NO. OF BOOKS 10

1 HLT
2 ACG
3 TANSLEY
4 Schumacher
5 SOD LEECH
6 SOD MITCHEL
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GILBERT'S

CONTRIBUTIONS

WORLD WAR II

INDEX

Jang 3rd

ALFRED C. GILBERT, PRESIDENT

The A·C·Gilbert Co

MANUFACTURERS OF GILBERT TOYS
GILBERT ELECTRICAL PRODUCTS

NEW HAVEN, 6, CONN.

August 5th, 1946

War Department,
Price Adjustment Board,
Springfield Ordnance District,
Springfield, Mass.

Gentlemen:

This is the final presentation of Gilbert's contributions to World War No. 2 and covers our major accomplishments for the period from February 1st, 1945 to September 30th, 1945.

The year 1945 was the high water mark in this Company's contribution to the war effort. It marked our fourth conversion for war purposes. We were requested by the Ordnance Department to manufacture Fuze Gear Sets and Slider and Slider Plates for Fuze Bomb Nose M-103, which required an entirely different type of manufacturing than we had ever been called upon to perform previously. It included the erection of an entirely new building and installation of new and different machinery, plus a rearrangement of our original plant. This requirement resulted in our producing strategic ordnance badly needed to win the war. It also meant a complete rearrangement of our plant that was expensive and difficult to accomplish and equally different and expensive to dismantle at the time of going out of war.

Another equally important contribution was the invention, development, engineering and manufacturing of "FANG" ... a demolition outfit for the Navy.

We were particularly proud to receive the Naval Ordnance Development Award on December 10th, 1945 from Rear Admiral G. F. Hussey, Jr. of the United States Navy, Chief of the Bureau of Ordnance. This award was for distinguished service to Naval Ordnance Development.

We also contributed to the development of the Radio Proximity Fuze for Bombs, Rockets and Mortars, which leading military experts have classed together with the Atomic Bomb and Radar, as the three top secret weapons of this war

As in previous reports, there is included a description of the items produced, together with illustrations and other pertinent information. It is a great satisfaction to me that The A. C. Gilbert Company has played a tremendously important role in World War No. 2 and the awards and letters of commendation received are appreciated by the entire organization.

Cordially yours,

President

DEMOLITION OUTFIT MARK 136 MOD 0 MOD 1
DESTRUCTOR (DEMOLITION) MK 1 MOD 0 AND 1

INTRODUCTION

(This item was designated as FANG for highest of priorities)

Due to the engineering and inventive ability of The A. C. Gilbert Company and the Company's ability to produce great quantities of war materials on time for the various arms of the Armed Services, including the Air Corps, Army Engineers, Navy and Chemical Warfare, these branches were thoroughly familiar with the past records of the Company's inventive genius and the engineering development as contributed to the New Arm of Combat (Fuzes) known as Firing Devices for land and water mines.

INVENTION, DEVELOPMENT AND ENGINEERING

Lieut. Pitchard of the Navy Department Bureau of Ordnance called at The A. C. Gilbert Company seeking engineering aid and technical advice. A conference was called with the Company's engineering staff in regard to the problem which confronted the Navy Ordnance Department. The result of this conference was that at a later date The A. C. Gilbert Company had actually invented, developed and engineered and manufactured a New Arm of Combat known as the Underwater Mine Destructor which was applied against the horn type Japanese Underwater Mine and others for the purpose of clearing passage for ships and amphibious forces. These units were designed to be carried by underwater swimmers in a belt which was attached to the swimmer. This unit was then attached to the horn mine and was so designed as to detonate that mine by delayed action. Further, this unit was designed so that it could be safely used under water and was so engineered that it could be attached to the mine in a minimum of time and also the safety mechanism could become disengaged under water at will. It was also designed so that this unit could remain under water for almost any indefinite period and still could be actuated. This New Arm of Combat was to be known as FANG. This designated high priority and secrecy.

To give a general over-all picture and history during the engineering and development of this unit, we will go into the history of the Mine Destructor step by step. Early in June Lieut. Pitchard came to our plant. He was extremely interested in seeking engineering aid and other technical data. At that time one of our Senior Engineers on Firing Devices and also a model maker and development man on special fuzes were called into the conference. Lieut. Pitchard was rather reluctant to divulge the entire Navy plan, due to the secrecy of the unit, but after much hesitancy he unfolded the problem which confronted our Amphibious Forces in island landings. At that time the Lieut. did not go into all of the minor details, but asked our advice on waterproofing M-1 Delay Devices. Sketches were made by our Engineering Department and given to Lieut. Pitchard along with certain suppliers of other commodities which he had requested. In approximately three weeks we received a telephone call from a Lieut. Lietz asking us if we were interested in the manufacture of a new device. The Lieutenant was told to bring in drawings or models to the factory and that then we would be glad to go over this new item in detail. This was followed up by a visit to our plant by a Lieut. Taylor, who was turned over to our Engineering Department when it was found that the device was that which Lieut. Lietz and Lieut Pitchard had consulted with us before.

During that conference we worked out some plans and sketches and were asked at that time to submit to the Navy Department 32 units which were to be hand made as per the sketches that had been made up. These units were made up and carried by a messenger and tried out at Vero Beach. In a very few days the Company was awarded a contract of 12,000 sets.

At that time we were visted by many of the Navy's personnel, such as Lieut. Schriber and Lieut. Scherner. Lieut.Taylor was placed in our plant to help expedite materials.

Our Engineering Department, which is very familiar with time delayed action fuzes, worked out with Lieut. Taylor the mechanical solution as to the proper timing of the delayed action as requested by the Navy Department. The A. C. Gilbert Company was also instrumental in saving many weeks on the engineering and production end in using assemblies and units of another device to speed the delivery of the units as requested by the Navy.

As fast as we produced these units, all shipments were rushed to Floyd Bennett Field and were then rushed out to the Pacific by Navy Air Transport.

We prepared for the Navy the Ordnance Pamphlet of Instructions and the Time Temperature Charts which accompanied each device. Due to our previous experience in delay devices and several under water devices, we were able to advise the Navy on testing methods. Likewise, our personnel was expert on procuring materials and assembling this type of device.

TYPE OF MATERIAL

Zinc pigs or bars, die cast in our own plant on our special high pressure die casting machines. Thermo-plastic materials moulded by us on specially designed moulding machinery. Rubber sheathing purchased on the outside, but designed by us. Brass rod brought in in long lengths and fabricated on our automatic screw machines. Wire clips - steel wire bought in coils and fabricated on our wire and 4 slide machines. Pressed steel parts - sheet steel purchased in sheets, slit and fabricated in our Power Press Dept. Copper tubing purchased in lengths, cut off, fabricated and annealed in our special heat treating ovens. Many other materials were also used which are too numerous to mention.

TOLERANCES AND METHODS OF QUALITY CONTROL

Tolerances and Quality Control as requested by the Engineer Board had to be adhered to because these units were made to function 100%, meaning that 10 of these units when carried by an underwater swimmer would have to function correctly as he not only risked his own life if there was any defective workmanship or defective material, but it also would upset the plans of the entire Army and Navy on amphibious landings if everything did not go along as scheduled. So, therefore, each and every part had to be tested and gauged. Many units were taken from each day's production and if there were any failures, this entire lot had to be reinspected, and again, if there were any failures, the entire lot would have to be reworked.

NATURE OF SUBCONTRACT WORK

95% of all of the work was done at The A. C. Gilbert Company plant. The balance was subcontracted, such as primers, rubber sheathing and springs, because this plant did not have the facilities to manufacture same.

OPERATIONS

There were 103 major operations necessary to fabricate and assemble these devices. There were 35 quality control and gauging and inspection operations, plus the functional test that was necessary to insure quality levels. This plan was worked out at The A. C. Gilbert Company in collaboration with the Engineer Board. This type of manufacturing required totally different manufacturing from anything we had ever made in peace time or in the manufacturing of Flares or Firing Devices. This really started our fifth conversion for war production.

Our accomplishments were recognized by the United States Navy Bureau of Ordnance by awarding The A. C. Gilbert Company the Naval Development Award.

(Preliminary)

DEMOLITION OUTFIT MARK 136 MODS 0 AND 1

A BUREAU OF ORDNANCE PUBLICATION

28 JULY 1945

(Preliminary)

DEMOLITION OUTFIT MARK 136 MODS 0 AND 1

28 JULY 1945

NAVY DEPARTMENT

BUREAU OF ORDNANCE

WASHINGTON 25, D. C.

28 July 1945

RESTRICTED

ORDNANCE PAMPHLET 1579 (PRELIMINARY)

DEMOLITION OUTFIT MARK 136 MODS 0 AND 1

1. Ordnance Pamphlet 1579 (Preliminary) contains a description of, and instructions for the use of Demolition Outfit Mark 136 Mods 0 and 1.

2. Because of the urgent need for this information, it has been issued in preliminary form. This pamphlet will be revised and issued in final, complete form as soon as practicable.

3. This pamphlet does not supersede any existing publication.

4. This publication is RESTRICTED and shall be safeguarded in accordance with the security provisions of U. S. Navy Regulations, 1920, Article 76.

G. F. HUSSEY, JR.
Rear Admiral, U. S. Navy
Chief of the Bureau of Ordnance

J. H. CARTER
Acting

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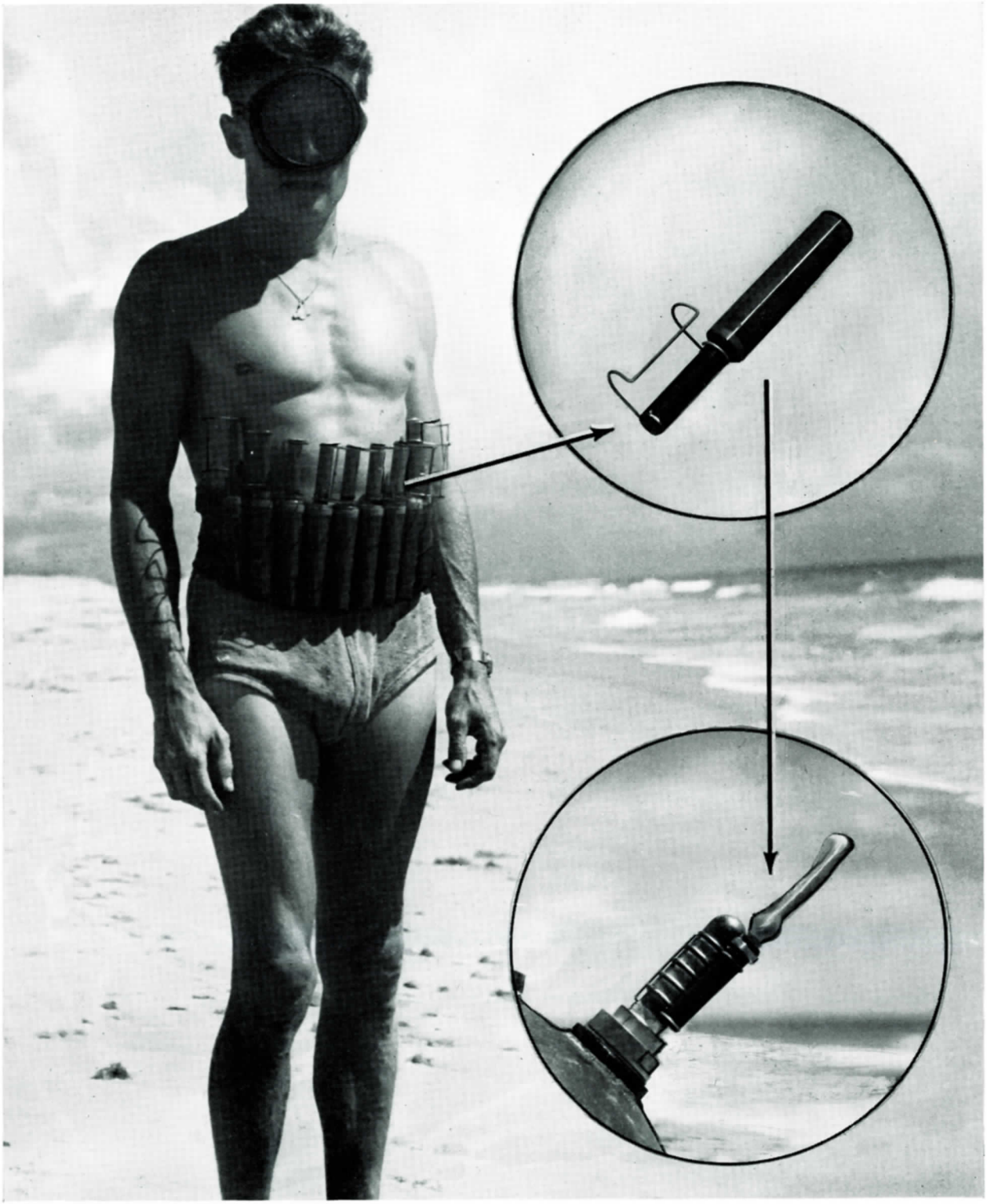

Figure 1. — Demolition outfit worn by swimmer . . . Destructor (Demolition) Mk 1 Mod 0 or Mod 1 . . . destructor placed on horn of anti-boat mine.

Chapter 1

INTRODUCTION

Demolition Outfits Mk 136 Mod O and Mod 1 are small, light weight belts, each loaded with Destructors (Demolition) Mk 1 Mod 0 or Mod 1. The Mod designation of the outfit is determined by the Mod of the destructor carried therein. A belt and ten Destructors (Demolition) Mk 1 Mod 0, having a two to seven hour firing delay in water at 70° Fahrenheit, make up Demolition Outfit Mk 136 Mod 0. A belt and ten Destructors (Demolition) Mk 1 Mod 1, having a ½ to 2½ hour delay in water at 70° Fahrenheit, make up one Demolition Outfit Mk 136 Mod 1. For convenience of description, this publication will refer only to Destructor (Demolition) Mk 1 Mod 0, excepting in cases where description of particulars differs.

Primarily, the outfit serves as a carrier for the destructors. The purpose of the destructor is to provide a means for activating Japanese chemical horn type mines (JE and JG) after a time delay. Placement of the weapon is by hand, Fig. 1.

The outfit (loaded) is quickly strapped to the user by elastic straps and adjustable buckles. The adjustable feature of the buckles permits adjustment for any waist measurement.

The destructor provides a waterproof means of detonating a blasting cap and effecting consequently the activation of the chemical horn type Japanese anti-boat mine. The destructor can be easily and quickly attached to the horn of the mine, and the time delay incorporated therein results in detonation after a period of time depending upon the modification of the outfit or destructor selected.

The destructor is designed to hold and fire an engineer's special blasting cap encased in a muffling device. The muffling device in turn is fitted with a means of clipping the entire destructor to the horn of the JG or JE type mine. Resultant activation of the blasting cap crushes the horn of the mine . . . explodes the mine through chemical action of its (the mine's) horn.

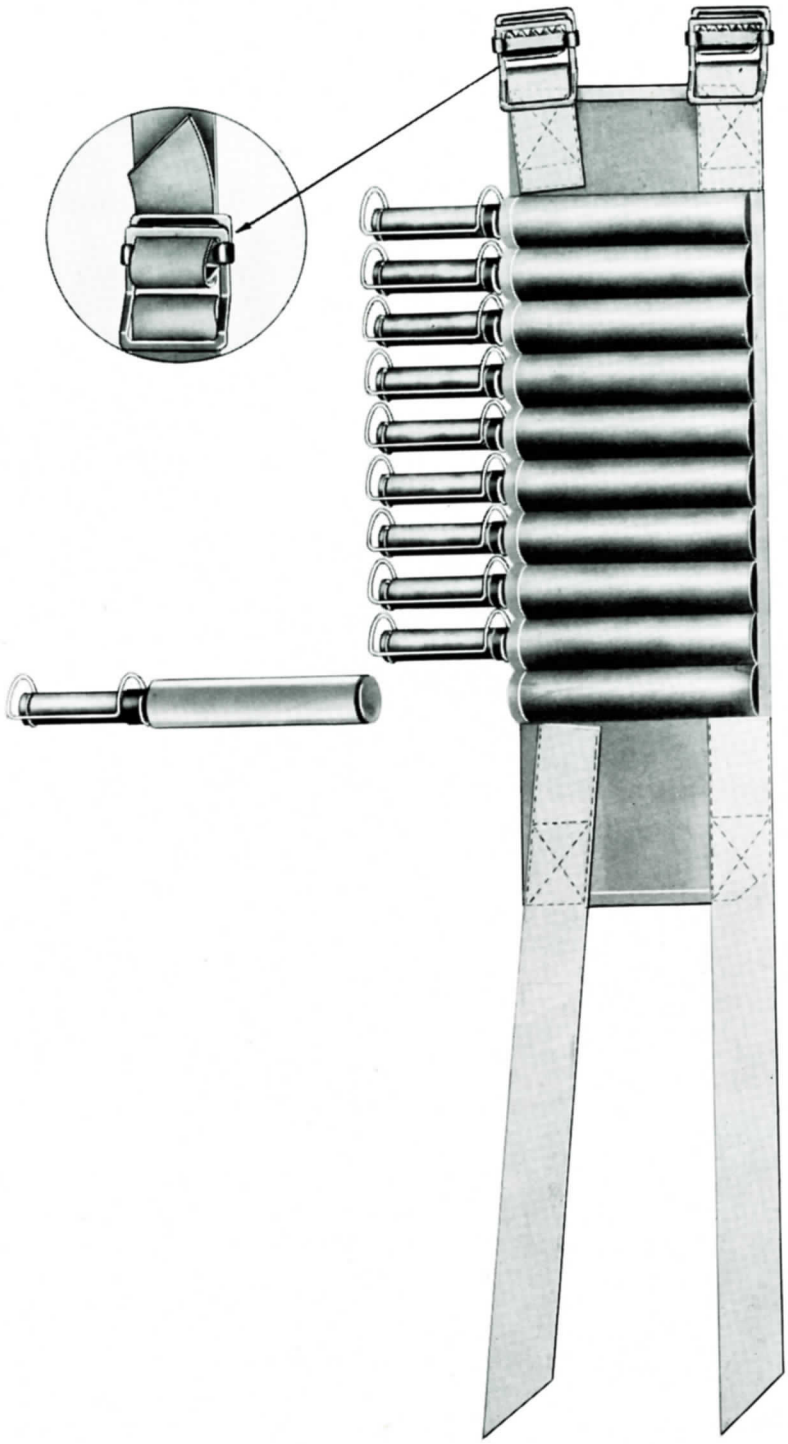

Figure 2. — Demolition outfit showing placement of destructors (ten) in the belt.

Chapter 2

DESCRIPTION

General

The outfit is built around the destructor as its chief component, Fig. 2. The main objective of the outfit is to provide a portable, light weight, source of destructors for the activation of Japanese type JE and JG anti-boat mines.

Accordingly, the intent of this chapter on Description will be to describe briefly the components of the outfit from a functional standpoint. More important, however, will be the description of the destructor . . . in rather minute detail. The importance of such description is evident from the fact that the destructor is the heart of the outfit . . . the reason for its existence.

Primarily, the outfit (and destructor) have been designed to serve the needs of beach reconnaissance parties (UDT) for the clearance of anti-boat mines. Operating as the parties do, the outfit, weighing approximately three pounds, provides a source of ten destructors in a belt easily strapped to the swimmer's body. The belt is of such design that the destructors are readily accessible . . . and after having served its purpose, the belt is easily jettisoned, freeing the swimmer of his burden.

The sequence of events initiated by the arming and firing of the destructor results in the crushing (but not rupturing) of the chemical horn of the mine by the explosive force of the blasting cap. The horn is not completely destroyed . . . the blast of the cap being only sufficient to dent the horn, break the glass ampoule, energize a battery, and explode the mine.

Description will include the following: Belt, including pockets and straps; firing device assembly, including firing pin, corrosive acid, positive safety pin, and modified coupling base; rubber sheath and seals; plastic transportation tube; cap protector and clip; Mod identification; and shipping information.

Belt

In general, the belt is a nylon band approximately two feet long and six inches wide, Fig. 2. Stitched to two-thirds of its length are ten folds of sufficient breadth and material to provide snug pockets for the destructors.

Each of the folds is provided with an elastic "tuck" at its top "open-end" so as to secure the destructor positively in place. The latter is a safeguard against loss of the destructor during the swimming operation.

Sewn into the upper edge of the belt is a cotton duck "stiffener". This serves as a means of preventing sag in the belt when worn by the operator in water.

The belt is equipped with two elastic straps and two buckles of the commercial type, Fig. 2. These buckles provide positive attachment of the belt to the body and similarly provide "quick release" of the unit when the outfit has served its purpose.

One buckle is attached to each of two short lengths of elastic strap sewn to the belt. The buckle is adjustable along the entire length of the

elastic strap to allow for a wide range of waist measurements. Since usage prescribes that the belt fit snugly around the middle of the operator (like a girdle), adjustment for size is made by varying the position of the buckle on the elastic strap.

Firing Device Assembly

Essentially, the firing device assembly, Fig. 3, consists of a spring loaded plunger (firing pin) poised above a cup primer loaded in a modified coupling base. Upon release of the firing pin, the cup primer is fired and the flame spit detonates a standard type non-electric blasting cap.

Spring loading of the firing pin is counteracted by means of a restraining wire . . . and release of the pin (firing of the unit and the delay incorporated therein) is accomplished by destroying the restraining wire through the corrosive action of an acid. The delay thus attained is a minimum of 2 hours for the Mod 0 and ½ hour for the Mod 1 (See Table, Page 15).

The components of the device, the water sealing methods and devices, the safety pin, etc., are described below in the order of their function.

BODY: The firing components of the assembly are housed in a two-section tube known as the body, approximately 4¼ inches long. The upper half of the body is of soft seamless copper tubing, wall thickness, 0.005 inches. The lower half of the body is of seamless brass tubing, wall thickness 0.016 inches.

The two units comprising the body are swaged together around an outer tube plug. The latter is a copper plated brass plug machined to receive the two parts of the body, drilled and countersunk to allow passage of the restraining wire and seating of the acid ampoule, and bearing surface for the compression spring. Reinforcing of the joint is accomplished by a brass sleeve, Fig. 3. Sealing of the joint is accomplished by filling a transverse hole in the plug with a plastic sealing compound.

The upper half of the body provides a housing for the glass ampoule of corrosive acid. Fabricated as it is of copper tubing (soft), actuation of the device can be accomplished by crushing this half of the body and consequently crushing the ampoule of acid . . . for the copper tubing is soft and can be collapsed with a minimum pressure of approximately 15 pounds.

The lower half of the body provides a rigid housing for the firing plunger and spring assembly, Fig. 3. Also, the lower body provides means of inserting the safety pin between the plunger and the cup primer in the coupling base.

AMPOULE, SPRING, AND PLUNGER: The glass ampoule of corrosive acid is contained in the upper half of the body. Small wads of absorbent cotton protect the ends of the ampoule and the design of the brass connecting plug is such that the ampoule seats itself snugly thereon, Fig. 3.

The compression spring is fabricated from No. 18 (0.040) wire and has a free length of approximately 1⅜ inches. It compresses to approximately

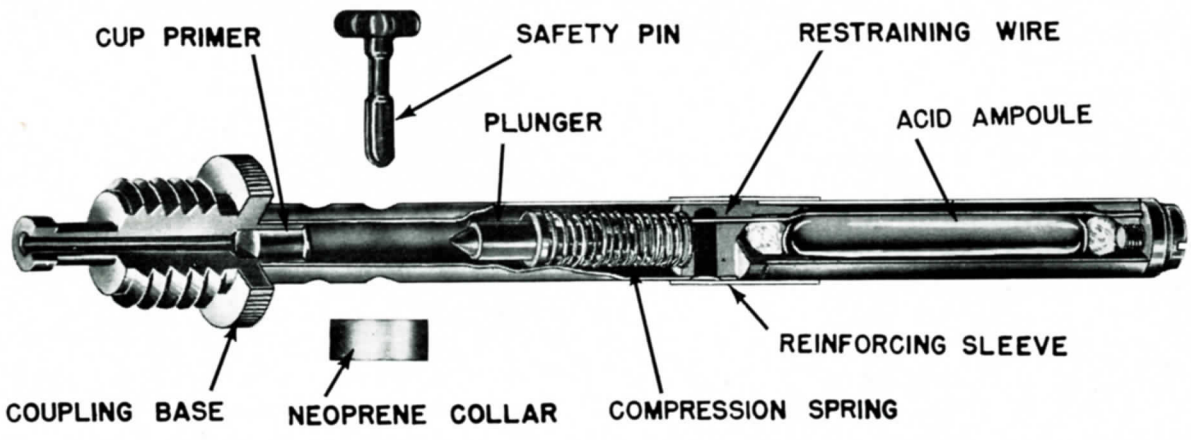

Figure 3. — Quarter section view of firing device.

