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WAR DEPARTMENT FIELD MANUAL
FM 4-7

TACTICS AND TECHNIQUE OF CONTROLLED SUBMARINE MINES, GROUND

WAR DEPARTMENT • APRIL 1945

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CHAPTER 1

ESTABLISHMENT OF A MINE DEFENSE

Section I. GENERAL

1. SCOPE. This manual covers the planning, planting, operation, and maintenance of controlled submarine ground mine fields; the organization and duties of the personnel of a mine battalion; and the matériel and installations employed.

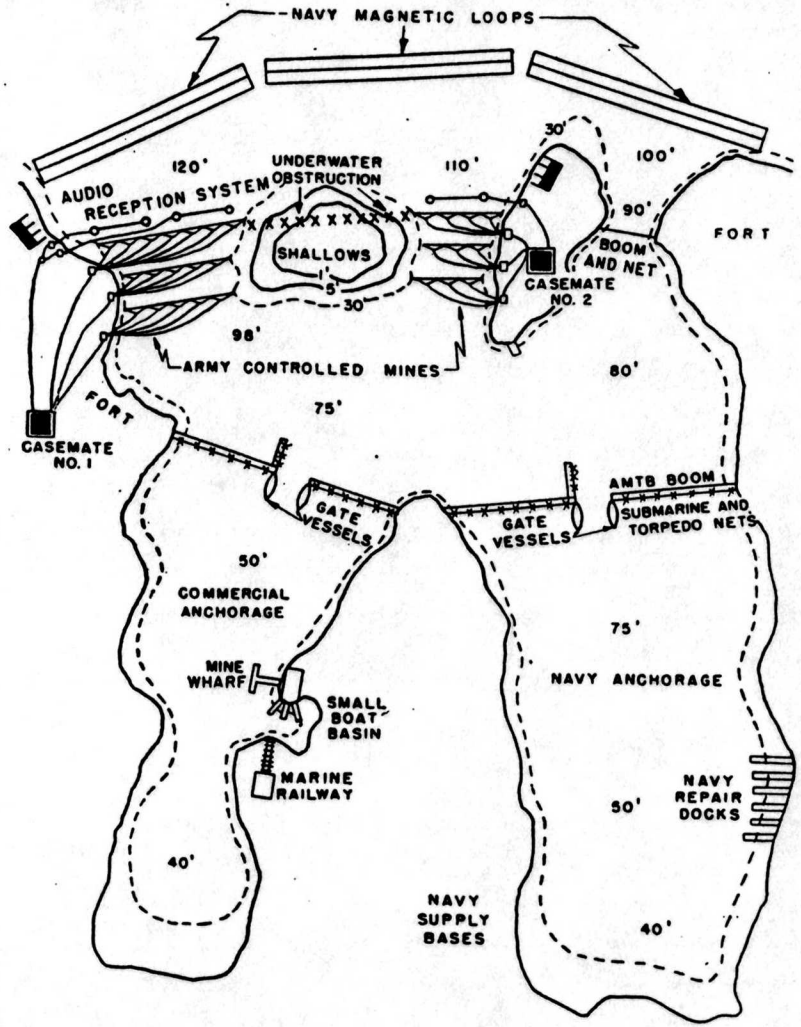
2. GROUND MINE. The ground mine is an Army type controlled submarine mine of negative buoyancy which rests on the bottom of a harbor or harbor approach. The firing of the mine is controlled from shore. When the shore controls are set to prohibit firing, the mine may be influenced by a vessel without firing. This is an important consideration in making tactical and technical plans for a mine project. (The controlled buoyant mine is covered in FM 4–6.)

3. REFERENCES. Appendix I lists non-War Department correlated references on submarine mining.

4. RESPONSIBILITY. The underwater defense (fig. 1) of a coastal defense area normally employs both Army and Navy installations. The Army is responsible for the development, procurement, installation, opera-

Note. For definitions of military terms not contained in this manual, see TM 20–205; for list of publications, see FM 21–6; and for list of visual training aids, see FM 21–7.

tion, and maintenance of all controlled submarine mine equipment. (See AR 100–20.) The Navy is responsible for the development, procurement, installation, operation, and maintenance of all uncontrolled mines and all nets, obstacles, and underwater intelligence devices with the exception of the Army's audio-reception system M1.



NOTE: NAVY CONTACT MINES ARE NOT SHOWN. THESE MINES ARE NOT NORMALLY USED IN ACTIVE HARBORS.

Figure 1. Under water defense installations.

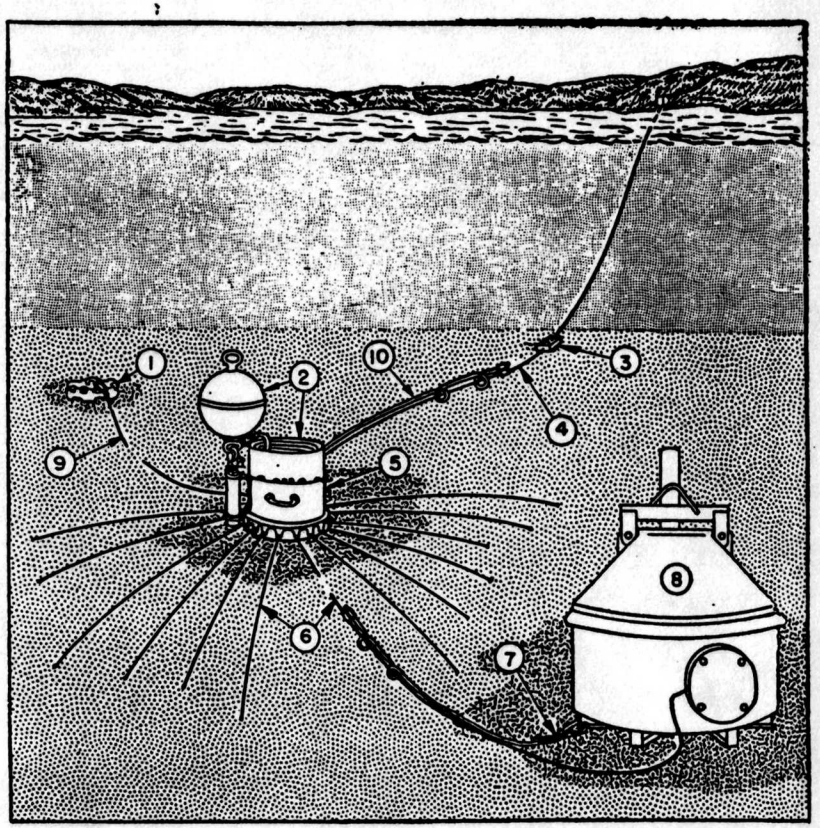


Figure 2. Ground mine under water equipment.

1. DB boat anchor.
2. Distribution box release buoy M1.
3. Junction box.
4. Shore cable.
5. Distribution box M2B1.
6. Individual mine cables (for one group of ground mines).
7. Mine raising rope.
8. Ground mine M4.
9. Mooring rope, DB boat.
10. Distribution box raising rope.

Section II. FACTORS DETERMINING ESTABLISHMENT OF A MINE DEFENSE

5. MISSION. a. Controlled mines. The mission of a controlled submarine mine defense is to prevent all

enemy vessels (especially submarines, which are the largest vessels capable of approaching undetected by surface surveillance) from entering a protected area and, at the same time, to permit the safe passage of friendly shipping. This mission may be accomplished by—

(1) Forcing the enemy, through the psychological effect of an unseen threat, to be cautious and uncertain when planning operations in water areas which they know or believe to be mined.

(2) Effecting the destruction of or causing serious damage to hostile vessels entering the mine field.

(3) Preventing enemy vessels from entering the harbor during periods of darkness and low visibility, or when other weapons of the Army and Navy are entirely or partially ineffective.

(4) Restricting maneuver of enemy vessels in formation.

(5) Limiting or preventing navigation of certain water areas or channels by hostile submarines.

b. Uncontrolled mines. Uncontrolled Navy mines are fired by contact with or when influenced by a vessel. They are used to close channels which are not needed for friendly shipping and which might aid the enemy if available to him. This type of mine may also be used to block large water areas offshore. These mines should be planted far enough from shipping lanes to reduce the danger to friendly ships which may be off course.

6. JOINT ARMY-NAVY ACTION. In addition to the joint Army-Navy Board the Army and Navy have established local joint planning committees to attain close cooperation between the two services, coordination in operations, and a common understanding of their mutual problems ("Joint Action of the Army and the Navy," 1935). The duties of these committees include determining the necessity, location, and extent of all mine fields, nets, booms, and obstructions required for the protection of the area under consideration.

7. TACTICAL AND TECHNICAL CONSIDERATIONS. Individual Army and Navy considerations are taken up by the Joint Army-Navy Board prior to the establishment of a controlled mine defense. These considerations are often mutual. The Navy indicates the areas in which protected anchorage is desired and which must be protected by Army controlled mine fields. The Joint Army-Navy Board should have a thorough knowledge of the location of channels and control of traffic passing through the mine field.

a. Army considerations. (1) Establishing the strongest defense with the least amount of matériel.

(2) Locating the mine field so that a vessel destroyed by the mines will not block the entrance to the protected area.

(3) Locating the mine field so that fire from secondary armament will be able to furnish complete protection; coverage of the mine field by searchlight and radar for surveillance, defense, and fire-control purposes during periods of darkness and low visibility.

(4) Planting mines with or without the aid of natural or artificial obstacles to provide shore-to-shore protection; planting mines so they will not be exposed or moved at low tide or during storms.

(5) Avoiding locations where reefs, undertow, surf, or excessive sanding occur.

(6) Studying the routes of shore cable; avoiding wrecks, natural obstructions, and Navy net gates which may foul ropes and cables on the bottom.

(7) Avoiding military and commercial cable routes whose cables may otherwise be seriously damaged by mine planting operations or mine explosions.

(8) Availability of vessels capable of planting mines.

(9) Locating mine fields so that Navy gate or patrol vessels will not be endangered by mine explosions.

(10) Determining the problems of wartime planting for all approved mine projects. This is accomplished by continuous planting and testing of at least one group of mines in each mine project during time of peace. For most reliable results, this test planting should be in the area of the mine field having the worst hydrographic conditions. The audio-reception system may also be retained in operation during peacetime to test its per-

formance under all possible conditions and to determine the best location for the hydrophones.

b. Navy considerations. (1) Location and size of mine fields.

(2) Providing obstructions (submarine nets, torpedo nets, contact mines, antimotor torpedo boat booms, and pilings).

(3) Providing navigational aids for vessels entering the protected area.

(4) Locating free channels, if necessary.

(5) Locating, installing, operating, and maintaining underwater detection devices (usually magnetic loops and subaqueous sound equipment); locating of this equipment so that timely warning may be given the harbor defense upon the approach of enemy vessels.

8. ELEMENTS OF A GROUND MINE DEFENSE. a. The controlled mine defense is part of the underwater defense which extends from shore to shore across the harbor entrance. A ground mine defense consists of one or more fields of controlled submarine ground mines with associated installations and equipment. A field of ground mines usually has three or four parallel lines of mines. The distance between lines is 1,000 to 2,000 yards; the interval between mines is 150 yards. For control, each line is broken down into groups of 13 mines each. Groups are numbered from left to right, as viewed from within the harbor, beginning with the most seaward line. The mines of each group are also numbered from left to right. Each mine is connected by single-conductor cable, called mine cable, to the group selector assembly by which mines are controlled from shore through the shore cable. (See fig. 2.) The shore installations required are mine wharves, loading rooms, storerooms, cable tanks, magazines, command and observation stations, and mine casemates. To aid in the control of the mine field, each casemate is provided with at least one audio-reception system. (See par. 11.) Controlled mine fields are usually protected by rapid-fire gun batteries assisted by searchlights and radar. See figure 3 for elements of a mine defense. For

mine planting and maintenance operations on the water, a mine flotilla, composed of at least one mine planter and auxiliary vessels, is necessary for each mine defense.

b. During peace time all matériel and equipment for an approved submarine mine defense project should be stored locally. Storage of explosives will be subject to controlling regulations. A flotilla for planting, operating, and maintaining the mine field should be available. This concentration will permit immediate installation of mine fields when war is imminent. The facilities for storage should include the following:

(1) Shore installations, including boathouses. (See ch. 4.)

(2) Mechanical devices capable of lifting and moving all mine matériel and equipment.

(3) Necessary railroads and roads connecting wharves, storehouses, magazines, and loading rooms.

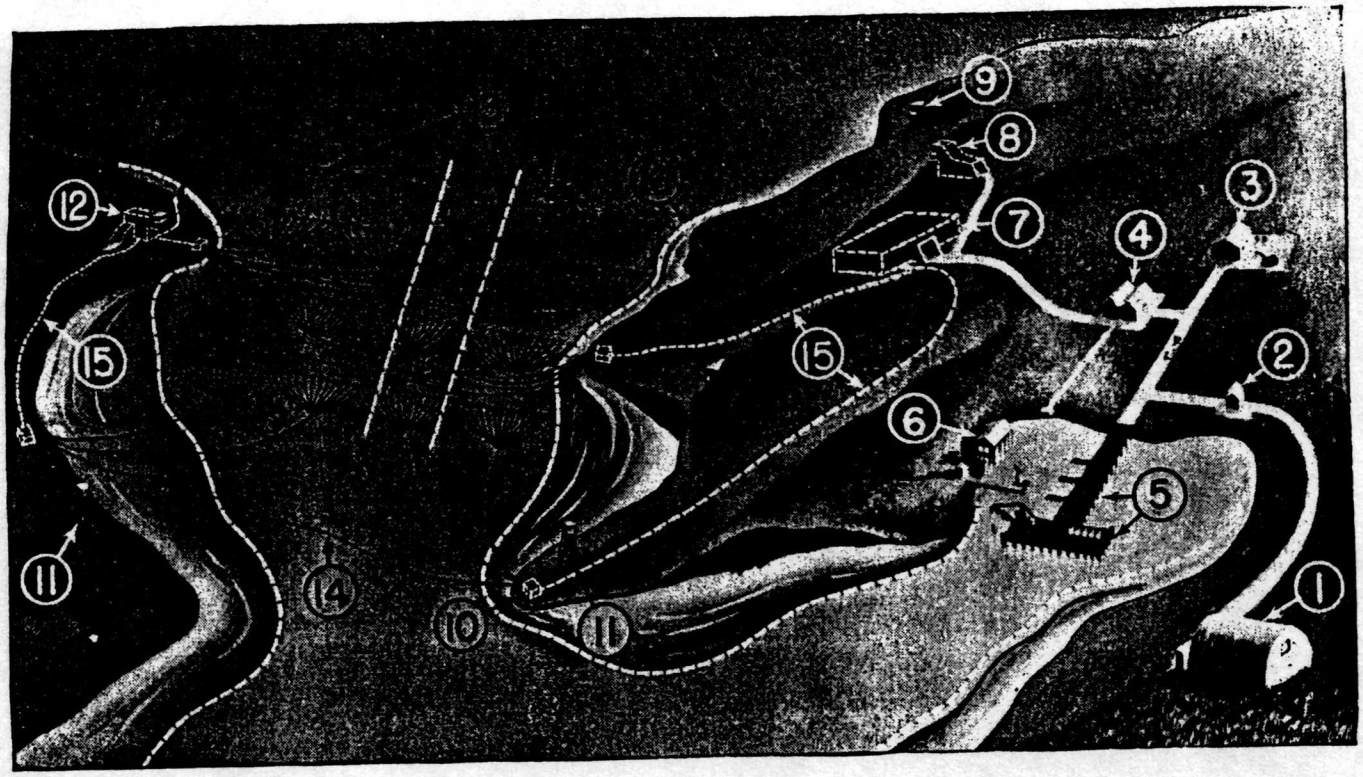
c. Until such time as the mine project is installed, all mine storage facilities should be located in one safeguarded area for economical maintenance. However, safety regulations for storage of explosives will be adhered to in the location of magazines.

Section III. PLANNING THE MINE FIELD

9. DISPOSITION OF GROUPS OF MINES. a. After the location of a new controlled mine field has been approved by the Joint Army-Navy Board, the individual mine groups are located. Mine groups are arranged to insure that any hostile vessel approaching an entrance to the protected area passes within the effective range of one or more mines. This may be attained in part by using at least three, and preferably more, lines of mines.

b. In addition to the considerations listed in paragraph 7, the following factors must be considered in planning the mine field:

(1) Controlled mines must be separated from uncontrolled mines by a distance sufficient to insure the safety of vessels planting and maintaining the controlled mine field. The minimum distance is 1,000 yards.



1. TNT magazine.
2. Loading room.
3. Mine storehouse.
4. Cable tank house.
5. Mine wharves.
6. Boathouse.
7. Mine casemate.
8. Mine command post.
9. Base-end station.
10. Cable terminal hut.
11. Base-end stations.
12. Casemate and observation station.
13. Hydrophones of audio reception system M1.
14. Interlock common cable.
15. Land cable.
16. 30-foot contour line.

Figure 3. Type of submarine mine installation.

(2) Mines in each group should be planted in a straight line to facilitate planting and maintenance.

(3) Lines of controlled mines should be separated by 1,000 to 2,000 yards, using the greatest distance practicable within the hydrographic limitations of each harbor defense. This is sufficient distance to allow planting and maintenance vessels working on one line of mines to maneuver without undue danger from lines to the front or rear and to facilitate traffic control. The distance between lines must be sufficient to allow the return of firing power to one line before removing power from the next line when friendly ships are entering the harbor.

10. ROUTING OF CABLES. When the location of groups of controlled mines has been determined, the mine battalion commander determines the shore cable routes and the location of the cable huts. Several factors which influence the routing of cables and the bringing of cables ashore are listed below:

a. Where possible, the route should be in water which will permit the mine planter to operate without difficulty. It should avoid the regular shipping lanes and the anchorage and cable areas.

b. Cables that cross commercial or fire-control cables should be kept to a minimum.

c. Artificial and natural obstructions should be avoided. (See par. 7.)

d. The cable should be landed on a protected, sandy, sloping beach. Rocks and steep beaches greatly increase maintenance problems.

e. The number of shore cables to be brought into any one cable hut is determined by local conditions. This number is ordinarily limited to four.

f. If more than one casemate is used, cables should be laid so that the loss of one casemate will not leave an open channel in the mine field.

g. To minimize danger from hostile action, all cable routes should avoid potential targets and be located as far apart as possible.

11. LOCATING AUDIO-RECEPTION SYSTEM M1. The two hydrophones of each audio-reception system M1 cover the frontage of four mine groups or fraction thereof. In an ideal situation the hydrophones are planted 3,000 feet apart and 500 to 900 feet in front of each seaward line of mines controlled from a different casemate. The cable leading from each hydrophone to the shore should be connected to the main amplifier in the same casemate which controls the groups of mines covered by the two hydrophones.

12. LOCATION AND CHARACTERISTICS OF SHORE INSTALLATIONS. a. Cable huts should be located on the beach as close as possible to their respective groups yet far enough apart to allow a minimum fairway of 50 yards for each cable coming into the hut.

b. Mine wharves, mine storehouses, loading rooms, cable tanks, and magazines should be located in an area sheltered from the action of the sea and as conveniently as practicable to the mine field. Loading rooms and magazines should comply with quantity-distance tables and safety regulations. Other installations should be close together to facilitate rapid communication and transfer of equipment and also be near the living quarters of mine command personnel.

c. Casemates should be located in a strongly defended zone near the cable terminal huts and away from other installations.

d. Base-end stations should be located so that the base line will afford the best intersection in the center of the mine field and a minimum intersection of 15° in all parts of the mine field covered by the base line. The length of the base line should be at least one-fourth the range to the group of mines most distant from the M1 station but should not exceed 8,000 yards because of the limitations of atmospheric visibility. A method of graphically testing a proposed base line is covered in appendix VI.

e. Provisions for protective security of shore installations must be considered at the time their construction is planned. Mine defense shore installations should be located as far as possible from other shore installations which may draw enemy fire.

CHAPTER 2

ORGANIZATION OF MINE COMMAND

Section I. MINE BATTALION

13. GENERAL. A mine batallion (fig. 4) is both administrative and tactical. It is organized and equipped to plant, operate, and maintain the controlled submarine mine fields of a harbor defense.

14. ORGANIZATION. **a.** A mine battalion operates under a group or harbor defense commander. The size of a mine battalion will vary to fit the requirements of

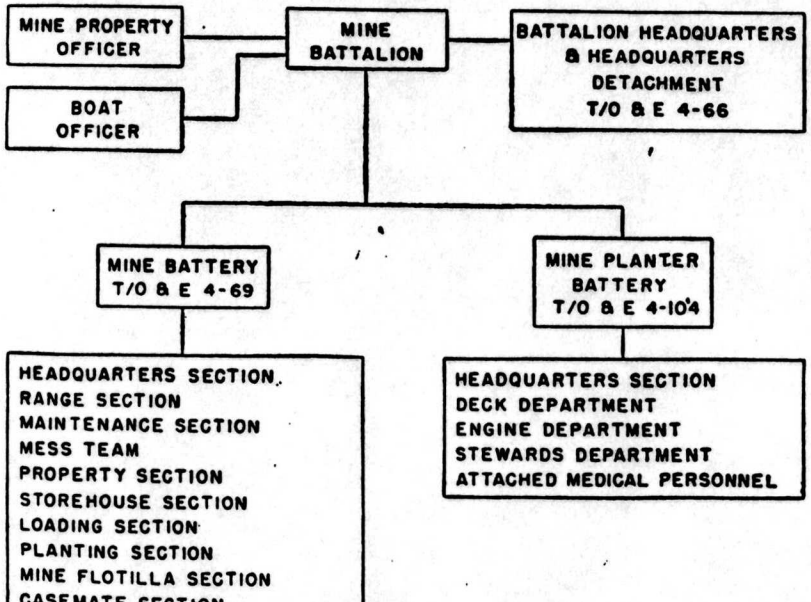


Figure 4. Organization of a mine battalion.

a particular harbor defense. A harbor defense having an extensive mine project and severe hydrographic conditions will require a greater number of batteries and increased equipment, including a larger flotilla, than a harbor defense having a small project and favorable hydrographic conditions. A mine battalion composed of one mine battery, one mine planter battery, and the necessary equipment is normally adequate to plant, operate, and maintain 20 groups of controlled submarine mines.

b. A mine battalion is organized as follows:

(1) Battalion headquarters.
(2) Battalion headquarters detachment.
(3) One or more mine batteries.
(4) One or more mine planter batteries.

c. A manning table for each unit and section, showing the actual duty assignments of all personnel thereof, should be kept up to date and posted in each command post and station where battalion personnel are assigned.

Section II. BATTALION HEADQUARTERS AND HEADQUARTERS DETACHMENT

15. BATTALION HEADQUARTERS. **a. General.** The battalion headquarters consists of the battalion commander and the staff officers necessary to assist and advise him on all tactical, technical, and administrative matters pertaining to the battalion.

b. Battalion commander. (1) The mine battalion commander is normally the representative of the harbor defense commander in coordinating Army and Navy operations connected with planning, installing, operating, and maintaining the Army's underwater defense elements of a harbor. He must have a knowledge of the capabilities and limitations of the mine system, shore installations, and vessels in the mine flotilla. He should be familiar with all Army, Navy, and Coast Guard installations that affect the underwater defense of the harbor.

(2) The mine battalion commander is responsible to

the group or harbor defense commander for the proper administrative and tactical functioning of the mine battalion.

(3) After the mine project has been approved by the joint Army-Navy Board and upon orders from the group or harbor defense commander to install the controlled submarine mine field, the mine battalion commander is responsible for—

(*a*) Installing and operating all elements of the mine field.

(*b*) Repair and maintenance of the mine field.

(*c*) Observance of safety regulations, conduct of all tests, and the preparation of reports to the harbor defense commander.

(4) The large number of difficult and dangerous technical operations involved in controlled submarine mining make detailed advance planning of all operations in the mine field imperative. The battalion commander is directly responsible for the close supervision of these operations.

c. Battalion staff. (1) The mine battalion staff consists of the executive (who is also S–3); adjutant (and S–1); S–2 (who is also gas officer); S–4 and mine property officer; radar officer; searchlight officer (who is also headquarters detachment commander); and communications officer (who is also headquarters detachment executive). (See T/O & E 4–66.) In addition, one of the officers of the battalion will be designated as boat officer.

(2) (*a*) *Mine property officer.* The battery executive of the mine battery is the mine property officer. He commands the property section of the mine battery and is responsible to the mine battalion commander for the performance of the following duties:

1. Receives, stores, maintains, issues, and keeps a record of all submarine mine property in the harbor defense.
2. Initiates a report of any alterations in the approved mine project which will change the amount and type of matériel required.

