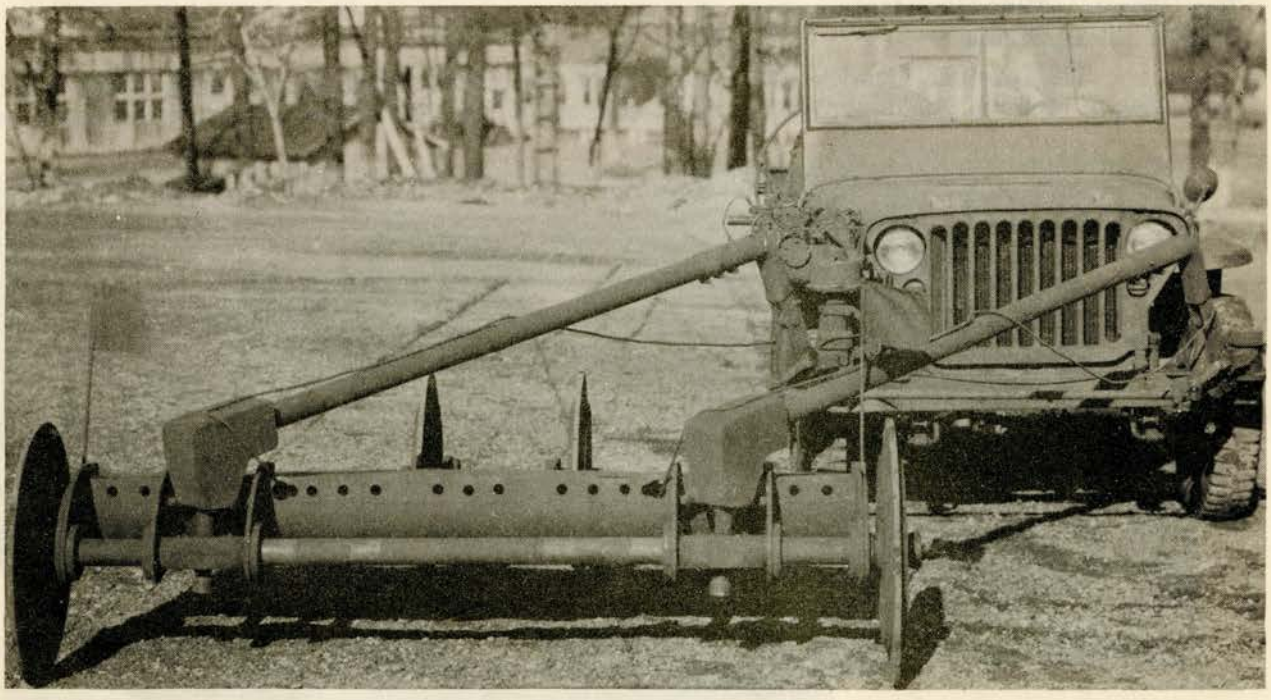
Vehicular Mine Detector AN/VRS-2

A new vehicular mounted mine detector has been developed which operates the same as the AN/VRS - 1, but can sweep directly in front or to either side of the 1/4 4 x 4 ton truck.

This unit permits the sweeping of the shoulders of roads while the vehicle rides on the road. It also permits faster sweeping of roads since, once a lane has been cleared, the vehicle can travel at a faster speed over the cleared land and sweep to the side as the automatic braking system need not be used. Ten units of this new device are now being procured for service testing.



Unit mounted in normal driving position



Jeep-mounted detector, showing position for sweeping road shoulders

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Mine Detector Set AN/PRS-3

The Corps of Engineers has developed a new mine detector to replace the SCR 625 which gives the advantages of easier operation in any position, lighter weight and greater ruggedness, water and moisture-proofing. It will thus be better suited to Pacific operations. This detector is capable of detecting a German Teller-mine at a distance of 48" in air and of detecting an "S" mine buried in a normal manner.



The AN/PRS-3 in use in the kneeling position

Electrical Parts Hermetically Sealed

The device is based on the same general principles as the SCR-625. It has hermetically sealed condensers and transformers. The amplifier chassis is shock mounted with battery compartment separated from it to avoid exposure of the electronic equipment to the air when batteries are changed. The device weighs 35 pounds, as compared to the 50 pound weight of the SCR 625.

The improved set is to replace the SCR-625 as standard issue.



The device can also be conveniently used in the prone position

Mine Detector Set SCR-625

A modification has been developed by the Corps of Engineers to permit use of the SCR-625 in standing, kneeling or prone positions. Kits for moditying the SCR 625's now in the theaters are being procured by the Signal Corps and will be available for issue in the near future.

Tank Mounted Detector Set

A new mine detector unit is under development which will consist of the same basic circuits as the AN/VRS-1 (the jeep mounted vehicular mine detector) but which will be mounted in front of a medium tank and will be armored against damage by fragments or shrapnel from anti-personnel mines and from small-arm fire. Pilot model is being procured. This device will not be ready for field testing for several months. It is described here simply to indicate the trend in development.

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Non-Metallic Mine Detector
(Detector Set, A/T Mine, Portable, AN/PRS-1)

The non-metallic mine detector described in the original bulletin has proved useful in the field. Development work to improve its characteristics is still underway but is not far enough along to determine what improvements in capabilities can be expected.

The present device is the most effective non-metallic mine detector yet developed but has serious limitations. It can detect "S" mines and Schumines only under most favorable conditions. Difficulty in holding the detector head at a constant height above ground, and operating it on rough or rutted ground, further limit its effectiveness.

The device operates on ultra-high frequency and consists of a search coil on a carrying rod, the upper end of which is wired to batteries and electronic equipment carried on a back pack. Visual and audible signals are given.

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