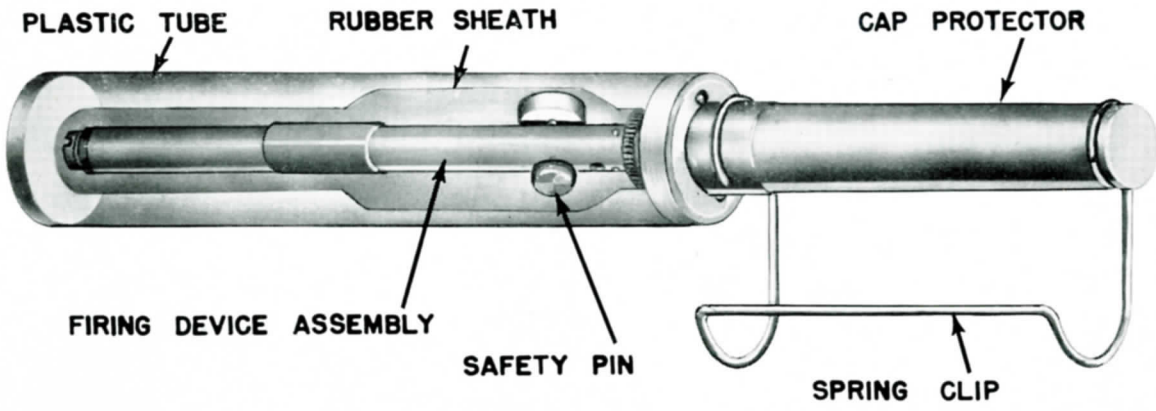

Figure 4. — Phantom view showing firing device assembly in transportation tube.

7/8 inch under a pressure of from 14 to 16 pounds. Compression of the spring is accomplished by means of a plunger and a restraining wire, Fig. 3.

The plunger (firing pin) is of brass, approximately 3/4 inch long, machined at one end to form a striker ball having a radius of 0.040 inch. The other end of the plunger is beveled, shaped and drilled to receive the restraining wire required to hold the plunger cocked (the compression spring compressed), Fig. 3.

RESTRAINING WIRE: Assembly of the unit in itself provides the working arrangement of the firing device. To this end, the restraining wire provides the connecting link between the body of the unit, the ampoule of corrosive acid, and the cup primer in the coupling base.

The restraining wire is a seven inch length of music wire (0.014 inch diameter) fastened to one end of the plunger. The wire is passed between the coils of the compression spring and enters the upper body of the unit (through an access hole in the outer tube plug) where it passes along the side of the glass ampoule before it leaves the body of the unit through the end plug. It is secured in place by a lead washer and the head of a screw.

Positioned as the ampoule and restraining wire are in the upper body of the device, corrosive action is self-evident. In operation, the ampoule of acid is crushed and chemical action begins the firing process.

SAFETY PIN: The safety pin is of the positive type, fabricated of brass, and fits transversely through the lower body of the unit between the cocked plunger and the cup primer of the coupling base, Fig. 3. The pin is secured positively in place by means of a small, circular, neoprene collar (5/8 inch diameter).

Positiveness of action is provided in the machining of the safety pin. Eleven sixteenths of an inch long, the pin is cylindrical in shape with a button head at one end for a finger grip . . . a grooved or recessed center . . . and a smooth, rounded nose at the other end for assembly with the neoprene locking collar.

Should accidental firing occur, the plunger would lodge in the recess of the pin. This design is intended to prevent removal of the safety pin by hand in the event that the restraining wire had parted.

COUPLING BASE: The coupling base used in the destructor is much the same as that issued for standard service, modified for attachment of a rubber gasket and adapter for securing the plastic transportation tube. A standard type cup primer is pressed and sealed into one end . . . and the other end is machined to allow for attachment of a standard non-electric blasting cap, Fig. 3.

The tube containing the ampoule, plunger and compression spring, and safety pin is pressed onto the cup primer end of the coupling base and secured in place by staking. The unit as assembled, is waterproofed by means of a continuous rubber sheath. The latter is described below in more detail, Fig. 4.

ADAPTER, SHEATH, AND PLASTIC TUBE: Waterproofing and protection during transportation are the main features provided by the adapter, sheath and plastic tube, Fig. 4. Each in turn is dependent upon the other for proper operation of the unit.

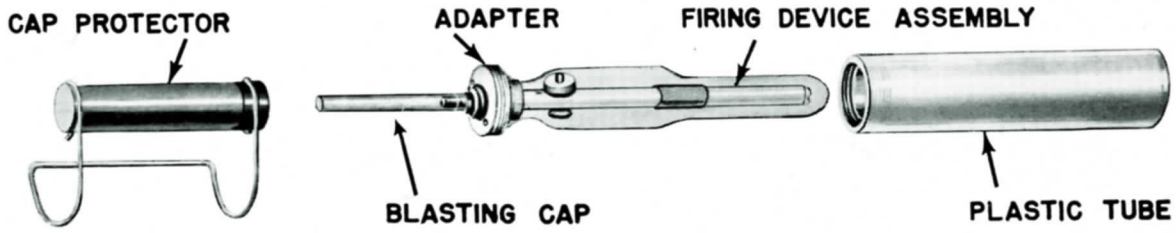

Figure 5. — Exploded view of firing device assembly staked to the coupling base, cap protector, and plastic transportation tube.

The adapter is a brass collar machined to thread onto the coupling base over the snout or blasting cap extension. The external threads of the adapter receive the plastic transportation tube.

Assembly of the adapter to the coupling base is accomplished with a rubber gasket. This seals the assembly at one end, for the gasket is forced snugly against the underside of the coupling base shoulder by means of the adapter.

A rubber sheath, Fig. 5, moulded to fit (with a minimum clearance) over the body of the unit, extends down and over the shoulder of the coupling base. The sheath is designed with a bulge at its lower end to provide easy removal or positioning of the safety pin.

The sheath seats around the rubber gasket assembled with the adapter. Further waterproofing is obtained by cementing the sheath to the gasket with a plastic type sealing compound. Thus, the combination of the gasket and the rubber sheath provides for complete waterproofing of the unit.

The plastic tube, Fig. 5, provided to protect the unit during transportation has already been mentioned. Other than that the tube is of light weight, fabricated to enclose the unit by threading **(left hand threads)** onto the adapter and thus protect the unit, no further description is necessary.

BLASTING CAP: The blasting cap, Fig. 6, used with the device is the engineer's special non-electric blasting cap, and is crimped in place over the snout of the coupling base. A water tight joint is assured through the use of a small sleeve fitted over the snout of the coupling base extension. Crimping of the cap should be by means of a cut-throat type crimper.

CAP PROTECTOR: The cap protector, (three inches long) is a plastic case that houses the blasting cap. It serves as a means of muffling the blast of the cap as well as a physical protector.

A 5/16 inch diameter flat bottomed hole is drilled from one end of the cap to form a recess for the blasting cap. The open end of the cap is threaded to fit the 9/16-12 threads of the coupling base. Thus the cap protector fits over the blasting cap and threads onto the coupling base to complete the assembly, Figs. 6 and 8.

A reinforcing ferrule of sheet metal is pressed over the open end of the cap protector. This provides added strength to the threaded end of the protector to prevent cracking and splitting during successive operations of assembly of the unit.

In order that the end-point of the destructor be successfully attained, the blast produced by the cap must be of only sufficient force to dent or crush the horn. The protector sufficiently controls the blast of the cap to give the proper crushing action required, Fig. 7.

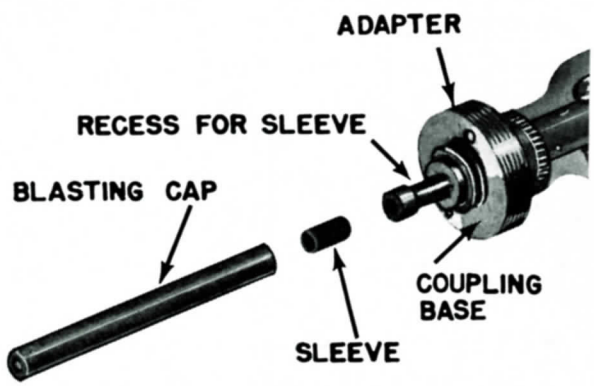

Figure 6. — Exploded view showing coupling base, sleeve, and blasting cap.

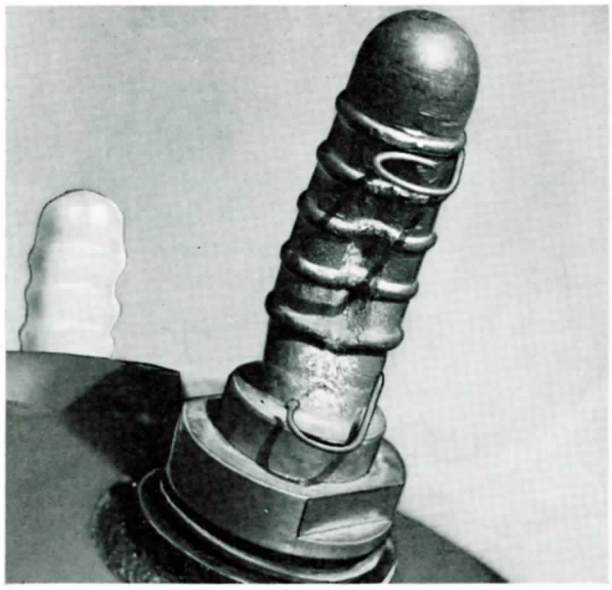

Figure 7. — Proper crushing of the mine horn . . . the horn has not been destroyed or ruptured.

SPRING CLIP: The primary function of the spring clip, Fig. 8, is to secure the destructor to the horn of the mine. Its design is such that the clip (and destructor) can easily be clipped to, and positioned on the horn of the mine.

The clip consists of a length of 18 gage, spring steel wire formed into a yoke 2¾ inches long, Fig. 8. Each end of the clip is formed into a loop and fitted over the ends of the cap protector. In order to positively locate the spring clip onto the cap protector, one end of the protector is grooved to receive the smaller of the two loops of the clip.

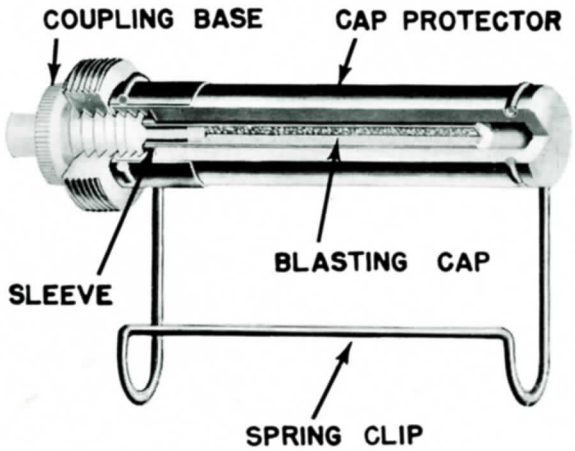

Figure 8. — Cap protector and spring clip for attaching destructor to the mine horn.

Mod Identification

Means of identification have been incorporated in the design of the destructor to assist personnel in choosing the time delay desired. In the case of the Demolition Outfit Mk 136 Mod 1, Destructor (Demolition) Mk 1 Mod 1 is supplied. Identification is as follows:

1. The rubber sheath enclosing the delay firing device assembly is white.
2. The closed end of the plastic transportation tube is dipped in white paint.
3. The closed end of the plastic transportation tube has a raised flat 1/16 inch high, ¼ inch wide and ⅞ inch long, Fig. 9.

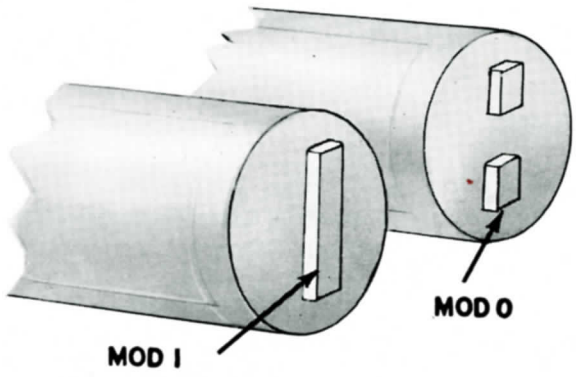

Figure 9. — Raised flats to distinguish Mods of destructor.

Identification of the Destructor (Demolition) Mk 1 Mod 0 is by means of similar aids. These are:

1. The rubber sheath encasing the delay firing device assembly is green.
2. The end of the plastic transportation tube is dipped in green paint.
3. The closed end of the plastic transportation tube has two ¼ inch square raised flats, each 1/16 inch high, Fig. 9.
4. In addition, the cap protector has a groove turned around the circumference of the cap near its lower end.

Shipping Information

The parts comprising Demolition Outfit Mk 136 Mod 0 will be shipped in one box, packaged

in accordance with the latest specifications applicable to overseas packaging. However, the destructors and the belts will be separately packaged therein. One spanner wrench required for the assembly of the unit will be packaged with each belt. The blasting caps necessary to the final assembly will not be shipped as part of the unit.

One hundred destructors will be packed in an "all flaps meeting" style fiberboard box, sealed for overseas shipment. The destructors, as mentioned above will be fully assembled, excepting the blasting cap. One of the following legends, as appropriate, will be stencilled on the outside of the container: "Contains 100 Destructors (Demolition) Mk 1 Mod 0", or "Contains 100 Destructors (Demolition) Mk 1 Mod 1".

Ten belt assemblies, and ten spanner wrenches for assembly of the destructors will be packed in a separate container. These will similarly be packaged in an "all flaps meeting" fiberboard box, sealed for overseas shipment. The outside of the box will carry one of the legends: "Contains 10 Belts for Demolition Outfit Mk 136 Mod 0", or "Contains 10 Belts for Demolition Outfit Mk 1 Mod 1".

As stated above, the two containers comprising the components of the outfit will be packed in one wood box nailed and sealed with an interliner (waterproof) for overseas shipment. One of the following legends, as appropriate, will appear on the outside of each box: "Contains 10 Demolition Outfits Mk 136 Mod 0", or "Contains 10 Demolition Outfits Mk 136 Mod 1".

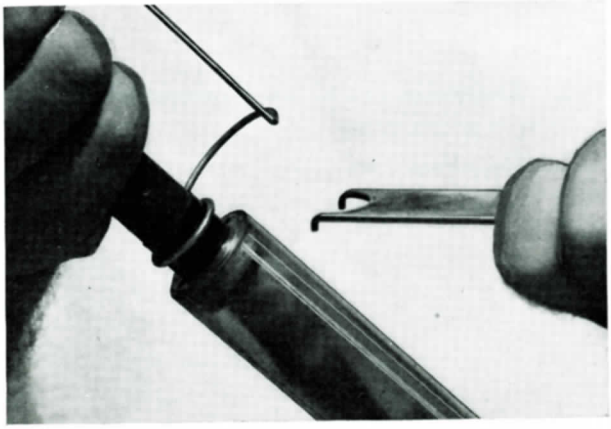

Figure 10. — . . . using spanner wrench to remove cap protector.

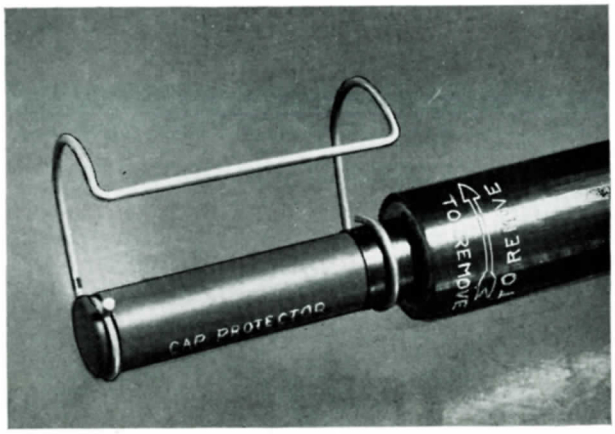

Figure 11. — Remove the plastic tube . . . this is a left hand thread (see arrow).

Chapter 3

OPERATION

General

Operation of the weapon, as described in this chapter, will deal primarily with the usage of the destructor. However, in order to introduce the steps necessary to operation, repetition of the theory involved is desirable.

Basically, the delay firing device incorporated in the destructor is an adaptation of the U. S. Army Delay Firing Device M-1. The intent of the device is to fire a blasting cap after a time delay of from two to seven hours. Thus, the result is attained by the release of a plunger (firing pin) to actuate or fire a cup primer . . . which in turn detonates a blasting cap. Release of the plunger is accomplished by crushing an ampoule of corrosive acid . . . destroying or weakening the restraining wire holding the plunger cocked.

In order that the end-point of the destructor be successfully reached . . . detonation of the mine through the chemical action of its horn . . . the blast produced by the cap must be of only sufficient force to dent or crush the horn. A horn that is completely destroyed or one that is severely ruptured would not result in detonation of the mine.

Preparation For Usage

The outfit (and destructors) are shipped to the field in one box, separately packed therein (see Description—Shipping Information). Preliminary preparations necessary to ready the equipment for operational usage is necessary. The latter will take the form of crimping a blasting cap to the coupling base, inspecting the equipment for defects or accidental activation, reassembly of the destructor, and loading into the belt of the outfit. In order that the steps involved result in ultimate operational efficiency, it is suggested the procedure outlined below be followed:

1. Unpack the destructors and belts from the shipping containers.
2. Remove the cap protector using the spanner wrench provided, Fig. 10.
3. Remove the plastic transportation tube. Be careful not to allow the rubber sheath to become twisted during this operation, Fig. 11.
4. Inspect the rubber sheath . . . if the rubber sheath has been ruptured or if it appears defective, discard the device as having been activated or partially activated, Fig. 12.
5. Remove the neoprene collar from the safety pin . . . do not attempt to remove the safety pin in this step . . . do so without rupturing the rubber sheath.

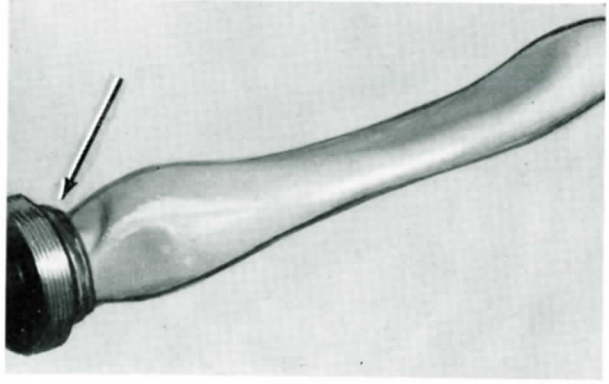

Figure 12. — . . . inspect the rubber sheath (see arrow) . . . discard the destructor if the sheath is ruptured.

6. Remove the safety pin . . . should a great deal of effort be required in attempting to remove the pin, assume that the device has accidentally fired and discard the device.

7. Replace the safety pin and neoprene collar. Make sure that the safety pin is fully inserted and that the collar is positively attached . . . be careful not to rupture the rubber sheath.

8. Grasp the coupling base in one hand and the tube body with the other hand. Gently strain the assembly to make sure that it is firmly staked. A loose device will be of no value and should be discarded.

9. Replace the plastic transportation tube. **This is a left hand thread** (finger tight fit).

10. By inspection, insure that the sleeve is in place in the recess on the snout of the coupling base, Fig. 13.

11. Crimp a non-electric blasting cap over the sleeve and snout making a water tight joint. Be sure to use a crimping tool of the style that results in a cut-throat type crimp around the circumference of the cap, Fig. 13.

12. Replace the cap protector . . . use the spanner wrench provided . . . make this a tight joint.

13. Load ten destructors into each belt. Insert the transportation tube first . . . and make sure that the destructors are fully seated in the pockets and that the elastic edging (or tuck) snaps over the top of the transportation tube.

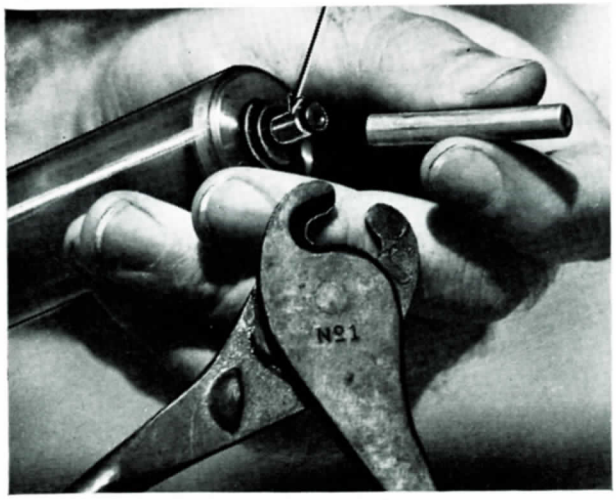

Figure 13. — . . . crimp the non-electric blasting cap in place . . . use a sleeve (arrow) . . . use a "cut-throat" type crimping tool.

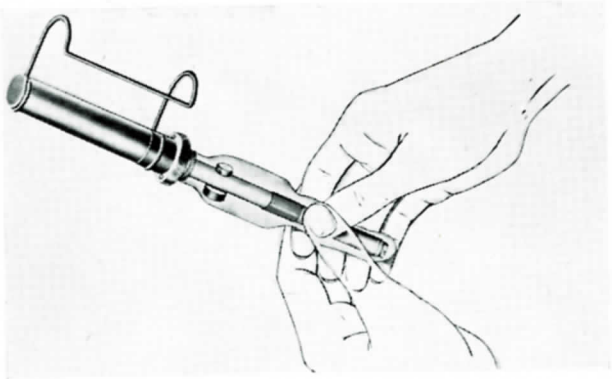

Figure 14. — . . . squeeze the tube with the thumb and fingers of both hands to crush the ampoule.

The outfit is now fully prepared and ready for use. No further attention before placement is necessary.

The belt is fastened about the middle of the operator simulating a girdle. Adjustment for size of operator can be made by varying the position of the buckles and elastic straps. The belt should fit snugly around the waist, destructors to the front for accessibility by the operator.

Placement

Placement of the destructor on the horn of the mine is accomplished by hand. Since the spring clip is of positive design, no adjustment after placement is necessary. As long as the clip is attached around the horn, the cap protector and therefore the cap, will be in proper position for actuation of the mine when the device explodes.

In order that the device functions satisfactorily, it is desirable to mention at this point that sequence of steps as outlined below is important. Thus it is suggested that the device be actuated and the safety pin removed before the destructor is positioned. If such procedure is followed, defective devices can be discovered and discarded and danger to operating personnel avoided. The steps in placement and actuation of the destructor are as follows:

1. Remove one destructor from the belt.
2. Remove the plastic transportation tube . . . **this is a left hand thread** . . . discard the tube.
3. Crush the upper body of the tube between the thumb and fingers of both hands, Fig. 14.

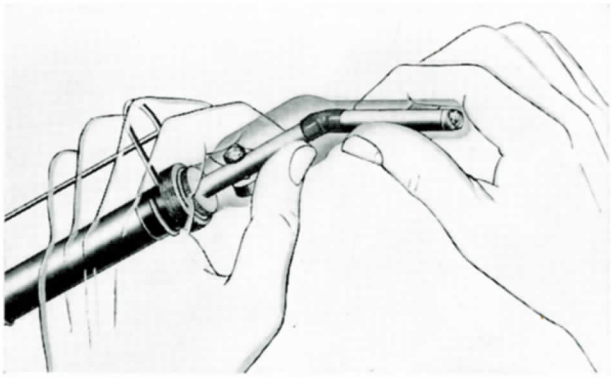

Figure 15 — . . . do not bend the device by grasping in both hands.

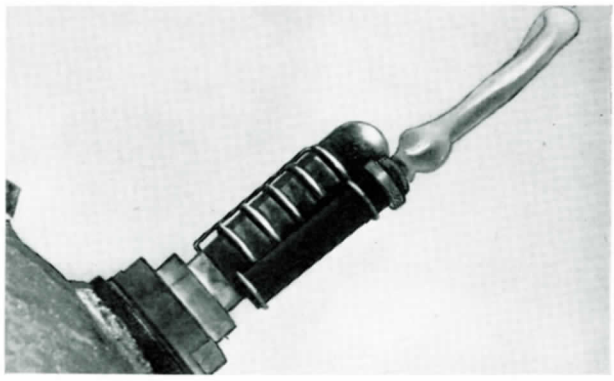

Figure 16. — . . . snap the spring clip around the horn of the mine.