3. Prepares all required reports on submarine mine property.
4. Requires prescribed tests and inspections of mine matériel in the harbor defense.

(*b*) *Assistant mine property officers.* There is a commissioned officer and a warrant officer assigned to the mine battery who are designated as assistant mine property officers. The commissioned officer assists the mine property officer in the duties listed in (*a*) above. The warrant officer is in direct charge of the requisition, receipt, storage, and distribution of all TNT employed in the mine battalion.

(3) For duties of other staff officers, see FM 4–5.

d. Boat officer. The boat officer is not necessarily a member of the mine battalion staff but is directly responsible to the mine battalion commander for the performance of the following duties with respect to DB boats and mine yawls operated by the battalion:

(1) Inspects DB boats and mine yawls at least weekly and reports findings to the mine battalion commander.

(2) Supervises dispatching of DB boats and mine yawls.

(3) Checks performance of first- and second-echelon maintenance by the operating personnel of DB boats and mine yawls as prescribed in TM 55–320.

(4) Supervises timely preparation of forms required by current regulations for the performance of third-, fourth-, and fifth-echelon maintenance of DB boats and mine yawls. (TM 55–320 discusses the agencies responsible for this class of maintenance.)

(5) Assists the mine flotilla commander (par. 31) to train the DB boat and mine yawl crews in the operation and maintenance of their boats, and in the performance of mine planting duties.

16. HEADQUARTERS DETACHMENT a. The headquarters detachment of the mine battalion provides the personnel to assist the battalion commander and his staff in the exercise of their tactical, technical, and administrative duties.

b. (1) The battalion medical detachment is normally

attached to the headquarters detachment for administration, mess, quarters, and supply.

(2) Battery medical personnel is attached to the battalion medical detachment for training.

c. The headquarters detachment is provided with its own command, administration, mess, and supply personnel.

Section III. MINE BATTERY

17. GENERAL. A mine battery is an administrative and tactical unit. It installs, operates, and maintains all or part of a mine project. (It does not operate the mine planter.)

18. ORGANIZATION. a. A mine battery (T/O & E 4–69) differs in size and composition, depending on the number of base-end stations, plotting boards, casemates, storehouses, DB boats, and mine yawls necessary for the operation of the particular mine defense project to which the battery is assigned.

b. A mine battery consists of the following:

(1) Headquarters section and attached medical personnel.
(2) Maintenance section.
(3) Mine property section.
(4) Casemate section.
(5) Range section.
(6) Loading section.
(7) Planting section.
(8) Flotilla section.

19. BATTERY COMMANDER, AND HEADQUARTERS AND MAINTENANCE SECTIONS. a. Battery commander. The battery commander is responsible to the battalion commander for the battery administration and the tactical and technical training and operation of the battery. His administrative duties are prescribed in pertinent Army Regulations and TM 12–250. He is responsible for the preparation of the standing operating procedure for the battery and its sections and the

compliance of battery personnel with provisions of this manual. He may appoint battery officers as mess, supply, and administration officers to assist him in his duties.

b. Headquarters and maintenance sections. The headquarters and maintenance sections perform the administrative, mess, and supply functions common to all batteries. These sections come directly under the battery commander, assisted by the battery executive officer and first sergeant.

20. BATTERY EXECUTIVE. The battery executive assists and acts for the battery commander and must be capable of taking command in the absence of the battery commander. He is also the mine property officer and as such performs, under the mine battalion commander, the duties listed in paragraph 15.

21. ASSISTANT MINE PROPERTY OFFICERS AND PROPERTY SECTION a. A commissioned officer and a warrant officer are assigned to the mine battery to assist the mine property officer. Duties of these officers are discussed in paragraph 15.

b. The property section performs duties as directed by the mine property officer and assistant mine property officers. Personnel of the loading section assist the property section as required.

22. CASEMATE OFFICER AND CASEMATE SECTION. a. The casemate officer commands the casemate section and is also the assistant battery executive. He controls the operation of the mine field from the shore as prescribed in this manual and in the standing operating procedure for the casemate operation. He trains the casemate section, conducts the prescribed casemate tests, and submits required reports.

b. The casemate section assembles and tests all selector assemblies and firing devices, and operates and makes prescribed tests of the casemate control equipment. The master sergeant electrician is responsible to the casemate officer for the routine maintenance of all

casemate control equipment. (See AR 100–20.) Details of the casemate section's technical operation of the mine control systems are described in TM 9–405 and 9–406 (when published). When the mine field is in operation, the casemate will be manned 24 hours a day by personnel trained in the operation of casemate control apparatus.

23. RANGE OFFICER AND RANGE SECTION. a. The range officer commands the range section. He trains and supervises the range section in their duties and is responsible for maintaining correct orientation of all position-finding equipment.

b. The duties of the range section are:

(1) Operating the position-finding system of the mine battery.

(2) Directing the planter in the location of groups of mines according to the project lay-out.

(3) Assisting the mine flotilla in locating distribution box and mine positions during planting, and maintenance of the mine field.

(4) In observation fire upon enemy vessels or in target practice, tracking and plotting the course of the target, determining the mine to be fired and the time of the order to fire, and transmitting the order to fire to the casemate operator.

(5) During periods of hostility, maintaining a watch status at all times and keeping a log of all vessels passing through the mine field.

(6) When all or any part of the mine field is set for automatic fire, tracking and plotting all vessels in the vicinity and reporting immediately to the proper authority if a friendly vessel is in danger.

24. LOADING OFFICER AND LOADING SECTION. a. The loading officer commands the loading section. He personally supervises, and is responsible for, the safety and technical correctness of the procedures for assembling mine cases, installing firing device assemblies, and loading mine cases with TNT.

b. The loading section prepares all underwater mine matériel for planting and reconditions this matériel when it is brought in from the mine field. This section may assist in loading the mine planter and, as required, assist the property section.

Note. **Personnel continuously engaged in loading mines with TNT should be changed at least monthly.**

25. PLANTING AND FLOTILLA SECTIONS. a. Under the control of the mine flotilla (mine planter) commander, the planting section loads and unloads the planter and plants and picks up underwater equipment and buoys.

b. The flotilla section operates and performs routine maintenance of DB boats and yawls. Section V covers the administration of the mine flotilla.

c. For administration and duties other than training and operating as members of the mine flotilla, the planting and flotilla sections are under the control of the mine battery.

Section IV. MINE PLANTER BATTERY

26. GENERAL. The mine planter battery consists of the personnel required to operate and perform the routine maintenance of a mine planter. The battery has its own administration, mess, and supply personnel. Necessary medical personnel are attached to the battery.

27. ORGANIZATION. The personnel of the mine planter battery (T/O & E 4–104) is organized as follows:

a. Headquarters section with attached medical personnel.

b. Ship's operations section.

(1) Deck department.

(2) Engine department.

(3) Steward's department.

28. COMMANDING OFFICER AND HEADQUARTERS SECTION. a. The administrative duties of the

mine planter battery commander are the same as those of the mine battery commander. (See par. 19.) In addition, he is the mine planter commander and is responsible for the vessel as prescribed in AR 90–150 and AR 90–155. He commands the vessel and its personnel and supervises all work performed in the mine field by the mine flotilla and attached personnel. The executive officer assists the mine planter commander as required.

b. The headquarters section performs the administrative duties of the mine planter battery, under the first sergeant, and assists the steward in maintaining records of battery mess and supply. The administrative details of ship's operation, maintenance, and supply are performed by this section. Radio operators operate and maintain their equipment and keep logs of all messages sent and received.

29. OPERATIONS SECTION. a. Deck department. The deck department repairs, renews, changes, overhauls, and paints the deck gear (not including ship's machinery) and maintains all decks, deckhouses, hulls, masts, and equipment not maintained by other departments.

(1) *Master.* The operations section is under the immediate command of the master of the vessel. The master is the senior deck department warrant officer assigned to a mine planter. He must be professionally qualified to handle the ship under all conditions. He coordinates the operation of the deck, engine, and steward's departments and verifies that their activities are in keeping with pertinent regulations and the policies of the mine planter commander. He is responsible to the mine planter commander that the vessel is properly operated and that necessary safety conditions are enforced. During work in the mine field, the master is responsible to the planting officer (planter commander) for the proper maneuvering of the planting vessel. He is charged with the training of the deck department warrant officers on his ship and assigns them duties in connection with planting operations. Duties of warrant

officers assigned to a mine planter may be found in AR 90–150 and 90–155.

(2) *First mate.* The second ranking deck warrant officer is the first mate. He is in charge of the deck department and is responsible for the efficient and safe operation of all deck machinery during mine planting operations. During planting operations he is stationed on the foredeck or bow of the ship. He assists the master by giving lead of cable and other pertinent information. He is responsible for the observance of safety precautions on deck.

(3) *Second mate.* The third ranking deck warrant officer is the second mate. Normally, he is designated as navigating officer and is responsible to the master for the proper operation and care of navigating equipment. He also assists the first mate in his duties aboard ship. Usually, the second mate is stationed near the stern of the ship during planting operations. He provides the master with information regarding the progress of work and sees that safety precautions are observed.

(4) *Maritime warrant officer.* On mine planters of the Knox type (par. 80), an additional warrant officer known as a maritime warrant officer is provided (T/O & E 4–104). This officer will act as directed by the master.

b. Engine department. This department is charged with the operation, care, and maintenance of all mechanical and electrical systems and equipment for propelling, lighting, sanitary, ventilating, heating, and cooking purposes aboard the planter.

(1) *Chief engineer.* The engine department is directly under the control of the chief engineer and three assistant engineers.

(2) *Assistant engineers.* These officers, with such enlisted personnel as may be required for the fireroom and engine room details, assist the chief engineer in the performance of his duties.

c. Steward's department. The steward's department is charged with the mess, supply, and housekeeping details aboard ship. The department is directly under the steward and supply sergeant. It consists of assistant

stewards, cooks, and such other personnel as may be required. The steward may be assisted in supply matters by the medical sergeant or clerk. The effective functioning of the steward's department is a major factor in shipboard morale.

Section V. MINE FLOTILLA

30. GENERAL. A mine flotilla is an element of the mine battalion consisting of the vessels and personnel employed by the battalion in the planting and maintenance of controlled submarine mines. Personnel of the mine flotilla consists of the personnel of the mine planter battery and of the planting and flotilla sections of the mine battery. The local situation will dictate the number and types of mine planters, junior mine planters, DB boats, and mine yawls which constitute a flotilla. A flotilla normally consists of at least one mine planter, two DB boats, and five mine yawls. A junior mine planter may be added if needed and available.

31. MINE FLOTILLA COMMANDER. Normally the mine battalion commander designates the mine planter commander as flotilla commander. The flotilla commander is responsible for the training of mine flotilla personnel and the operation of the mine flotilla during planting and maintenance of the mine field.

32. MINE PLANTER PERSONNEL. Personnel for operation and routine maintenance of the mine planter is furnished by the mine planter battery as covered in section IV. Personnel for the actual planting of the mines is furnished by the planting section of the mine battery.

33. DB BOAT PERSONNEL. Manning details for the DB boats are furnished by the flotilla section of the mine battery (T/O & E 4–69) and include the following for each DB boat of the flotilla:

a. Coxswain. The coxswain is master of the DB boat. He should be qualified for and encouraged to obtain the Government license for the class of boat he is operating. He is responsible for the operation and maintenance of his boat and the training of his crew. AR 90–160 lists the routine duties of DB boat crews.

b. Engineer. The engineer of the DB boat is responsible for the efficient operation and first-echelon maintenance of power equipment on his boat and must be a qualified Diesel operator. He supervises the police of the engine room; checks the operation of all engines, generators, motors, and pumps; checks and services batteries; maintains adequate fuel oil and lubrication oil supply; inspects fire-fighting equipment, lifesaving equipment, bulkheads and compartments; and supervises the cleaning of bilges.

c. Deck hands. Deck hands assist the coxswain in mine work and under his direction perform routine maintenance of the boat. They will be trained in the use of deck machinery.

d. Cable splicers. The cable splicers under the supervision of the coxswain are responsible for all DB boat cable tests, watertight joints and connections, and for all operations connected with direct handling of selector and distribution boxes on the boat. In addition, they assist the deck hands, engineer, or coxswain as directed by the coxswain.

e. Radio operator. The radio operator operates and maintains the radio and visual signaling equipment of the DB boat. However, the operator is not permitted to make repairs on the radio. He must be familiar with all methods of signaling that are used.

f. All members of the DB boat detail must be familiar with the operation of the boat so they will be able to handle the boat in an emergency or when ordered by the coxswain.

34. MINE YAWL PERSONNEL. Manning details for mine yawls are furnished by the flotilla section of the mine battery and include the following for each yawl of the flotilla:

a. Coxswain. The coxswain is master of the yawl. He is responsible for the operation and condition of his boat and the presence of all required safety equipment. He directs the work in the boat as ordered by the flotilla commander while operating in the mine field and supervises routine maintenance of his boat. He must be familiar with instructions contained in *Rules to Prevent Collision of Vessels and Pilot Rules for Certain Inland Waters of the Atlantic and Pacific Coasts and of the Coast of the Gulf of Mexico.*

b. Engineer. The engineer is charged with the operation and routine maintenance of the engine.

c. Deck hands. Deck hands will work as directed by the coxswain and assist the coxswain in maintaining the boat in proper condition.

CHAPTER 3

PROTECTION OF CONTROLLED SUBMARINE MINE FIELDS AND OTHER UNDER WATER DEFENSES AND SURFACE OBSTRUCTIONS

35. GENERAL. Controlled submarine mine fields and other under water defenses and surface obstructions that are employed to defend a harbor must be protected by rapid-fire armament. This protection is necessary to prevent the enemy from removing these defenses and to protect the vessels that are engaged in maintaining these defenses. This protection is the responsibility of the harbor defense commander and should be covered in detail in the harbor defense SOP. Fire from harbor defense artillery must be coordinated with mine field control to prevent countermining (par. 146) caused by shell fire falling in the mine field. Searchlights and radar should be available to a mine battalion to assist in the protection of the mine field.

36. RAPID-FIRE ARMAMENT. A harbor defense should have as many rapid-fire gun batteries as necessary sited to provide complete protection for the controlled submarine mine fields and other under water defenses and surface obstructions. "Complete protection" includes the seaward approaches to these defenses as well as the defenses themselves. The harbor defense commander may or may not assign this defense to gun batteries as a primary mission, but he should assign it as a secondary mission to any gun battery whose field of fire covers these defenses or their approaches. Personnel of a mine battery do not man seacoast artillery guns.

37. SEARCHLIGHTS AND RADAR. When a mine battalion must use the mines for its own protection

during periods of darkness and low visibility, the control of searchlights or radar units that have been sited to aid in this mission will be required. The harbor defense commander may assign or attach these units to the mine battalion for tactical control, or he may provide for releasing the necessary units to the mine battalion upon request. The procedure adopted should be clearly set forth in the harbor defense SOP.

CHAPTER 4

MINE MATERIEL AND INSTALLATIONS

Section I. MATERIEL

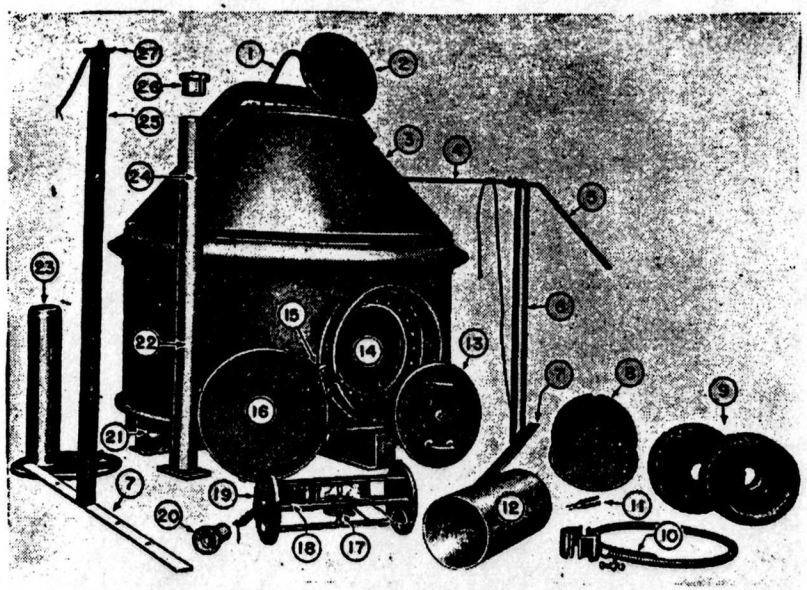
38. GENERAL. The general description and functions of the matériel and installations used in a mine defense are discussed in this chapter. Controlled submarine mine matériel is discussed in detail in TM 9–405, 9–406, and 9–420 (when published) and other publications. Further details on the operation and use of mine matériel are listed in chapters 6, 7, and 8.

39. MINE CASES. The mine case M3A1 is standard for ground mine projects. This case is designed to contain a firing device assembly and 3,000 pounds of TNT in flake or granulated form.

40. FIRING DEVICE ASSEMBLY M5. The firing device assembly M5 consists of the firing device (with cushions); coil rod; straps; loaded booster can; and the coil rod leads and the connector assembly conduit which connect the coil rod and the firing device.

a. The firing device is an assembly of electrical parts housed in a cylindrical container. This device establishes the circuit for signaling the casemate that the presence of a vessel has been detected. Through its circuit the mine may then be disarmed or fired. The firing device further provides a means of selecting the mine from shore in order to test the mine selection circuit *but not the detection circuit.* This feature also permits the use of observation fire.

b. The coil rod is a magnetic influence detector, consisting of a large number of turns of wire wound on a

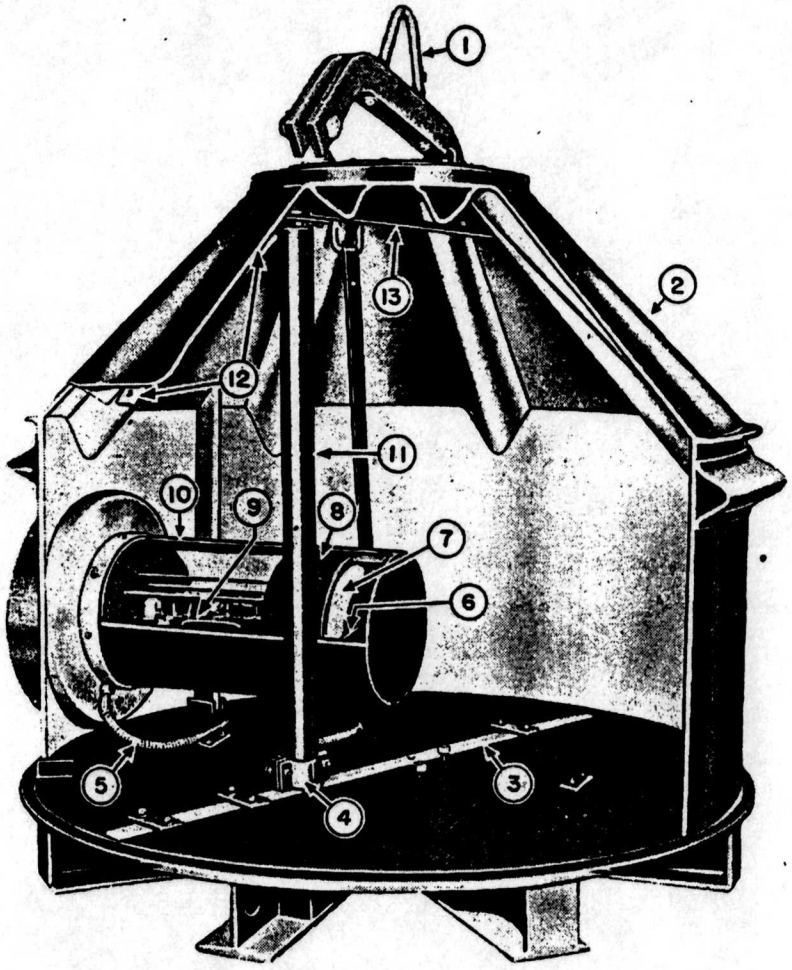


1. Mine case bail.
2. Top cover (48-inch coil rod).
3. Mine case M3A1.
4. Extension strap (48-inch coil rod).
5. Top strap (48-inch coil rod).
6. Coil rod, 48-inch.
7. Bottom strap, 57-inch.
8. Booster can.
9. Hair-rubber cushions for firing device.
10. Metal conduit and split clamp.
11. Blasting caps.
12. Firing device cylinder.
13. Side cover.
14. Cylinder.
15. Turkshead clamp.
16. Cover guard.
17. Sensitive relay of firing device.
18. Mine and firing relays of firing device.
19. Firing device mounting.
20. Desiccant container.
21. Hole for attaching raising rope.
22. 72-inch coil rod housing.
23. Mine case top cover (72-inch coil rod).
24. Coil rod lead opening (72-inch coil rod).
25. 72-inch coil rod.
26. Centering plug (72-inch coil rod).
27. Collector strap (72-inch coil rod).

Figure 5. Component parts of ground mine M4.

metal core of high magnetic permeability. When installed in a mine, the coil rod leads are connected to a galvanometer, known as the sensitive relay, in the firing device. The steel of a passing ship causes a change

of magnetic flux in the coil rod. This induces a voltage in the coil rod windings. This voltage, in turn, causes a current to flow in the coil rod circuit. This current operates the sensitive relay of the firing device.



1. Mine case bail.
2. Mine case M3A1.
3. Bottom strap.
4. Clamp.
5. Connector assembly conduit.
6. Blasting caps.
7. Booster can.
8. Hair-rubber cushions.
9. Firing device M5.
10. Cylinder.
11. 48-inch coil rod.
12. Top strap.
13. Extension strap.

Figure 6. Sectional view of ground mine M4.

Through the sensitive relay contacts another circuit is established to signal the casemate that the mine is armed.

c. The straps, made of highly permeable metal, are attached to the ends of the coil rod core to form a part of the magnetic flux path of the coil rod. They increase the detecting capacity of the firing device assembly.

d. The booster can (figs. 5 and 6) contains the booster charge of approximately 18 pounds of TNT and two electric blasting caps for detonators.

41. EXPLOSIVES. TNT in flake or granulated form is the main charge used in controlled submarine mines. This main charge is detonated by the booster. (See par. 96.) The booster is detonated by two commercial type blasting caps, each of which contain 13½ grains of either tetryl or PETN.

42. ROPE. a. Manila rope, steel-wire rope, and marline-covered steel-wire rope are used in submarine mine projects.

(1) Manila rope is usually measured in inches of diameters by shore agencies, and in inches of circumference for the sizes used in controlled submarine mining (¾-inch or over) by maritime agencies. It is furnished in the following diameters and for the following purposes.

(*a*) 5/16-inch diameter (1-inch circumference), for heaving lines.

(*b*) ⅝-inch diameter (2-inch circumference), for stoppers, messenger lines, and buoy lines.

(*c*) 1-inch diameter (3-inch circumference), for heavy-duty work with mines, anchors, and cables.

(2) Steel-wire rope, ½-inch in diameter, attached to the distribution box release buoy, is used for raising the distribution box. This rope is very pliable and has high tensile strength.

(3) Marline-covered steel-wire rope is used in 1-inch and 1⅛-inch diameters as raising ropes for mines, anchors, and buoy mooring lines.