Note: Do not grasp the device in both hands and attempt to crush the copper tube by leverage, Fig. 15. Bending of the device will result in the rupturing of the two tubes comprising the body of the device and failure to fire will result. Crush the ampoule using the thumbs and fingers of both hands . . . use a squeezing action . . . squeeze until the sides of the copper tube meet, Fig. 14.

4. Remove the neoprene collar and safety pin . . . make sure that the pin is completely removed from the lower tube.

Note: A good practice to assure removal of the pin is to permit the pin to drop, within the sheath, to the shoulder of the coupling base. If this practice is followed, the operator can be sure that the pin has been removed completely. If an attempt at removal of the safety pin requires considerable effort, assume that the device has been activated . . . discard it. Again, be careful not to rupture the rubber sheath when removing the safety pin.

5. Snap the spring clip of the cap protector around the horn of the mine so that the device proper is up, Fig. 16.

No further attention to the device is required. Within the limits of the time delay (½ to 2½ hours for the Mod 1 device and two to seven hours for the Mod 0 device) the device will fire.

TEMPERATURE CORRECTION CHART
Destructor (Demolition) Mark I Mods 0 and 1
*Delay Time in Hours

	MOD 0 GREEN			MOD 1 WHITE		
TEMP. °F	PROBABLE MINIMUM	NOMINAL	PROBABLE MAXIMUM	PROBABLE MINIMUM	NOMINAL	PROBABLE MAXIMUM
80°	1½	3	4½	¼	1	1¾
70°	2	4¼	6¾	½	1½	2½
60°	2¾	5¾	9	¾	1¾	3¼
50°	4	8	12¼	1	2¾	4½

* On the basis of currently known data, not more than 1 out of 100 destructors will fall outside of the above limits for the temperatures shown.

Chapter 4

PRECAUTIONS

Handling And Stowage

Demolition Outfit Mark 136 Mod 0 and Mod 1, and its main component, Destructor (Demolition) Mk 1 Mod 0, or Mod 1 (whichever applies), must be handled in accordance with existing regulations for the handling and stowage of ammunition as promulgated in Ordnance Pamphlets 4 and 5. Particular attention is invited to the section therein where specific mention is made of the handling and stowage of cup primers. Destructors incorporating cup primers should be handled in accordance with regulations governing live explosives and should be stowed in ready boxes or magazines both afloat and ashore.

Safety Precautions

1. Never store the outfit or the destructor with high explosives or in magazines containing explosives of any kind.

2. Exposed lights or flames are not to be allowed in the vicinity of the outfit or destructor, or where the outfit or destructor are stored.

3. Never throw or drop the outfit or the destructor. Thoroughly inspect each destructor of an outfit that has been dropped.

4. Never use any tool other than a crimping tool when crimping the blasting cap to the destructor.

5. Never force a blasting cap onto the snout of the coupling base.

6. Never store the outfit or the destructor near radio equipment or antennas.

7. Always keep blasting caps in HE magazines or ready boxes according to the regulations promulgated in Ordnance Pamphlets 4 and 5.

8. Never attempt to remove or investigate the contents of a blasting cap.

9. In the event of a misfire, wait until the maximum delay time has expired (See Table on Page 15), before approaching and disposing of the destructor. Never disassemble a misfired destructor.

10. Never attempt to crush the acid ampoule of the destructor with safety pin removed.

11. Never try to remove the safety pin of a destructor by excessive force . . . assume that the destructor has been activated and dispose of the destructor in deep water.

12. Never attempt to disassemble a blasting cap from a destructor.

Operating Precautions

1. Never leave the destructor lying around in wet or damp places.

2. Always use a cut-throat type cap crimper when attaching the blasting cap to the coupling base. Always use a sleeve in crimping the cap in place to assure a waterproof joint.

3. Never remove the rubber sheath from the destructor.

4. Never bend the firing device at the middle as this will permit the acid to leak out of its container . . . cause the device to malfunction.

5. Never attempt to disassemble the firing device assembly of the destructor.

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NAVY DEPARTMENT

Washington, D.C.

DEMOLITION OUTFIT
MARK 136 MODS 0 and 1

Consisting of 10 Demolition Mine Destructors and Belt

Order No. Contract No.	Quantity Ordered	Quantity Shipped	Total Cancelled	Date Cancelled	Date of Last Shipment
N-60911S024P	32	32			
NOrd-9400-7/20/45					
Mark 1, Mod. 0 (Green)	6000 Sets	1200 Sets	4800 Sets	9/17/45	9/21/45
Mark 1, Mod 1 (White)	6000 Sets	2500 Sets	3500 Sets	9/17/45	9/21/45

NAVY DEPARTMENT

Washington, D. C.

DEMOLITION FIRING DEVICE

MARK 6

Contract No.	Quantity Ordered	Quantity Shipped
NOrd-6239	20,000	20,000

7 7

NAVY DEPARTMENT

Washington, D. C.

COUPLING BASES

Order or Contract No.	Quantity Ordered	Quantity Shipped
36S-(103955)	1000	1000
NSo-6510-P	2700	2700
NSo-9814 P	2500	2500
NOrd-9582	53,000	52,850

THE A. C. GILBERT COMPANY'S

4th CONVERSION

FOR WAR PURPOSES

We were requested by the Ordnance Department to produce M103A1 Fuze Gear Sets and Slider and Slider Plates for Fuze, Bomb Nose, which resulted in our being obliged to make a fourth conversion consisting of the building and installing of machinery in a new wing built for that purpose and added to our plant, plus a readjustment of our old plant.

This required changes, not alone to produce strategic items badly needed to win the War, but left its mark in that our plant had been so disarranged that it was expensive and difficult to rearrange the plant back to peacetime production.

9

M103 A1 FUZE GEAR SETS

INTRODUCTION

This train of gears was made up of internal gear, clearance disc, main disc, eccentric gear and external gear, and was used in the M103 Fuze. A propeller drove this set of gears after the bomb had been dropped from the bomb bay. This armed the bomb after it had been dropped and then the propeller made the necessary amount of revolutions. This was so designed that the fuze of the bomb could not be armed until the bomb was far enough away from the plane or at any distance as set by the person who set the fuze for arming.

INVENTION, DEVELOPMENT AND ENGINEERING

We were requested by the Ordnance Department to make these gears. At that particular time there was only one manufacturer making them in New England. This type of work is a clock company's product generally and it was very difficult for any other type of manufacturing concern to manufacture this type of product. Many months were spent in laying out departments, purchasing machinery and designing of tools and in the general production engineering of the gear train sets. Because of the amount of the order and the high production needed by the Government, it was necessary for The A. C. Gilbert Company to purchase many duplicate dies. In some cases, we purchased 7 or 8 dies for one particular part. Much ingenuity was used by The A. C. Gilbert Company in the machine and floor layouts and also in the designing of different metal working machinery. During the time that these tools, jigs and fixtures were being built, many design changes and inspection changes were being made by the Ordnance Department. This made it very difficult to get into production because of tool and product obsolescence. Because of the many close tolerances, special inspection methods were used and after the first pilot run of gears was made and rejected by the Ordnance Inspector, it was then learned that the other concern in New England and the concerns in the Middle West that were making these parts were producing them satisfactorily. However, they were not making them according to the specifications or drawings and in each case the Ordnance was passing gears that were not made to their specifications and drawings. Later we learned that when the gears were made according to the drawings, they would not function. This information was not given to us at the time that the contract was awarded us but was found out later by us after we had built all tools and gauges necessary for the high production of this item. Therefore, it was necessary for us to scrap much of the tool work and engineering work that had been done and get into production as quickly as we could by making our drawings correspond with the way that the gears were being manufactured in other plants and not according to the Government specifications or drawings. This not only delayed us in our production, it made it necessary that we send engineers to the various plants throughout the country in gathering up data so that we could produce a second set of tools. After this second set of tools were made, then we were able to produce satisfactory parts which would work and were acceptable to the Ordnance Inspector.

TYPE OF MATERIAL

Sheet and strip brass. This was all purchased in coils and in flat strips which we fabricated on special presses and other metal working machines. Also there was brass rod which was used. This was bought in rod form and was fabricated in our automatic screw machines.

TOLERANCES AND METHODS OF QUALITY CONTROL

ECCENTRIC DRIVE GEAR: The gear blank was blanked and then the teeth were shaved. The tolerances on this particular part were as low as + or - .001". There could be no burrs visible on the teeth of this gear. This order, as well as others, had to meet quality control and on this particular piece part the hub was assembled by staking and then drilled on an automatic Screw Machine with a special attachment. This particular device was held to very close tolerances and had to meet quality control levels.

DRIVE GEAR: This was made from drawn pinion stock and fabricated on Screw Machines. This also was put through quality control inspection and in many cases the tolerances were again held to + or - .001".

EXTERNAL GEAR: This was a gear blank made out of .125" stock on a special automatic machine. Teeth were then cut on special hobbing machines and tolerances were held to .001". This was also checked on quality control levels.

INTERNAL GEAR: This was an assembly of four parts. It went through several machine operations after assembly and then were turned on specially built lathes to tolerances of .001". All of this work had to be free of burrs, discolorations in the brass, and had to meet quality control levels.

NATURE OF SUBCONTRACT WORK

There was no subcontract work on this job because it had to be run in a progressive assembly line and there had to be such close supervision over the parts that we did not attempt to subcontract any of it.

OPERATIONS

There were 65 major operations necessary to fabricate and assemble these devices. There were 35 gauging and inspection operations necessary to insure quality levels. This was the plan as worked out at The A. C. Gilbert Company.

The preliminary Engineering and laying out of the tools and installation of necessary machinery and equipment and layout of manufacturing departments was started in 1944 for 1945 production.

The type of manufacturing required was totally different from anything we had made in peace time or in manufacturing Flares or Firing Devices. This situation started our fourth conversion for war production.

SPRINGFIELD ORDNANCE DISTRICT

CONTRACT W19-059-ORD-2071

GEAR SETS FOR FUZE, BOMB NOSE AN M103A1

	Quantity Ordered	Quantity Shipped	Total Made	Total Cancelled
GEAR SETS	1,000,000 or 5,000,000 pcs.			
Consisting of				
INTERNAL	1,000,000	20,910	29,710	979,090
EXTERNAL	1,000,000	68,600	75,000	931,400
DRIVE GEAR	1,000,000	178,500	189,000	821,500
ECCENTRIC DRIVE	2,000,000	44,710	44,710	955,290

M103 SLIDER AND SLIDER PLATE

INTRODUCTION

These two parts were used on the M103 Bomb Fuze. They made up the assembly of the fuze and then were inserted into the Bomb Nose. There they actuated the safety and setting device which controlled the release mechanism of the Bomb Fuze.

INVENTION, DEVELOPMENT AND ENGINEERING

The above item was designed by the Ordnance Department, and through necessity by the Government for procuring huge quantities, these parts were released without too much thought as to what their specifications should be, the result being that when The A. C. Gilbert Company got into the manufacturing of these parts and discovered that the specifications were not correct, our production was held up trying to unravel the various specifications and details in order to make the Slider and Slider Plate so that it would function correctly.

TYPE OF MATERIAL

Zinc pigs and bars and nickel plating. The parts were die cast by us in special high pressure die casting machines and because of the design of the Slider and Slider Plate, special conveyors and plating racks were used in order to force the plating down into the holes which were called for on the plating specifications as issued by the Ordnance Department.

TOLERANCES AND QUALITY LEVELS

All parts had to go through Ordnance Quality Control. All dimensions were held to very close tolerances in order to prevent expansion and extremely critical salt spray tests were given. The Gilbert Company set up a special copper coating solution which was done before nickel plating. All of this was necessay and our Production Engineering Department designed plating machines and special racks to get full coverage of plating. All castings which were passed by our Inspectors and the Ordnance Inspectors had to be perfect and free from any cold shot marks, because neither the Slider or Slider Plate would function if there were any burrs or any rough surfaces which could cause friction.

NATURE OF SUBCONTRACT WORK

None.

OPERATIONS

SLIDER. There were 13 major operations and 2 gauging (Inspection) operations, plus critical visual (Inspection) operations.

SLIDER PLATE. There were 18 major operations and 5 gauging (Inspection) besides the critical visual (Inspection) operations. The preliminary engineering and the laying out of tools and the installation of necessary machinery, equipment and conveyors all had to be done by the Production Engineers of The A. C. Gilbert Company.

SPRINGFIELD ORDNANCE DISTRICT

CONTRACT W19-059-ORD-2072

SLIDER AND SLIDER PLATES
FOR FUZE, BOMB NOSE AN103A1

	Quantity Ordered	Quantity Shipped	Total Made	Total Cancelled
SLIDER PLATES	920,000	377,080	404,640	542,920
SLIDERS	920,000	297,728	306,048	622,272

VANE ANEMOMETER

INTRODUCTION

We were urgently requested by the Springfield Ordnance to pick up at Picatinny Arsenal a set of experimental dies which had been built at Picatinny for the development of the Vane Anemometer. This was used on a bomb fuze and was used for arming the fuze. This was done by setting the fuze at a given altitude and when the bomb was released from the plane, the Vane Anemometer was spun and thereby armed the fuze so that it would detonate when it reached a certain altitude level.

INVENTION, DEVELOPMENT AND ENGINEERING

At the time that the request came in from the Ordnance Department to assist them in the engineering of this particular device, all of our Design Engineers were very busy on other items which this Company was engineering or manufacturing at that time. However, to further aid the War effort, we agreed to assist the Springfield Ordnance Department in the development and further engineering of this item. We requested that the dies be shipped direct to us from Picatinny Arsenal and after they arrived at our plant, it was discovered that we could not meet the rigid requirements set forth on the drawings and specifications which accompained them without further development and engineering by us. We immediately obtained approval to change the construction of the dies and the sequence of operations. After this was done, we submitted samples for approval. All of the parts were approved except for the deflection requirement, and as these parts had been heat treated according to the Government specifications, we were requested to experiment with heat treating equipment and to heat treat them so that the deflection requirement could be maintained. This was then turned over to our Chemical Engineering Department which made several experiments on different methods of heat treating. Finally, by setting up our own hardness specifications, we proved by changing the specifications and using the method suggested by The A. C. Gilbert Company, all parts would meet the deflection requirements.

TYPE OF MATERIAL

Steel sheets and steel stripe:. This material was bought in coils and was fabricated by us on special power presses and other metal working machinery.

TOLERANCES AND METHODS OF QUALITY CONTROL

These parts were blanked out on specially constructed power presses. Very close tolerances were used. There could be no visible burrs on any part of the item. These went through and had to meet quality control, and as this part was being experimented on by the Ordnance Department on very critical war items, very close tolerances had to be met to pass the Quality Control Levels.

NATURE OF SUBCONTRACT WORK

None

OPERATIONS

There were 17 major operations and as the quantity was very low, the inspection was all covered by one operator having several gauges and these were also inspected for heat treating and finish.

SPRINGFIELD ORDNANCE DISTRICT

ANEMOMETER ARMING VANE

	Contract No.	Quantity Ordered	Quantity Shipped	Number Cancelled
4/7/45	W19-059-ORD-2873	100,000	14,586	85,414

SPRINGFIELD ORDNANCE DISTRICT

FIN ASSEMBLY FOR 81MM and M56

	Contract No.	Quantity Ordered	Quantity Shipped	Number Cancelled
4/11/45	W19-059-ORD-2904	220,000	0	220,000

INTRODUCTION

On May 8, 1945 we received from the Springfield Ordnance District a Letter Purchase Order for 220,000 pieces of this Fin Assembly, which consisted of a steel liner made on Screw Machines which was used as an insert for an aluminum casting.

INVENTION, DEVELOPMENT AND ENGINEERING

Our Tool Design Engineer and others from the Engineering Department made several trips to various concerns throughout the country which were making this item, as it was something ehtirely out of our line and one for which we had very little equipment on hand. Our Engineering Department worked out the sequence of operations, equipment and machinery which would be needed and the Tool Engineers put through several tool drawings. There were several hundred hours of tool drafting work done in our own factory, and also approximately 170 hours of tool drafting work done by an outside concern. However, on July 6, 1945, this contract was cancelled.

SPRINGFIELD ORDNANCE DISTRICT

FIN ASSEMBLY FOR SHELL, 60MM - M49A2

Contract No.	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
W19-059-ORD-3164	650,000	0	650,000

INTRODUCTION

On June 27, 1945 we were awarded a contract on the 60MM Fin Assembly. The amount of the order was for 650,000 pieces. It was really upon the insistence of the Springfield Ordnance District that we accepted the contract, because at that time we were tremendously loaded up with other war contracts. It was our policy not to take on more than we could do, as we had always been prompt on shipments and kept up to schedules. The 60MM Fin Assembly was in production in several other plants throughout the country and each one of these concerns manufacturing the Fin Assembly were having a great deal of trouble, due to the construction of the Fin Assembly and the close tolerances, plus the nature of the item itself. Our Engineers had to spend a great deal of time consulting with other manufacturers and their Engineers, learning their troubles, and it was our Engineers' job to overcome the troubles that outside manufacturers were having before the item could be placed on our production lines. A great deal of time was spent by our Tool Engineering Department in checking on other manufacturers and their tool layouts. In all, our engineers spent approximately 1000 hours on the engineering and development of tools and ways of manufacturing this item. This contract was cancelled without production.

18

SPRINGFIELD ORDNANCE DISTRICT

METAL PARTS ASSEMBLY
OF BOMB, CHEMICAL
100 lb. - M47A3

	Contract No.	Quantity Ordered	Quantity Shipped	Number Cancelled
7/25/45	W19-059-ORD-3151	70,000	0	70,000

INTROCUTION

We were asked by the Ordnance Department to figure on this new Chemical Bomb. This bomb was different from anything we had attempted to figure on before, and due to its size, it would require a great deal of our factory space. The Chemical Bomb was of all sheet metal construction and there were a great number of parts which had to be engineered from a standpoint of functioning, tool design engineering, and also production engineering. Our Engineering Dept. was filled up at the time, although we did have three of our own Engineers on the job, and we contracted outside engineers, who spent some 500 to 700 hours of engineering, along with many weeks of our tool engineer's time in which we made trips to various plants which were also just getting started in producing this same item. The contract was cancelled without production.

TYPE OF MATERIAL

Steel sheets, steel tubing, steel rod, which in most cases would be fabricated at our own plant.

TOLERANCES AND QUALITY LEVELS

Tolerances were close. One of the inspection tests that had to be put on the manufacturing specifications was that there was a very rigid leakage test which required a very elaborate testing set-up. Much of this work was in progress when the War terminated.

COMBINATION MINE FUSE M6

This description includes - M2, T12, T13, M6, M7, T14 and M10A1.

INTRODUCTION

The Combination Mine Fuze is a mechanical firing device which is activated by either pressure or pull. This particular type of fuze was used on anti-peronnel mines or fragmentation mines very similar to the bounding mines which were used by the Germans. This particular fuse was also used in many other combinations with explosives and was employed in the mine fields providing an anti-tank obstacle which could be established rapidly if properly sited and concealed and could have considerable surprise value and also on account of the fuze's safety requirement, it could be removed very readily from any mine field and with the minimum of danger to the solider.

INVENTION, DEVELOPMENT AND ENGINEERING

This device was invented, developed and engineered by us at the request of the Technical Division of the Washington Engineers. We also had the responsibility of designing and making the drawings of this device in accordance with the Engineer's Specifications. This particular work was done in our Drafting and Engineering Department. It was through our insistence that the Engineers had this device developed, because of its adaptability and at the same time to be more effective than any other fuze used. By developing this fuze, it took away a great hazard and risk in setting out the device, and also in the deactivating of the mine when it was no longer needed by the solider whose duty it is to set out and clear mine fields. By working day and night in our Engineering and Research Department, we were able to perfect this fuze in the minimum of time. A pilot lot of 25 was submitted to the Picatinney Arsenal, Aberdeen Proving Grounds, and to the Engineer Board at Fort Belvoir. This later was adopted by the Ordnance Department and the drawings then had to be transferred on to Ordnance Forms in our Drawing Room. We were then favored with a contract and repeat contracts that are described on the following page.

TYPE OF MATERIAL, FORM IN WHICH IT WAS PURCHASED

Zinc pigs or bars melted and molded in our Die Casting Department on semi-automatic and automatic machinery. Steel rod which was fabricated in ourScrew Machine Department on automatic Screw Machines and other special metal working machinery. Coils of wire which were fabricated in our 4 slide automatic machinery.

All of the above parts required extensive machining and in the majority of cases the machining necessary was done on special types of machines not used for the regular Gilbert production. It was first recommended by the Engineers at Fort Belvoir that this device be made of brass because of the close tolerances. However, it was proved at that time that the Gilbert Company could hold the required tolerances by using zinc die cast, which was cheaper and could be obtained more readily and it saved brass, which was urgently needed at that time by the Ordnance Department.

TOLERANCES, METHODS AND QUALITY LEVELS

Quality control was established on this device at the very start. Tolerances on most pieces were extremely close. It was very necessary that these tolerances be held because of the nature of the device, its technical nature and in its safety factors. For instance: On the release pin, there were 18 machine operations and many of the dimensions had to be held to + or - .0015". A certain angle had to be held to

$$17^\circ - 30' \quad \begin{matrix} + 1^\circ - 0' \\ - 0' - 0' \end{matrix}$$

We subcontracted this out to four concerns in New England and we kept 1/3 of the orders for these parts in our own shop. Because of the close tolerances and difficulties in manufacturing, only one of the subcontractors made good, so the balance was brought back into our shop and fabricated here. This only goes to show how difficult this one particular part was to manufacture. Special machinery had to be set up and through our own ingenious methods we were able to broach these parts on a very special broaching machine which involved 14 machines in all. On the head, which was die cast in a multi-cavity die, 3 of the dies were made in our own shop and one die was made on the outside, and very close tolerances had to be held and we were told by some of the largest die casting companies in this country that the tolerances that were set up could not be held. However, this part was run in our semi-automatic machines in the Die Casting Department and were held to a quality control method as used by the Ordnance Department. Some of the tolerances had to be held to .003" This was difficult because of the nature of the device. The dies were very complicated because of the nature of the piece. The base for this device was die cast by us and the dies were built in our own shop. This base had two sizes of threads which were National Fine #1 Fits. Some of the dimensions were held as low as + or - .001". Dimensions which have been shown on some of the above items might be held with a minimum amount of difficulty on small production runs. However, we had to produce 10,000 to 20,000 pieces per day in order to meet the Ordnance requirements.

NATURE OF SUBCONTRACT WORK

The only part, outside of springs, cotter keys and rings which were subcontracted, was the release pin. In checking through, as has been stated before, there was only one outside source who could successfully manufacture and hold the tolerances on that part.

OPERATIONS

There are 220 major operations necessary to fabricate and assemble this device. There are 47 gauging and inspection operations necessary to insure quality levels. This enumerates only operations which are done by The A. C. Gilbert Company.

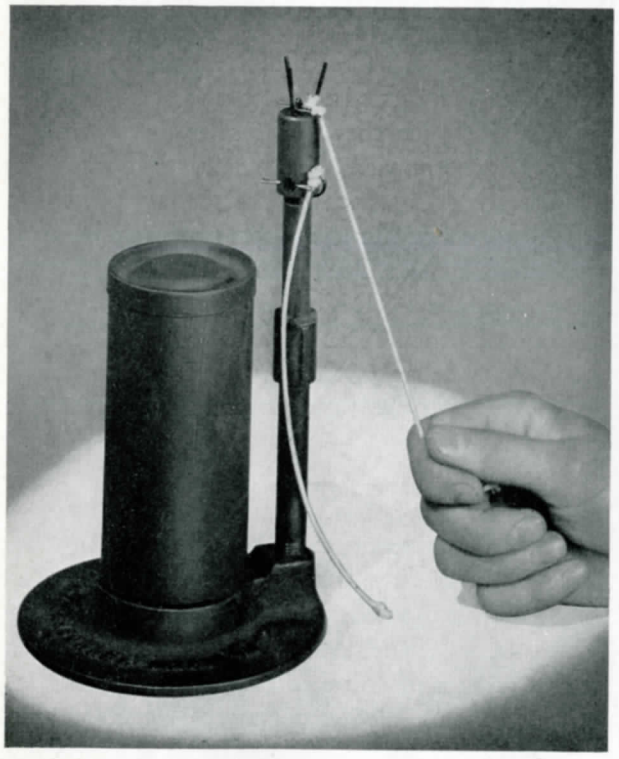
M6A1

THE G. I. CALLS IT A "JACK-IN-THE-BOX" —WE CALL IT "SUDDEN DEATH"

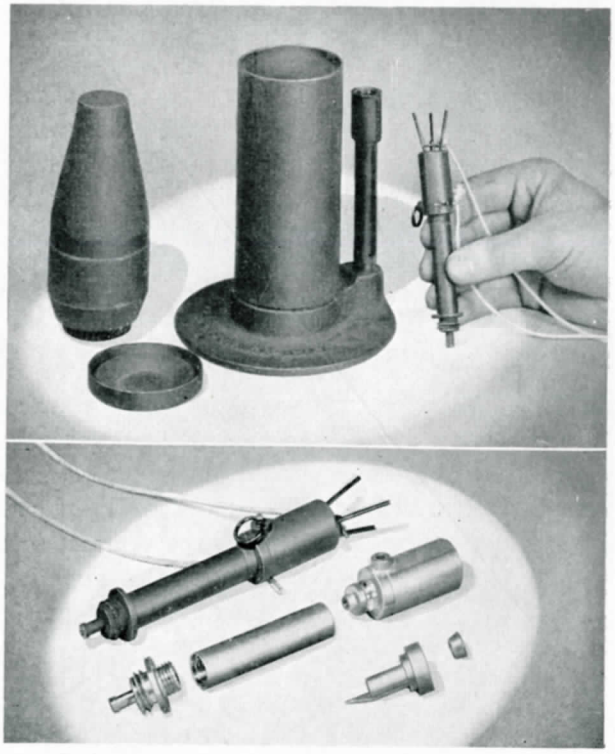
Pictured above is the action of an anti-personnel mine. This is just one of the many lethal devices developed by U. S. Army Ordnance experts to help our doughboys in their job of extermination. The fuse of this mine (see photo in lower right hand corner), like many shell fuses, is assembled with ZINC Alloy Die Castings.

Actually, this is a combination land mine and booby trap, which accounts for the two cords shown in the photographs below. As a mine, it is detonated when any weight of over 15 pounds comes in contact with the prongs on the fuse which is buried just below ground level. The fired projectile explodes about ten feet above ground, showering jagged steel fragments over a considerable area. As a booby trap, the device is concealed and is rigged up to detonate by contact with any object to which the fuse cord is attached.

Speed of production is the principal reason why ZINC Alloy Die Castings were specified for the fuse assembly of this mine. The complexity of design possible with die castings has reduced the required number of parts to a minimum—thereby eliminating many time-consuming machining and assembling



The complete anti-personnel mine



The mine and the fuse disassembled

M2

M6, M7

SPRINGFIELD ORDNANCE DISTRICT

COMBINATION MINE FUZE

M6 and M6A1

Contract No.	Quantity Ordered or Carry Over Balance	Quantity Shipped
W19-059-ORD-1481	155,400	155,400
W19-059-ORD-2037	1,362,000	1,362,000
	1,517,400	1,517,400

SPRINGFIELD ORDNANCE DISTRICT

T3 ARMING DELAY

AIR TRAVEL

Contract No.	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
W19-059-ORD-2005	500	15	485

T-1 CONCUSSION DETONATOR

INTRODUCTION

The Concussion Detonator is a mechanical firing device which is activated by a concussion wave transmitted either by air or water by another explosion. It is used for the clearing of obstructions prior to establishing a beachhead. A number of charges with these detonating devices attached would be placed at intervals along the obstruction and then, at the proper moment, an explosion would be set off which would discharge the series of explosive charges.

On the first Concussion Detonator made, which is known as the Chase Model, we were invited to bid and manufacture this very confidential and secret device. This device was tested and approved by the Engineers. There were many faults found in these devices after we started manufacturing them. It was not adaptable for high speed production and was not entirely satisfactory for field use, as it was very fragile and not entirely safe.

INVENTION, DEVELOPMENT, AND ENGINEERING

Because of our inventiveness and "know-how" in the field of special firing devices, and as The A. C. Gilbert Company suggested changes [illegible], we were invited to attend a conference sponsored by the National Defense Research Committee to collaborate with them in inventing and designing a new improved unit. A new device was developed on more practical lines for manufacturing and which provided for more durability in combat use than the Chase Model. This new development represents a great deal of time and effort spent by the members of the Gilbert Engineers in collaborating with members of the Engineer Board and the Holmes Electric Protective Company in order that the proper design for use in the field and for production practices could be attained. This particular design was constantly checked throughout the production runs by Engineers of The A. C. Gilbert Company in developing and engineering so that the devices would meet all conditions that they were subjected to in the actual combat field.

TYPE OF MATERIAL, FORM IN WHICH IT WAS PURCHASED

Zinc, pigs, or bars melted and moulded in our Die Cast Department on semi-automatic and automatic machinery. Brass rod fabricated in our Screw Machine Department on automatic screw machines and other special metal working machinery. Brass sheets fabricated in our Press Department in specially designed dies, jigs, and fixtures. All of the above parts required extensive machining and in practically all cases, the machining necessary was done on special types of machines not used for the regular Gilbert production. On changing over from the Chase Model, which was fabricated from brass rod, we recommended that it be changed to #5 Zamac Metal. This represented a saving of approximately 250,000 pounds of brass, which was critical, and was needed in many other war devices which could not be changed over to different materials. This also resulted in the saving of several thousands of hours on automatic screw machines and turret lathes, which then could be turned over to other important war work.

TOLERANCES, METHODS, AND QUALITY LEVELS

Tolerances were extremely close, and high quality levels had to be maintained because of the nature of the device , as to its adapatability and safety in setting out in mine fields and other sections that this device was to be used in. All of the tolerances on the blueprint were held by quality control methods, which were set up by the Inspection Department of The A. C. GilbertCompany. It was not only necessary to maintain certain close tolerances, but also to have special inspection as to the assembly and setting of the devices. Tolerances in some dimensions on Part No. 4-738 were held to a .0005" and the threads on Part No. 4-901 and Part No. 4-902 are all very fine threads and are #2 fit, which is an extremely close tolerance to hold on a die cast part. There were some extremely hard dimensions to hold on Parf No. 4-903 Firing Pin which were held to + or - .0015".

NATURE OF SUBCONTRACTED WORK

One of the most important parts of the device was the diaphragm, which activated the devices by means of hydrostatic pressure and this was given out to a subcontractor. However, this subcontractor could not obtain the correct pressure and hold the tolerances as outlined from the various dimensions and our own engineers and expediters were sent out to this subcontractor for the purpose of working out a satisfactory solution and it was through our own recommendation that tolerances as previously specified were expanded in some cases so that the subcontractor was able to manufacture the diaphragm disc and still maintain the correct quality level and in sufficient quantities for the much needed production.Of the many thousand parts or units that have been manufactured by us, to date we have never had a rejection by any Government Agency.

OPERATIONS

There are 201 major operations necessary to fabricate and assemble this device. There are 38 gauging and inspection operations necessary to insure quality levels. This enumerates only operations which were done at The A. C. Gilbert Company

THESE INSTRUCTIONS MUST NOT BE TAKEN TO PLACES WHERE THEY MAY FALL INTO ENEMY HANDS. DO NOT SHOW THEM TO UNAUTHORIZED PERSONNEL. DESTROY THEM AFTER THEY HAVE SERVED THEIR PURPOSE.

TB 5-25-4

WAR DEPARTMENT TECHNICAL BULLETIN

INSTRUCTIONS FOR USE OF DETONATOR, CONCUSSION, TYPE T-1

Ref.: FM 5-25, Explosives and Demolitions

War Department, Washington 25, D. C., 25 May 1944

1. DESCRIPTION.—*a.* The Concussion Detonator T–1 (see fig. 1), is a mechanical firing device which is actuated by the concussion wave of a blast. It is used to fire several charges simultaneously without interconnecting the charges with wires or detonating cord. A single charge, fired in any desirable way, will fire all charges equipped with concussion detonators provided that they are within range of the main charge or within range of each other. The device can be used to fire demolition charges either in air or in water, and a table showing the ranges at which the concussion detonators will reliably function in either medium is shown below:

RESTRICTED

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Operating range of concussion detonators

Initiating charge (pounds)	In water		In air—Recommended range (feet)
	Depth of water (feet)	Recommended range (feet)	
0. 5	2	10	---
0. 5	4	50	---
0. 5	6	80	---
0. 5	8	80	---
2. 5	---	---	15
2. 5	2	20	---
2. 5	4	80	---
2. 5	6	80	---
2. 5	8	150	---
5	---	---	20
10	---	---	35
15	---	---	35
20	---	---	35
20	2	20	---
20	4	80	---
20	6	180	---
20	8	260	---

b. The concussion detonator is supplied with a protective shipping plug in place and with a base and blasting cap assembly and base gasket contained in the package. In preparing the detonator for use the plug should be discarded and replaced by the base and blasting cap assembly. In this replacement it should be carefully observed that the joint is tight and that the gasket is properly seated to form a watertight seal. The base is constructed with a thread to fit the threaded cap wells of Corps of Engineers explosives. If the detonator is used with some other type charge than one of those equipped with the standard cap well, a short length of detonating cord should be taped to the blasting cap and its other end, containing a Corps of Engineers Special Nonelectric Cap, connected to the charge. In any case it is advisable to wire or tie the detonator to its associated charge, using the holes in the detonator provided for this purpose.

2. USE OF CONCUSSION DETONATOR IN WATER.—*a.* To provide safety during the arming of the device in water, the detonator is supplied with two time delay tablets of a water-soluble nature. A blue normal delay tablet of approximately 3½ minutes' dissolving time is installed within the device, and a yellow long-delay tablet of approximately 7 minutes' dissolving time is packaged with the device for alternate installation in the field. One or the other of these delay tablets should be used for underwater installations.

b. Since surf conditions and water temperatures influence the dissolving time of salt tablets, it is advisable to expend one detonator to measure its arming time. The same device can be used to test either

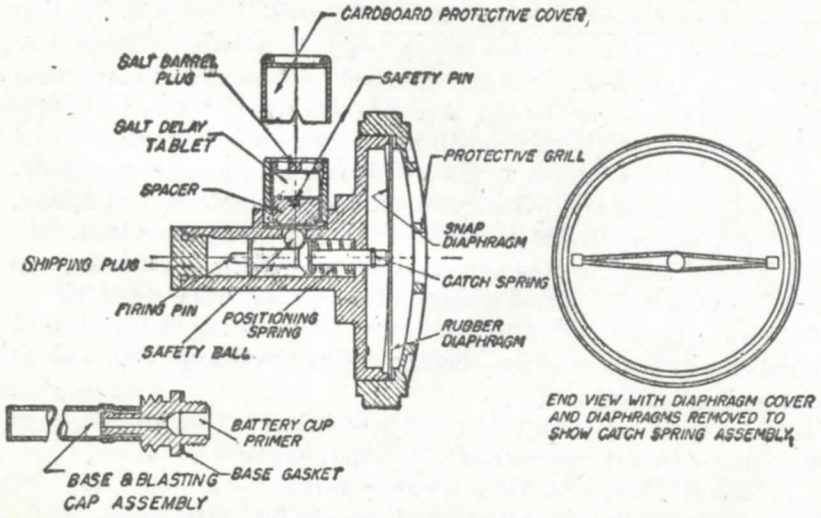


Figure 1.—Detonator, Concussion, Type T–1

or both delay elements. This detonator, when equipped with the type of tablet that will be used, should be tested under conditions similar to those contemplated in the actual operation. This test should be made by submerging the device to the proper depth under simulated operating conditions, with the shipping plug in place and the cardboard protective cover and the safety pin removed, and observing the time required for the salt tablet to dissolve.

c. The dissolving or arming time observed in the foregoing test is the proper interval that should elapse before the main initiating charge is fired under the proposed conditions of use. Since the tablets become soft during solution before they completely dissolve, and since this softening takes place within approximately one-half of the dissolving time, the detonators should be considered dangerous after one-half of the arming time has elapsed. Personnel should be withdrawn from the danger area within half the dissolving or arming time, since a nearby concussion from enemy bombs or shells could fire the detonators.

d. A major function of the cardboard protective cover with which the device is equipped is the protection of the water-soluble tablet during the preliminary phase of its underwater installation. This cover should be undisturbed and should remain in place, if possible, during placing of the charge under water. It should be removed at the last possible moment prior to the removal of the safety pin.

e. When using concussion detonators in water, the charges with which they are connected should be spaced within the recommended ranges, predicated on the anticipated minimum depth of water, as

shown in the foregoing table. Detonators will frequently function at greater ranges than those shown but their reliability at greater ranges is not assured. The device should not be used in surf of a greater depth than 15 feet. The diaphragm will function by hydrostatic pressure and the device will fire at a depth of 25 feet.

f. Installation of device in water.—(1) If long delay is necessary, remove blue tablet and install yellow tablet, taking care that spacer, safety pin, and cardboard protective cap are properly assembled.

(2) Discard shipping plug and carefully insert base and blasting cap assembly with its associated gasket to form a tight waterproof fit.

(3) Fit the blasting cap and base into a threaded cap well contained in the charge or connect the blasting cap to the charge with a short length of detonating cord.

(4) Wire or tie detonator to the charge and observe that diaphragm of detonator is free of obstructions and clearly exposed.

(5) Place all charges in water where required.

(6) Remove cardboard protective covers and pull safety pins.

(7) Evacuate the danger area within one-half of the arming time of the delay tablets in use.

(8) Wait the full interval of the arming time of the delay tablet in use before firing the initiating charge.

3. USE OF CONCUSSION DETONATOR IN AIR.—*a.* When the device is used in air the salt delay tablet installed within the device during manufacture must be removed and discarded. All devices to be used in air should also be checked to insure that the catch spring properly restrains the firing pin when the safety pin is withdrawn and the spacer is released. Removal of salt tablets and checking of firing pin restraint should be accomplished before the base and blasting cap assembly is fitted to the device. In checking the restraint of the firing pin it will be observed that the pin moves forward approximately $\frac{1}{16}$ inch. This movement is proper but the firing pin should neither fall nor fly out of the barrel of the device. In either case the device should be discarded. After checking the firing pin restraint, the spacer and safety pin should be replaced and the base and blasting cap assembly should be firmly fitted into the threaded barrel in place of the shipping plug.

b. When used in air it is advisable that all charges equipped with concussion detonators be placed reasonably equidistant from the main or initiating charge and that they be placed a minimum distance of approximately 15 feet from the main charge. When placed too close to another charge in air the concussion wave frequently causes the firing pin to pierce the diaphragm and be impaled thereon with a resultant probability of a misfire.

c. Installation of the device in air.—(1) Remove salt delay tablets.
(2) Check the restraint of all firing pins by removing safety pins and observing that firing pin is held in place by catch spring.
(3) Replace spacer and safety pin.
(4) Discard shipping plug and carefully insert base and blasting cap assembly with its associated gasket to form a firm fit.
(5) Fit the blasting cap and base into a threaded cap well contained in the charge or connect the blasting cap to the charge with a short length of detonating cord.
(6) Wire or tie the detonator to the charge and observe that diaphragm of detonator is free of obstructions and clearly exposed.
(7) Place all charges with diaphragms of detonators facing the initiating charge.
(8) Withdraw safety pins and evacuate the area—THE DEVICES ARE IMMEDIATELY ARMED.
(9) Fire initiating charge when personnel are clear of the danger zone.

4. TO DISARM DEVICE.—*a.* Depress spacer and force safety ball against shoulder of firing pin.
b. Insert tenpenny nail through holes in salt barrel.
c. Remove base and blasting cap assembly from device.

[A. G. 300.5 (19 May 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION:

Engr O of Armies (10); Corps (10); Base Comds (10); Sv C (10); Overseas Def Comds (10); IR 5 (5); I Bn 5 (5); IC 5 (5).

IR 5: T/O 5–21, Engr Gen Sv Regt; 5–52, Engr Port Cons & Rep Gp; 5–192, Engr Comb Gp.

I Bn 5: T/O 5–15, Engr Comb Bn; 5–215, Armd Engr Bn; 5–275, Engr Hv Pon Bn.

IC 5: T/O 5–627, Engr Treadway Bridge Co.

U. S. GOVERNMENT PRINTING OFFICE: 1944

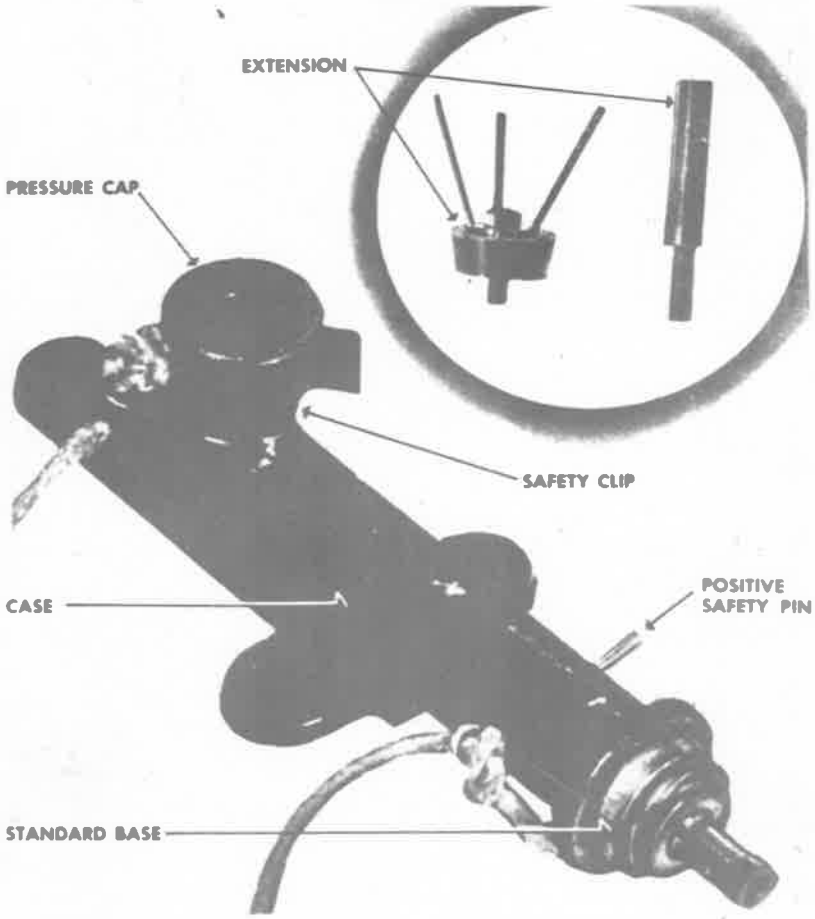
U. S. ENGINEERS

Boston, Mass.

DETONATOR CONCUSSION TYPE M1

Contract No.	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
W37-018-Eng-(MSP)-275	4,550	4,550	
W37-018-Eng-(MSP)-412	50,000	50,000	
W19-016-Eng-(MSP)-1702	150,000	33,100	116,900
	204,550	87,650	116,900

U. S. PRESSURE FUZE M1A1



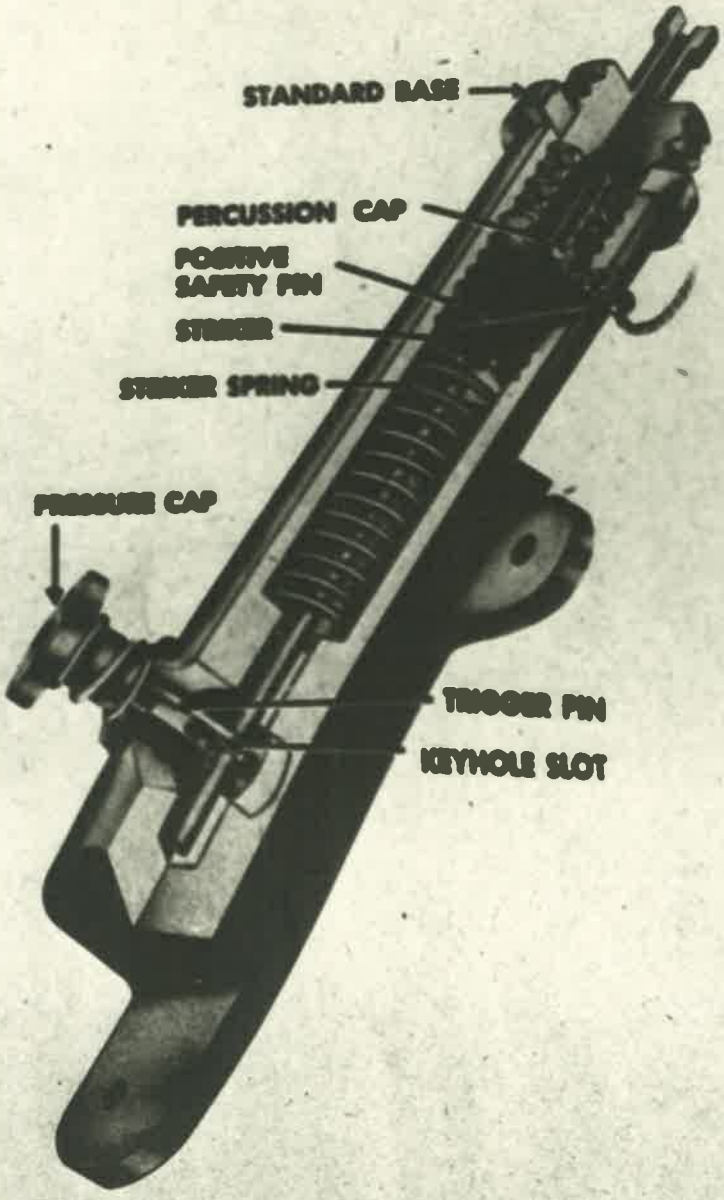
TYPE. Pressure fuze

COLOR. Olive-drab

CASE. Alloy metal

EMPLOYMENT. In antipersonnel mines and booby traps

U. S. PRESSURE FUZE M1A1



FUNCTIONING

1. Pressure of 20 or more pounds on pressure cap compresses trigger spring and pushes trigger pin into barrel.
2. When enlarged portion of keyhole slot in trigger pin is in position, striker is released.
3. Striker, driven by striker spring, fires percussion cap.

M1-A1 PRESSURE TYPE FIRING DEVICE

INTRODUCTION

This device is used in connection with anti-personnel mines and booby traps. It is very similar to the M1 Pressure Firing Device, but the M1-A1 has an explosive attachment composed of 3 prongs in an adaptor which permits a better camoflage, and, naturally, this makes it less apt to be seen. This device was so constructed that a special base was made, the base was screwed into an explosive charge and the entire device, plus the explosive charge, is sealed so that anybody stepping on the prongs would detonate the charge. Originally this device was known as the M1 Pressure Type Firing Device and through our method of manufacture we were able to convert this into the M1-A1 Firing Device and this again was developed and engineered through our Engineering Dept. at a minimum of tool cost and a minimum cost for development work, which was for the U. S. Engineers at Fort Belvoir.

TYPE OF MATERIAL AND FORM IN WHICH IT WAS PURCHASED

Zinc pigs or Bars - We melted and cast these into the various parts that went to make up this device.
Steel Rod - This was fabricated in our Screw Machine Dept. and other semi and automatic metal working machines.
Steel Wire - It was headed and threaded and made up into screws in our Headers & Threaders Department on special machinery.
Sheet Steel - It was fabricated in our Press Department.
Cardboard - It was made up by special machinery in our box making department for cartons, shipping containers, etc.
Paper - It was fabricated and printed in our Printing Dept. for labels and instruction sheets.

All other standard parts, such as cotter keys, rings, etc. were purchased through outside vendors.

TOLERANCE, METHODS AND QUALITY LEVEL

Tolerances on the firing mechanism on this particular device were very close dimensionally. Parts that went into the M1-A1 Firing Device were all quality controlled through our own Inspection Department. The methods for manufacturing these devices were mostly on automatic or semi-automatic machinery. Departments that manufactured them were all conveyorized, painting was done on automatic spray machines. Each and every device was weighed and tested on the scales for pressure, etc.

OPERATIONS

There are 188 major operations necessary to fabricate and assemble this device. There are 19 gauging and inspection operations necessary to insure quality levels. This enumerates only operations which were done at The A. C. Gilbert Company.

U. S. ENGINEERS

Boston, Mass.

M1 A1

PRESSURE FIRING DEVICE

Contract No.	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
W17-018-Eng-(MSP)-603	949,950	701,100	250,000

32

M2 FUZE LIGHTER

INTRODUCTION

This is a firing mechanism for igniting or lighting an Ensign Bickford Fuse. This device was weatherproofed and it would ignite the fuse under water. It would also light fuses at night without showing any flash or light. It is also noise-proof. It was generally used by demolition squads.