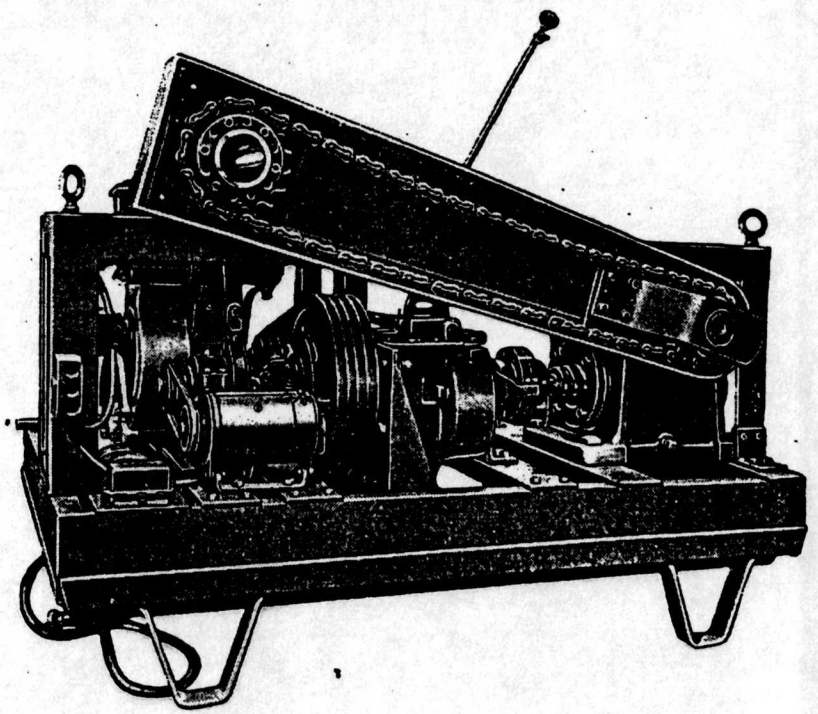
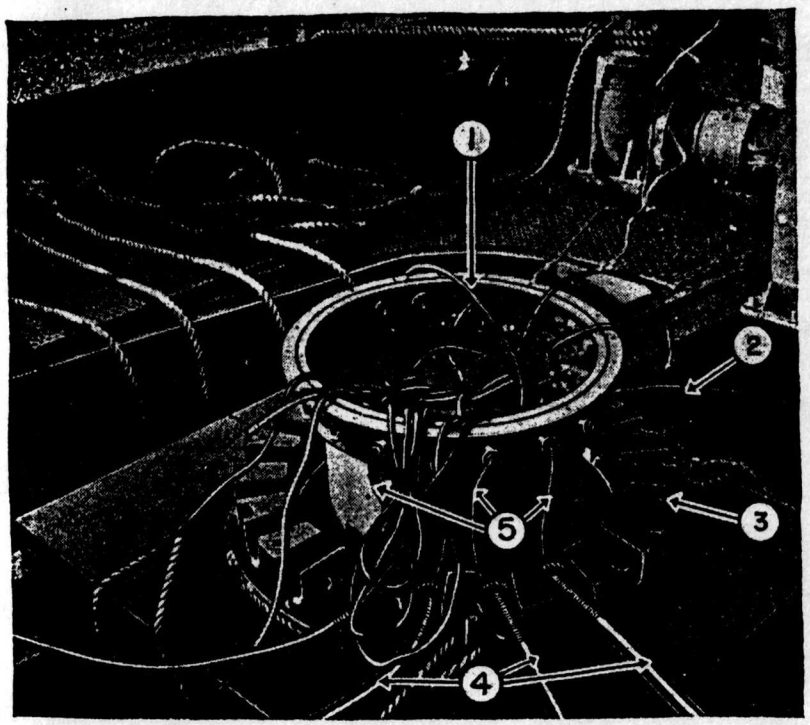


Figure 7. Portable cable reeler M1.

43. CABLE. a. Single-conductor cable is used as mine cable to connect electrically the individual mines to the selector box, and as shore cable to connect the selector box to the cable hut terminals on shore. It may also be used between the boxes and a centrally located junction box which is connected to the cable hut by 7-conductor submarine cable. In special situations when 7-conductor cable is used as shore cable, it should connect no more than 4 groups of mines to a single hut. (See par. 9.) This 7-conductor cable eliminates the necessity for several shore cables lying in approximately the same path and reduces maintenance on shore cable to a minimum. Not more than one 7-conductor cable should be run to any one cable hut, and all 7-conductor cables should be separated by at least 100 yards.

b. Normally 3- or 4-conductor land cable is furnished for use from the shore to the casemate. It is usually laid underground to keep it from being



1. Selector box, with cover removed.
2. Shore cable.
3. Distribution box base.
4. Mine cables.
5. Selector box terminal leads.

Figure 8. Selector box (mounted in distribution box base) during planting operations aboard the DB boat.

damaged. Land cables should be dispersed and should follow varying routes to the casemate or control station.

44. PORTABLE CABLE REELER M1. A gasoline-engine-driven cable reeler (figs. 7 and 24) is furnished to turn heavy reels of cable while they are reeling and unreeling.

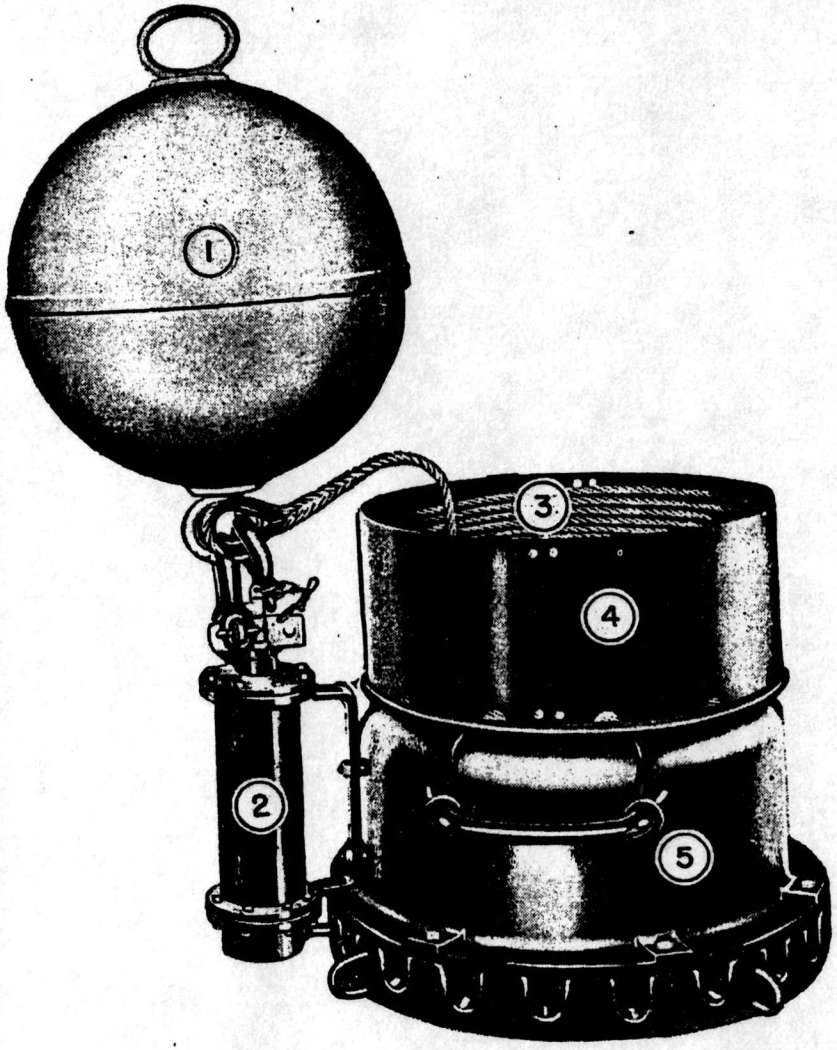
45. SELECTOR ASSEMBLY AND DISTRIBUTION BOX. a. The selector assembly M3 establishes the electrical junction of the individual mine cables of a group of mines to the single-conductor shore cable. It is inclosed in the waterproof selector box M4 or M4A1. The selector assembly provides the means of connecting

any mine in the group with the control equipment ashore for signaling, firing, and disarming, or for testing the selection circuit of the mine. If a mine becomes armed the selector assembly automatically connects the mine to the casemate control equipment. In addition to this automatic selection of the mine, the casemate operator can manually cause the selector assembly to connect the control equipment to any mine for testing or for observation fire. The waterproof selector box, which houses the selector assembly, is mounted in a dome shaped box called the distribution box.

b. The distribution box provides a rigid clamp for holding the turk's-heads of mine and shore cables and provides mechanical protection for the selector box. The distribution box is planted at least 375 feet to the rear of the center of the group of mines.

46. DISTRIBUTION BOX RELEASE BUOY M1 (fig. 9). One of the problems in the servicing of a group of mines is locating and picking up the distribution box. In order to eliminate time lost by underrunning a cable or by grappling for the raising rope, a releasing hook is used to hold a marking buoy under water until the distribution box is to be picked up. At this time the buoy is released by the application of power from the casemate. The release buoy, which is attached to the distribution box, consists of a release assembly, a rope container, raising rope, and buoy. The raising rope (in this case ½-inch wire rope) connects the buoy to the distribution box. When the distribution box is to be picked up, the casemate operator selects the firing device in the release assembly in the same manner as when selecting a mine and then fires the primer. The buoy rises to the surface, carrying one end of the raising rope with it. The buoy is taken aboard the DB boat and the distribution box is raised by means of the raising rope.

47. MARKING BUOYS. Marking buoys are used to mark the position of the distribution box and the line of mines of a group prior to and during planting opera-



1. 21-inch spherical buoy.
2. Release assembly.
3. Raising rope (½-inch steel wire rope).
4. Rope container.
5. Distribution box M2B1.

Figure 9. Distribution box release buoy M1 (attached to distribution box M2B1).

tions. They are hollow, spherical steel buoys about 28 inches in diameter and are usually obsolete Army buoyant mine cases or Navy mine cases. A one-foot length of pipe may be welded to the top of the buoy for the purpose of inserting a flag to facilitate the observation and subsequent plotting of the position by the plotting section. (See fig. 31.) Four marking buoys are normally used for each group. They mark the positions of the distribution box and mines Nos. 1, 7, and 13.

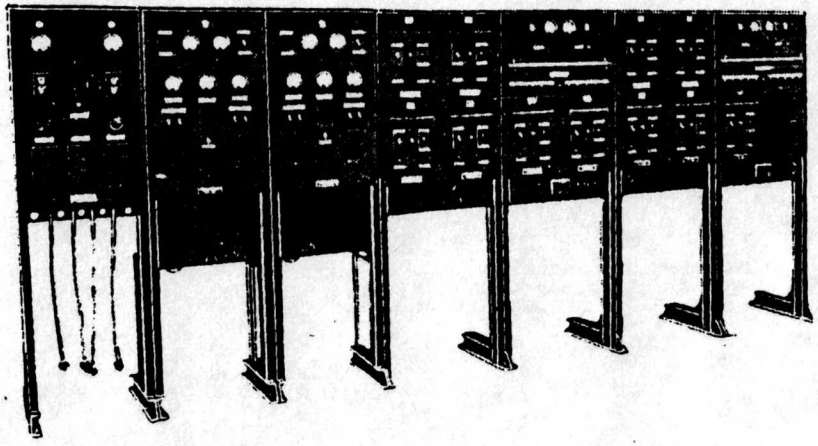
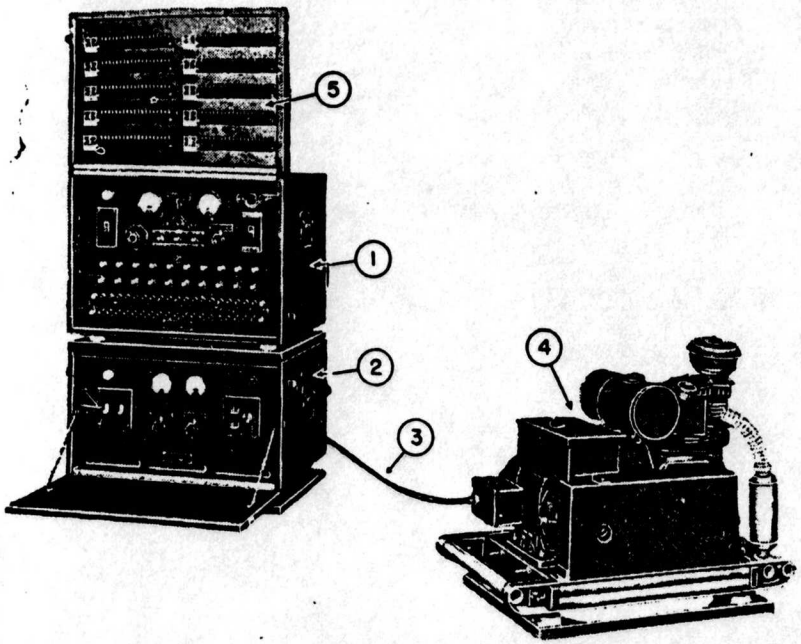


Figure 10. Casemate control panels, submarine mine system M3.

48. MINE CONTROL. a. The standard control system is the submarine mine system M3. (See fig. 10.) This system consists of the firing device assembly, selector assembly, mine and shore cables, and casemate control apparatus (including the primary power generating sets). The audio-reception system is employed as an aid in the control of the mine field but is not a part of the M3 system. TM 9–405 covers the submarine mine system M3 in detail.

b. The emergency mine control M4 is used to replace the casemate control elements of the standard M3 system in an emergency (TM 9–406 and 9–420 (when published)). The M4 mine control is a small, port-



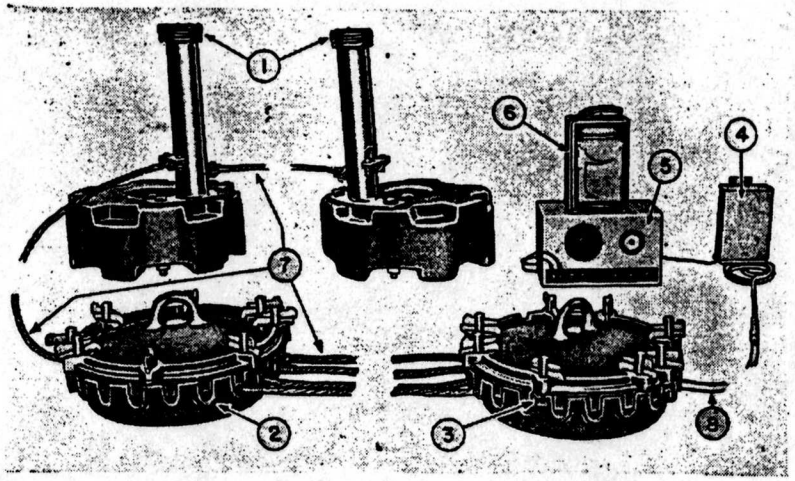
1. Operating panel.
2. Power pack.
3. Power cable.
4. Power unit PE 755.
5. Lid and mine indicators.

Figure 11. Emergency mine control M4.

able control system consisting of a power pack, operating panel, and two gasoline-engine-driven power units. One power unit is stand-by equipment. A maximum of ten groups of mines can be controlled with one M4 mine control. The M4 control should be run and tested at least monthly for an 8-hour period to insure serviceability in time of emergency and *should not be stored in the casemate or cable hut,* where it may be destroyed with the mine controls.

49. AUDIO-RECEPTION SYSTEM M1. The audio-reception system M1 (figs. 12 and 46) is used to determine whether mines are armed by vessels or by explosions of bombs or shells.

a. The audio-reception system underwater equipment consists of two hydrophones connected electrically to



1. Two hydrophones mounted on 1000-pound cast iron anchors.
2. Distribution box M1, with preamplifier installed.
3. Distribution box M1, with terminal box installed.
4. Cable terminal.
5. Main amplifier.
6. Graphic recorder.
7. Single conductor mine cable.
8. Multi-conductor cable.

Figure 12. Components of audio-reception system M1.

each other and to the shore equipment by single-conductor submarine cable. Each hydrophone is mounted on a 1,000-pound cast-iron anchor and is known as a mounted hydrophone.

b. The shore equipment consists of a preamplifier, main amplifier, and graphic recorder. The preamplifier is installed in a selector box on shore and is electrically connected by cable to the two hydrophones and also to the main amplifier, which is located in the casemate. The graphic recorder, also in the casemate, is connected to the main amplifier and visibly records the sound waves which are audibly reported by the main amplifier.

50. PLOTTING BOARDS. The M9C, M1918A1, or M1906 submarine mine plotting boards may be used in harbor defense mine projects. The M9C board is standard. This board has a plotting radius of 67½ inches and a normal scale of 150 yards to the inch,

which limit the range of the board to approximately 10,000 yards. The only differences between this board and the M4 plotting board (TM 9–1570) used by seacoast artillery are the absence of a gun arm on the M9C board and the scale of each board.

51. MINE PREDICTOR M1916. The mine predictor M1916 enables the plotter to predict directly from the plotting board the exact time that the target will be

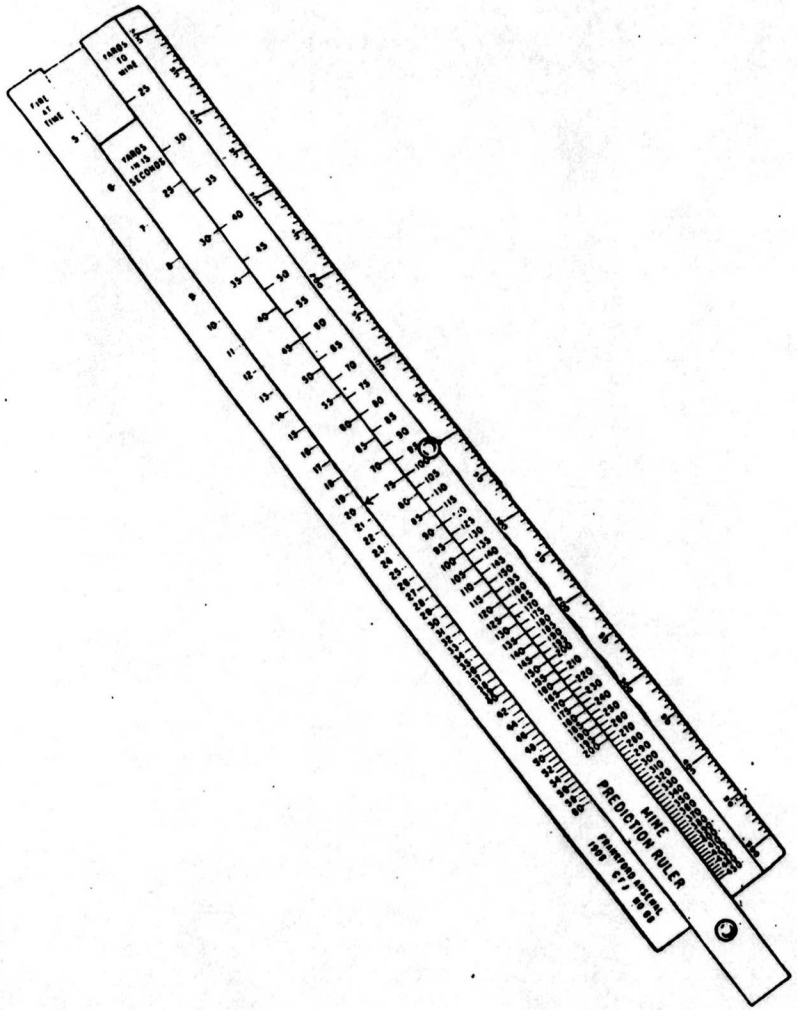


Figure 13. Mine prediction ruler.

over, or nearest to, the mine to be fired. It consists of a triangular-shaped piece of xylonite on which are marked a series of similar triangles constructed on a common base line. Radial lines represent time; horizontal lines represent the course of the target. Figure 45 shows the mine predictor M1916 and an example of its use by the plotter.

52. MINE PREDICTION RULER. The mine prediction ruler (fig. 13) is essentially a set-forward ruler. This device enables the assistant plotter to compute the time at which a particular mine is to be fired. The assistant plotter's computations are based on data furnished by the plotter (travel of the target during one observing interval and the distance to the mine selected to be fired). The mine prediction ruler is more accurate than the mine predictor M1916 when used with a small-scale plotting board.

53. OBSERVATION INSTRUMENTS. The azimuth instrument M1910A1 is used for observation; however, depression position finders may be employed when a base-end station has a sufficient height of site. For complete description and method of operation of these instruments, see FM 4–15.

54. ACCESSORIES. A list of submarine mine matériel and supplies required to install a complete mine project will be found in T/A 4–4 and TM 9–420.

Section II. SHORE INSTALLATIONS

55. GENERAL. This section covers the general design, equipment, and uses of the shore installations of the mine defense. Shore installations may vary, depending on the local situation.

56. BATTALION COMMANDER'S STATION. This is the battalion command post and is manned by battalion headquarters personnel. It should be located to

command a view of the mine field and its approaches. This station houses the observation instruments and the communication facilities necessary to enable the battalion commander to maintain control of his battalion.

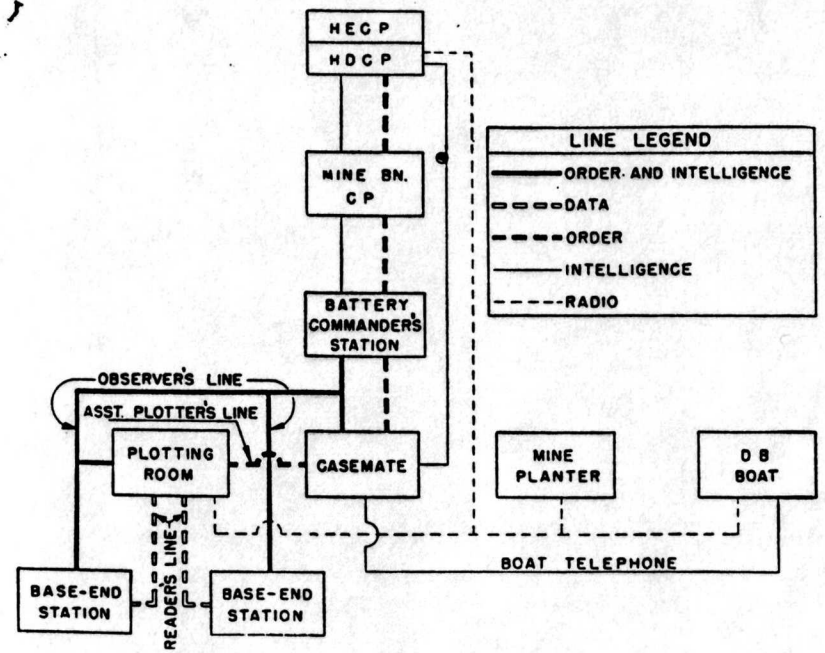


Figure 14. Typical communication system.

57. MINE BATTERY COMMANDER'S STATION. The mine battery command post may be located in a base-end station or other suitable structure associated with the mine defense. It contains the observation instruments and the communication facilities needed by the battery commander to control his battery.

58. BASE-END STATIONS. A base-end station is an observation station which has been accurately located by survey. There is one base-end station at each end of the base line. The number of base-end stations required varies with the project. An azimuth instrument and facilities for communication with the plotting room and battery commander's station are located in each base-end station. Depression position finders may

be installed in lieu of azimuth instruments in base-end stations having sufficient height of site. They may be used for single-station emergency observing.

59. PLOTTING ROOM. The plotting room is usually located in the casemate. It houses the plotting board and other position finding and communication facilities necessary for the proper operation of the range section. (See par. 142.)

60. CABLE HUT. The cable hut, located on or near the beach, is in the form of a dugout or manhole. In this hut the shore and land cables are joined. Usually the hut is constructed of concrete and is just large enough to allow a man to work within it. The cable hut should be well protected from damage by bombing or sabotage.

61. CASEMATE. The casemate should be bombproof, gasproof, and camouflaged and have as good defilade as possible. Figure 15 shows the floor plan for a permanent casemate. This structure contains the following: fortification power plants; panels of the mine control system; main amplifiers and sound recorders of the audio-reception systems; communication facilities; instruments for testing, operating, and maintaining the electrical equipment and circuits of the mine system. TM 9–405, 9–406, and 9–420 cover casemate equipment in detail.

62. LOADING ROOM. The loading room is used for the assembly and loading of mines and booster cans. (See pars. 95 and 96.) The room should be at least 20 feet by 20 feet by 12 feet. It should be well lighted and ventilated and have a floor of nonsparking material. Equipment for a loading room includes a loading platform, hoists, hand trucks, and tools of nonsparking material.