INVENTION, DEVELOPMENT AND ENGINEERING

This device was invented, developed and engineered by The A. C. Gilbert Co. in a very short space of time. It is the only lighter of its kind, weatherproof, flashproof and noiseproof. From our own ingenious methods we were able to produce quantities in amounts necessary for the Government to carry on this special type of warfare. In many cases these were put on long conveyors, special automatic machinery was built, overhead hoists were installed.

MATERIAL

The following material was purchased by us in the raw material stage:

Zinc Pigs or Bars - We melted and molded these in our own automatic or semi-automatic machinery
Steel Rod - This was fabricated in our Screw Machine and Special Machinery Department
Steel Wire - This was brought in coils and run off in our Header & Threader Department.
Cardboard - This was fabricated on our special box making equipment.
Paper - This was printed and fabricated in our Printing Department.
Decalcomanias - These were manufactured by us rather than purchased outside because of the time element.

All of the above were fabricated in our own plant from dies, jigs and fixtures which were engineered and designed by us. We built approximately 80% of all the dies, jigs and fixtures needed for producing the M2 Fuze Lighters.

These devices were given a special black finish in our Plating Department.

5 LIGHTERS, FUSE, WEATHERPROOF, M2

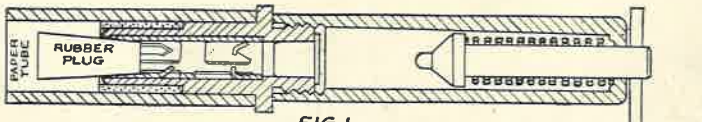


FIG. 1

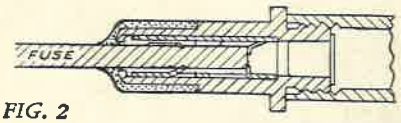
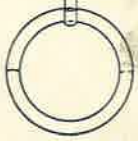


FIG. 2

FUSE MUST BE PUSHED ALL THE WAY IN OR ELSE MISFIRES WILL OCCUR



DIRECTIONS FOR USE

M2342

1. Remove paper tube.
2. Pull out rubber plug.
3. Cut off and discard 2 inches of fuse.
4. Insert freshly cut end of fuse in open end of Fuse Lighter (see Fig. 2).
5. Push fuse up hard and pull back with force of 3 to 5 lbs. to set prongs in fuse.
6. Work plastic sealing material into joint between fuse and fuse lighter.
7. Fuse Lighter is now ready to use. Pull ring to light fuse.

NOTE:—TO BE USED ONLY FOR FRONT LINE DEMOLITIONS OR UNDER ADVERSE WEATHER CONDITIONS.

U. S. ENGINEERS

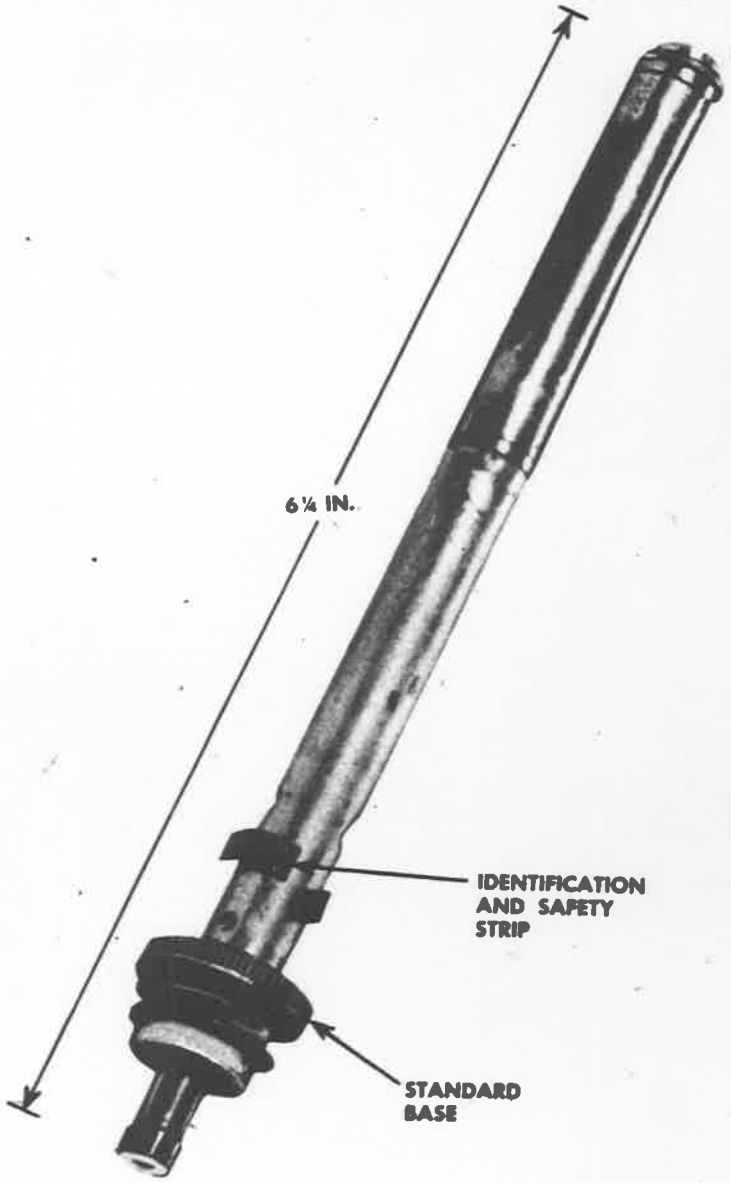
Boston, Mass.

M2 FUZE LIGHTER

Contract No.	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
W37-018-eng-(MSP)-602	4,609,500	4,609,500	
W19-016-eng-(MSP)-1487	1,867,000	1,867,000	
W19-016-eng-(MSP)-1709	3,000,000	1,898,100	1,101,900
W19-016-eng-(MSP)-1709	1,141,300	0	1,141,300
	10,617,800	8,374,600	2,243,200

35

U. S. DELAY FUZE M1



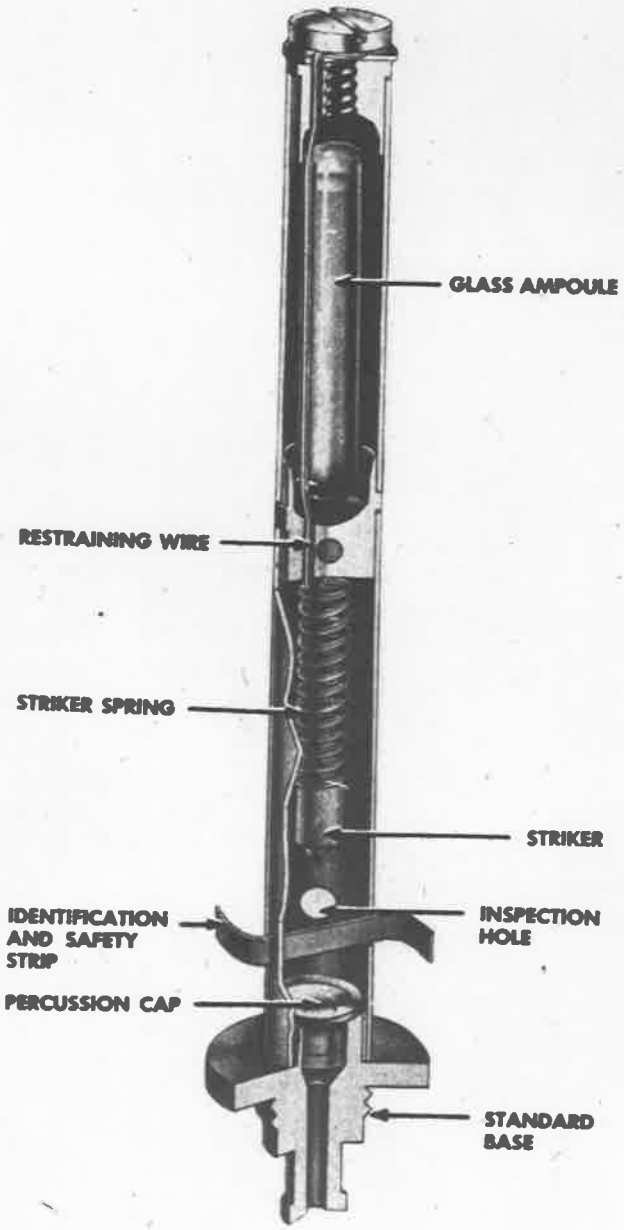
TYPE. Chemical delay fuze.

COLOR. Unpainted except for safety tab.

CASE. Upper half copper, lower half brass.

EMPLOYMENT. Delayed-action fuze for firing a delayed-action mine.

U. S. DELAY FUZE M1



FUNCTIONING

1. When glass ampoule is crushed, corrosive liquid is released.
2. Corrosive liquid eats through restraining wire, releasing firing pin.
3. Firing pin, driven by spring, fires percussion cap.

RESTRICTED

CHEMICAL DELAY FIRING DEVICE M1

INTRODUCTION

We were requested by Captain Erhardt of the Engineer Board, Fort Belvoir, Virginia, to develop and engineer samples of the U. S. Delay Fuze M1. Samples were to have a standard base to hold a primer so that they could be used on all standard explosives used by the U. S. Army. This is a chemical delay fuze and is used as a delayed action fuze for firing a delayed action mine. When the glass ampule is crushed, a corrosive liquid is released and the corrosive liquid eats through the restraining wire which releases the firing pin. The firing pin is driven by a coiled spring which fires a percussion cup. There is no safe way after this device has been set to disarm it. However, if it were absolutely necessary to disarm it, then it could only be done at the risk of the person's life to insert a safety pin beneath the firing pin so that the firing pin could not strike the percussion cup.

INVENTION, DEVELOPMENT AND ENGINEERING

This is very similar to the signal relay which was used by the British. It was left up to The A. C. Gilbert Company to develop and engineer a base which would be standard for standard explosives used by the U. S. Army. However, before this device could be made, the Engineers requested that The A. C. Gilbert Company do a lot of engineering and research work which was done in our laboratory on the time limits and correct ampule. This device was developed so that the concentration of the chemical governed the time delay which varied from 10 minutes to 20 hours. Each fuse was so identified to show at a glance what the timing or delay was.

At the same time that we were developing the M1 Delay Firing Device, the Technical Branch of Harvard University requested that we also develop a time delay pencil with a special needle to strike a quick match. This device was to be used for a small incendiary bomb. It was planned that the devices were to be loaded in large containers and before taking off in flight, they would break the ampule and store these devices in refrigeration so that they would not function and when the bomber was over its target, these devices were released. So actually thousands of these would be scattered promiscuously over a wide area.

TYPE OF MATERIAL

Zinc pigs or bars which were die cast in our semi-automatic and automatic machinery. Steel rod, which was fabricated in our Screw Machine or special Machine department. Brass rod and tube which was fabricated in our Screw Machines or in our Special Machine Department. Special high tensile strength wire fabricated by us in our Wire Machine Department. Cardboard which was purchased in sheet form and then fabricated in our special box making equipment. Paper which was purchased in sheet form and fabricated and printed in our Printing Department. This was used for labels, instruction sheets and for the stripping paper used on the box.

U. S. ENGINEERS

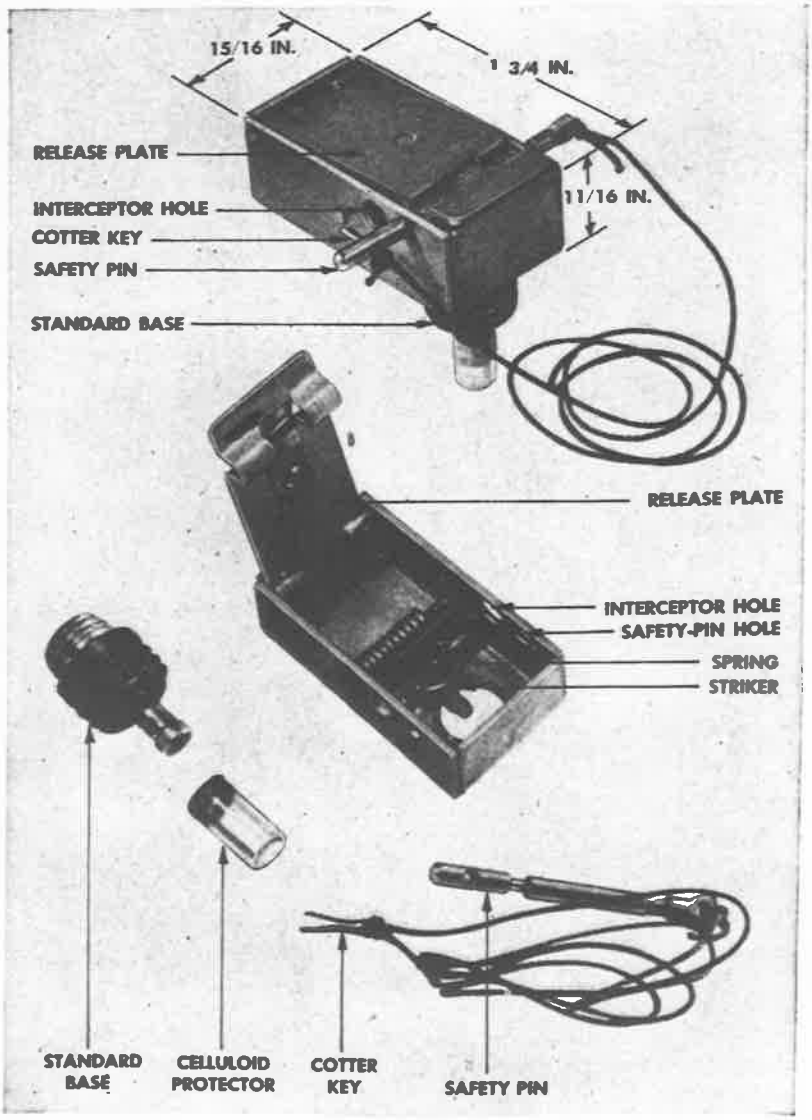
Boston, Mass.

M1 DELAY TYPE
FIRING DEVICE

Contract No.	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
W37-018-Eng-(MSP)-604	2,150,000	780,000	1,370,000

39

U. S. PRESSURE RELEASE FUZE M5



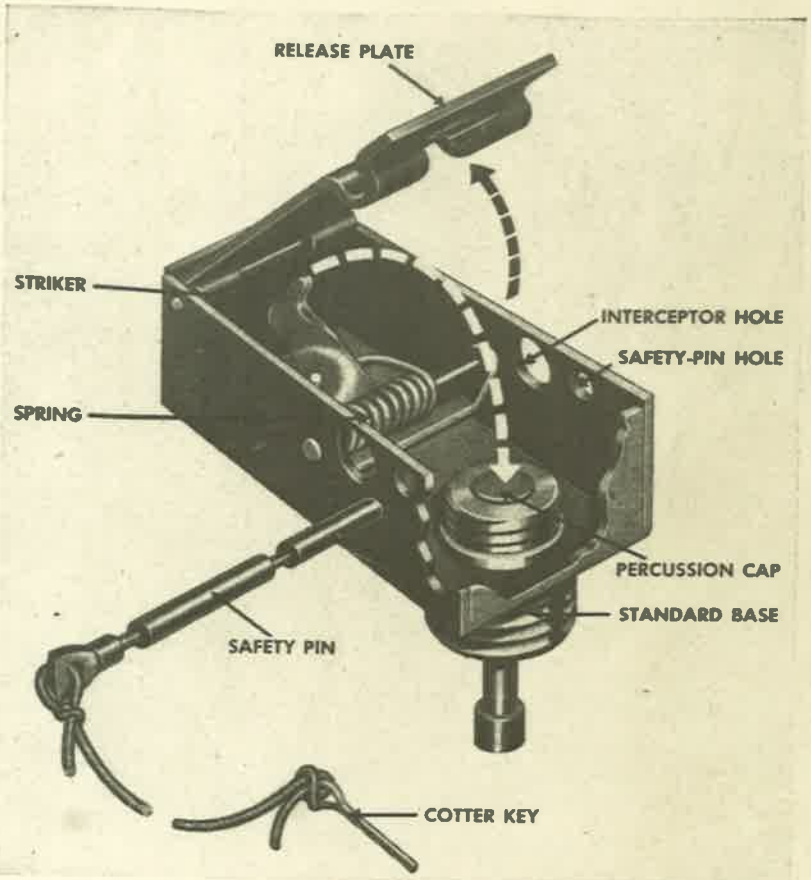
TYPE. Release fuze.

COLOR. Light khaki-green.

CASE. Steel.

EMPLOYMENT. For booby-trapping U. S. antitank mines equipped with supplementary fuze wells and for general booby-trap installations with charges having a threaded well.

U. S. PRESSURE RELEASE FUZE M5



FUNCTIONING

1. When restraining load of at least 5 pounds is displaced more than ⅝ inch, release plate releases striker.

2. Striker, impelled by spring, fires percussion cap.

TESTING. Testing before use is unnecessary. Inspect fuze to make sure that there are no obvious defects, that striker is cocked, and that safety pin is in proper position.

INSTALLING AND ARMING

1. Make sure safety pin is in proper position and remove small cotter key.

2. Slip nail or length of stout wire through interceptor holes.

3. Remove base.

T5 RELEASE TYPE FIRING DEVICE
M5 PRESSURE FIRING DEVICE

INTRODUCTION

This is a firing device used for booby traps and anti-tank mines. This device was generally installed under the other mines. The object being to explode the mine when it was being removed by the enemy. It can also be used under other objects with sufficient weight to hold the pressure release down and would detonate on the removal of that object.

INVENTION, DEVELOPMENT AND ENGINEERING

This item was invented, engineered and developed by The A. C. Gilbert Company in collaboration with the Engineer Board, Fort Belvoir, Virginia. Drawings were made and samples made from these drawings. The Engineers at Fort Belvoir tested them and okayed the samples. We were then given a production order which we started on immediately and produced these items from the specifications that were written up by us and submitted to the Engineer Board.

TYPE OF MATERIAL

Raw materials as follows were used:

Steel Sheets - Fabricated by us in the dies that we build in our own Toom Room

Steel Rod Stock - This was fabricated in our Screw Machine Department and Special Machine Department.

Steel Wire - Fabricated by us in our Header and Threader Department

Zinc Pigs or Bars - This was melted and molded in our Die Casting Department.

Cardboard - This was scored, died out and stacked up into boxes for the shipping of the M5 Release. Paper was purchased and printed and fabricated into instruction sheets. All the items were printed at The A. C. Gilbert Company plant.
The dies to be built for these special firing devices were all built in The A. C. Gilbert Co. Tool Room. Also, the special fixtures and jigs in order to expedite the production, of which 90% were built in the Gilbert Tool Room.

TOLERANCES, METHODS AND QUALITY LEVELS

The tolerances had to be kept close. A large amount of inspection had to be put on these units as it was important that the device should function under all conditions and at the same time it had to be safe for the Soldier who was setting the device in the field. We continued extensive tests just before the device was ready for packing to ascertain that the safety pin could be removed at the correct degree of pull.

NATURE OF SUB-CONTRACT WORK

The only parts that were purchased from sub-contractors were standard parts, such as primers, cotter keys, etc.

OPERATIONS

There are 119 major operations necessary to fabricate and assemble this device. There are 11 gauging and inspection operations necessary to insure quality levels. This enumerates only operations which were done at The A. C. Gilbert Company.

V3-10

U. S. ENGINEERS

Boston, Mass.

M5

PRESSURE FIRING DEVICE

Contract No.	Quantity Ordered or Carry Over Balance	Quantity Shipped
W19-016-Eng-(MSP)-1149	240,800	240,800

MINE TRAINING AID SET #2 JAPANESE

INTRODUCTION

In February, 1945, Mr. Roysdon of the Engineer Board brought to this plant an assortment of Japanese Land Mines and Hand Grenades. We were asked to make a formal bid on reproductng these items in appearance only and in certain functioning parts. We were also asked to produce them the same as the actual mines and grenades themselves. These devices were to be used in training our own soldiers so that they could detect the actual Jap Mine and disarm it. This set was packed in a certain box and was sent out as a set to different training centers. This set contained the following units:

One Anti-Tank Mine Type #93
One Armor-Penetration Magnetic Mine Type #99
One Bar Yardstick Anti-Tank Mine
One Hand Grenade Type #97
One Land Mine Type #3
(Plus the necessary fuze for each one of the mines)

INVENTION, ENGINEERING AND DEVELOPEMENT

We submitted a bid on the assortment of mines, grenades, and the carrying case and were awarded the contract. Because of the large number of parts necessary to make up the various units and the urgency of the Mine Training Aid Set, we engineered in our own plant the various items so that they would correspond with the original design work to take advantage of speedier production methods. However, an outside drafting concern was asked to do all of the drawings under the supervision of our engineers. There were a great many trips made by our engineers to outside concerns instructing them in the requirements of certain items which fell outside our facilities to produce. We corrected the original drawings of the Engineer Board and they made their blueprints from the ones that we submitted. We also wrote up the specifications for the set. It was necessary for us to contact Yale University to decipher and reproduce tags and labels which we made up in various colors, finishes, and weights and had inscribed upon them original Japanese characters. A suitable carrying case was designed by us which cost the Government considerably less than had been originally suggested by the Engineer Board.

TYPE OF MATERIAL

Many types of material were used, such as zinc, brass sheets, brass bars, copper sheets, steel sheets, which were all bought by us in the raw material stage and fabricated on special metal working equipment.

TOLERANCES AND METHODS OF QUALITY CONTROL

Dimensional tolerances were not held closely because there was no real necessity to do so. However, the visible appearance, color, shade and contour all had to be held very closely. In fact, we were told by the Engineer Board after we had shipped the first few sets to them, that it was almost impossible to tell the difference between the sets that we had manufactured and the original Japanese set.

NATURE OF SUBCONTRACT WORK

Very little subcontract work was done for us because in nearly every case we had available special machinery for the job and it was only on rubber plugs, cotter keys, and special wire forming that was done on the outside of The A. C. Gilbert plant.

OPERATIONS

There were 150 major operations necessary to fabricate and assemble sets. There were 18 major gauging operations, plus many visual inspections to check to see that the carrying container and size were identical with the original Japanese Mine Set.

TB ENG 79

WAR DEPARTMENT TECHNICAL BULLETIN

USE OF JAPANESE MINE TRAINING AID SET NO. 2

War Department, Washington 25, D. C., June 1945

Section I

GENERAL

1. PURPOSE. This Technical Bulletin is a guide for instructing troops in handling Japanese mines. It is intended for use with the Japanese mine training-aid set No. 2 (fig. 1).

2. SCOPE. This bulletin describes the components of the set and how they are used in training. It also covers use, recognition, functioning, and disposal of common Japanese mines.

3. DESCRIPTION OF MINE TRAINING-AID SET. *a. General.* (1) *Container.* Japanese mine training-aid set No. 2 (figs. 1, 2, and 3) is packed in an unfinished wood case with hinged top. Outside dimensions of the wood case are 13⅛ inches by 3 feet 2⅞ inches by 5⅜ inches. The complete set and container weigh 40 pounds.

(2) *Mines in set.* The mines in the set have been manufactured to resemble real Japanese mines as closely as possible. Enough of the moving parts have been incorporated in the mines and fuzes of the set to give proper instruction in arming and disarming of the various mines. All mines and fuzes are inert. Several of the mine cases have been designed so they can be filled with soil or sand to simulate the weight of the actual mines. The mines are tagged with instructions for handling, reproduced in Japanese characters. Training should include brief recognition and translation of Japanese inscrip-

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tions. An accurate translation of all Japanese characters appearing on tags is glued to the *inside* of the packing case top (fig. 1).

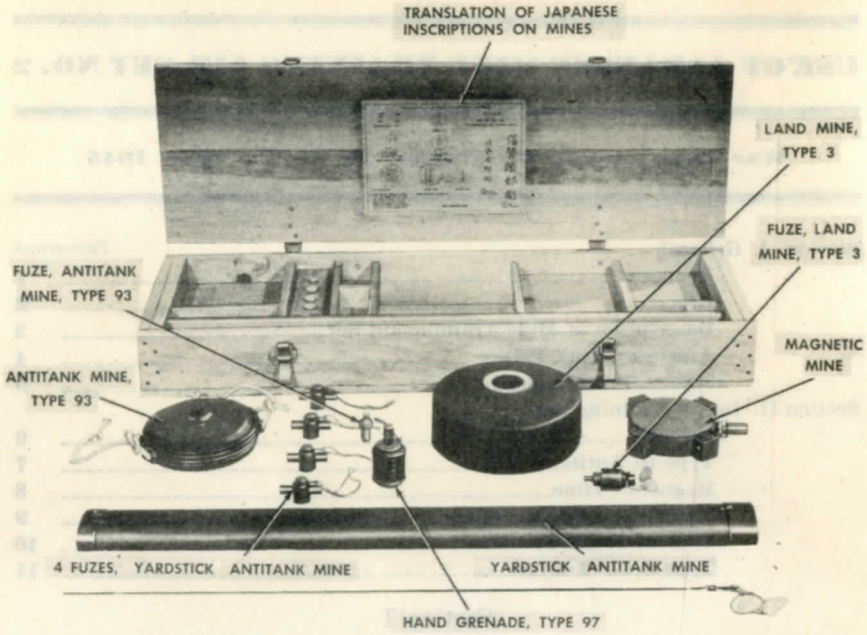


Figure 1. Components of Japanese mine training-aid set No. 2.

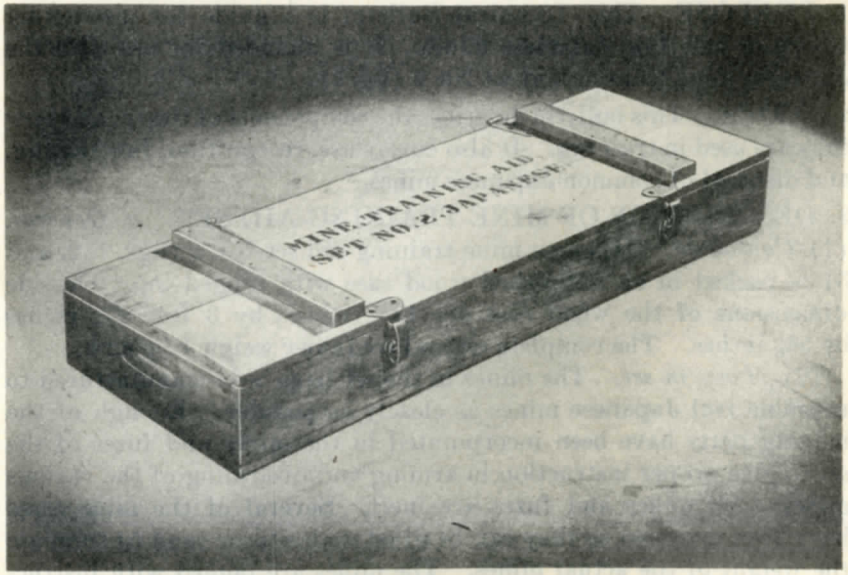


Figure 2. Packing case for mine training-aid set.

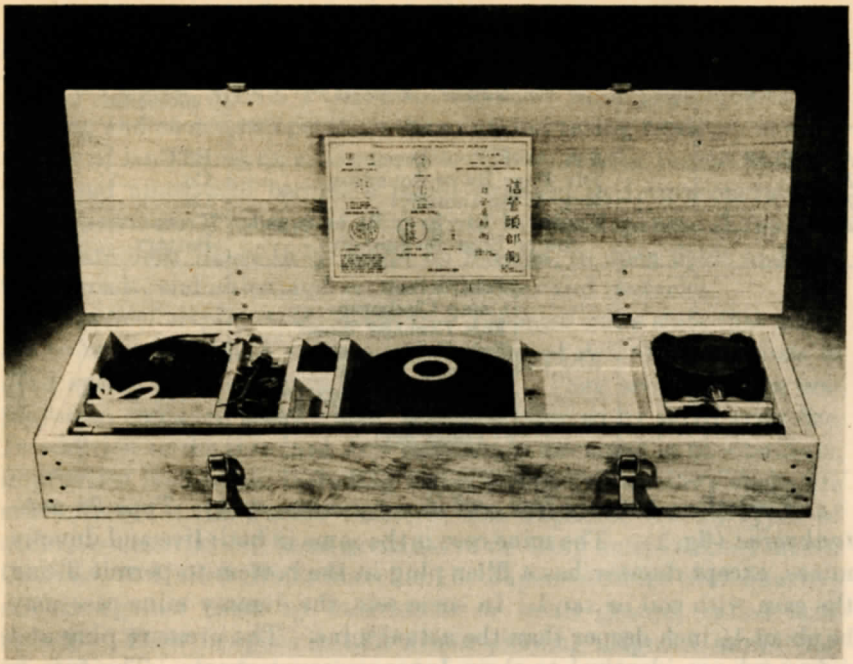


Figure 3. Arrangement of mines in case.

b. Components of mine training-aid set. (1) Correct nomenclature and stock numbers of the component parts of the Japanese mine training-aid set No. 2 are listed below:

Set No. 586-02, mine, training-aid, set No. 2, Japanese

Nomenclature	Unit	Stock No.	Quantity
Mine, training-aid, Japanese:			
Antitank, type 93	ea NX	04-6498. 500-100	1
Armor-penetration, magnetic, type 99.	ea NX	04-6498. 500-200	1
Bar, yardstick	ea NX	04-6498. 500-300	1
Hand grenade, type 97	ea NX	04-6498. 500-500	1
Land, type 3	ea NX	04-6498. 500-600	1

(2) *Authorized distribution of the set is as follows:*

T/A No.	T/O & E No.	Name of organization	Basis of distribution	Quantities
AGF T/AS	------	Sch; AGF Repl Depot	RTC	60
20–2	------	Div Engr Bn or Squadron	Co	3
20–2	------	Engr C Bn (nondiv)	Co	3
20–2	------	Except in Div Engr Bn or Squadron or Engr Bn (nondiv).	Troop Battery	1 ------
		ASFTC: Fort Belvoir	----------	100
		ASFTC: Camp Claiborne	----------	100
		ASFTC: Fort Leonard Wood	----------	100
		ASFTC: Fort Lewis	----------	150
		ASFTC: Engineer School	----------	50
		ASFTC: Granite City Engr Depot	----------	15
		ASFTC: Columbus ASF Depot (Engr Sec).	----------	10

c. Variations between live and dummy mines. (1) *Type 93 antitank mine* (fig. 1). The mine case is the same in both live and dummy mines, except dummy has a filler plug in the bottom to permit filling the case with soil or sand. In some sets, the dummy mine case may be about ¼ inch deeper than the actual mine. The pressure plug and safety tab are identical to their Japanese counterparts. The fuze is identical in appearance to the actual fuze, except that the bottom of Japanese fuze is recessed.

(2) *Magnetic mine* (fig. 1). In appearance, this mine and fuze are identical to the actual Japanese mine. However, the magnets are dummies and the canvas case contains wooden blocks to simulate the explosive charge.

(3) *Yardstick antitank mine* (fig. 1). This dummy mine is identical in appearance to the actual mine. It varies from the actual mine in that the explosive charge is simulated with plaster-of-paris blocks, and the fuzes are made in one piece with no removable parts such as the booster and striker holder of the actual fuzes.

(4) *Type 3 land mine* (fig. 1). This mine varies from the actual mine only in the construction of the fuze. The dummy does not contain a striker and the detonator tube is solid metal. The fuze can be disassembled and recocked by unscrewing the two halves of the fuze body and then pushing the percussion hammer up and reinserting the hammer-release fork. All dummy fuzes have right-hand threads, whereas Japanese counterparts have been found with either right- or left-hand threads. The fuze seat is also removable for filling the mine body with sand or soil.

(5) *Type 97 hand grenade* (fig. 1). This grenade is identical with the actual grenade, except that the fuze, instead of containing the de-

lay train and detonator, is solid. The fuze is removable, but the plug is not.

4. JAPANESE MINE POLICY. Japanese mine technique is improving and each new operation shows an increasing tendency toward the use of land mines on a larger scale. There is little reason to doubt that land mines will become a major problem in future operations.

a. Locations. Past use of land mines by the Japanese shows that mines are most likely to be found on beaches, in open fields and airfields, roads, and cities, and around pillboxes and obstacles.

b. Tactical employment. Captured Japanese notes state that mines are to be spaced 3 to 5 yards apart in front of defensive positions in dead spaces and near wire entanglements. They are also to be employed in defiladed areas which cannot be covered by small-arms fire. In addition to the standard Japanese mines discussed in this bulletin, improvised land mines including aerial bombs and artillery shells are encountered in the Pacific theater. The Japanese use all types of ordnance material and hand grenades in devising antipersonnel mines. Contrary to United States doctrine, the Japanese stress close-quarters attacks against tanks by individuals or small groups, called tank fighters. Their weapons include armor-piercing magnetic mines (fig. 1), combinations of grenades and mines, grenade clusters, Molotov cocktails, and pole mines. The Japanese use antiboat and beach mines extensively as a part of their beach defenses.

5. SAFETY PRECAUTIONS. The following safety precautions should be observed when dealing with all mines:

a. Never move a mine until the mine and the area surrounding it are closely inspected. All mines may be booby-trapped.

b. Remember, shear wires requiring less pressure can be substituted for the shear wire usually found in mines. The type 93 mine fuze is issued with a 25-lb shear for antipersonnel use.

c. Do not carry the mine any farther than is absolutely necessary from the area being cleared.

d. Mark located mines so they can be avoided by other personnel.

Section II

USE OF TRAINING SET

6. GENERAL. *a. Use with other training aids.* The Japanese mine training set used with other mine training aids will be valuable for training troops in the handling and disposal of common Japanese mines. To familiarize troops with the recognition, arming, disarming, and disposal of Japanese mines, the mine training set should be used in conjunction with graphic training aids, film strips, and

film bulletins. Detailed directions of arming, disarming, and disposal methods are given in FM 5–31.

b. Training schedules. Mine training schedules should stress recognizing mined areas, locating mines and booby traps, breaching mine fields, and disposing of mines. *Emphasis should be placed on disposal methods other than hand removal*, such as pulling out by rope or exploding in place. Mines should only be disarmed by hand when conditions do not permit other methods. An effort should be made to reproduce Japanese mine tactics in training. Night operations should be included in the schedule. Instructors should supplement information in this bulletin with the latest material from intelligence notes and documents and FM 5–31.

7. TYPE 93 ANTITANK MINE. *a. Description.* The Japanese type 93 antitank mine (fig. 4) is normally painted olive-drab with a red ring on top. Total weight is 3 pounds, including 2 pounds of picric acid explosive.

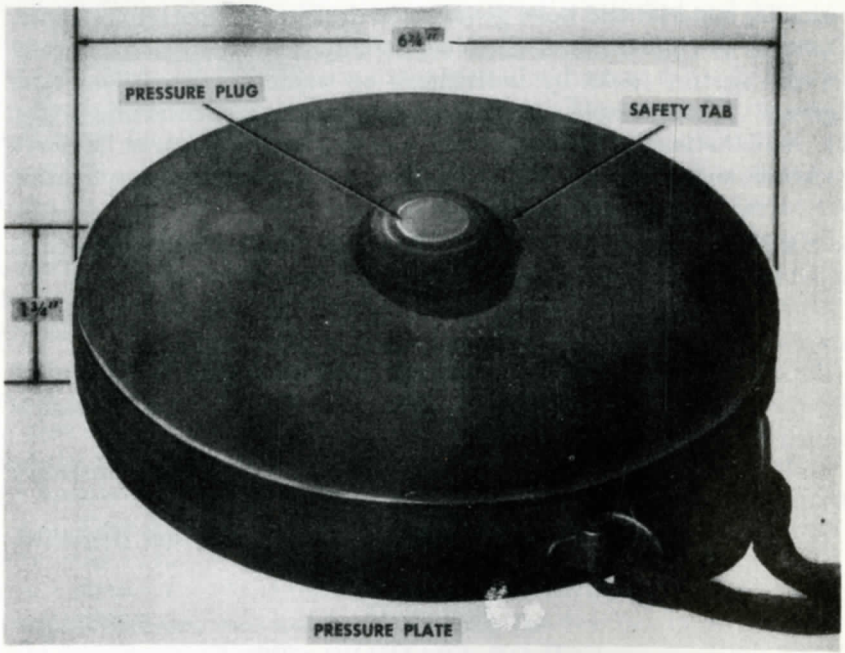


Figure 4. Japanese type 93 antitank mine.

b. Use. The Japanese use the mine against vehicles. To disable tanks, it is used in groups of two or three. The mines are normally tied together, one on top of the other.

c. Functioning (fig. 5). Normally, 250-pound pressure on the pressure plug will fire the mine. The pressure plug depresses the

striker pin which cuts the shear pin. Spring drives striker pin downward, firing percussion cap—detonator—booster—main charge.

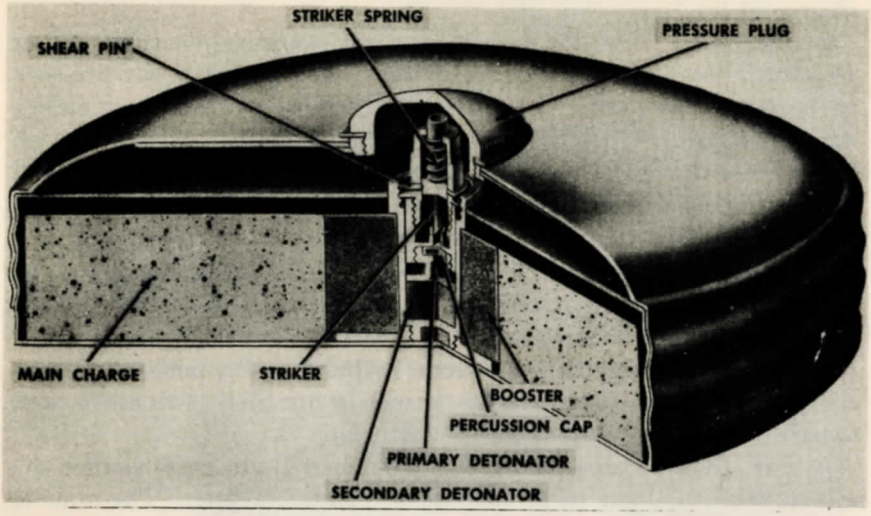


Figure 5. Cut-away of type 93 antitank mine.

d. Installing and arming. Unscrew pressure plug and remove leather washer. Lift off combination washer and sleeve (tab at-

Figure 6. Installing type 93 mine.

tached). Unscrew safety cap from fuze. Replace leather washer and screw pressure plug into place. Finally, bury mine with pressure plug at ground level.

e. Disarming (figs. 7① and ②). Examine mine and surrounding area for booby traps. Without moving mine or exerting any pressure on pressure plate, unscrew brass pressure plug. Screw brass safety cap, if available, firmly into top of fuze. Similarly, if combination washer and sleeve are available, place them over brass safety cap and replace pressure plug. To defuze the mine, (fig. 7③) unscrew pressure plug and then unscrew whole fuze.

8. MAGNETIC MINE. *a. Description.* The Japanese type 99 magnetic antitank mine (fig. 8) is normally covered with khaki-colored canvas. The mine and fuse are carried in a stiff canvas pouch (fig. 9). Total weight is 2½ pounds, including a 1½-pound explosive charge. One mine will perforate ¾-inch armor plate; two mines used together will perforate 1¼-inch armor plate.

b. Use. The Japanese normally use this mine in pairs against armored vehicles, doors of pillboxes, and similar targets. The mine is held in place, flat against iron or steel objects by attraction of four magnets. The Japanese also use this mine as an antipersonnel weapon (figs. 10 and 11).

c. Functioning (fig. 12). When used against tanks, personnel placing the mine first remove the safety pin and depress plunger of delay action fuze, which releases steel balls into groove in the sliding cap. The striker, driven by the spring, fires the percussion cap which fires the delay pellet—detonator—main charge. The delay fuze allows 4 or 5 seconds for personnel to take cover after placing the mine.

d. Installing and arming. Remove wooden plug from body of mine. Screw fuze into body of the mine. Remove safety pin and press plunger and mine will detonate in 4 or 5 seconds.

e. Disarming. To disarm the Japanese magnetic mine, insert safety pin in safety-pin hole. To defuze the mine, loosen ring holding fuze in place and then remove fuze from mine body. Finally, (fig. 13 (3)) unscrew detonator from fuze to make parts safer to handle.

9. YARDSTICK ANTITANK MINE. *a. Description.* The yardstick mine (fig. 14) is normally painted olive drab. Total weight is 10½ pounds, including 6 pounds of picric acid explosive.

b. Use. The yardstick mine is employed against vehicles and is usually buried in landing strips and trails (figs. 15 and 16).

c. Functioning (fig. 17). A pressure of 335 pounds or more on the mine forces case against head of release plunger of fuze, shearing shear pin and forcing plunger down. The enlarged portion of slot in

① *Unscrewing brass pressure plug.*

② *Screwing safety cap into top of fuze.*

③ *Defuzing.*

Figure 7. Disarming type 93 mine.

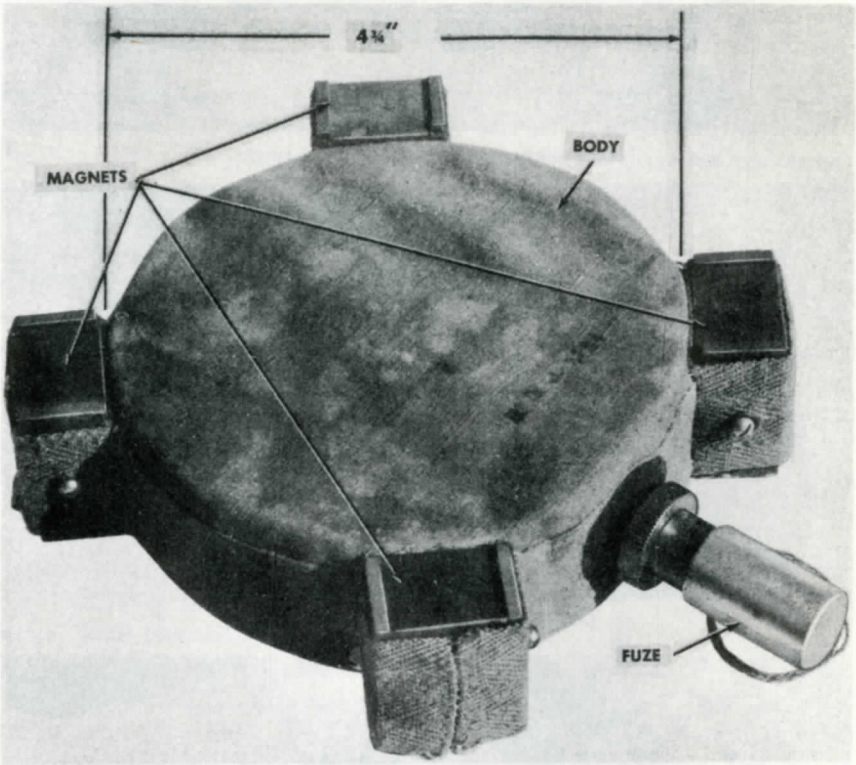


Figure 8. Japanese magnetic mine.

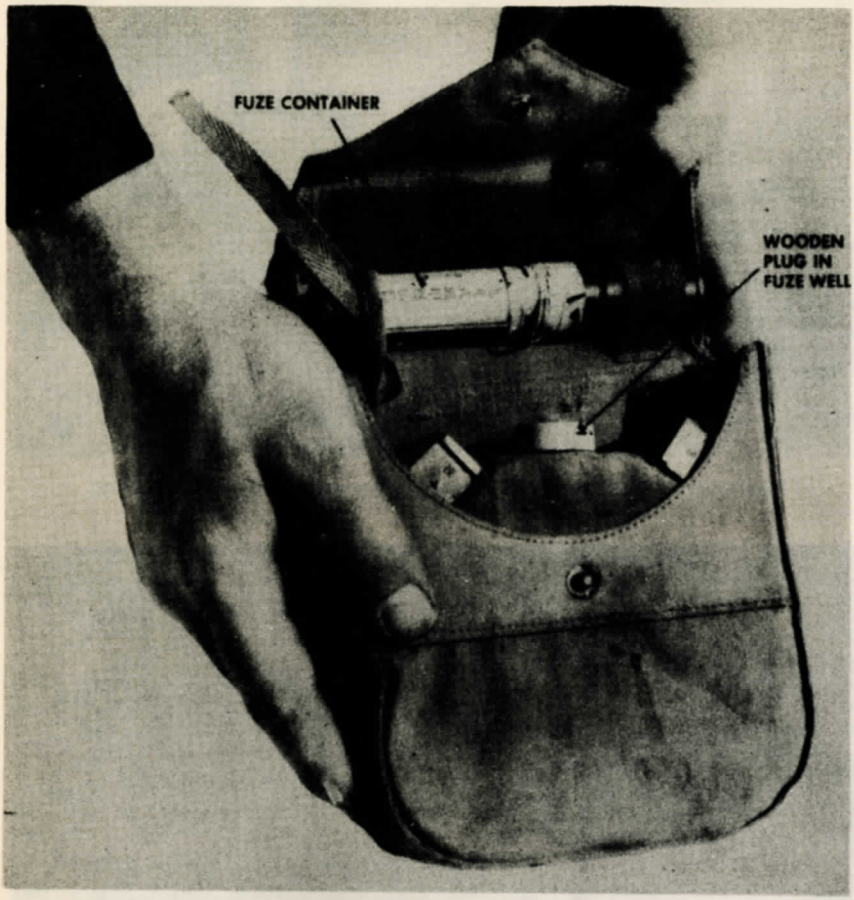


Figure 9. Canvas carrying pouch for magnetic mine.

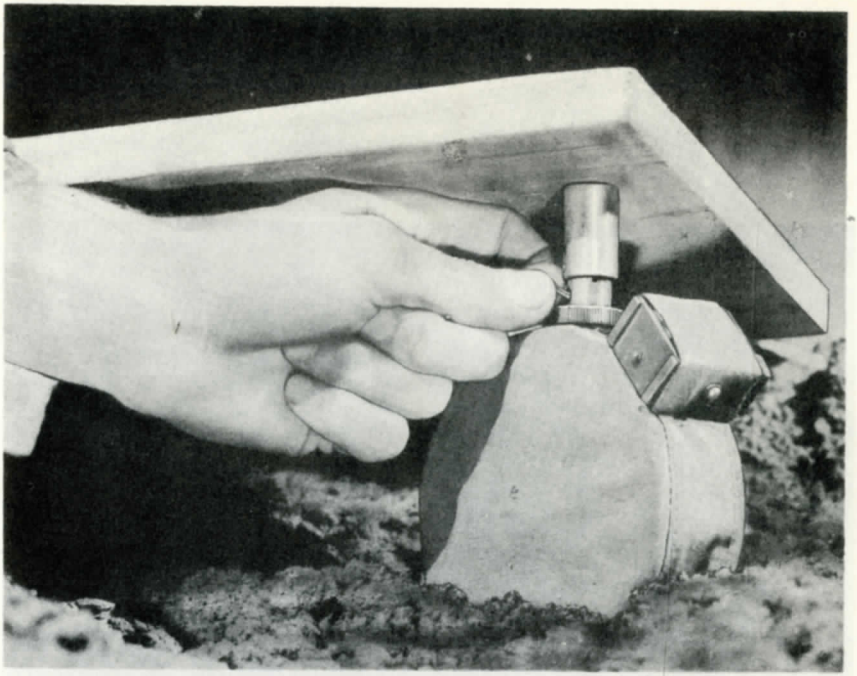


Figure 10. Rigging magnetic mine for use as an antipersonnel mine.

Figure 11. Using plank or board with magnetic mine to give more bearing on fuze.

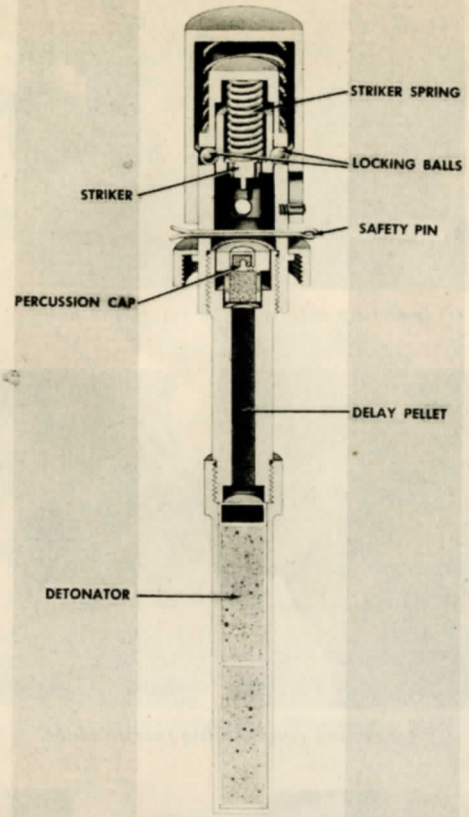


Figure 12. Cut-away of magnetic mine fuze.