63. MINE STOREHOUSE. The mine storehouse is the building used for the storage and maintenance of

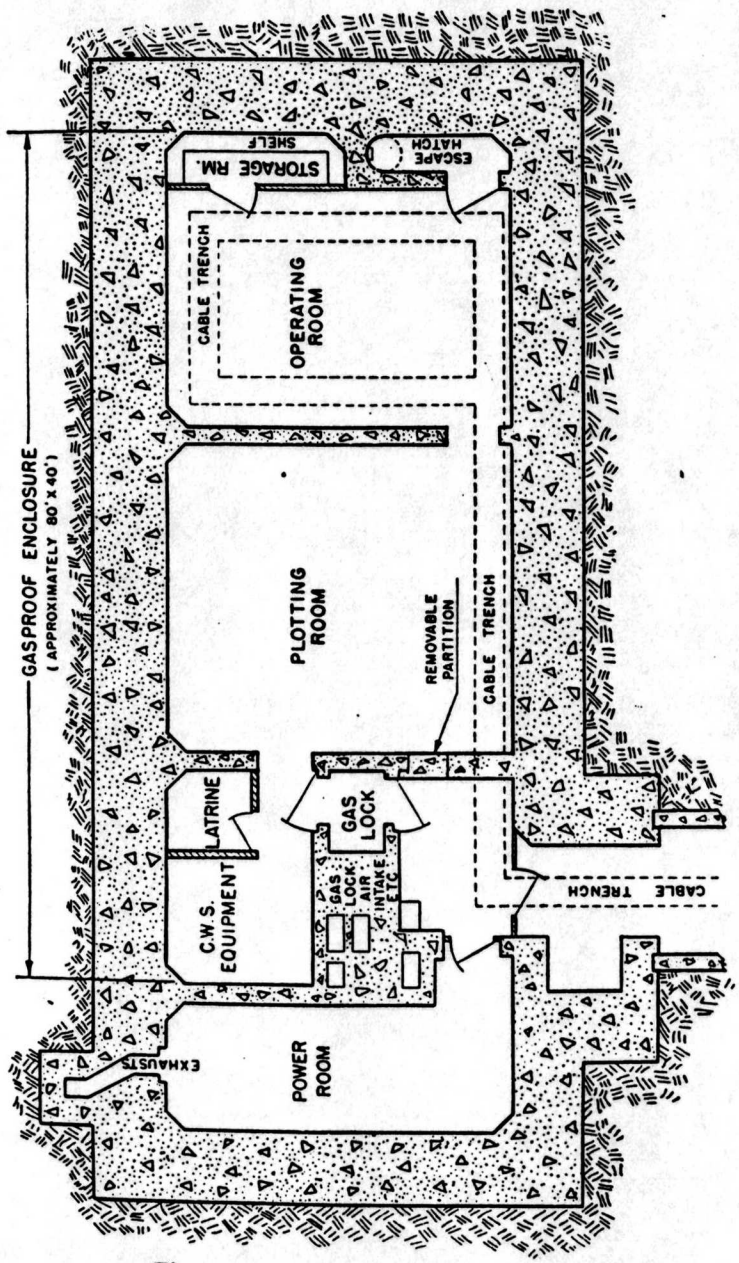


Figure 15. Lay-out of a casemate.

all submarine mine property not actually planted and not prescribed in this section to be stored and maintained elsewhere. The structure should be located near the railroad and mine wharves to facilitate the moving of heavy property. In addition to the necessary storage space, it must be large enough to accommodate the property office. This structure should have fresh water facilities and electricity and should be equipped with adequate lifting equipment.

64. **CABLE TANKS.** Cable tanks are necessary as submarine cable not in use should be stored in sea water. Cable tanks are usually built in cells 30 feet by 30 feet by 10 feet to facilitate the maintenance and handling of cable. These tanks are inside a structure called a cable tank house. The cable tank house should be situated in a favorable position for the movement of cable to and from the mine wharves. Each cable tank house must have salt water pumping equipment, adequate drainage, and the proper devices for lifting and moving the 5-ton reels of cable.

65. **MINE WHARVES.** Mine wharves should be located in an area sheltered from rough water. These wharves are constructed as a permanent base for mine planters and should have fresh water and electricity available. Heavy-duty lifting equipment of at least 10-ton capacity is necessary on mine wharves. DB boats and mine yawls usually have moorings separate from the mine wharves.

66. **BOATHOUSE.** A boathouse containing lifting and repair equipment must be available for the maintenance of mine yawls. It should also house an adequate machine shop. Boathouses are maintained and operated by the Army Service Forces.

67. **MAGAZINES.** Magazines are necessary for the storage of TNT. Plans for these structures are approved by the Ordnance Department prior to construction. (See TM 9–1900 for safety regulations for storage of TNT.)

Section III. INSPECTIONS, TESTS, RECORDS, AND REPORTS

63. INSPECTIONS AND TESTS. Mine property will be inspected for serviceability and certain articles tested for conformance with specifications. These inspections and tests are duties of the mine property officer. Details of the tests required are listed in TM 9–415 and 9–420 (when published).

69. RECORDS. a. Complete and accurate records will be maintained by the mine property officer of all property received, stored, and issued.

b. The mine battalion record book will be maintained by the mine battalion commander, as prescribed in TM 4–245.

c. Each mine battery commander will maintain, in any convenient form, a diary of the mine field and mine installations under his control. This diary will contain the following information: identification, by component parts, of each mine planted; the behavior of each mine after planting; and the reason for picking up a mine. This diary will also contain all data required for the mine battalion record book that is pertinent to the installations as well as the records of all operations performed in these installations. He will also maintain a casemate operations log which will contain a record of all tests made in the casemate and the results of these tests (TM 9–420).

70. REPORTS. In general, two types of reports will be required of submarine mine battalions:

a. *Periodic reports* that are submitted in accordance with current regulations.

b. *Special reports* concerning specific information which may be requested by Army Service Forces from time to time.

CHAPTER 5

ELEMENTS OF MINE FLOTILLA

Section I. GENERAL

71. INTRODUCTION. The vessels of the mine flotilla consist of a mine planter (or junior mine planter), distribution box boats (DB boats), and mine yawls. These vessels have equipment and construction features essential for their specific operations in planting and maintaining a mine field. This chapter discusses the equipment, characteristics, and employment of these vessels, as well as the maintenance procedures, operating instructions, visual signals, and safety precautions necessary for their proper operation. The organization of the mine flotilla was described in chapter 2.

72. MAINTENANCE OF BOATS. Local units of the Army Service Forces are responsible for the repair and overhauling of all boats of the flotilla. These units maintain a marine repair shop for the performance of this work. However, the boat crews of the mine flotilla perform the routine maintenance of their boats, including greasing, oiling, refueling, cleaning, and painting. TM 55–320 covers duties and responsibilities of boat operating personnel and the responsibilities of Army Service Forces in maintaining boats.

73. EQUIPMENT. Although Army craft are not subject to United States Coast Guard requirements and inspections, all boats of the mine flotilla should carry all the equipment specified by the Coast Guard for boats of their class. (See par. 75.) However, each mine

planter and DB boat *will* carry the following items as a minimum requirement:

a. Spotlight with blinker attachment.
b. Compass.
c. Self-igniting flares.
d. Life buoys.
e. Jacket life preserver for each person aboard.
f. Radio telephone.
g. Fire extinguishers.
h. Whistle or horn.
i. Appropriate running lights.

The above items must be kept in good condition at all times.

74. CHECK LISTS. All boat commanders should have the following items checked before his boat leaves the dock:

a. Life preservers.
b. Fuel supply. (Yawls and DB boats should be refueled after each run.)
c. Fire-fighting equipment.
d. Anchor and anchor rope.
e. Tools in tool box.
f. Mine planting equipment. (See app. III for detailed lists of equipment for each vessel.)
g. Operation of—
    (1) Engine.
    (2) Compass.
    (3) Lights.
    (4) Foghorns and whistles.

75. OPERATING INSTRUCTIONS AND REQUIREMENTS. a. Safe and efficient operation of boats is largely dependent on the instruction and training received by the officers and crews and the presence of certain navigational and safety equipment aboard each boat. The publications listed in this paragraph cover the general nautical subjects necessary for this training and the requirements set forth by the Coast Guard for navigational and safety equipment for the classes of boats employed in a mine flotilla.

b. At least one copy of each of the following publications should be aboard each mine planter and DB boat. These publications should also be made available to crews of mine yawls for study.

United States Coast and Geodetic Survey. Tide Tables, Atlantic Ocean.[1]
United States Coast and Geodetic Survey. Tide Tables, Pacific Ocean and Indian Ocean.[1]
United States Coast and Geodetic Survey. United States Coast Pilot (issued for each locality).
United States Coast Guard. Laws Governing Marine Inspection.
United States Coast Guard. Light List (issued for each locality).
United States Coast Guard. Nautical Rules of the Road.
United States Coast Guard. Vessel Inspection—Bays, Sounds, and Lakes Other Than the Great Lakes.[2]
United States Coast Guard. Vessel Inspection—Ocean and Coastwise.[2]
United States Department of Commerce. Manual for Lifeboatmen and Able Seamen.
United States Department of Commerce. Motorboats and Certain Vessels Propelled by Machinery Other Than by Steam, More Than 65 Feet in Length.[3]
United States Department of Commerce. Rules to Prevent Collision of Vessels and Pilot Rules for Certain Inland Waters of the Atlantic and Pacific Coasts and the Coast of the Gulf of Mexico.
United States Navy Department. The Bluejackets' Manual, United States Navy.
United States Navy Department, Hydrographic Office. American Practical Navigator, Bowditch, N. 1943.
United States Navy Department, Hydrographic Office. International Code of Signals. Visual, vol. 1, Am. ed.

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[1]Only the applicable tide tables need to be kept aboard.
[2]Mine planters only.
[3]DB boats and mine planter Niles only.
Note. Publications issued by the Department of Commerce are now distributed by the Commandant, United States Coast Guard.

76. SIGNALS. The visual signals to be employed by vessels engaged in mine field work are those prescribed in *Nautical Rules of the Road*. The visual signals to be displayed by mine planters and DB boats working in all waters are those listed for vessels employed in laying or picking up a telegraph cable and are as follows:

a. By day. Three shapes not less than 2 feet in diameter and not less than 6 feet apart mounted in a vertical line. These dimensions may be reduced proportionately for DB boats. The highest and lowest shapes will be red globes and the middle one a white diamond. These shapes will be displayed where they can best be seen. (See fig. 16.)

b. By night. Three lights, not less than 6 feet apart, mounted in a vertical line on or in front of the foremast. The highest and lowest lights will be red and the center light white. They will be displayed so as to be visible all around the horizon for at least two miles. On vessels without a foremast these lights will be displayed on the fore part of the vessel. (See fig. 16.)

Note. **When carrying loaded mines, the international code flag "B" (Baker) must be flown in addition to the other signals prescribed in this paragraph. All shipping must stand clear when this red flag, used universally to indicate danger, is flying.**

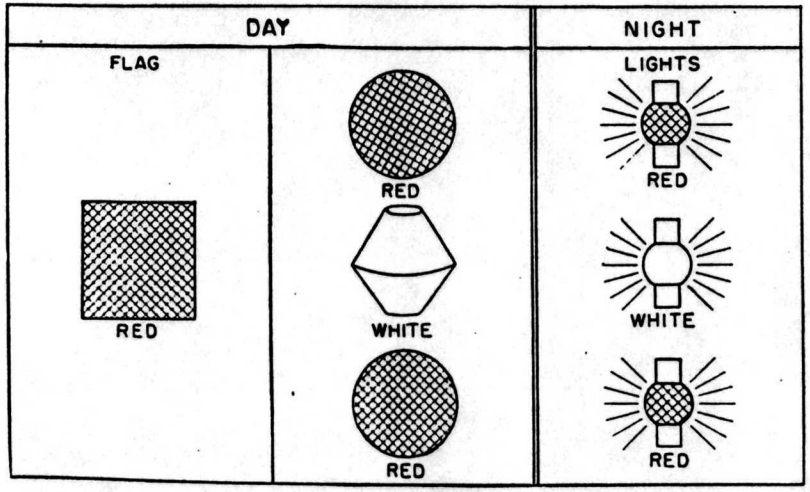


Figure 16. Visual signals displayed by mine planters and DB boats during mine planting operations.

77. SAFETY PRECAUTIONS. **a.** Fire extinguishers, hoses, and other fire-fighting equipment should be tested once a month under the supervision of an officer or warrant officer and all defects remedied at once. Fire hose that fails to withstand its rated pressure tests should be replaced. Bilges should be pumped out at least once a day and cleaned weekly. Gasoline engines should be aired for 5 minutes before they are started in order to allow accumulated gases to escape. Gasoline engines should be stopped during refueling. Fuel tanks and lines should be checked daily for leaks and breaks. All boats should hold a fire drill at least once a week.

b. Mine yawls should take high waves bow-on or on the quarter. An attempt to turn should not be made unless there is sufficient time to complete the movement without unnecessary risk. If the yawl is tied to a buoy or towing vessel, sufficient line should be let out to permit the yawl to ride the sea. The mine yawl should be moored at the bow only.

Section II. MINE PLANTERS

78. GENERAL. The construction of mine planters is a function of the Transportation Corps. The administration and operation of these vessels are carried out in accordance with instructions from the Commanding General, Army Service Forces, and the commanding generals of defense commands. (See AR 90–150.) Several types of regular mine planters are now in use. These can be divided into two general groups, those built prior to 1940 and the M1 (Knox class) built subsequent to that time. In addition, there are junior or emergency mine planters which may be put into service in lieu of or in addition to regular mine planters.

79. EMPLOYMENT. The mine planters are the heavy-duty vessels of the mine command. They are used chiefly to—

a. Plant and pick up mines and anchors.

b. Lay and maintain mine and shore cables.
c. Plant control buoys.

80. CHARACTERISTICS. a. Types. Several types of mine planters were built before 1940. All of these, with the exception of the Niles are steam-powered. The Niles is Diesel-electric driven. All planters built since 1940 have been of a standard design known as the M1 or Knox class. (See fig. 17.) The planters of this class are powered by two uniflow steam engines. The characteristics of mine planters are as follows:

	Before 1940	*M1 (Knox class)*
Length	160 ft. to 184 ft.	188 ft. 8 in.
Beam	36 ft. (average)	37 ft.
Power	1,100 hp., twin screws	1,200 hp., twin screws
Fuel capacity	30,000 gals. (average)	50,000 gals.
Fuel used	Bunker "C" oil	Bunker "C" oil
Draft	10 ft. 6 in.	12 ft.

The fresh water capacity of both types is sufficient for operations consistent with fuel capacity.

b. General features. (1) *Mine load.* Both classes of mine planters are capable of carrying one group of ground mines, and the Knox-class vessels can carry several spare mines in addition to the group.

(2) *Mine planting equipment.* Each mine planter is equipped with the following items of ship's equipment to facilitate mine field work. (See fig. 18.)

(*a*) Boom.
(*b*) Davits.
(*c*) Catheads.
(*d*) Capstans.
(*e*) King reel.

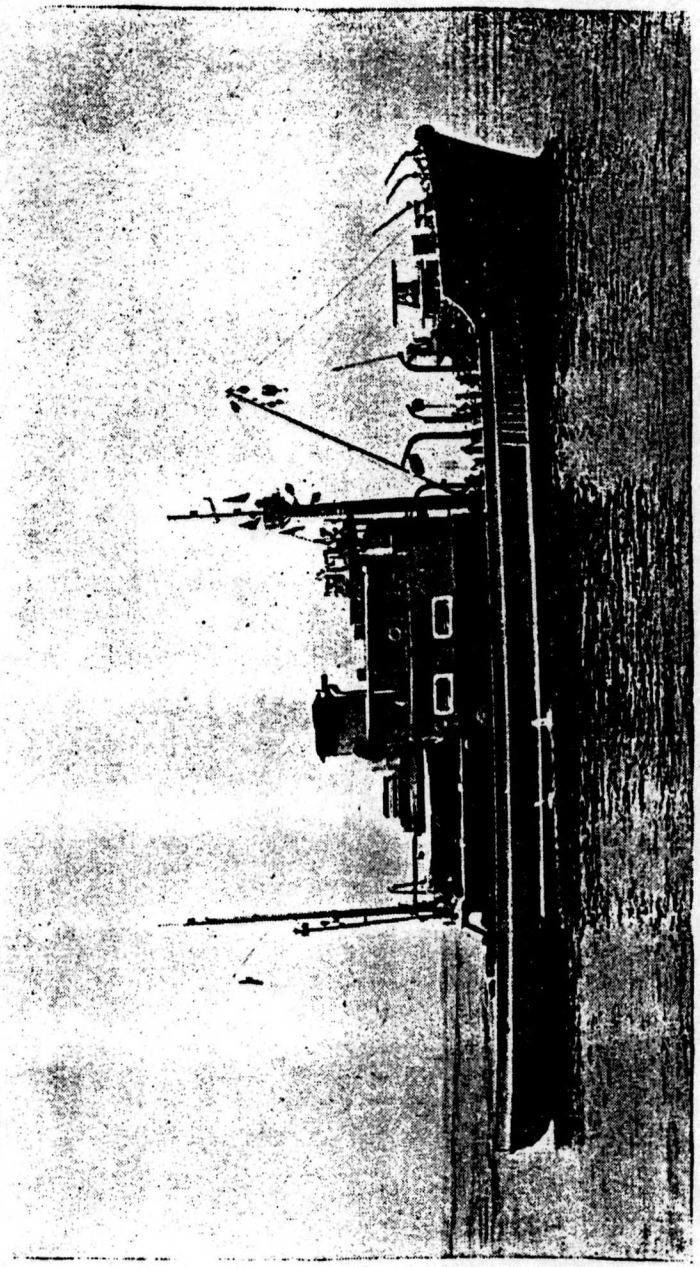
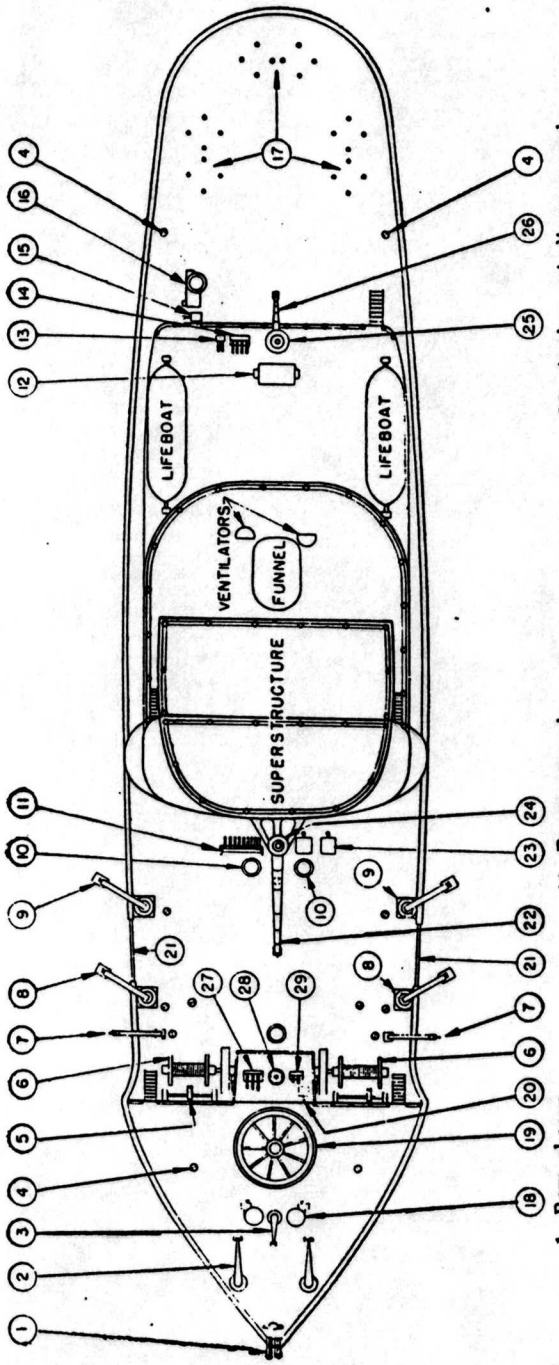


Figure 17. United States Army mine planter M1 (Knox class).



1. Bow sheave.
2. Anchor davits.
3. Cable davit.
4. Deck eye.
5. Cable reel sheave.
6. Cable reels.
7. Catheads.
8. Mine davits.
9. Mine anchor davits.
10. Capstans.
11. Boom controls.
12. After boom winch.
13. After boom controls (power).
14. After boom controls (clutch).
15. After capstan controls.
16. After capstan.
17. Sockets for figure-of-eight stanchion.
18. Anchor windlass.
19. King reel.
20. Anchor windlass controls.
21. Removable section of rail.
22. Main mast boom.
23. Capstan controls.
24. Main mast.
25. After mast.
26. After mast boom.
27. King reel controls.
28. King reel brake
29. Cable reel controls.

Figure 18. Location of ships equipment on M1 planter (Knox class).

Section III. DISTRIBUTION BOX BOATS

81. EMPLOYMENT. Distribution box boats (fig. 19) are the most versatile boats in the mine command. These boats are designed to pick up, hold, and replant the distribution box. They may be used, however, for practically any task in the mine field and are especially adaptable to the accurate positioning of control buoys used when planting mines. DB boats may also be employed for the following operations:

a. Underrunning cable.

b. Planting or picking up mines in maintenance.

c. Moving planted mines to position.

d. Laying shore cable in lengths up to one reel (10,000 feet).

e. Making splices on submarine mine cable at sea.

f. Grappling for raising ropes and cable.

82. CHARACTERISTICS. a. Two general classes of DB boats, the old type constructed of wood and the newer all-steel boat, are in service. As the steel boats are rapidly replacing the wooden boats, the characteristics of the steel boats only are discussed herein.

b. The steel boats are in two series: L–64 to L–100 inclusive and those numbered above L–100. The characteristics of the two series are as follows:

	L–64 to 100	*Above L–100*
Length (feet)	64	64
Beam (feet)	18	18
Main engine	8-cylinder, 230 hp., 4-cycle, full Diesel.	6-cylinder, 222 hp., 4-cycle, full Diesel.
Reduction gear ratio	3 to 1	2 to 1
Crane	1½-ton	2½-ton
Winch	1½-ton	1½-ton
Radio	SCR–281	SCR–281

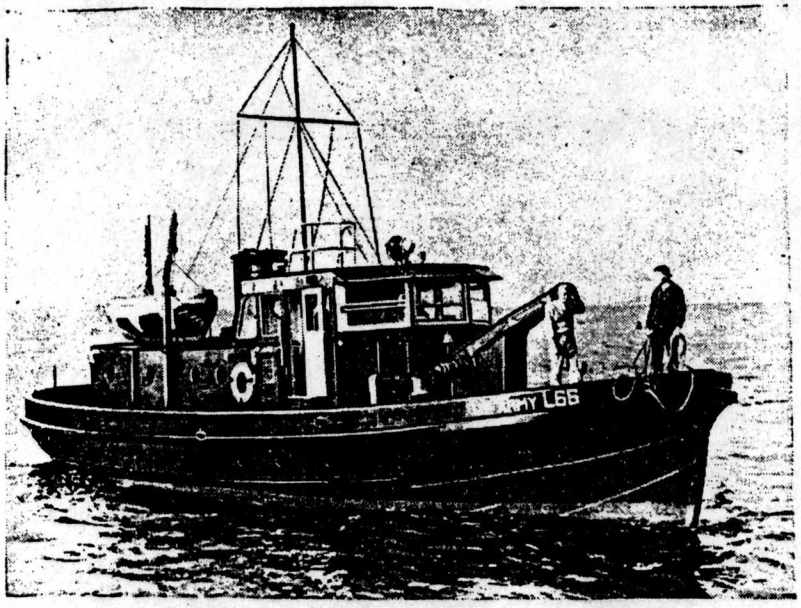


Figure 19. Distribution box boat (DB boat).

Section IV. MINE YAWLS

83. GENERAL. The yawls (fig. 20) are the utility boats of the mine flotilla. Occasionally, a harbor defense will use locally procured fishing boats as yawls. The standard yawls are ruggedly built work boats, 26 to 30 feet long, powered by gasoline or Diesel engines of from 40 to 150 horsepower.

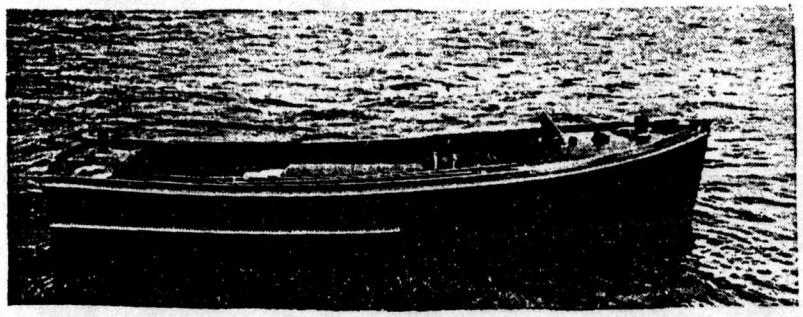


Figure 20. Mine yawl.

84. EMPLOYMENT. The mine yawls are employed to—

a. Act as safety boats behind planters.
b. Underrun cable.
c. Install junction boxes and make splices.
d. Mark the position of mines (fig. 42).
e. Act as messenger boats between various vessels or between vessels and the shore.
f. Take soundings.
g. Assist in landing shore cable near cable huts.
h. Grapple for cables and lost equipment.

CHAPTER 6

PREPARATIONS FOR MINE PLANTING

Section I. PLANS

85. GENERAL. The length of time required to prepare and plant one group of ground mines depends, to a great extent, on the amount of training that the personnel of the mine battery and the mine flotilla have had and upon local hydrographic and weather conditions. Under favorable conditions and with a complete battery of well-trained men, a group of mines may be made ready to plant in 1 day. The actual planting of the group, including the planting of control buoys, distribution box, 13 mines with cables, and laying the shore cable, will also require approximately 1 day. By working full time without secondary missions or details, one mine battery and flotilla should be able to prepare and plant a minimum of 3 groups a week, weather permitting.