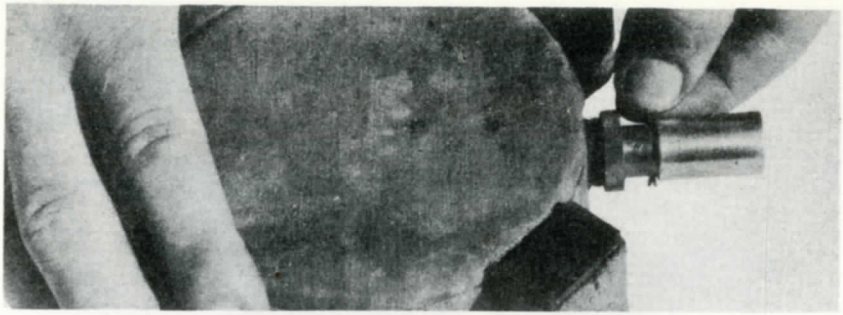
release plunger then moves down, and the striker drives through opening, firing the percussion cap—detonator—booster—main charge.

d. Arming. To arm the yardstick mine, remove the safety wire.

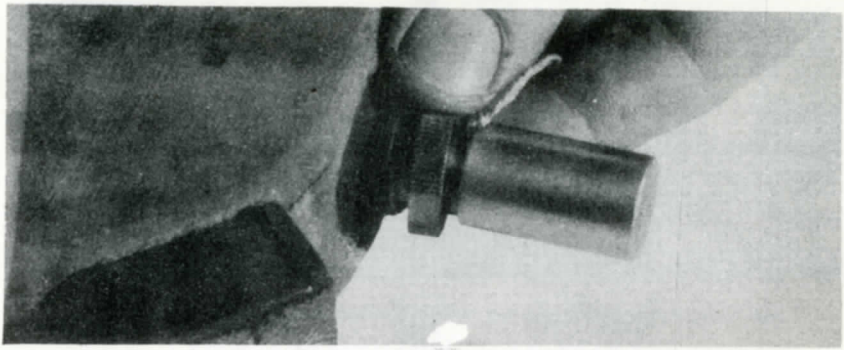
e. Disarming. Examine for booby traps. Remove blocks of explosives and fuzes from each case. Insert safety pin or improvised safety pin in safety-pin hole of each fuze (fig. 18).

10. TYPE 97 HAND GRENADE. *a. Description.* The Japanese type 97 grenade is a pressure-operated fragmentation grenade (fig. 19). It is normally black and has a grooved (horizontal and vertical) cast-iron case. Total weight is 1 pound, including 2 ounces of high explosive (fig. 20).

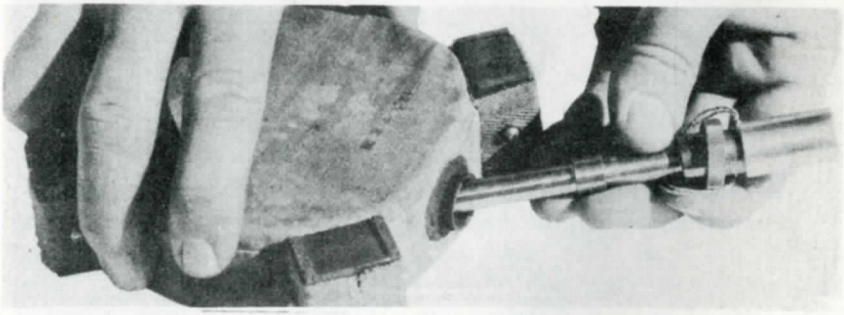
b. Use. The type 97 grenade is the standard Japanese hand grenade. However, it has been used as a pressure-operated booby trap by removing the pin and cap. The grenade has a delay fuze, but it can be removed and the detonator taped in the normal position of the delay



① *Inserting safety pin in safety-pin hole.*



② *Loosening ring holding fuze in place.*



③ *Removing fuze from mine body.*

Figure 13. Disarming magnetic mine.

train. With this change, the grenade fires immediately on pressing the cap.

c. Functioning (fig. 20). Remove safety pin and give cap a sharp pressure or blow to drive striker onto percussion cap. The percussion cap then ignites a 5-second delay train which sets off detonator and the main charge.

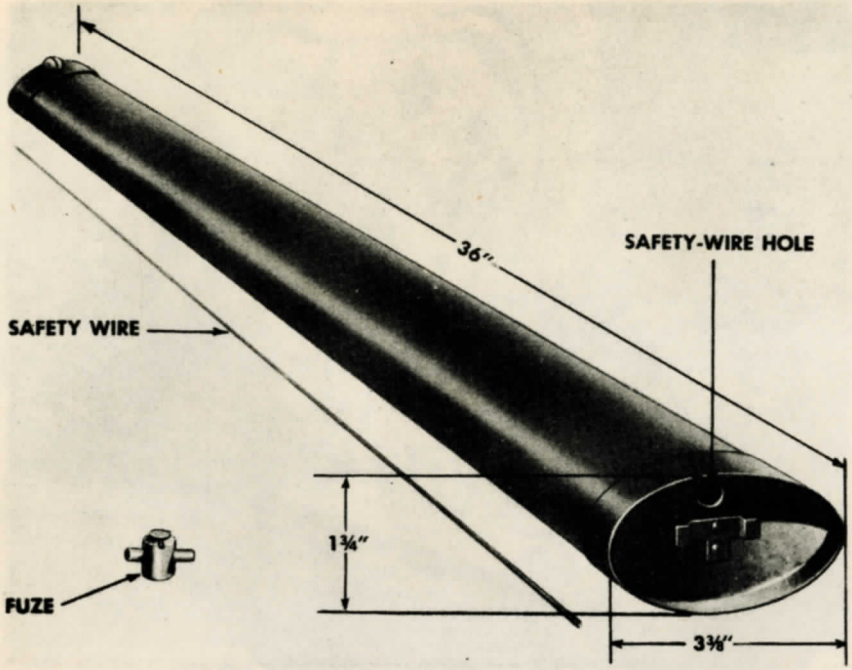


Figure 14. Japanese yardstick antitank mine.

Figure 15. Installing yardstick mine on road shoulder.

Figure 16. Yardstick mine used against vehicles.

d. Installing and arming. To install the type 97 grenade as a booby trap, dig a small hole in the ground and place grenade upright with cap just above ground level. Camouflage excavation and grenade. Remove safety pin as last step.

e. Disarming. To disarm, remove metal cap and lift out striker. Finally, unscrew fuze and plug.

11. TYPE 3 LAND MINE. *a. Description* (fig. 21). The Japanese type 3 land mine has no exposed parts made of metal which makes detection difficult with standard mine detecting equipment. The circular terra cotta case has an earthen color. The fuze body is of bakelite with only springs, pins, and striker made of metal. The mine is manufactured in two sizes, 10½ inches in diameter and containing 6½ pounds of explosive, and 8½ inches in diameter and containing 4½ pounds of explosive.

b. Use. These mines have been found in mine fields and on roads and airfields. Normally they are used as antitank mines but they have been set up as antipersonnel mines with trip wires attached to the fuze. The mine has been found with pressure board on top to increase the pressure area.

c. Functioning (fig. 22). This mine may be detonated by pressure or pull, after the safety pin is removed. Normally, a percussion

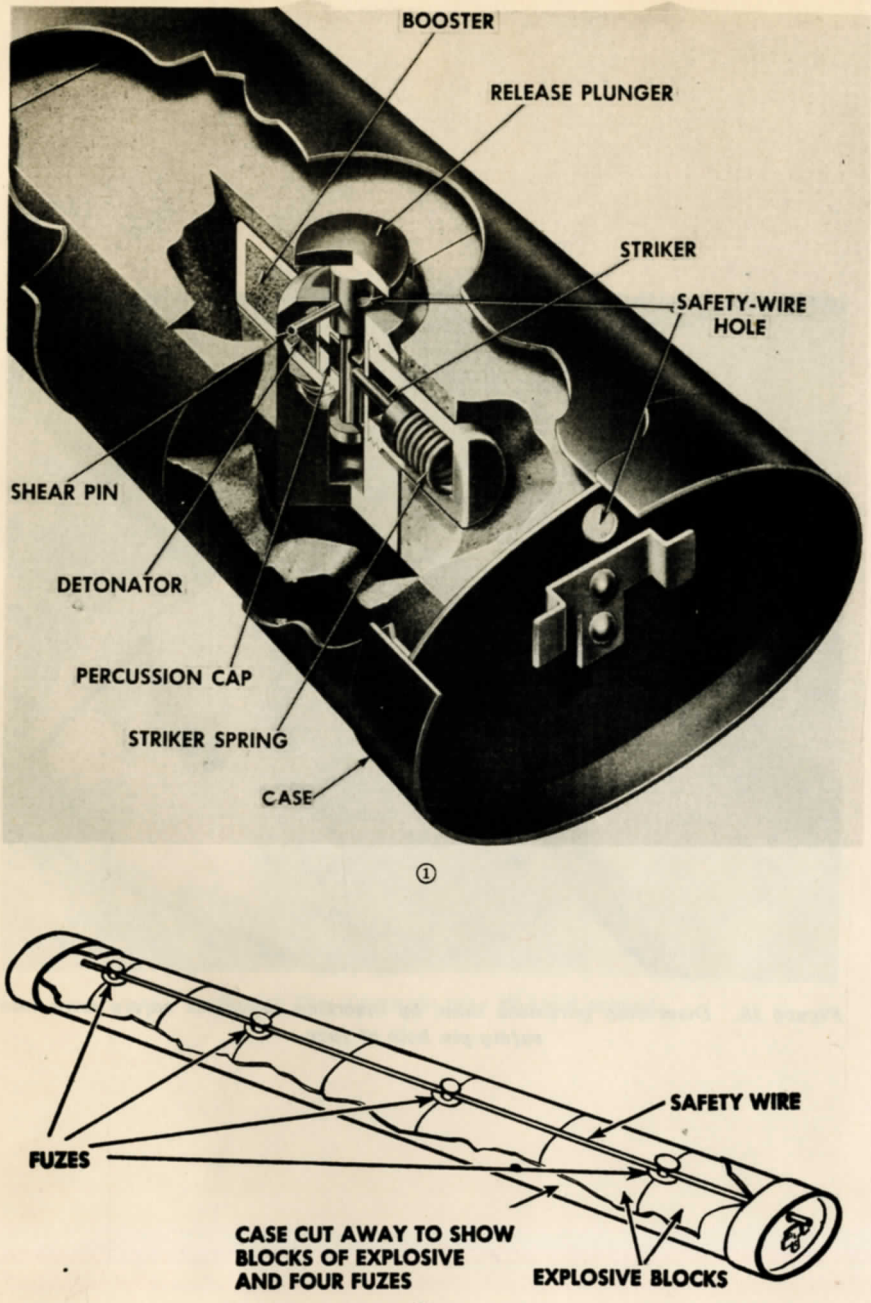


Figure 17. Cut-away of yardstick mine.

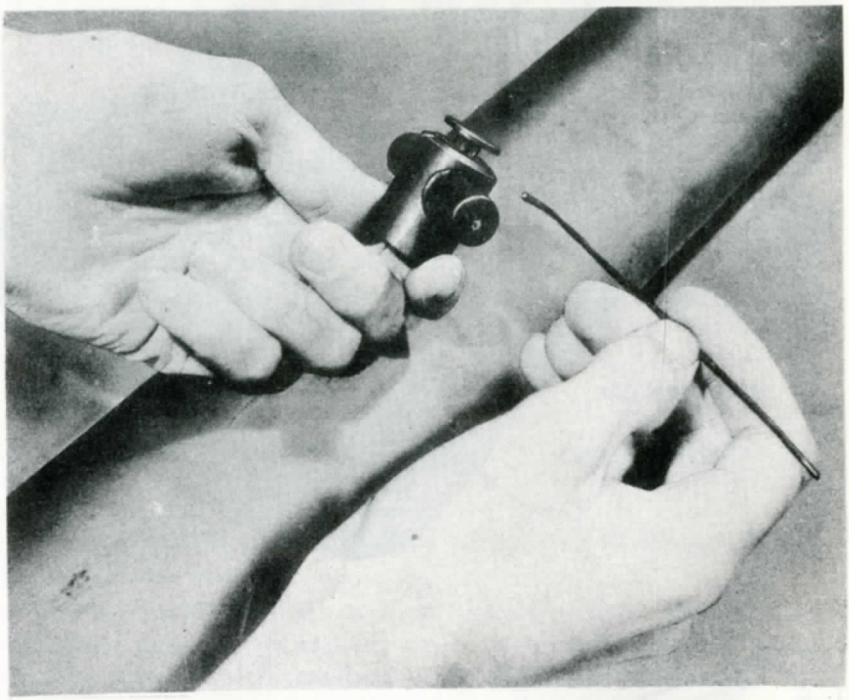


Figure 18. Disarming yardstick mine by inserting expedient safety wire into safety-pin hole of fuze.

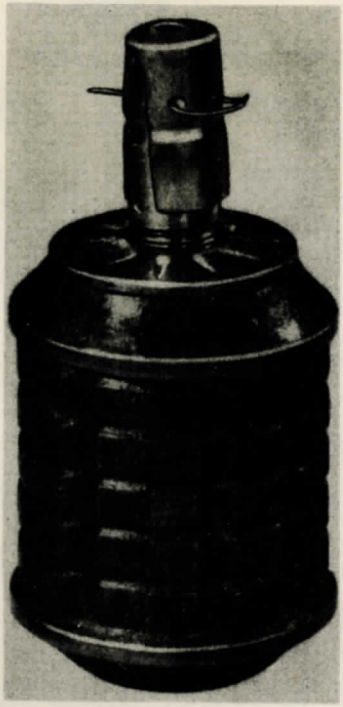


Figure 19. Japanese type 97 hand grenade.

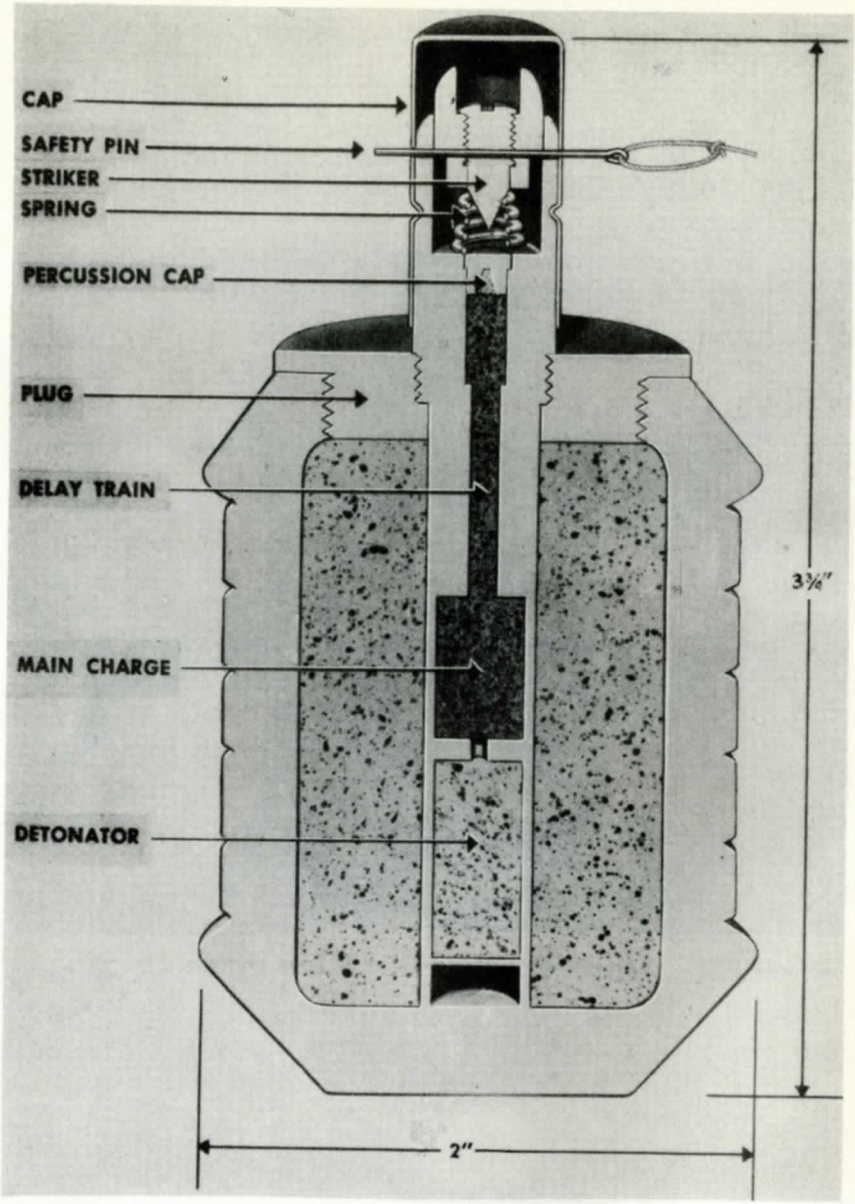


Figure 20. Cut-away of type 97 hand grenade

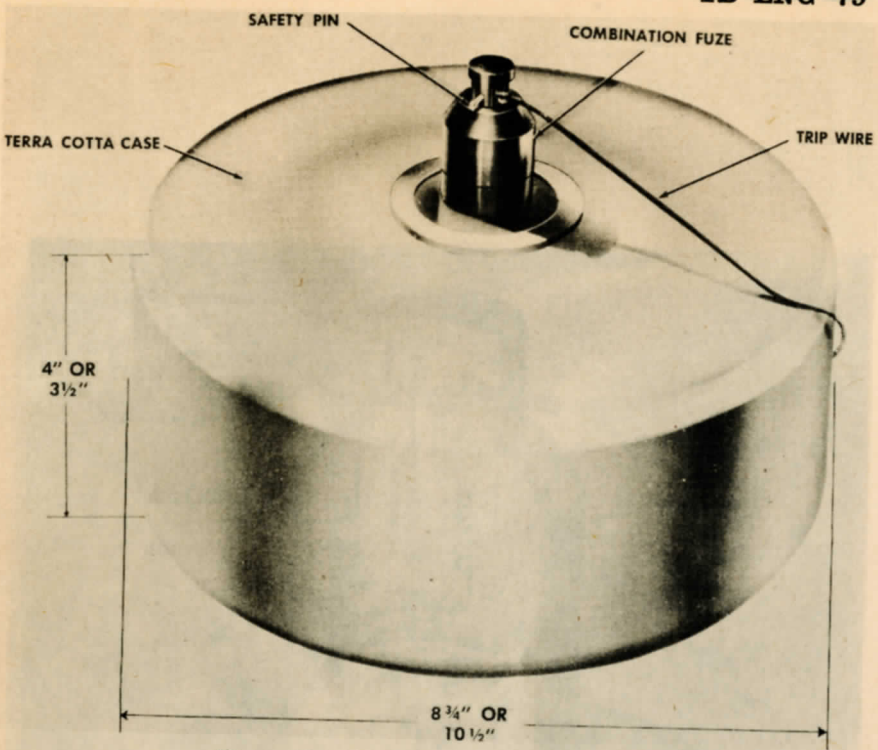


Figure 21. Type 3 Japanese land mine.

hammer within the fuze is held in position by a release fork to which a trip wire may be attached. When the wire is pulled, the fork releases the hammer, which is forced downward by the percussion hammer spring. The hammer hits the striker, forcing it against the percussion cap. A variable pressure up to 40 pounds, or a pull as low as 10 pounds, normally causes detonation.

d. Installing and arming. To install as an antitank mine, bury mine or lay it on surface of ground. Screw fuze into mine body and complete camouflage. Finally, remove safety pin from safety-pin hole.

e. Disarming (fig. 23). To disarm the mine, first examine carefully for trip wires. Then insert safety pin in fuze and cut any trip wires. To defuze, examine for booby traps, then with *safety pin in* and trip wires cut, unscrew fuze from mine (fig. 24). Fuze has either right- or left-hand thread.

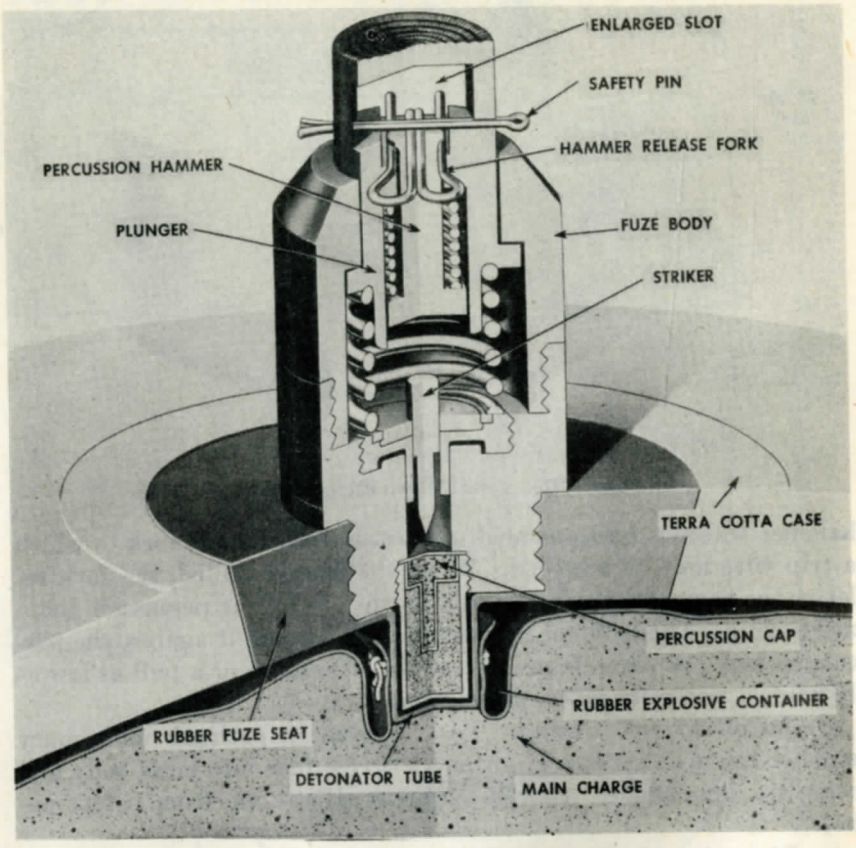


Figure 22. Cut-away of type 3 land mine.

Figure 23. Removing safety pin from safety-pin hole of fuze.

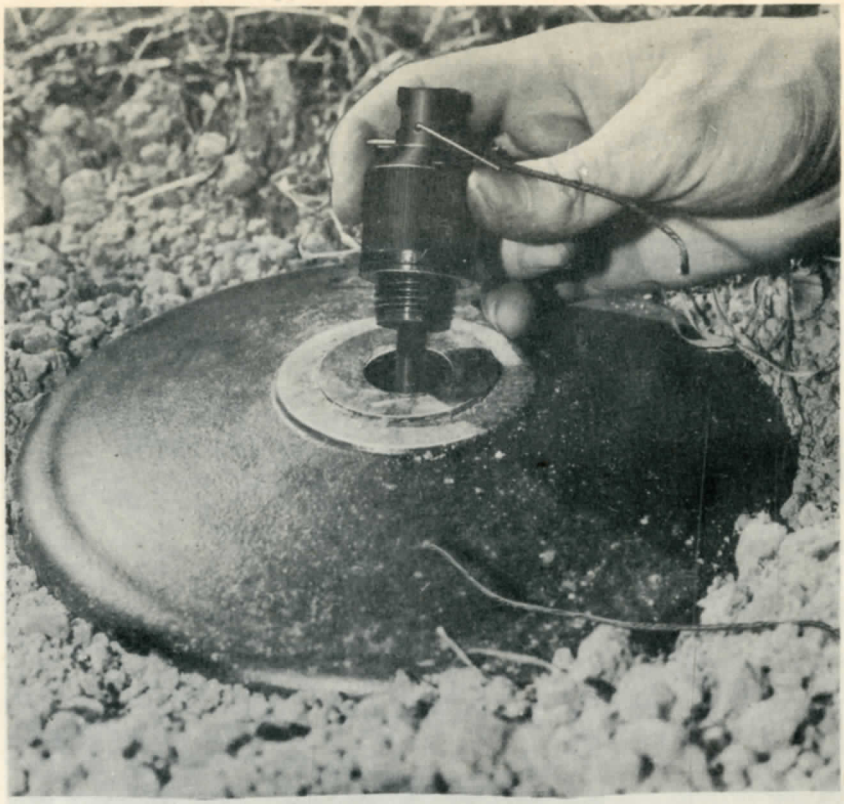


Figure 24. Defuzing type 3 land mine.