86. WORKING PROGRAM. a. During peacetime, the mine battalion commander will prepare and keep up to date a schedule of operations for the planting of the approved wartime mine project. This schedule, classified as "secret," (AR 380–5), will treat in detail the following items:

(1) Exact location of all elements of the project.
(2) Matériel and equipment required.
(3) Estimated time required for all operations of preparing, transporting, and planting the under water equipment.
(4) Plan for coordination of work of various elements of the mine command.

(5) Shortages of materiel and equipment.

b. An up-to-date chart showing the location of the mine field, depths of water, cable routes, and all data necessary for a complete graphical picture of the project will be maintained.

87. PROJECT REQUIREMENTS. The harbor defense project is planned basically by the War Department General Staff and the defense commander and approved by the Joint Army-Navy Board. (See AR 100–20; FM 4–5). The Army Service Forces (Chief of Ordnance) develops and procures controlled submarine mine equipment. Local project requirements are determined by the harbor defense commander and requisitioned from the Ordnance Department, Army Service Forces, Submarine Mine Depot, which checks and ships the required equipment. T/A 4–4 is the basis of allowances for controlled submarine mine equipment. After the original equipment has been received, the local mine property officer initiates a semiannual stock report and requisition in order to maintain a constant level of equipment on hand as authorized by T/A 4–4.

Section II. PREPARATION OF EQUIPMENT

88. GENERAL. Items of submarine mine equipment are not furnished ready for planting. Cables and ropes must be cut to length; mines must be loaded; firing device assemblies installed; marking buoys and buoy ropes assembled; and accessories, such as heaving lines and tools, must be made ready to take out on the planter and other vessels. (See app. II for mine assembly check sheet.) Preparation of equipment is usually performed simultaneously by the several sections of the mine battery.

89. CABLE. a. General. Single-conductor submarine cable is shipped on reels containing 10,000 feet. Each reel of cable has a permanent identifying number. When a length is cut from a reel of cable, this length

is assigned a letter in addition to the reel number. (See fig. 21.)

b. Cutting cable. Since the mines of one group are planted in line and are connected to the same distribution box, various lengths of cable are required. (See table below.) Another factor in determining the length of each mine cable is the depth of water in which the mine is planted. As a result of plantings in many areas, the following procedure has been developed for determining the over-all length of each mine cable; add to each length listed in the following table the depth of the water (in feet) at the location of the mine. For example:

Mine 7

Length of cable	425 feet
Depth of water	100 feet
Over-all length of cable to be cut	525 feet

The lengths of cable in the table do not include water depth.

Mine number	*Length of cable (feet)*
7	425
6 and 8	500
5 and 9	575
4 and 10	725
3 and 11	875
2 and 12	1,025
1 and 13	1,200

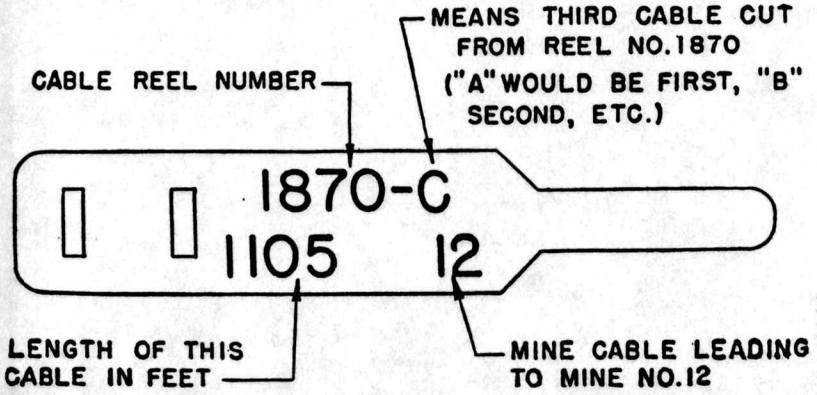


Figure 21. Cable tag.

The required length of cable for each mine is unreeled from the cable reel and is either made into a figure-of-eight (fig. 25) or wound on a raising rope reel. As each cable is cut, it is tagged at both ends with a metal tag (fig. 21) showing the cable number, length, and mine for which it is cut.

c. Testing cable for insulation and conductor resistance. Cable is tested for insulation and conductor resistance after it has been cut to the desired length. The insulation resistance should be at least 5 megohms per 1,000 feet and the conductor resistance should not

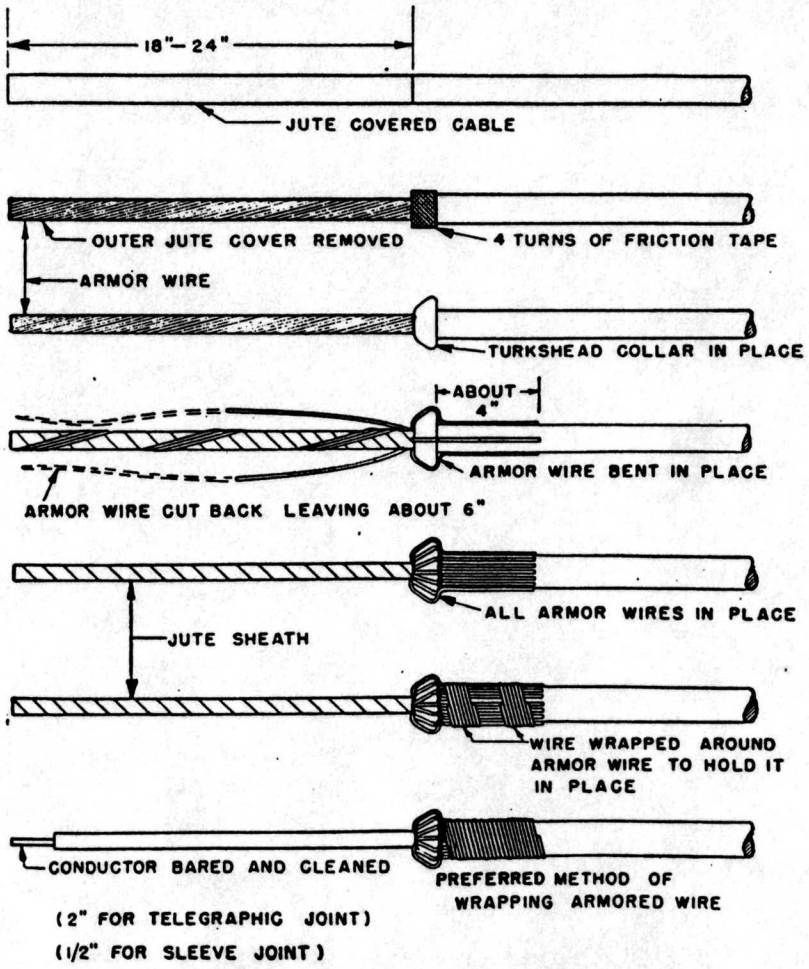


Figure 22. Making a turk's-head.

exceed 4 ohms per 1,000 feet. See TM 9–415 for details of these tests.

d. Making a turk's-head. . (1) A turk's-head is used on submarine mine cable to insure that no tensile strain will be placed on the conductor. Some reels of submarine mine cable come from the manufacturer with a turk's-head on the outer end. After a length of cable is cut from a reel, a new turk's-head is made on the loose end of the cable remaining on the reel.

(2) To make a turk's-head (fig. 22), trim the ends of the cable and place a wrapping of friction tape about 20 inches from the end to give the turk's-head collar a snug fit. Slip a turk's-head collar, flat side first, on the cable until it rests against the friction tape wrapping. Bend back the armor wires evenly over the collar. Cut all the armor wires with pliers so as to remove all but about 6 inches from the strands. Bend the armor wires separately to form 2 right angles that will fit snugly around the turk's-head collar. Arrange the bends of the wires smoothly along the cable. Wrap the armor wires which have been bent back with No. 14 galvanized wire. The wrapping may be made to conform to either type illustrated in figure 22.

90. RAISING AND MOORING ROPES. a. General. Mine raising ropes are lengths of marline-covered, steel-wire rope. This rope comes in reels containing approximately 1,200 feet. Mine raising ropes are attached to the mine and mine cable and are used to raise mines from the bottom of the sea for maintenance or replacement. Marline-covered, steel-wire rope is also used as mooring rope for the mooring of control buoys and distribution boxes. The raising rope used in the distribution box release buoy is ½-inch steel-wire rope.

b. Cutting the raising rope. The length of raising rope depends on the depth of the water. This length should be 100 feet plus the depth of the water at the point the rope is to be used. When the water depth does not vary more than 20 or 30 feet, cut all ropes the same length, thereby making them interchangeable.

Cut the rope to the desired lengths, whip the ends, fit one end with a thimble and three clips, and wind into coils. (See fig. 23.)

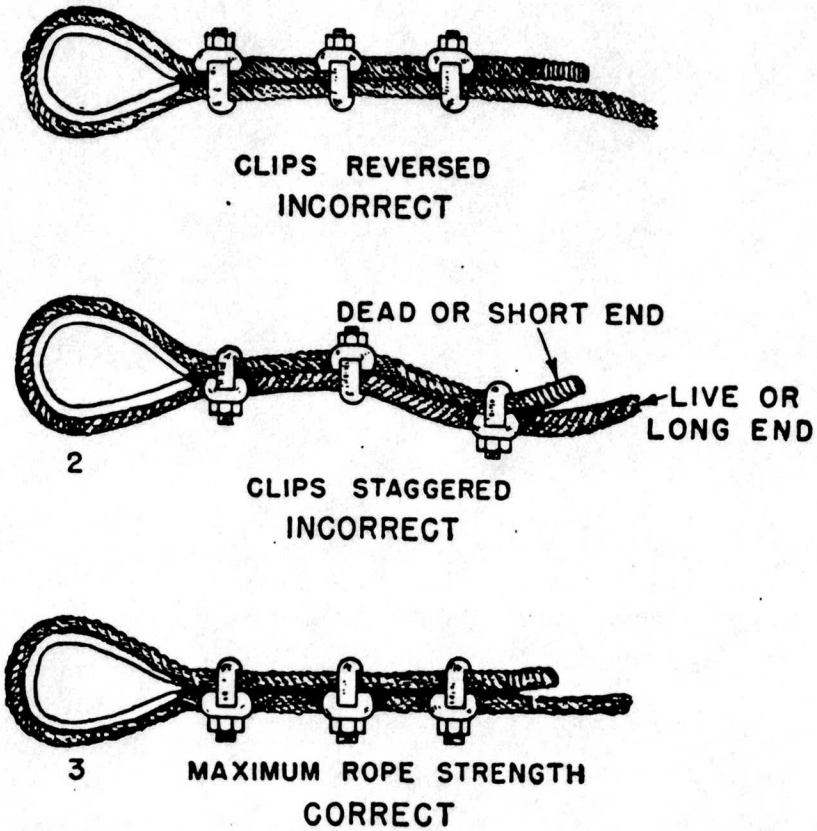


Figure 23. Method of attaching clips.

91. WINDING CABLE AND RAISING ROPES ON REELS. There are two methods of winding cable and raising rope on raising rope reels.

a. Method 1. Attach a 100-foot length of ⅝-inch diameter manila rope (messenger line) to the loose turk's-head end of the cable. This end will become the distribution box end of the cable. Fasten the cable, with attached messenger line, to the flange of the raising rope reel, leaving the pigtail out for testing. Wind the cable and the messenger line parallel to each other on the

reel, measuring the cable as it is wound. When the end of the messenger line is reached, lash it to the cable with marline. Continue to reel the cable until the point is reached where the length of cable still to be wound is equal to the predetermined length of the raising rope plus 6 feet. Fasten the raising rope to the cable with two half hitches and a cable clamp and reel it parallel with the remainder of the cable. Lash the outer end of the cable and the eye of the raising rope to the reel when the turk's-head is completed.

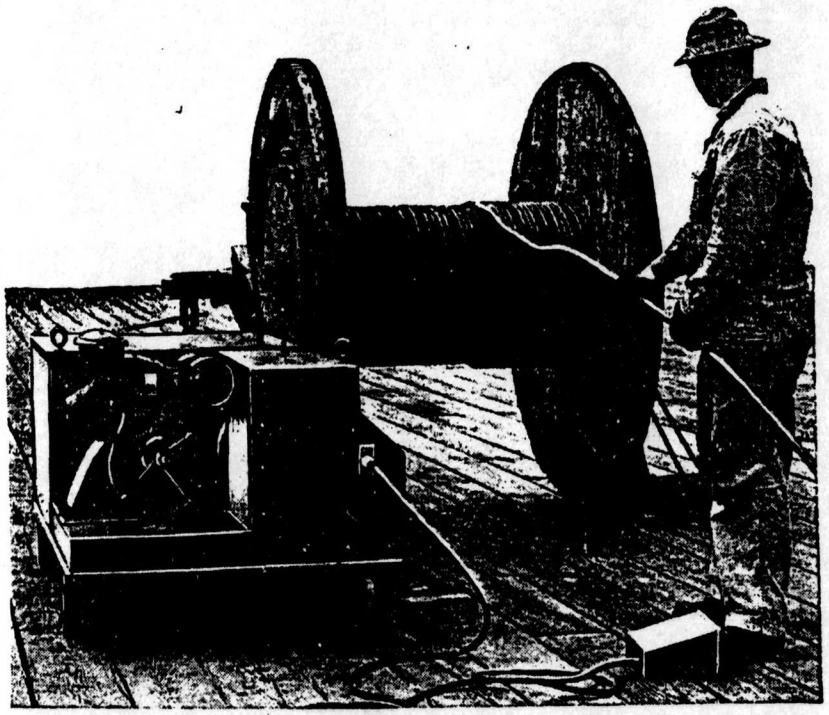


Figure 24. Using portable cable reeler M1.

b. **Method 2.** In the second method the messenger line is not used; double the cable back on itself for about 100 feet and start reeling with the bight of the cable. Lash the free end to the running end a few feet from the turk's-head so that both sides of the bight will unreel together. Leave the pigtail out for testing.

The remainder of the procedure is the same as described in *a* above. In this way the distribution box end of the cable is given to the heaving line men before the entire cable is payed out in the planting operation.

92. **FIGURE-OF-EIGHT CABLE COILING.** When the cable is laid before the mine is planted, the cable must be coiled for planting with both ends free so that one end can be passed to the DB boat and the other carried forward on the planter and attached to the mine. To accomplish this, the cable is made into a figure-of-eight by coiling it on a figure-of-eight frame (TM 9–415) in the following manner: Start the figure-

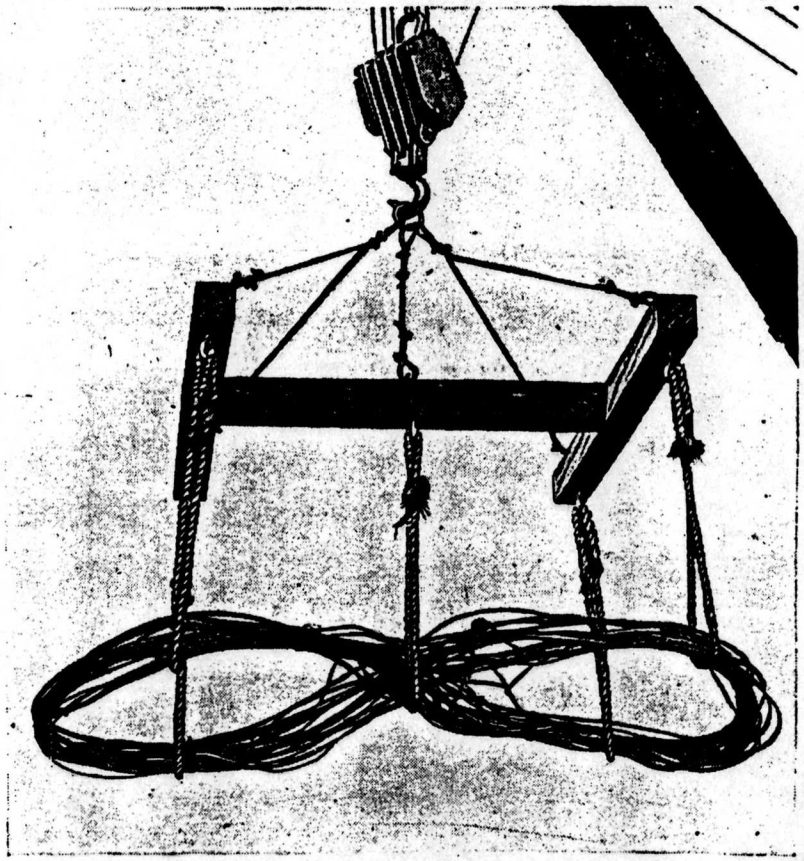


Figure 25. Yoke for handling figure-of-eight coils.

of-eight about 135 feet from the mine end of the cable. Carry this length through the center of the frame and coil the remainder of the cable on the figure-of-eight frame, spreading out the laps at the center to reduce the height at that point. Lash the outer loops and the center of the figure-of-eight, leaving ends of the lashing of sufficient length to lash the 135 feet of cable remaining uncoiled. To retain the figure-of-eight in proper shape for planting, it is securely tied with 5 or more lashings. Coil the 135 feet of cable for the mine end on top of the coil and secure the cable with the ends of the lashings. Use old measuring and heaving lines for lashing cable. When figures-of-eight are loaded on the afterdeck, take the 135-foot lengths forward and attach the end to the mine for which it is intended with a water-tight joint. Shackle the raising rope thimble to the mine and, when ready to plant, stretch the rope along the side rail with the cable. Fasten the end of the raising rope to the mine cable with two half hitches and a cable clamp or a binding of wire.

93. MINE CASES. Each mine case is air tested as prescribed in TM 9–420. If there are no leaks in the case and all parts fit properly, the case is ready for the installation of the extension straps and coil rod (or coil rod housing if the 72-inch coil rod is being used). This installation is usually made at the loading room where the loading officer has the data for the combinations of coil rods and firing devices to be used.

94. COIL RODS. a. Coil rods are supplied in two lengths, 48 inches and 72 inches. Observe care in handling coil rods. Do not drop, bend, or damage them in any way. Before installing the rods in mine cases, the following tests should be made:

(1) Conductor resistance of 48-inch coil rod (resistance required: 66 ohms plus or minus 10 percent).

(2) Conductor resistance of 72-inch coil rod (resistance required: 100 ohms plus or minus 10 percent).

(3) Insulation resistance of all coil rods, lead to core (resistance required: minimum of 20 megohms).

Note. **No electrical tests whatsoever will be made on a TNT-loaded mine case until the mine is planted and the "dry test" (par. 122) is performed.**

b. Installation. The rods should be installed vertically, and the extension straps should be well grounded to the mine case. Proceed as follows:

(1) *Coil rod, 48-inch (26).* (*a*) Scrape any dirt, paint, rust, and other foreign material from the case at all points where the straps are to make contact. Install the 57-inch bottom strap, leaving the clamps loose.

(*b*) Stand the coil rod upright on a block of wood with the leads at the bottom. Screw on the bent top strap so that 3/8-inch or more of threaded rod extends through the strap.

(*c*) To insert the coil rod into the mine case with the top strap in place, first insert the bottom of the rod into the loading hole, tilting the entire rod until the top strap can be brought through the loading hole into the mine case.

(*d*) Set the bottom of the rod into the threaded hole in the bottom strap with the angular section of the top strap in place between the holding studs.

(*e*) Hold the top strap firmly; turn the entire coil rod clockwise and screw it into the bottom strap. The bottom of the rod should be flush with the underside of the bottom strap.

(*f*) The top of the rod should be flush with the upper side of the top strap or extend slightly through the top strap.

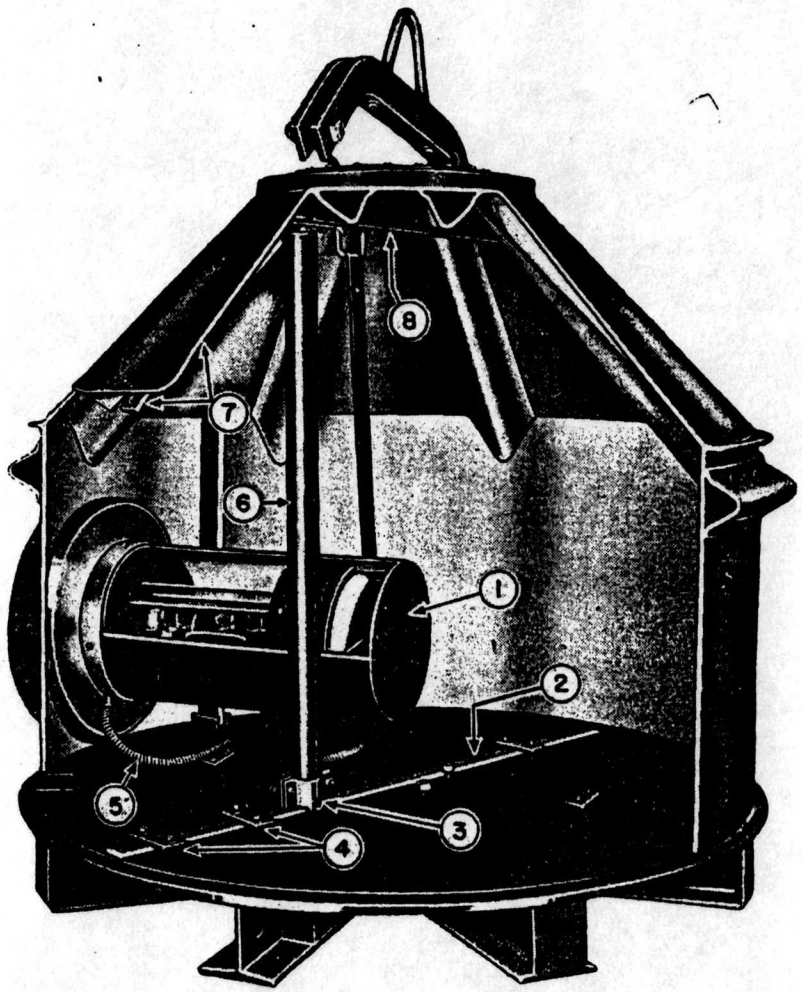
(*g*) Clamp all straps firmly in place.

(*h*) Thread the coil rod leads through the connector assembly conduit to the mine cylinder, using a galvanized iron wire as a fishline. Then pull gently on the leads until the split clamp rests snugly against the coil rod base.

(*i*) Attach two nuts and bolts to the other half of the split clamp. Tighten the bolts until the clamp is fastened to the coil rod. Care must be taken not to damage the protective cover of the coil rods.

(*j*) Repeat the conductor and insulation resistance tests as prescribed in *a* preceding.

(*k*) Load the mine with TNT. (See par. 95.) *Pay particular attention to safety regulations.*



1. Cylinder.
2. Bottom strap.
3. Split clamp.
4. Holding clamps.
5. Connector assembly conduit.
6. Coil rod, 48-inch.
7. Top strap.
8. Extension strap.

Figure 26. Installing 48-inch coil rod.

(*l*) Bolt the extension to the top strap.

(*m*) Fasten the mine case top cover securely in place.

(2) *Coil rod, 72-inch (fig. 27).* (*a*) Make the required electrical tests (a above) prior to installing the 72-inch coil rod. *As the mine case is loaded with TNT before the 72-inch coil rod is installed, no electrical test will be made on the 72-inch coil rod after it is installed in the mine case.*

(*b*) Remove the top and side covers.

(*c*) Remove the bottom strap clamps. Clean the case as in (1) (*a*) above and insert the 57-inch bottom strap so the ¾-inch threaded hole, located 24¾ inches from one end, is between the coil rod housing hold-down studs. Replace clamps but do not tighten.

(*d*) Place the housing for the 72-inch coil rod on its studs.

(*e*) Install the coil rod housing fixture by slipping it over the coil rod housing and bolting it to the top cover ring. The center bolt hole of the fixture should be over the bolt hole in the top ring which is directly opposite the center of the side opening.

(*f*) Align the hole in the bottom strap with the hole in the bottom plate of the housing by either temporarily installing the coil rod or by using a dummy.

(*g*) Screw down the nuts on the housing hold-down bolts with the dummy in place. Tighten clamps.

(*h*) Pull a 9-foot piece of two-conductor rubber-covered wire through the connector assembly conduit by means of a fishwire.

(*i*) Insert one end of this two-conductor wire through the threaded hole into the cylinder and screw the connector of the conduit into place in the threaded hole.

(*j*) Thread the other end of the two-conductor wire through the threaded hole on the upper end of the coil rod housing.