[AG 300.5 (4 Jun 45)]

BY ORDER OF THE SECRETARY OF WAR:

OFFICIAL:
J. A. ULIO
Major General
The Adjutant General

G. C. MARSHALL
Chief of Staff

DISTRIBUTION:

AAF (10); AGF (10); ASF (2); T of Opn (5); T of Opn (Eng) (10); Arm & Sv Bd (1) except Eng Bd 15); S Div ASF (1); Tech Sv (2) except OCE (50); Sv C (10); ASF Dep (Eng Sec) (2); Dep 5 (2); Gen & Sp Sv Sch (2) except Eng Sch (50); USMA (2); AGF Repl Tng C (25); A (Eng Sec) (10); CHQ (Eng Sec) (10); D (2); B (2); R (2); Two (2) copies to the following T/O&E 5–15, 5–16, 5–17, 5–21, 5–72, 5–75, 5–88, 5–115, 5–116, 5–121, 5–135, 5–192, 5–200–1, 5–215, 5–216, 5–217, 5–225, 5–235, 5–267.

Refer to FM 21–6 for explanation of distribution formula.

AGO 212B

U. S. GOVERNMENT PRINTING OFFICE: 1945

THE ENGINEER BOARD

Fort Belvoir, Va.

EXPERIMENTAL AND DEVELOPMENT MINE SET, TRAINING, JAPANESE

Contract W44-009-Eng-309 -dated 3/14/45

for 16,000 Sets

	Quantity Ordered	Quantity Shipped	Total Made	Total Canc.	Date Canc.	Date of last Shipment
Domestic Type	12,500	2767	2767	9733	Aug.	8/30/45
Export Type	3,500	2190	2190	1310	Aug.	8/30/45

JAPANESE YARDSTICK MINE (INDICATOR)
JAPANESE TYPE 3 LAND MINE FUSE (INDICATOR)
RELEASE FORMS FOR TYPE 3 LAND MINE FUSE

INTRODUCTION

This device had to be produced with other details duplicated as in the Japanese Yardstick Mine so that the Yardstick Mine could be used for training our troops as indicators for testing mine clearing methods. In other words, this mine had to be made up so that it could be used as a dummy exactly the same as the original yardstick mine so that the troops who cleared the mine fields would know exactly how this mine would function, how it looked, and how much pressure it would take before detonating.

INVENTION, ENGINEERING AND DEVELOPMENT

Specifications on the yardstick mine were such that The A. C. Gilbert Company had to do a lot of research and engineering work before the yardstick mine could actually be built. For instance, material used for the outside case had to be exactly the same tensile strength as that of the original. By obtaining the correct tensile strength, it would be necessary to use material with a hardness temper rarely used in this country. The fuzes had to be engineered so that they would function and shear in the same manner and under the same load as the Japanese yardstick mine. Our Engineering Department had to perfect charges which would have a material having the same weight and size as the original explosive charge. The fuzes which were engineered by us for the Japanese Yardstick Mine likewise had to function with the same pull and pressure found necessary to fire the real Japanese fuze. This required much development and engineering to produce the fuze which would charge the same as the Japanese type. We found that in all cases the Japanese materials and hardness tempers were hard to duplicate. We worked out with the Engineer Board additional release forks for this fuze which could be supplied by us as this particular part had to be replaced after each one of the tests were made on the Yardstick mine.

TYPE OF MATERIAL

Specially drawn and tempered steel in sheets, fabricated by us. Zinc for die castings which were fabricated in our own plant. Wire rod which was fabricated by us on Screw Machines. Dummy demolition charges of a Plaster of paris content which was engineered by The A. C. Gilbert Company and many other raw materials.

TOLERANCES AND METHODS OF QUALITY CONTROL

All materials had to be checked for temper and hardness by our Chemical Engineers. Tolerances were held very closely on the fuze and quality control was used in producing the yardstick mine. This control called for the testing of several units from each lot and after this test if there were rejects, then the entire lot had to be reworked.

NATURE OF SUBCONTRACT WORK

The only subcontract work that was released was the actual making of dummy charges, the coil springs, and the cotter pins. The A. C. Gilbert Co. engineered and laid out all tools and installed the necessary machinery and equipment and the laying out of manufacturing departments.

THE ENGINEER BOARD

Fort Belvoir, Va.

JAP ANTI TANK YARDSTICK
(Indicator Type)
MINE

	Contract No.	Quantity Ordered	Quantity Shipped
3/24/45	W44-009-Eng-311	5,000	5,000

THE ENGINEER BOARD

Fort Belvoir, Va.

Contract or Order No.	Item	Quantity Ordered or Carry Over Balance	Quantity Shipped
38109	Special Pull Type Firing Device	250	250
38153	Base and Prime Assembly - Firing Device	3,000	3,000
38332	Assembly Base and Blasting Cap for Concussion Detonator T1	1,000	1,000
38871	Foreign Demolition Container	1,000	1,000
38871	Modified M2 Fuze Lighter	300	300
24883	Fuze Lighter Base with Spring Snout	500	500
39174	Switches	2	2
26790	M1 Delay Firing Device	598	598
25533	4X7420 Spools of Wire	500	500
40016	Release Forks for Type 3 Land Mine Fuze	1,000	1,000
39984	Type 3 Land Mine Fuze	4,000	4,000
38884	Firing Device Bases - Special	1,000	1,000
40112	Stoppers	1,000	1,000
40318	Type 3 Land Mine Fuze	1,000	1,000
40621	M2 Fuze Lighter	500	500
40897	M1 Concussion Detonator Cans	200	200

51

BENRUS WATCH COMPANY

Waterbury, Connecticut

Order No.	Item	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
12023	Pivots	50,000	0	50,000
21831	Arming Stems	600,000	0	600,000

52

BROWN-LIPE-CHAPIN COMPANY

Syracuse, N. Y.

A9520 OIL BUFFER
SPRING GUIDE KEY

Order No.	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
40636-X	8,000	8,000	
45876-X	20,000	0	20,000

EASTMAN MACHINE COMPANY

Buffalo, N.Y.

B700E

TRIM TAB MOTOR

Order No.	Quantity Ordered or Carry Over Balance	Quantity Shipped
10679	630	630
11440D	1,825	1,825

54

SPERRY GYROSCOPE CO.

Long Island, N. Y.

BLOWER

	Quantity Ordered	Quantity Shipped	Total Made	Total Canc.	Date of Last Shipment
April thru June					
4 Orders -	400	208	400	192	9/14/45

INTRODUCTION

We were contacted by the Sperry Gyroscope Company to design for them a special heater blower. This was to maintain a workable temperature on radio equipment which was being used in the far Northern sector. Our engineers were called in to check the specifications and design on this unit and through their ingenuity we were able to convert another unit, thereby saving the Government considerable money and time.

BRIDGEPORT MOULDED PRODUCTS CO.

Bridgeport, Conn.

PROTEK PLUG CAP

	Quantity Ordered	Quantity Shipped	Total Made	Total Canc.	Date Canc.	Date of Last Shipment
5/23/45	4,000,000	2,000,000	2,000,000	2,000,000		
7/17/45	1,000,000	560,148	560,148	439,852	8/17/45	8/24/45

INTRODUCTION

We received tour first thermoplastic machine in 1945. At that time we were asked by the Bridgeport Moulded Products Company to mould for them several hundred thousand of the Protek Plug Cap. This type of manufacture was new to us. However, within a few days after the die was given us by the Bridgeport Moulded Products Co., we were turning out daily production as required by them.

These Protek Plug Caps were produced by us until the termination of the War. Our deliveries were quite satisfactory and our quality levels were very high.

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SELSYN ROTOR

INTRODUCTION

This engineering work was done in our Electrical Engineering Department in collaboration with the Electrolux Corporation of Old Greenwich, Conn. This unit was a 3 phase winding which was used on a Selsyn rotor for stabilizing guns on tanks.

INVENTION, ENGINEERING AND DEVELOPMENT

We worked out methods of production on the above item. This job was completely engineered in collaboration with Electrolux methods and adaptability to our machinery and our conveyor system. It was a very urgent and critical job which required special training of our operators. We assigned a special technical foreman to commute back and forth between our plant and the Electrolux plant, training our personnel and in many instances we transported special assembly and electrical operators to and from the Electrolux plant in order to teach the different personnel how to do this job successfully. Production was completed as specified. This job was worked on during March, April and May of 1945. While working with Electrolux we undertook the engineering and the manufacturing of the DM 34 and DM 35 which was a dynamotor armature which was engineered by us in collaboration with Electrolux. We also tooled up for production runs. This was a very special winding, testing and assembly job which called for very intricate tools which our Tool Design Department designed and we also set up our quality control in our Inspection Department on this particular job. However, this job was cancelled before we could get into production.

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ELECTROLUX CORPORATION

Old Greenwich, Conn.

Date	Order #		Quantity Ordered	Quantity Shipped	Total Made	Total Cancelled
1/27/45	8676	SELSYN ROTOR GENERATOR FIELD COILS #27830	4000	4000		
3/14/45	9868	GENERATOR FIELD COILS #28035-1	5750	5193	5193	557
3/14/45	8676	MOTOR FIELD COIL ASSEMBLY #27739-1	4000	3298	3298	702
3/23/45	10040	MOTOR FIELD COIL ASSEMBLY #28034	5750	1157	1157	4593
4/20/45	11	FIELD COIL ASSEMBLY #23834	12,250	4186	4186	8064
4/20/45	59	ROTOR ASSEMBLY #21129	5000	946	946	4054

NATIONAL FIREWORKS COMPANY

Hanover, Mass.

DELAY HOUSINGS AND BODIES

	Quantity Ordered	Quantity Shipped	Total Made	Total Cancelled
Four Orders	4,724,000	196,272	196,272	4,527,728

INTRODUCTION

We were awarded a contract for the Delay Housing and Body. These parts made up a special sub-assembly for a hand grenade which was being produced by the National Fireworks Company.

INVENTION, DEVELOPMENT AND ENGINEERING

Extensive tool development and engineering was done by us to overcome the many difficulties that were happening in other plants in manufacturing these two parts.

TYPE OF MATERIAL

Zinc pigs or bars -- the two items were die cast by us in our high pressure die casting machines.

TOLERANCES

While these parts were not only held to close limits and had to go through quality control inspection, one of the main difficulties that was outstanding was the fact that these castings had to be produced free from porosity. This was overcome by us in our tool and die design and with special high pressure die casting machines. One of the specifications that had to be adhered to was that all these castings had to be free from porosity so that when the pin was pulled on the hand grenade, no amount of flame or sparks could issue through the housing and thus interfere with the proper functioning of the hand grenade itself.

NATURE OF SUBCONTRACT WORK - None.

OPERATIONS

There were 18 major operations and 7 inspection operations.

59

HIGH STANDARD NEW GUN PARTS

INTRODUCTION

We had furnished High Standard and also Colt with parts all during the War for their 50 Calibre Machine Guns, and as our quality standards were very high and our delivery excellent, when the High Standard Manufacturing Co. was developing their new improved 50 calibre machine gun, we were asked to produce 11 different parts for the gun.

INVENTION, DEVELOPMENT AND ENGINEERING

Many of the parts which we were asked to do on the new improved 50 calibre machine gun were not engineered from a standpoint of design, nor were they engineered for production. Our first pilot lot went to High Standard according to specifications and tolerances which they had set up. These parts went through their Inspection Department with a very few changes. During that time we were engineering and building tools, dies, jigs and fixtures for the improved 50 calibre machine gun.

TYPE OF MATERIAL

Steel rod which was fabricated into parts. Steel sheet which was fabricated by us into gun parts and sheet fibre which was fabricated by us into various gun parts. On this order we also had assembly work for the High Standard Company.

TOLERANCES AND QUALITY LEVELS

The specifications and tolerances were very close. In fact, the tolerances were held in some instances as close as + or-.0005. All of the parts had to have a mirror finish because of the free action requested by High Standard when assembling into their guns. All of these parts were very hard to machine because they were, in most cases, made from tool steel.

NATURE OF SUBCONTRACT WORK

None

OPERATIONS

There were 11 parts made by us with an average of 8 major operations on each part, plus an average of 6 inspection operations for each part.

REPUBLIC AVIATION CORPORATION

Farmingdale, L.I. N.Y.

#89F36190 TRIM TAB BOX

Order No.	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
04390	620	620	
06015	1,000	1,000	454
06738	1,350	0	1,350
07013	150	150	

SPRINGFIELD ORDNANCE DISTRICT

BOOSTER CUP

This Booster Cup was used on the M103A1 Fuze. The Springfield Ordnance requested that we supply them with this particular device. Much time was spent in our Tool and Engineering Department in designing the proper molds and gauges. Also, a considerable amount of time was spent by our Industrial Engineer in laying out departments, such as the Machining and Die Casting Departments for this particular item.

This again is another job that required many months of engineering and tool design work at no cost to the Government.

Changes in requirements for the Armed Services eliminated intended acquisition of production quantities.

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SPRINGFIELD ORDNANCE DISTRICT

BOOSTER CUP

Contract No.	Quantity Ordered or Carry Over Balance	Quantity Shipped	Total Cancelled
W19-059-ORD-2347	300,000	0	300,000

SPECIAL PULL FIRING DEVICE

INTRODUCTION

In February, 1945, Captain McCord of the Engineer Board, Fort Belvoir, Va. contacted our engineers. He had in mind a special pull Firing Device to be used in mine clearing. It was left up to The A. C. Gilbert Company to work out the suggestions as recommended by The Engineer Board. A practical device was engineered and developed at The A. C. Gilbert Company from a functional item to a practical production item. A working model was made and submitted to the Engineer Board on March 9, 1945. We were requested to immediately make up 250 more of the devices so that they could be tested at the Engineer Board's Proving Ground. As the 250 units were not a production run, The A. C. Gilbert Company had the 250 units made up in our Tool Room from the drawings that were made at The A. C. Gilbert Company and from the sample which had been submitted to the Engineer Board previously. The production of the 250 devices was completed in April, 1945, and no further production requirements were needed and there were no further orders.

PROXIMITY (V.T.) FUZE T-3 ARMING DELAY

INTRODUCTION

Captain D. M. Hall, SPOTM - Special Projects Branch, first conferred with our Engineering Department on this device. His mission to this plant was on a very secretive item and the purpose of his visit was for engineering and requirements for a cover and arming delay for the T-51 (E1) Bomb Fuze. Our engineers went to Washington with sketches of a proposed design and other engineering data and also to obtain more detailed information.

INVENTION, DEVELOPMENT AND ENGINEERING

Our engineers were in constant touch while working on this project with NDRC at the National Bureau of Standards and with the Zenith Radio Corp. in Chicago. Due to the urgency of the item, it was necessary for this Company to have some of the drafting work done by an outside concern, since our own draftsmen were overloaded with other work and we did not have the space to accommodate more draftsmen. Our Engineering Dept. constructed a special temporary wind tunnel and made several which met all requirements of the Government. The model and drawings were taken to Washington. This met up with all of their requirements and standards.

However, in the interim between the time that Captain Hall came up and the time this model was completed, the design and requirements had been changed. The change was that the mechanism must only lock the vane of the fuze rather than act as a cover. It also would have to accommodate the T2 Timer of which we were given a sample. Also, a separate cover had to be designed for protection in shipment and in handling at the loading plant. The latest revision constituted many changes. However, we had a working model of this latest revision and a cover made for the device for a Lieut. Dumaresq when he called on January 1 to carry back with him to Washington. He gave us verbal instructions to make 12 more samples for field tests immediately. 12 samples were made and shipped to the National Bureau of Standards along with an improved model of the cover. Lieut. Dumaresq called on us with the information that as our part of the development had been performed satisfactorily he suggested that our samples be turned over to the manufacturer of fuzes to incorporate in the fuze design. It was unnecessary for us to produce any more samples of this item. The A. C. Gilbert Company did a tremendous amount of engineering and inventive work on this item. After it had been developed, it was taken to other plants for manufacturing. However, it was the creed and motto of The A. C. Gilbert Company to lend a hand wherever necessary in order to further the war effort.

PROJECTED LINE CHARGE SWITCH

INTRODUCTION

Captain Torbert of The Engineer Board at Fort Belvoir, Va. contacted our Electrical Engineering Department on what they called the Projected Line Charge Switch. This device was to be used for clearing mines through the aid of a tank and a charge projected from a sled towed behind the tank. The information given us was that Fort Belvoir had been working on this item for months and were not able to perfect a suitable contact switch which would meet the requirements of functioning and safety. Because of the long experience The A. C. Gilbert Company had in dealing with Fort Belvoir and solving their problems, they came to us seeking advice, asking us if we would collaborate with them and design this contact switch and compute the electrical circuit for them.

Our Engineers contacted outside manufacturers, such as the Micro-Switch Company in Chicago, made various trips to New York and Washington and eventually did work out a switch plus an extensive working diagram and layout. Three models were engineered and made up by our engineers and shipped to Vero Beach by air. Work was started on this project March 15, 1945 and finished a few weeks thereafter. This entire unit worked out very suitably on the tests made by the Engineers at Vero Beach, however no production orders resulted from this engineering work.

ANTI-RADAR EQUIPMENT

INTRODUCTION

In March 1945 we were contacted by the Radio Research Laboratory of Harvard University, their address being 18 Divinity Avenue, Cambridge 38, Mass. to inquire if we would be interested in helping them with experimental work on an Anti-Radar Unit which was called, for secret reasons, an Umbrella.

INVENTION, DEVELOPMENT AND ENGINEERING

This was a top and very guarded secret and it required a lot of inventive genius to develop and engineer this item for production. Our Chief Engineer made several trips to Cambrdige and was called into Engineering Conferences with Mr. Marlowe G. Moses, Dr. F. L. Whipple and Mr. L. S. Cooke. These same gentlemen also came to New Haven repeatedly to have conferences with our engineers. We offered many suggestions and made preliminary hodels and sketches. However, in May the Laboratory at Harvard University called our Chief Engineer direct and told him that some field experiments would have to be made before any further engineering could be done. Our Chief Engineer was notified to stop work on the project temporarily. This was really the last that was ever heard from Harvard University on this project. The item did not reach the production stage. This took up a great deal of our Chief Engineer's time, plus other engineers and model makers.

I do not believe that this Company was ever reimbursed for experimenting and engineering this project.

U. S. DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

WASHINGTON

ADDRESS REPLY TO
NATIONAL BUREAU OF STANDARDS
:MHP

January 8, 1946

IN YOUR REPLY
REFER TO FILE
OD-5

General Manager
The A. C. Gilbert Co.
New Haven, Connecticut

Dear Sir:

Enclosed herewith is a copy of an official history of the development of the Radio Proximity Fuze for Bombs, Rockets, and Mortars, prepared by the Ordnance Development Division of the National Bureau of Standards. Leading military experts have classed the Radio Fuze together with the Atomic bomb and Radar as the three top secret weapons of this war.

As your company played an important role in this development, it is felt you will wish to have a copy of this history for your records. The information contained therein may be reprinted or quoted freely in whole or in part. It may also be used for advertising purposes if desired. Mention of your connection with the National Bureau of Standards in this project is hereby authorized and encouraged.

A limited supply of photographs of the fuzes, whole or cut-away, or mounted on bombs, rockets, and mortars, and action scenes, that have been cleared by the War Department are available for your use upon request. You are cautioned against revealing information other than that contained in this history or in publications already released and approved by the Army and Navy. Any other information should be cleared prior to release by submitting it to the War Department, Office of the Chief of Ordnance, Research and Development Branch, Attn. Col. C. E. M. Roberts, Pentagon Building, Washington, D. C.

Respectfully,

NATIONAL BUREAU OF STANDARDS

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ADDRESS REPLY TO
BUREAU OF ORDNANCE, NAVY DEPARTMENT
AND REFER TO

NAVY DEPARTMENT
BUREAU OF ORDNANCE
WASHINGTON 25, D. C.

10 December 1945

Subject: Naval Ordnance Development Award.

Enclosure: (A) Certificate for Distinguished Service to Naval Ordnance Development.

Dear Mr. Gilbert:

It is the great pleasure of the Chief of the Bureau of Ordnance to confer upon The A. C. Gilbert Company the Naval Ordnance Development Award which has been granted in recognition of the distinguished service of your organization to the research and development of naval ordnance.

The congratulations of the Bureau of Ordnance are extended to every man and woman of The A. C. Gilbert Company for outstanding performance in connection with the research and development of special underwater demolition equipment.

The Certificate for Distinguished Service to Naval Ordnance Development and the lapel emblem for each member of your organization connected with the particular development referred to above are the symbol of appreciation from the Bureau of Ordnance and from the entire Navy for the expert supervision and hearty cooperation which you have consistently displayed.

Very truly yours,

G. F. HUSSEY, JR.
Rear Admiral, U. S. Navy
Chief of the Bureau of Ordnance

Mr. A. C. Gilbert, President
The A. C. Gilbert Company
New Haven 6, Connecticut

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69

United States Navy

Bureau of Ordnance

Naval Ordnance Development Award

CERTIFICATE TO

The A. C. Gilbert Company

In appreciation of
Distinguished Service
to Naval Ordnance Development

10 December 1945
Date

W. R. Purnell
Rear Admiral, U.S. Navy
Chief of the Bureau of Ordnance

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PRESENTATION OF NAVAL ORDNANCE DEVELOPMENT AWARD BY CAPT. J. H. CARSON OF THE U.S. NAVY TO THE A. C. GILBERT CO.
FOR OUTSTANDING PERFORMANCE IN CONNECTION WITH THE RESEARCH AND DEVELOPMENT OF
SPECIAL UNDERWATER DEMOLITION EQUIPMENT IN 1945

Remington

ALL COMMUNICATIONS SHOULD BE ACCOMPANIED BY CARBON COPY AND ADDRESSED TO

TO INSURE PROMPT ATTENTION
IN REPLYING REFER TO

_____ NO. _____

ATTENTION OF

_____

WAR DEPARTMENT

OFFICE OF THE CHIEF OF ORDNANCE

WASHINGTON

17 DEC 1945

Mr. A. C. Gilbert, President
A. C. Gilbert Company
319 Peck Street
New Haven, Connecticut

Dear Mr. Gilbert:

It is a pleasure to extend to you and to your entire organization my personal congratulations and those of the Ordnance Department for your signal contribution to the war effort.

The award of the Army-Navy "E" serves to emphasize your record of performance and accomplishment in the production of Anti-Personnel Devices, Parachute Flares, and Fuzes for Anti-Tank Mines. Your consistent volume production of quality products at uniformly low prices has been exceptional and your ability to convert from peacetime manufacture to wartime needs is an outstanding example of the flexibility of American industry.

Without the complete cooperation of Industry with Ordnance plus willingness to accept every responsibility we could not have attained our objectives. In final victory I am sure it must be a continuing source of greatest satisfaction to have held an important place in this Industry-Ordnance team which has done so much.

Sincerely yours,

L. H. CAMPBELL, Jr.
Lieutenant General, Chief of Ordnance

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CONCLUSION AND SUMMARY

1. 1945 represented the fourth conversion in the war effort.

2. Inventive genius contributed by The A. C. Gilbert Company.

3. Our development, research and experimental work on strategic and important top secret war devices reached its peak during 1945.

4. The work undertaken was of a very definite precision nature.

5. The overall picture is manufacturing from raw material right through to the finished product.

6. Particularly outstanding and unusual accomplishments were

   a. The invention, development, engineering and production of Demolition outfits for the Navy, for which we received the Naval Ordnance Development Award. This required a third conversion.

   b. Production of M-103 A1 Fuze Gear Sets and Slider and Slider Plates which required a complete rearrangement of our main plant and the erection of an entirely new wing.

   c. Invention, engineering, development and production of Japanese Mine Training Aid Sets.

   d. Invention, engineering, development and production of Japanese Yardstick Mines.

   e. Invention, development and engineering of Proximity VT Fuzes and Anti-Radar equipment.

7. In addition to these outstanding contributions we continued our large production program of many types of firing devices, anemometers, fin assemblies, parts for bombs, detonators, fuze lighters, gun parts, Trim Tab motors and Selsyn motor parts and Trim Tabs for airplanes.

8. In addition, we invented, developed and engineered many other devices that were not actually put into production owing to the termination of the war.

9. We continued the record we had established in the previous year of having no rejections on any of our production.

10. Our accomplishments have been performed without increase in personnel of top management.

11. We received, for the fourth time, the Army-Navy "E" Award.