(*k*) Screw the other connector of the connector assembly conduit into the threaded hole in the coil rod housing. This is done by twisting the conduit backward three complete turns before engaging the threads of the connector in the hole.

(*l*) Drop the end of the two-conductor wire into the housing and cap the top of the housing with a plug.

(*m*) Load the mine case with TNT as prescribed in paragraph 95. *Pay particular attention to safety regulations.*

(*n*) Slip the centering plug over the coil rod so the large diameter of the plug faces *up.*

(*o*) Screw the 4-inch top collector strap on the coil rod until the rod projects about ⅛-inch through the strap. Tighten the jam nut against the collector strap.

(*p*) Remove the plug and lead the two-conductor wire out from the top of the coil rod housing.

(*q*) Slip the coil rod into the housing without bending it.

(*r*) Screw the coil rod into the bottom strap until tight, using the collector strap.

(*s*) Make a joint between the two-conductor wire and the coil rod leads, using a 3-inch piece of rubber tape and friction tape.

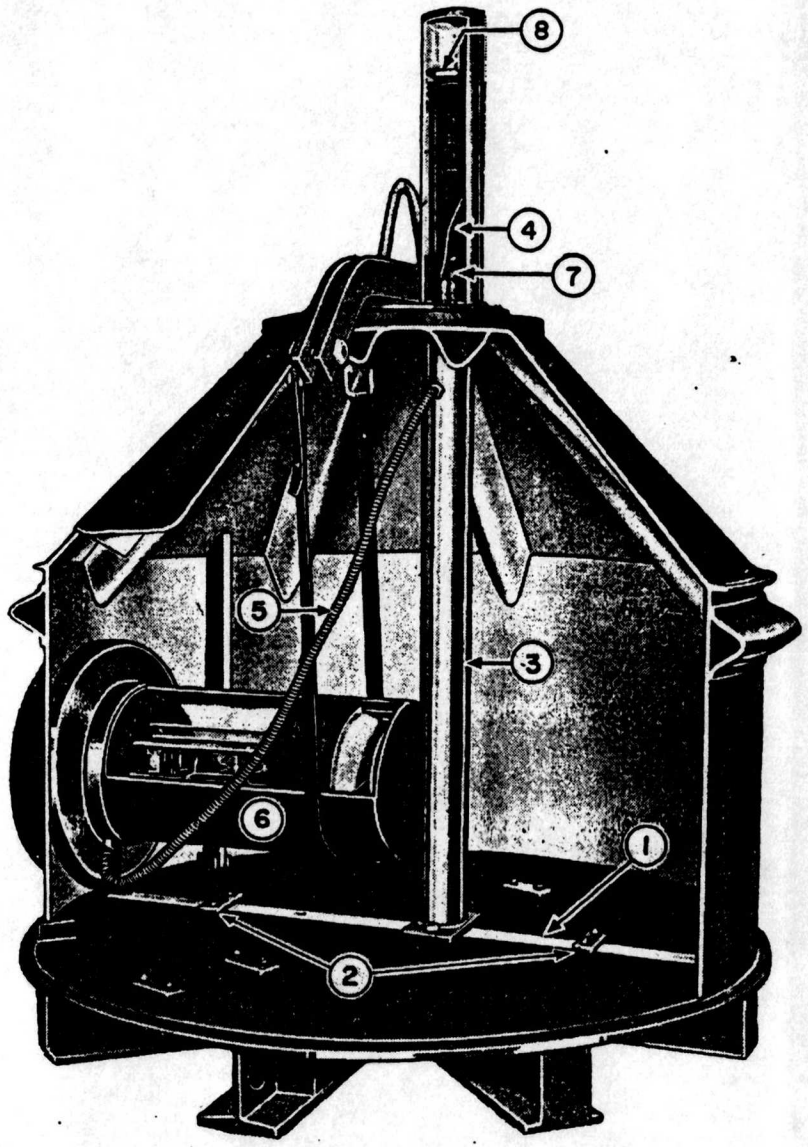
(*t*) Tape slack wire at the top to the coil rod.

(*u*) Slip the centering plug down the coil rod until it jams in the housing. Care should be taken to see that the two-conductor coil rod lead wire fits in the groove in the centering plug.

(*v*) Remove coil rod fixtures.

(*w*) Place the top cover on the mine, being careful not to injure the coil rod with the coil rod housing as the top cover is lowered into place.

(*x*) Fasten the top cover securely.



1. Bottom strap.
2. Holding clamps.
3. 72-inch coil rod housing.
4. 72-inch coil rod.
5. Connector assembly.
6. Cylinder.
7. Centering plug.
8. Collector strap.

Figure 27. Installing 72-inch coil rod.

95. LOADING A GROUND MINE. Figure 28 illustrates the loading of a ground mine. *Pertinent safety rules and regulations will be observed when handling explosives (See app. IV).* Before loading, screw the bolts into their respective holes and insert a rubber gasket into the groove to prevent TNT from entering these recesses and causing accidental detonation when the screws and cover are assembled to the mine case. In order to place 3,000 pounds of TNT into the mine, careful distribution will be necessary. As a precaution, after the first few boxes are put in, see that the TNT is evenly distributed within the mine case and that no strain has been exerted on the conduit, coil rod, or cylinder. As loading proceeds, a wooden tamp can be used to push the TNT into place. Careless tamping can injure the coil rod, cylinder, or conduit. If these are damaged, the mine case must be emptied, an operation that causes loss of time and labor. When the mine case has been completely loaded with 3,000 pounds of TNT, clean off all TNT on the ring of the top opening

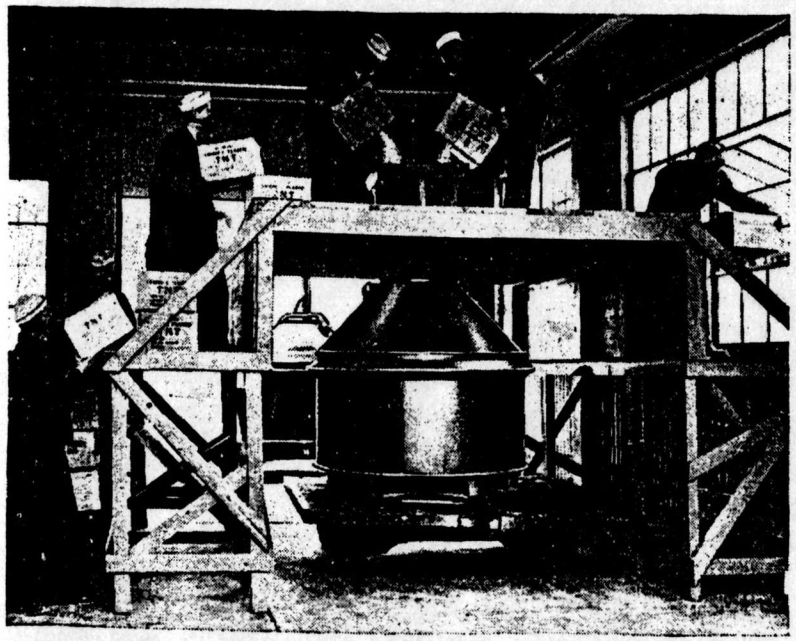


Figure 28. Loading a ground mine.

of the mine case by brushing with a soft, nonsparking brush. *Do not* remove the cap screws until this is accomplished. An officer will personally supervise all loading operations.

96. LOADING BOOSTER CAN. As a rule, load booster cans in a separate loading room. However, the loading room may be used if no loaded mines or no more than 300 pounds of TNT are in or near the loading room. Fill the booster can with TNT. Connect two blasting caps, with 1-foot leads, in parallel. (See fig. 29.) Attach these leads to the terminals on the inside of the cover of the booster. Bury the blasting caps in the TNT in the booster can, put the cover in place, and fasten with the brass screws or nuts provided. The loaded booster can will not be inserted into the mine until just prior to loading on the planter. Extreme care and every precaution must be observed in handling detonators and boosters. They contain approximately 18 pounds of TNT, a quantity capable of demolishing a loading room and its personnel.

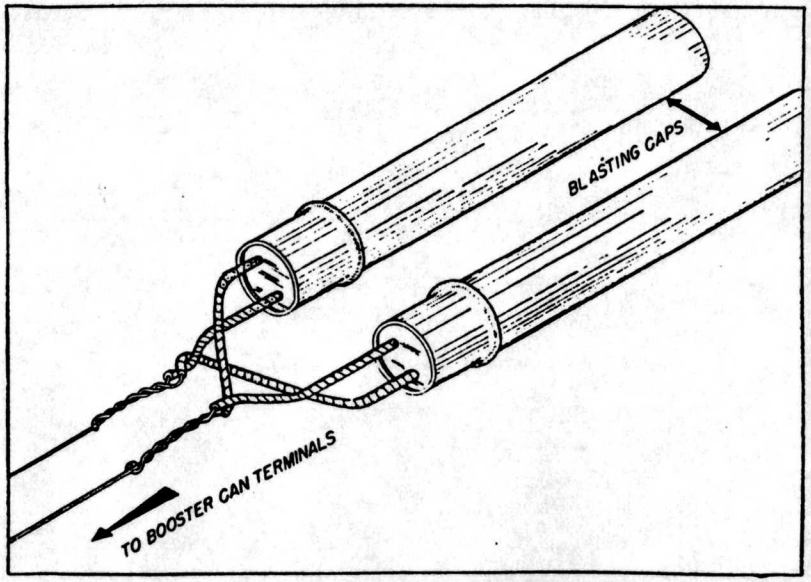


Figure 29. Proper connections for blasting cap leads.

97. INSTALLING FIRING DEVICE ASSEMBLY. It is of utmost importance that care be exercised in the handling of firing devices. These devices must be installed correctly or the operation of the mine may be seriously impaired. Firing devices are tested in the casemate. They are delivered to the loading area complete with two 3-foot detonator leads, two 15-inch coil rod leads, one 2-foot mine lead, one 18-inch ground lead, and with rubber cushions in place. The detonator leads and ground lead are made of loading wire, and the ends of all leads are fitted at the casemate with cup or locking type terminals carefully and securely fastened and soldered to the conductor wires. After the coil rod has been installed, the mine case loaded with TNT, the mine case top cover properly fastened in place, and the mine removed to the wharf, the booster can, cushions, and firing device are assembled and installed as follows:

a. Insert the loaded booster can in the side opening until flush with the side ring. The notch in the cover of the booster can fits into the guide bar or channel in the bottom of the cylinder. (See app. IV for safety precautions with booster cans.)

b. Attach the two 3-foot detonator leads to the outside studs on the booster can.

c. Make sure that the centering lug on the firing device is in the proper recess in the cushion.

d. Push the cushioned firing device and booster can into the cylinder after the excess loading wire between firing device and booster can has been tucked into the hole in the cushion. Keep the firing device upright, that is, with guide lugs uppermost.

e. When the firing device and cushions have been pushed in as far as they will go, connect the 1-foot ground lead of the firing device to the ground terminal of the mine case.

f. Connect the coil rod leads to the two red leads coming from the rubber plug in the firing device. Either coil rod lead can be connected to either red lead.

g. Insert the gasket in the groove of the side ring.

h. Pass the loading wire lead of the firing device through the insert in the cover.

i. Screw two locating studs made from 3/8-inch by 3 1/2-inch bolts (heads removed) into cap screw holes on opposite sides of the side opening. These studs permit the side cover to be installed and located properly by one man. Screw the studs in until fingertight and remove when all of the other cap screws are in place and tightened.

j. Put the side cover in place and screw in the cap screws.

k. Place a rubber packing, a brass gland, and a steel follower on the loading wire lead of the firing device. Screw in the follower to make a watertight fit. One-finger pressure on the end of an 8-inch wrench should be sufficient.

Note. No electrical tests will be made on a loaded mine until it has been planted in the mine field and the "dry test" (par. 122) performed.

98. MINE BUOYS AND BUOY ROPE. a. During planting operations, each ground mine is marked by two wooden mine buoys attached to the bail of the mine by 5/8-inch diameter manila rope. Several buoys may be needed to hold up the weight of the buoy rope, since it has been found that two buoys will submerge and become lost in swift water. This condition may be remedied if a third buoy is attached to the other buoys by means of a 10-foot length of rope. This third buoy will usually stay afloat and can be located by the marking boat. It is preferable to use small, hollow, steel marking buoys in place of the wooden buoys if they are available.

b. The length of buoy rope needed will vary with local conditions although for average water conditions a rope twice the depth of the water should be sufficient. There are two methods of fastening a buoy rope to the marking buoys and the mine. The method to be used must be considered beforehand to determine the amount of rope necessary in planting operations.

(1) *Method 1.* Pass the rope through the mine bail, keeping both ends equal in length and fastening these

See fig 30

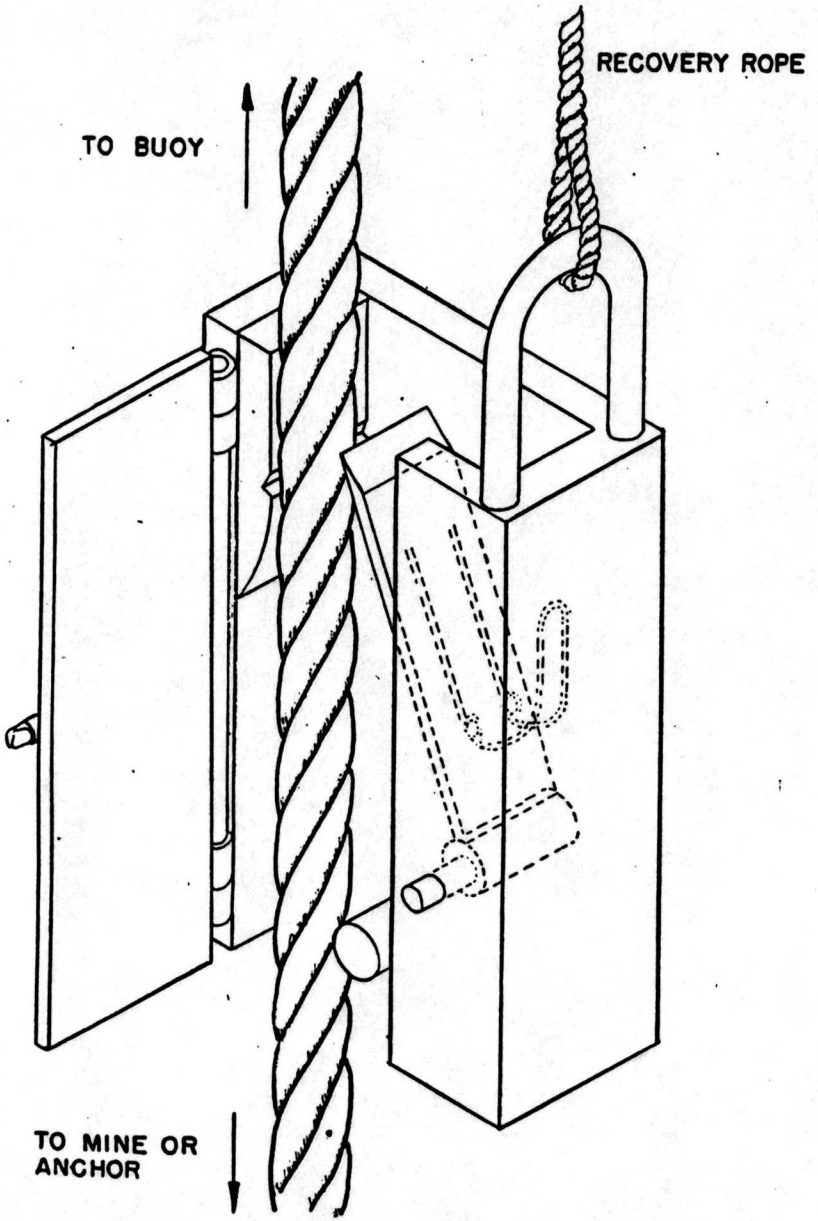


Figure 30. Mine buoy rope cutter M1.

ends to the buoys with bowliness. This forms a long loop with the bight at the top of the mine bail. To remove the buoys and ropes, take the buoys into a yawl, untie one bowline and draw on the other end until the rope has been pulled through the mine bail and aboard the boat. Then untie the second bowline. This method requires a large initial outlay of rope but there is no loss of rope by cutting.

(2) *Method 2.* The second method is tying one end of the buoy rope to the mine bail and the other end to the marking buoys. To remove the buoys and rope, take the buoys into a yawl, slide the mine buoy rope cutter M1 (TM 9–420) down the buoy rope until it reaches the mine bail, cut the rope at that point, and draw rope and rope cutter aboard the boat. This method requires one half as much rope initially as the method in (1) above, but there is a small loss of rope each time a rope is cut.

99. ACCESSORIES. Heaving lines are required to pass the cables to the DB boat. A minimum of thirteen should be prepared. Messenger and stopper lines; extra cable clips, cable clamps, and shackles; material for making turk's-heads and watertight joints; and assembled tool kits should be on the dock ready for loading aboard the planter. The quantities of each of these items will depend upon the extent of the job at hand.

100. DISTRIBUTION BOX AND SELECTOR BOX. A selector box, containing a selector assembly, and a distribution box for each group of mines to be planted should be on the wharf ready for loading aboard the DB boats when the planting operations commence. The selector assembly is adjusted and tested by the casemate electrician and installed in the selector box prior to delivery to the wharf.

101. CONTROL BUOYS. Control buoys are normally used to mark the positions of the distribution box and the line of mines prior to and during planting operations. The tops of the buoys are painted yellow and

marked with the group and mine numbers. Roman numerals are used to designate the group number; arabic numerals are used to designate the mine number. Four control buoys are usually employed for each group and mark the following positions: the distribution box, and mines Nos. 1, 7, and 13. These buoys are prepared and placed on the wharf, together with the necessary mooring rope and a 1,000-pound anchor for each buoy, for loading aboard the DB boat.

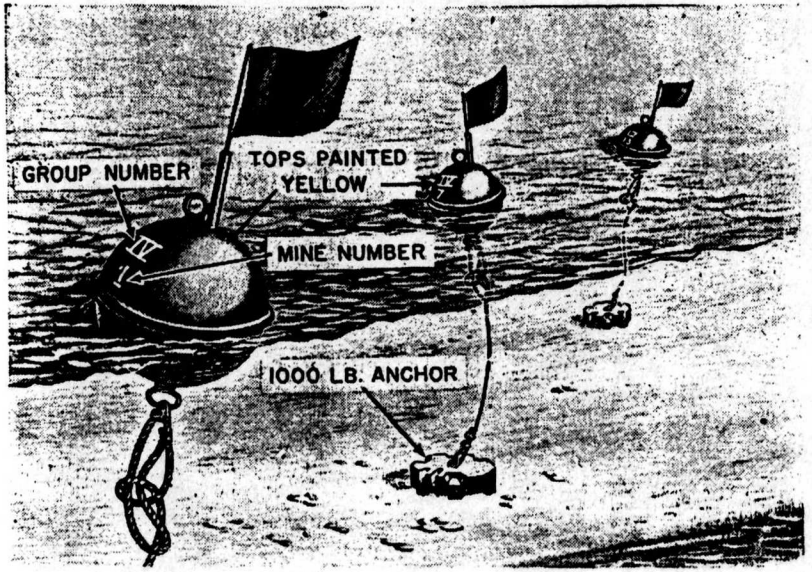


Figure 31. Control buoys and anchors for a group of ground mines.

102. AUDIO-RECEPTION SYSTEM M1. The following material for each audio-reception system is prepared for planting:

a. Two hydrophones mounted on 1,000-pound anchors.

b. Three thousand feet of cable coiled in a figure-of-eight to connect the two hydrophones.

c. Necessary length of shore cable wound on a reel.

d. One raising rope for each hydrophone, equal in length to the water depth at the hydrophone plus 100 feet.

e. Two balsa wood block buoys per hydrophone and a 5/8-inch-diameter manila rope equal in length to twice the depth of the water.

f. Steel marking buoys to mark the position of each hydrophone and the route of the shore cable prior to and during planting operations.

g. Anchors and mooring rope for the marking buoys.

Section III. FLOTILLA LOADING

103. PLANTER LOADING. The chief planter is charged with loading aboard the planter all necessary equipment for the work to be accomplished. (See app. III.) The loading of the mine planter should be supervised by an officer or warrant officer. The following is a suggested schedule for loading a group of mines.

a. Load the mines on the foredeck as indicated in figure 32. This method of loading provides access to the mines in the order in which they are planted. First load the side away from the wharf in the order of planting (par. 108); then load the mines on the wharf side of the planter in the reverse order of planting. By loading the mines on the far side of the planter first, the necessity of passing heavy equipment over that already loaded is eliminated.

b. While the mines are being loaded on the foredeck, load the cables on the stern. The cables are always loaded in reverse order of planting to insure their being available in proper sequence. The figures-of-eight are located so as to be accessible when necessary and yet out of the way at other times. If cable is laid from reels which are located on the foredeck of the planter, the reels of cable will be loaded on the foredeck after the mines are aboard. Raising ropes are loaded with cable, when the cable is on reels. If figures-of-eight are used, they are loaded on the side deck.

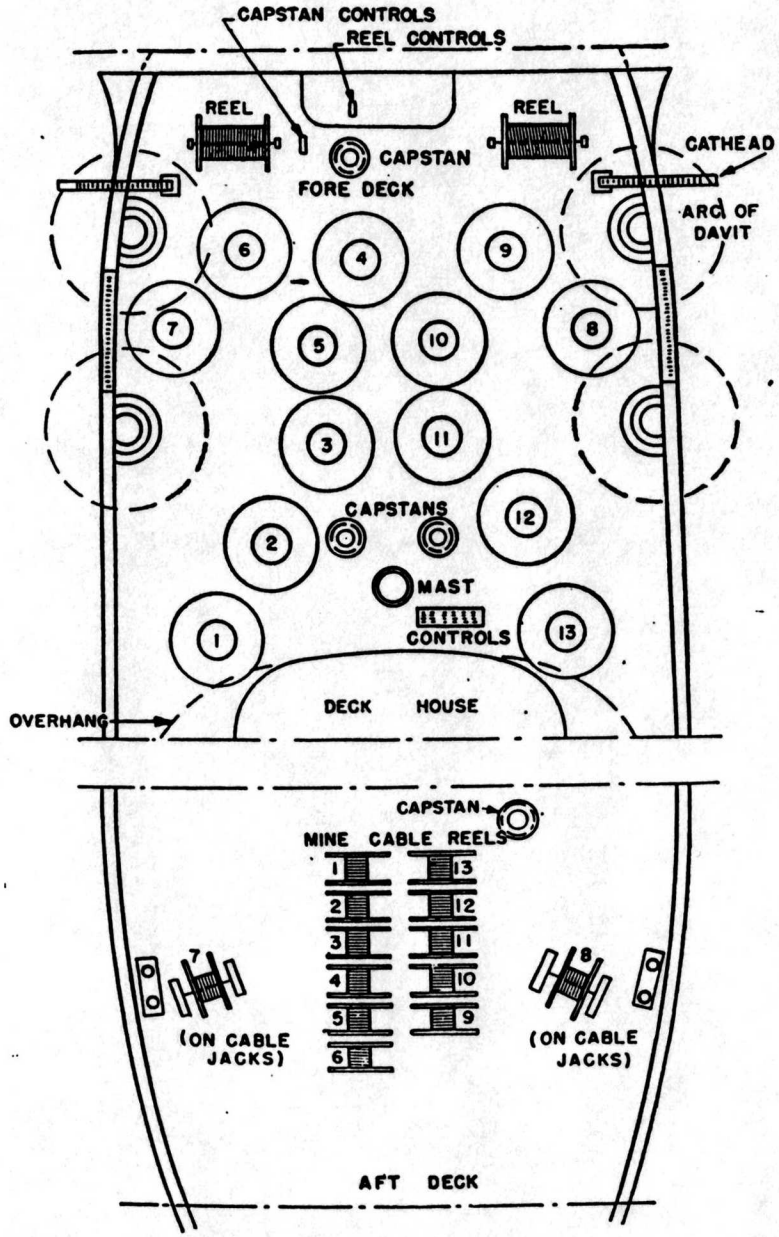


Figure 32. Location of mines and cables on deck of M1 planter (Knox class).

c. Marking buoys, buoy lines, heaving lines, and tools are loaded on the side decks in positions readily available to the foredeck. These articles are divided into port and starboard equipment and stowed on the same side as the mines to which they pertain. Marline, galvanized iron wire, thimbles, shackles, and extra cable clips and clamps should be stowed where they will be accessible when required for use.

104. DB BOAT LOADING. The coxswain of the DB boat is responsible for the loading of distribution boxes and the necessary tools and equipment. (See app. III.) The distribution box with selector box installed must be lashed firmly to the deck in such a manner that it will not interfere with the operation of the crane or winch. If the DB boat is to plant control buoys, the buoys and buoy rope are carried on the stern until needed. Anchors are loaded on the foredeck in a manner to facilitate planting.

105. YAWL BOAT LOADING. The coxswain of each yawl is responsible for the loading of all equipment, as listed in appendix III, aboard the yawl.

106. TOOL BOXES. Tool boxes are supplied for convenience in storing and handling the tools and supplies used on the flotilla vessels. These boxes, with a full quota of tools and supplies, are kept in readiness at all times. It is the responsibility of the chief planter and coxswains of DB boats and yawls to keep tool boxes and their contents in serviceable condition.

107. EQUIPMENT, TOOLS, AND SUPPLIES. Each boat in the flotilla will be equipped with the necessary tools and supplies to enable it to perform its assigned task. See appendix III for a check list of this equipment. Life-saving and safety equipment for all vessels is listed in chapter 5 and in general conforms to United States Coast Guard regulations for vessels of their particular class.

CHAPTER 7

PLANTING AND MAINTENANCE OF MINE FIELD

Section I. PLANTING OPERATIONS

108. GENERAL. a. Common sense and good judgment are the basis for successful planting and maintenance operations. Planting operations may be carried on at any stage of the tide, but swift running or rough water will hinder the operations and may even make them impossible. The most favorable time for the work will be determined by actual experience on the project and knowledge of local conditions. Work schedules should be based on this knowledge and experience. Officers of the mine command should understand all planting and maintenance operations employed.

b. The principal operations in planting a group of mines and the order in which they are performed are:

(1) Planting control buoys. This operation may be omitted if radio control of planting vessels is desirable. (See par. 114.)

(2) Anchoring DB boat over distribution box position.

(3) Laying shore cable and testing the cable when it is laid (operations 2 and 3 may be performed simultaneously).

(4) Planting the mines and passing mine cables to the DB boat. Mines of a group are usually planted in the following order: 7, 8, 6, 9, 5, 10, 4, 11, 3, 12, 2, 13, and 1.

(5) Locating and marking the positions of the planted mines on the mine plotting board.

(6) Making the dry test.

(7) Planting the distribution box.

(8) Making the wet test.

(9) Planting the underwater elements of the audio-reception system. This operation may be performed any time after the position of the seaward line of mines that is controlled from a single casemate has been established.

109. PLANTING OFFICER. The planting officer is in charge of operations on the water. Although he is normally the mine planter commander, another mine officer may be designated as planting officer by the mine battalion commander.

110. PLANTING SECTION. The planting section consists of 36 men divided into port, starboard, and stern details. (See T/O & E 4–69.) When only a few mines are to be planted, excess personnel of the details may be assigned to other duties on shore and made available to unload the planter when it returns. The variety of planting vessels now in use prohibits a detailed manning table which will be applicable under all conditions; therefore, actual duties of each man in a detail must be determined locally. The principal duties for one method of planting are outlined in the following subparagraphs as a guide.

a. Chief planter. The chief planter is a noncommissioned officer who is charged with the following duties: supervising the attaching of mine cables and raising ropes to their respective mines; reporting to the planting officer when each mine is ready for planting; directing all work of the planting section in laying and picking up mine and shore cables and passing cable ends to DB boats.

b. Recorder. The recorder is posted on the upper deck to keep records of all planting operations, including the time of planting of each mine, serial numbers of component parts of mines and cables as assembled on the deck of the planter, and location of mines with respect to the desired position as reported by radio from the plotting room.

c. **Port and starboard details.** These details may consist of a minimum of 9 men each. The men perform the following duties for each detail:

(1) *Noncommissioned officer.* A noncommissioned officer has charge of each detail.

(2) *Mine buoy and trip hook lanyard men (Nos. 1 and 2).* These men attach buoys to mines; handle the buoy mooring rope; coil and handle the trip hook lanyard; release the hook from the mine when directed; and assist in connecting cables.

(3) *Mine davit men (Nos. 3 and 4).* The mine davit men operate the davit turner and hoist to put the mine outboard; aid in transferring the mine to the raising rope which passes over the cathead or to the trip hook on the boom whip; and assist in attaching raising ropes.

(4) *Heaving line man (No. 5).* The heaving line man attaches the heaving line to the messenger line or to the end of the mine cable and heaves the other end of the heaving line (monkey fist) to the DB boat or yawl. He assists Nos. 6, 7, and 8 in cutting the marline lashings that secure the cable to the cable brackets and in lifting the cable to the rail. He handles the second heaving line on the opposite side of the vessel, backing up the heaving line man on that side of the vessel.

(5) *Cable men (Nos. 6, 7, and 8).* The cable men cut the marline lashings that secure the cable to cable brackets and lift the cable from the brackets to the side rail. After the mine is planted, they hold the cable along the rail until the heaving line is attached, keeping a slight tension on the cable as it pays out. They assist in replacing the guard covers.

d. **Afterdeck detail.** This detail consists of a noncommissioned officer in charge and four men who pay out cable in keeping with the planting method employed.

e. **Cable splicers.** The two splicers are technicians who make all the watertight joints. They also assist on deck.

f. **Mine transfer men.** Six transfer men move mines into positions on deck to facilitate planting operations. They also assist in assembling mine matériel aboard the planter and snub the mines to the vessel in rough weather.

111. **FLOTILLA SECTION.** a. **DB boats.** All work on DB boats is performed by members of the deck crew of the DB boat. The deck crew consists of the coxswain, radio operator, two cable splicers, and three deck hands. The cable splicers make all the required electrical connections and watertight joints. The deck hands catch or pass the heaving lines attached to the cables and assist in pulling the cables aboard and making them fast while electrical connections are being made. These operations should be supervised by an officer, a warrant officer, or the coxswain of the boat.

b. **Mine yawls.** All work on a yawl is performed by the crew of the boat. The crew is made up of the coxswain, engineer, and deck hand.

112. **PLANTING CONTROL BUOYS.** Normally, the first operation in planting a group of mines is to locate the control points accurately* (fig. 33). The DB boat or planter goes to the general location of the mine group to be planted. The range section, which has the control points plotted on the plotting board, tracks the vessel and directs it to the predetermined position of the control buoys to be planted. Normally, control buoys are planted first at the positions of mines Nos. 1, 7, and 13 of a group and then a buoy is planted to mark the position of the distribution box. The distribution box buoy is planted approximately 375 feet behind the No. 7 control buoy. If the mine control buoys are planted out of line, the range section directs the planting boat in dragging the buoys to the correct position. A mine control buoy is considered out of line if it is more than 15 feet out of position laterally or more than 25 feet forward or rearward of position. After the control buoys for the group are planted, the DB boat is anchored over the distribution box position and shore cable is laid to it.

* In certain situations where the control of planting vessels by radio (par. 114) has proved to be sufficiently accurate, groups of mines may be planted without using control buoys.

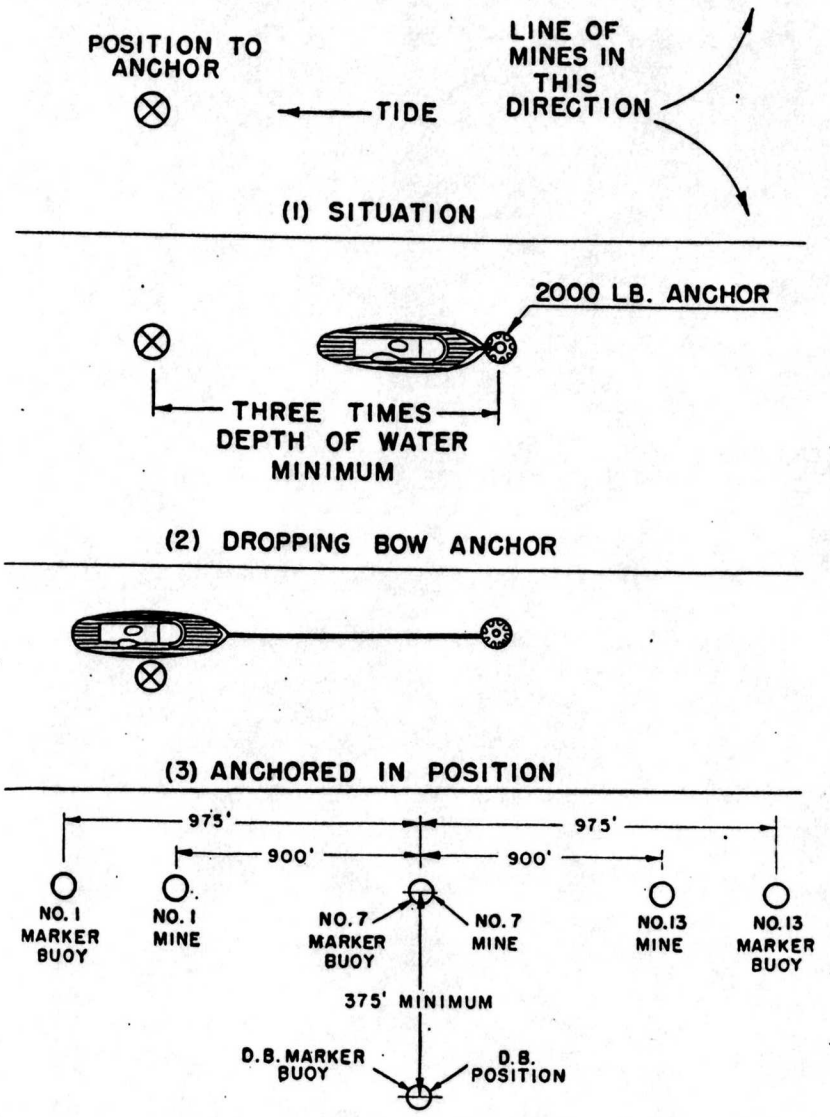


Figure 33. Method of planting control buoys.

Figure 34. Anchoring DB boat at distribution box position.

113. **ANCHORING DB BOAT.** The DB boat is anchored in position as illustrated in figures 34 and 35. The anchor must be dropped up-current from the desired position of the distribution box with a mooring rope at least three times the depth of the water under favorable conditions and five to seven times the depth of the water in currents of over 3 knots or under other unfavorable hydrographic conditions. The DB boat is then allowed to drift back until it reaches the position of the distribution box control buoy. At this point the anchor line is made fast to hold the boat in position. Should the tide turn during planting operations, the distribution box may be lifted and dropped over the

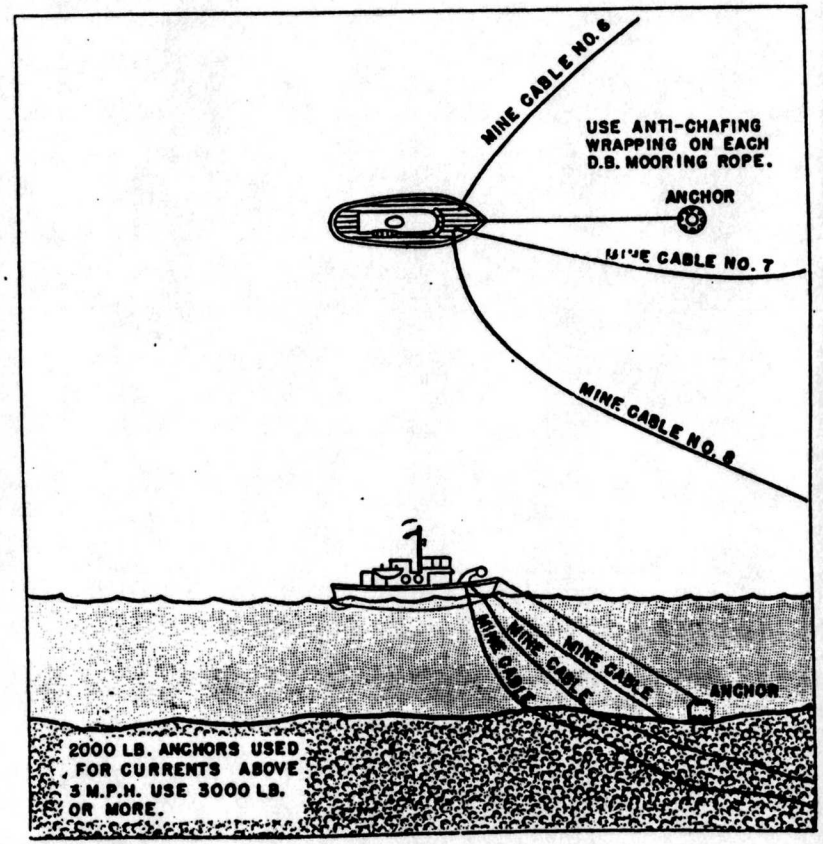


Figure 35. DB boat anchored at distribution box position.

bow until all cables clear the boat. This allows the boat to swing around without fouling the cables. After the DB boat has been allowed to swing around, it can be held in position by means of the mine cables or an anchor dropped up-current by the mine planting vessel.

114. CONTROLLING PLANTING VESSELS BY RADIO. a. General. The problem of horizontal control in planting operations is in giving the master of the planting vessel a clear and complete picture of his position with reference to the position he desires to place the mine. Radio control of planting vessels may be employed to plant control buoys (par. 112) or, where radio control has proved sufficiently accurate, it may be employed for the planting of mines without the use of control buoys. A method can be used which lends itself to the rapid and accurate transmission of position data by which the planting vessel may be directed into the desired position with a minimum of delay. An example of one control system which may be used is covered in b below.

b. Rectangular coordinate method. When using radio control, the rectangular coordinate method may be used to direct the planting vessel to the desired position. This method employs a grid imposed on a thin sheet of xylonite. (See fig. 36.) The scale of the grid must be the same scale as the plotting board. The grid graduations may be of any convenient size and should be marked along the edge in feet. The origin (zero of the X- and Y-axis) is the desired position of the mine or buoy to be planted; the *X-axis* is called *right* and *left* and the *Y-axis* is called *over* and *short*. In orienting the grid, the X-axis may be oriented to true north, but usually the X-axis is placed over and along the line of mines. After orienting the grid on the plotting board, it is fastened to the plotting board with scotch tape. To locate the planting vessel, simultaneous readings are taken on the boom or mast from two base-end stations at 5- or 10-second intervals, and the corresponding station arms on the plotting board are set to these readings. The point at the intersection of the arms is

the position of the planting vessel. This point is read directly from the grid, via radio, to the planting vessel. The course of the vessel can then be directed to the desired position. With these grid data radioed to the vessel, the navigator may employ a similar grid to locate his position, or he may visualize his position without the

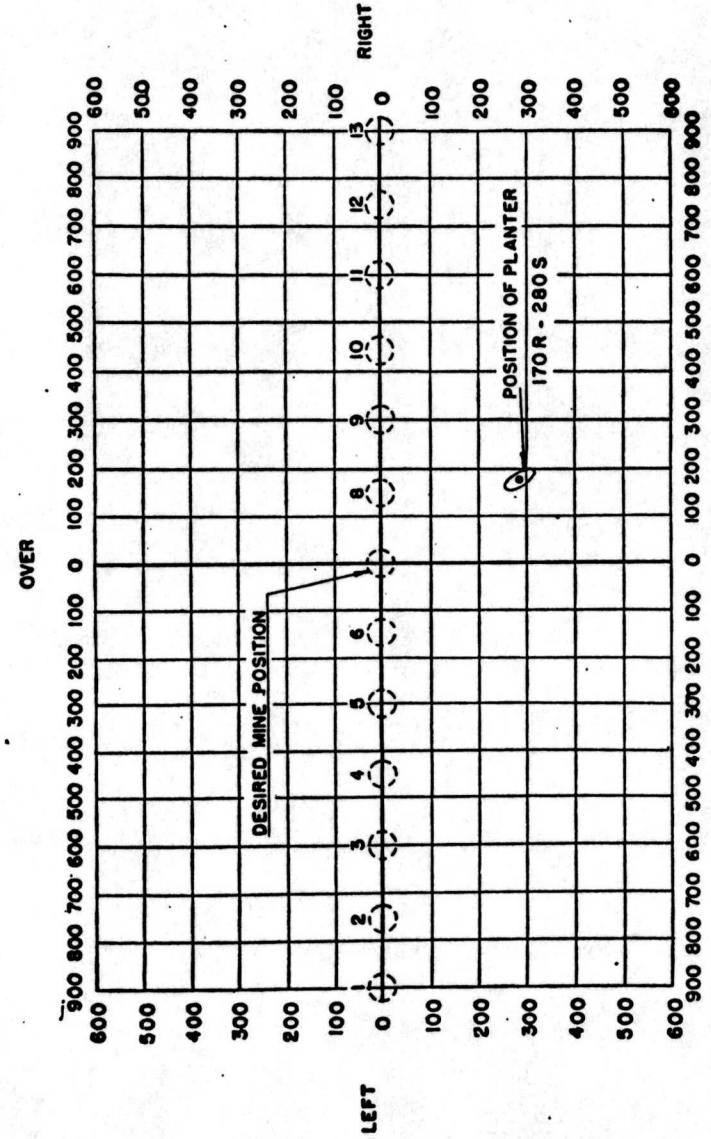


Figure 36. Radio direction by rectangular coordinates.

use of a grid. (The master must take into consideration the movement of the vessel since the reading was taken.) Figure 36 illustrates the orientation and use of the grid. After the mine or buoy has been accurately planted, the grid is moved so the next mine or buoy to be planted is at the origin of the grid and the grid again secured with scotch tape.

115. LAYING SHORE CABLE. Shore cable should always be laid against or across the current to facilitate the maneuvering of the cable-laying vessel. The planter approaches as close as possible to the shore in the vicinity of the cable terminal hut and passes the end of the cable to a yawl. The yawl drags the cable inshore as far as possible and then passes the end to the men on the beach, who drag the cable end to the cable hut. It may be necessary under certain conditions to employ an amphibious vehicle or to shoot ashore a line, to which the shore cable is attached, in order to bring the end of the shore cable ashore. As soon as the cable is made fast on shore, the planter starts for the distribution box position. If the group is more than 10,000 feet from the cable hut, it will be necessary to use more than one reel of cable and a splice must be made. This splice may be made before the planter leaves the dock as the cable is wound on the king reel, or it may be made on the water if more than one reel is used. A pipe-sleeve splice or a serve-up is made if the king reel is employed. A junction box is utilized when the splice is made between reels of cable. If the splice is made on the water, the ends of the planted cable and the new cable are given to the DB boat or yawl for splicing. The splicing boat uses its own anchor to hold its position and to prevent undue strain on the cable. (See TM 9–415 for methods of making splices.) When the planter reaches the distribution box position, the cable is cut and passed to the DB boat anchored there. Each shore cable is tested when laid and each junction box is marked with a buoy until the test is completed. If the cable test is unsatisfactory, the fault may be found at a turk's-head or at a watertight joint. If the turk's-head is bad, cut 2 or 3 feet from the end of the cable and make a new turk's-head. If the joint is bad, cut it out and make a new joint.

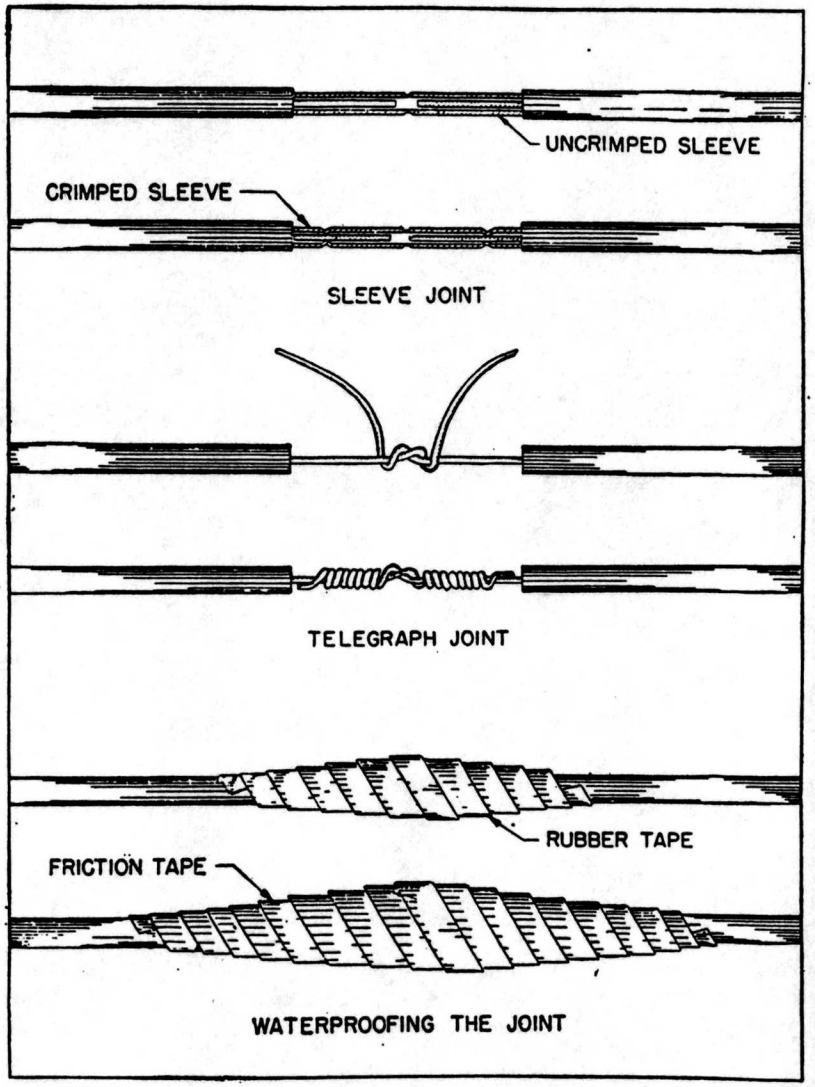


Figure 37. Making a watertight joint.

116. MAKING WATERTIGHT JOINTS. An important operation in controlled submarine mining is the making of watertight joints. (See fig. 37.) Training and practice in making watertight joints cannot be overemphasized. Several types may be made, but for usual practice the following procedure is recommended:

a. Examine both leads for faulty insulation.

b. Remove all wax, dirt, and grease.

c. Roughen insulation 5 inches back from the ends to be joined.

d. Strip 1½ to 2 inches of insulation from the ends of both leads and brighten the conductor wires.

e. Make a telegraph joint (fig. 37) (over-all completed joint to be about 1 inch long). Be sure the conductor ends are trimmed and *no sharp points are protruding.*

f. Recheck cleanliness of insulation for 3 inches on either side of joint.

g. Apply a smooth, light coat of rubber cement over the area of the prepared joint.

h. Allow rubber cement to dry. Cut two 6-inch and one 2-inch lengths of rubber (DR) tape.

i. Apply a 2-inch length of rubber tape as "filler," starting on the insulation of one side ½ inch in from the bared conductor and stopping on the insulation ½ inch on the other side of the bared conductor. *Use a 50-percent overlap in winding tape for a watertight joint.*

j. Apply one 6-inch length of rubber tape, starting at the center of the joint and working out over 1½ to 2 inches of insulation and back again until the end of the tape is reached.

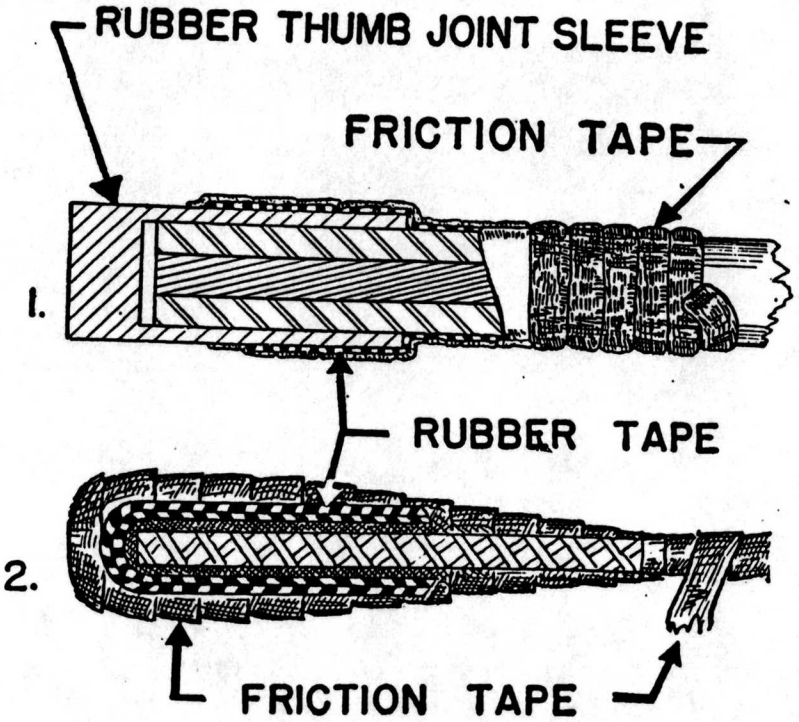
k. Apply the second 6-inch length of rubber tape, starting at the center and working to the opposite side and back again in the same manner as the first 6-inch length. "Work" the joint a few moments with hand pressure.

l. Apply 2 layers of friction tape.

m. Again "work" the joint a few moments with hand pressure.

n. After the watertight joint is made, complete the splice using either the pipe-sleeve or serve-up method.

117. MAKING THUMB JOINTS. Thumb joints are used to make the ends of conductors watertight until the final splice or connection is made in the cable. They may be used during cable storage, cable testing, or when passing ends of cable from one boat to another. The thumb joint is made by wrapping rubber tape around the end of the cable to make the conductor waterproof and then covering the rubber tape with friction tape for protection. An alternate method is to slip a rubber thumb joint sleeve over the end of the cable, securing it to the cable with rubber tape. The cap and rubber tape are then covered with friction tape for protection. (See fig. 38.)



1. Using rubber thumb joint sleeve.
2. Using rubber tape in lieu of rubber sleeve.

Figure 38. Cross section of two methods of making a thumb joint.

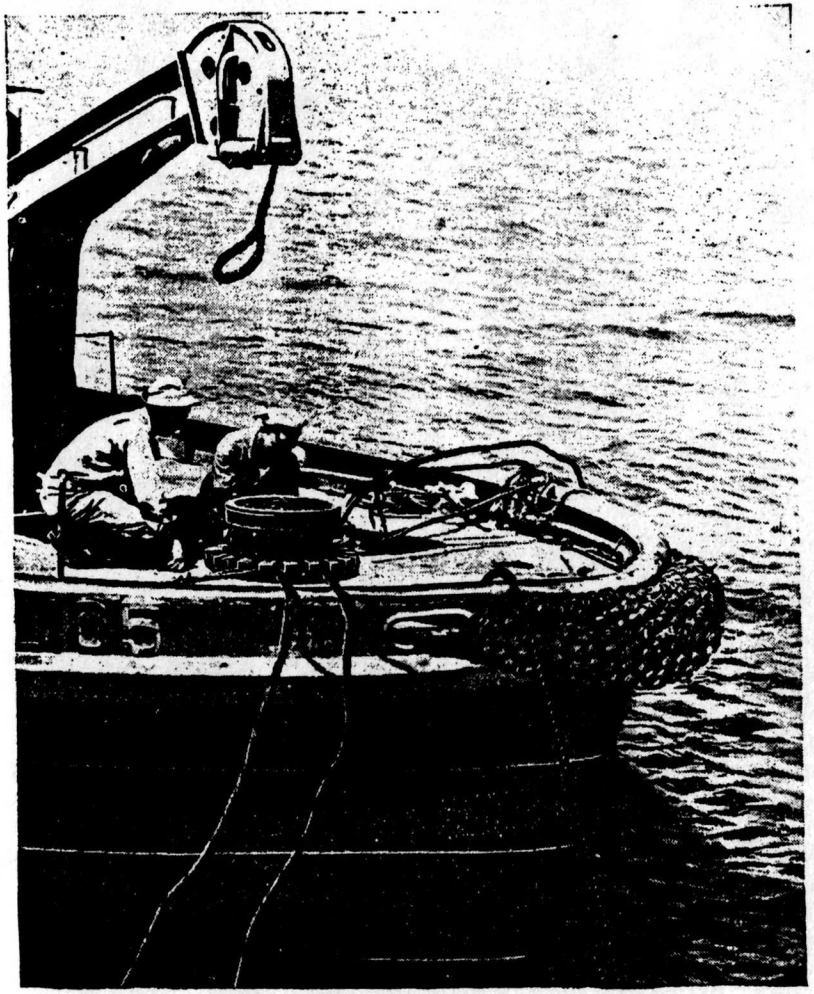


Figure 39. Attaching cables to DB boat and distribution box.

118. PREPARING DISTRIBUTION BOXES ON DB BOAT. The DB boat crew must prepare the distribution box for receiving individual mine cables before planting can proceed. After the DB boat is anchored at the distribution box position (par. 113) and the distribution box has been made fast in a convenient location on the deck, the selector box and distribution box covers are removed. A check is then made to see that

the selector box is fastened securely in place with the insert marked "C" opposite the shore cable slot in the box. A red flag is raised to notify the planting vessel that the distribution box is ready to receive cables or, if the planter is still at a distance from the DB boat, a message is sent by radio. A planter should be standing by with the individual units of the group of mines assembled and ready for planting. As soon as it receives the signal that the DB boat is ready, it should commence the planting operations.

119. PLANTING METHODS. a. There are several ways to plant controlled submarine ground mines. No one method may be called best for a locality unless proven so by actual operation. The mines may be tripped at the surface or lowered in place to the bottom. The cables may be placed on one large reel, or individual reels, or in figures-of-eight. When mines are planted, the planting officer must see that the cables are straight from the mine position and that there are no loose loops or coils in the vicinity of any planted mine. Loose coils of cable or steel rope in the vicinity of a mine are a frequent cause of spurious armings and one that can easily be avoided. If the mine is lowered first, it is a relatively simple matter to keep a slight tension on the cable until clear of the mine position. If a mine upsets in planting, the buoy rope may be used to right it.

b. Three successful methods of mine planting are discussed below:

(1) *Lowering the mine.* In this method the mine is planted first and the cable laid from the mine to the DB boat. The mine is swung outboard on the whip fall of the boom or on the forward davit and transferred to a lowering line which is passed over the cathead and around a capstan. The trip hook must be equipped with a lanyard long enough to reach the bottom. The mine cable and raising rope are arranged in a bight along the rail. This provides sufficient slack to allow the mine to sink straight to the bottom without being upset by the pull of the cable and also protects the

personnel in case of mishap by allowing the cable to go outboard without having personnel between the cable and the rail. The remainder of the cable is kept on the reel or in the figure-of-eight. The range section plots the position of the planting vessel by radio and directs the vessel to the exact position for planting. The mine is then lowered to the bottom and tripped. The planter maneuvers slowly toward the DB boat, paying out cable over the cathead or through a snatch block suspended from the boom or forward davit. When the distribution box end of the cable is reached, it is passed to the DB boat by means of a messenger line and heaving line. When each mine cable is on a separate reel, the messenger line is unwound from the reel with the cable. (See par. 91a.) Two heaving lines are attached to the end of the messenger line and the monkey fist end of the heaving line thrown to the DB boat. If the first line misses, the second line is thrown (otherwise it is detached). If no messenger line is used, unreel the last 100 feet to the bight of the cable (par. 91b) and attach the heaving lines to the end of the cable. In rough weather, a mine yawl is used to transfer the distribution box end of the cable from the planting vessel to the DB boat.

(2) *Tripping the mine.* A mine may be tripped at the surface of the water if the hydrographic conditions are such that the mine will remain upright on the bottom at the point where it first settles. The mine is swung outboard in the same manner as if it were to be lowered. The master may maneuver the planter into position by radio control or may estimate the position for the mine by reference to the line of mines established by buoys or yawls marking previously planted mines. If the position is to be estimated, all operations may be conducted at greater speed. The cable may be passed to the DB boat first, in which case a figure-of-eight must be used. If the cable is delivered to the DB boat after the mine is planted, either a reel or a figure-of-eight may be used. When mines are tripped at the surface, those which do not test satisfactorily should be lifted a few inches off the bottom by means of the buoy rope to insure that the mine is upright. This may be performed by the DB boat.

(3) *Yawl boat cable laying.* In this method the planter lowers the mine into position and then transfers the reel of mine cable to a rack on the stern of a yawl. The yawl lays the cable to the DB boat. With this procedure a crew can plant a group in a minimum of time. Calm weather is essential for planting mines by this method.

120. **WHISTLE SIGNALS.** The planting officer should arrange a whistle code for communication between vessels during planting operations. No code should be used that might possibly confuse other shipping. The following code is recommended:

a. One blast of the whistle from the DB boat indicates that the cable end is lost.

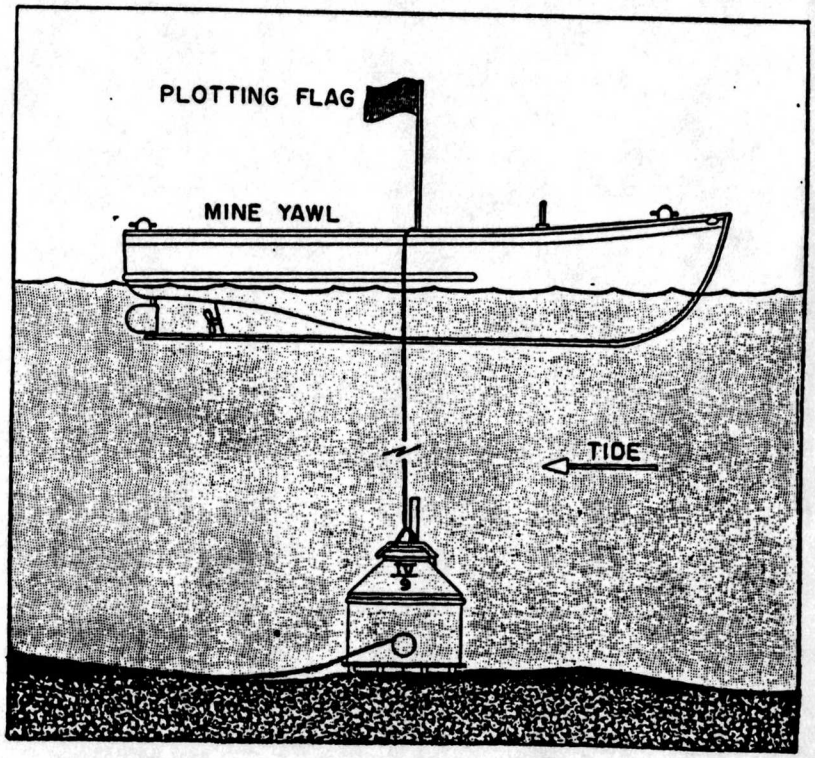


Figure 40. Marking position of planted mine.

b. When the cable is passed to the DB boat before the mine is planted, one blast from the planter's whistle means that the DB boat should release the last cable received from the planter as the mine will not be planted on that particular run.

c. Morse code letters are assigned each yawl for calling purposes.

121. LOCATING POSITION OF MINES. The range section plots the position of each mine. To obtain an accurate location of the mine, a yawl boat picks up the mine marking buoy and pulls in the buoy rope until a vertical lead is obtained. (See fig. 40.) The buoy rope is pulled over the forward cleat or, in a swift current, through the bow chock. A red flag is then raised over this position and the position of the flag plotted by the most accurate system available. Since currents sometimes cause buoys to submerge (par. 98), it is good practice to have the marking boat immediately available when the mine is planted. After the group is marked, all buoys are removed from mines. The mine buoy rope cutter M1 (fig. 30) is used for cutting single buoy rope. Double buoy rope may be untied from the buoy and then pulled through the mine bail.

122. MAKING DRY TEST. When all mines are planted and the field is clear, the casemate is informed by boat telephone, or by radio telephone if a boat telephone is not available, that the field is ready for the dry test. The shore cable is connected to the proper lead from the selector box and the casemate proceeds with the test of all mine circuits. After a prearranged time interval, the casemate is again contacted by boat telephone to secure the results of this test. However, the results may be radioed from the casemate. The planting officer will decide what action to take in the event of a mine that does not test satisfactorily. If all mines are operating properly, the planting officer will order the box to be planted. See TM 9–405 for details of the dry test.

123. PLANTING DISTRIBUTION BOX. When the planting officer orders the distribution box planted, the coxswain directs the planting of the box by ordering the DB boat crew to:

a. Make a watertight joint between the shore cable and the lead from the insert in the selector box.

b. Seal all inserts not used and see that all followers are tight (one-finger pressure at the end of an 8-inch wrench).

c. Check the air pressure in the selector assembly. This pressure should be at least equal to the weight of water which will be on the selector box when planted or approximately ½ pound per foot-depth of water.

d. Check the round rubber gasket of the selector box, making sure the gasket is serviceable.

e. Fasten the outer cover of the selector box securely in place.

f. Bolt the top of the distribution box securely in place.

g. Fasten a raising rope to the distribution box and to the shore cable by having a yawl underrun the cable for the length of the raising rope and then fastening the rope to the cable by means of two half hitches and a cable clamp or galvanized iron wire lashings.

h. Assemble the distribution box release buoy M1 for operation. Fasten the anchor line to the side of the box.

i. Pick up the distribution box by use of a trip hook and sling fastened to the head line of the crane.

j. Run the crane forward slowly, freeing cables as the box advances.

k. Lower the box to the bottom and trip the trip hook.

124. WET TEST. The wet test is made after the distribution box has been planted, and as soon as the field is clear of all shipping. TM 9–405 discusses the manner in which the wet test is performed.

125. SAFETY PRECAUTIONS. A few pertinent precautions and practices during planting operations are:

a. Never allow men to stand under overhead loads.

b. Keep men clear of bights and on the inside of all cables being payed out.

c. Keep one yawl alerted as a safety boat.

d. Keep slippery decks sanded.

e. Show pertinent signals when operating in the mine field.

f. Reduce men and equipment on deck to the minimum essentials.

g. Never allow smoking on the main deck when loaded mines are aboard.

h. *Take no unnecessary risks.*

126. PLANTING UNDERWATER ELEMENTS OF AUDIO-RECEPTION SYSTEM M1. a. General. The underwater elements of the audio-reception system may be planted at any time after the position of the seaward line of mines that are controlled from a single casemate has been established. These elements are usually planted from a DB boat.

b. Planting the mounted hydrophones. The first mounted hydrophone is placed in a sling which is attached to the crane by means of a trip hook. The hydrophone is then lowered by crane so that it will rest upright on the bottom. The trip hook lanyard is then pulled to release the hydrophone from the sling and the sling is drawn back on board. The raising rope and cable are payed out as the hydrophone is lowered. Marking buoys are attached by a buoy line to the anchor bail in the same manner as to a mine bail. (See par. 98.) Cable from the figure-of-eight is payed out under tension, without dragging the hydrophone, as the planting vessel moves to the next buoy. When one turn is left in the figure-of-eight, the second hydrophone is lowered in the same manner as the first hydrophone.

c. Laying and landing shore cable. The methods of laying and landing the shore cable are the same as when laying shore cable for a group of mines. The cable is laid without slack from the second hydrophone to the beach in the vicinity of the distribution box containing the preamplifier. Care should be taken to avoid kinks in the cable. Cable on the beach should be trenched for protection.

d. The course of the planting should be plotted continuously. The locations of the hydrophones should be plotted in the same manner as a mine position is plotted. After testing, if operation is found satisfactory, marking buoys should be removed.

127. NIGHT PLANTING. Controlled submarine mines are planted at night when, in the opinion of the responsible commander, the situation requires it. To efficiently perform mine planting operations at night, submarine mine units must be thoroughly trained in all planting procedures. During training, the final phase should be devoted to operations during the hours of darkness. No unusual difficulty should be encountered during night operations other than the marking of positions. When prearranged signals are used, this difficulty may be reduced to a minimum. However, planting operations may have to be accomplished during radio silence, in which case the highest cooperation and most detailed planning will be required of the planting and range officers.

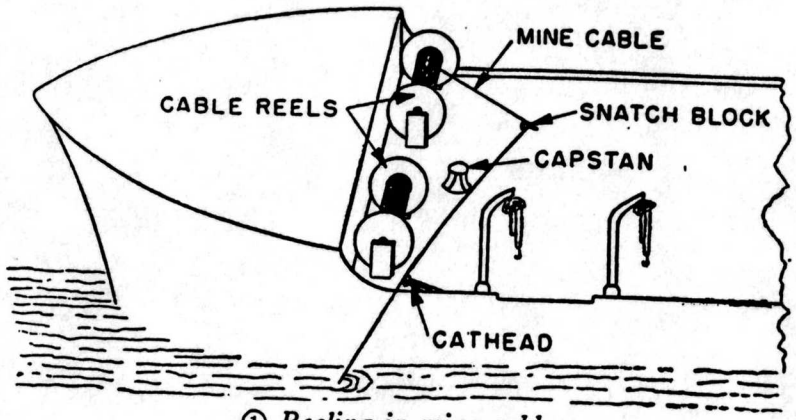
Section II. MAINTENANCE OPERATIONS

128. GENERAL. Mine fields must be maintained in 100 percent operating condition to accomplish their mission. The routine tests for mine fields prescribed in TM 9–420 will reveal the presence of any faults caused by defective matériel. This defective matériel must be picked up, repaired (or replaced if repair cannot be accomplished immediately), and then replanted. The men who perform the maintenance operations are from the same sections that plant the mine field.

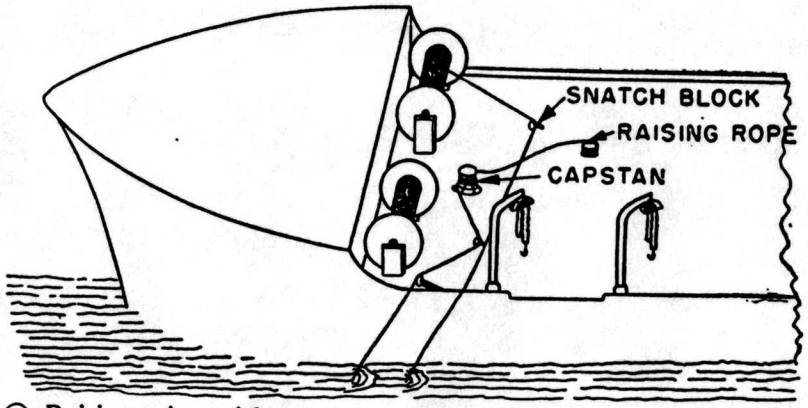
129. PICKING UP MINES. When mines are to be picked up and replaced, the DB boat proceeds to the vicinity of the distribution box. If the distribution box

release buoy is employed, the casemate, upon request from the DB boat, fires the primer which releases the hook. When the hook opens, the buoy rises to the surface with the distribution box raising rope attached. If the DB release buoy is not used, the DB boat drags a grapnel for the raising rope. The distribution box is picked up and the boat anchored in position. When all is ready, the planter is signaled and comes in to receive the cable of the mine to be picked up. On the planter, the cable is passed over a cathead, through a snatch block, and wound on a cable reel. If the cable does not come up readily, it may be necessary to use a capstan to pick it up; however, this should be done only as a last resort as it will ruin the cable beyond repair. The mate should keep the master informed of the lead of the cable. The cable should always lead slightly out and forward of the planter. Great care must be exercised by the operator of the cable reel to adjust the speed of picking up with the speed of the planter to provide a steady pull on the cable. If the stress placed on the cable becomes too great, the reel should be stopped or backed off to reduce the excessive stress. When the raising rope is reached and brought over the cathead and on the deck, pull in all slack. Next, place the raising rope in a snatch block near the base of the cathead and take four or five turns in the bight (slack), which has been pulled in, around a capstan and simultaneously unfasten the end of the raising rope from the cable. Throw the mine cable out of the cathead. As the raising rope comes aboard, the mine cable is picked up slowly on the reel. When the mine comes to the surface, engage the bail with the hook from the whip fall or forward davit and bring the mine aboard.

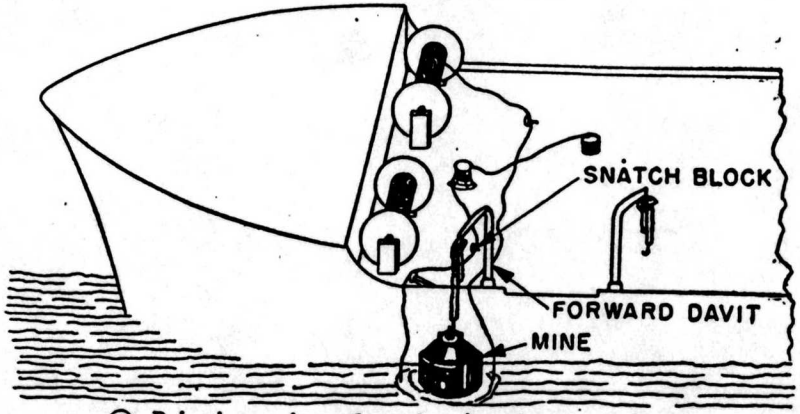
Note. When the distribution box release buoy is employed, the DB boat should stand off at least 400 yards shoreward (to the rear) of the distribution box position until the buoy rises to the surface. This precaution is necessary as the mine system may not function properly and a mine in that particular group may be fired instead of the primer in the buoy release assembly. By standing clear of the distribution box position, the DB boat also avoids possibility of damage to its propeller from the buoy and its attached steel-wire rope as they rise to the surface.



① *Reeling in mine cable.*



② *Raising mine with capstan and raising rope while continuing to reel in the mine cable.*



③ *Bringing mine aboard using forward davit.*

Figure 41. Picking up a mine.

130. REPLACING MINES. When the mine is replanted, use one of the methods described in planting procedure. (See sec. I.)

131. CABLE FAILURES. a. General. The most persistent source of trouble in controlled submarine mining is cable failures. Most cable failures occur at turk's-heads and watertight joints. For this reason, all watertight joints should be made by skilled cable splicers. When a cable tests "faulty" and, after inspection, all turk's-heads and joints are found to be satisfactory, two courses of action may be followed: the entire cable may be underrun and inspected visually and the fault repaired when found, or the cable may be picked up and replaced with new or reworked cable. The procedure of picking up and replacing the cable with new or reworked cable is usually preferred. Underrunning of cable by a yawl is possible in areas where hydrographic conditions are such that there is little or no possibility of the cable becoming fouled on the bottom.

b. Underrunning procedure. The yawl is the best vessel for underrunning cable which is not fouled on the bottom, but the DB boat may be used. The yawl has sufficient power to underrun the cable from practically any bottom with little likelihood of breaking or damaging the cable from sheer weight and power. Underrunning is accomplished by passing the cable through a snatch block located well forward on the boat and then using the power of the boat to move along the cable. The cable is passed through the snatch block and thence aft along the deck or side and back into the water. On the DB boat the snatch block is suspended from the crane and the crane run forward, or the snatch block is attached with a rope sling to a forward cleat and the block suspended outside a gunwale. If the cable is fouled on the bottom to such an extent that it cannot be raised by the yawl or the DB boat, it should be picked up by the planter. (When the cable is picked up by the planter, it may require replacing due to the great strain placed upon it.) When a bad spot in the cable is encountered, there will usually be some visual

indication, such as a kink, exposed conductor, or broken armor wires. Sometimes the cable will appear to be in good condition when examined.

c. Location of ground fault during underrunning. While the cable is being underrun, the casemate personnel may use the following procedure for locating a ground fault.

(1) Set a faultfinder for resistance, attach it to the cable being underrun, and balance the resistance.

(2) Watch the galvanometer constantly.

(3) When the fault comes out of the water, the galvanometer needle will show a deflection.

(4) Notify the underrunning boat immediately upon discovery of a fault. Very often this procedure will work so accurately that the fault will be on deck at the time the call is received on the boat. If the fault is located after only a short length of cable has been picked up, it may be advantageous to repair the fault and relay the same cable.

132. MAINTAINING AUDIO-RECEPTION SYSTEM M1. Normally, the various units of the audio-reception system require little maintenance when properly installed. However, when any unit of the system develops trouble, it should be replaced with a spare unit taken from the casemate and the faulty part returned to the casemate for attention. TM 9–410 (When published), discusses the repairs which may be accomplished by submarine mine personnel and those which must be made by the Submarine Mine Depot. Cable for the audio-reception system is maintained in the same manner as controlled submarine mine cable.

133. LOST EQUIPMENT. When equipment is lost overboard during operations on the water, some of it may be recovered if the plotting room is notified and the exact position of the lost equipment plotted and marked on the plotting board. This position may be marked with a buoy for visual relocation. The area in the vicinity of this location may then be systematically dragged with the grapnel or a diver sent down. If the

lost equipment is considered worth the effort, arrangements with the local naval authorities may be made to supply naval salvaging facilities to recover the lost equipment.

Section III. ALTERNATE PLANTING METHODS

134. **GENERAL.** Alternate methods of planting ground mines will vary with the equipment available and local hydrographic conditions. Individual mine units should determine the methods applicable in their locality. It is assumed that all mine commands have a minimum of two DB boats and five yawls. The following alternate planting method is one which has been employed successfully under all conditions but which is most efficient in water that is not exceedingly rough. One DB boat performs the normal functions of a DB boat while the other functions as a planter. The yawls perform the same duties as when regular planting methods are employed. Equipment is prepared for planting in the normal manner.

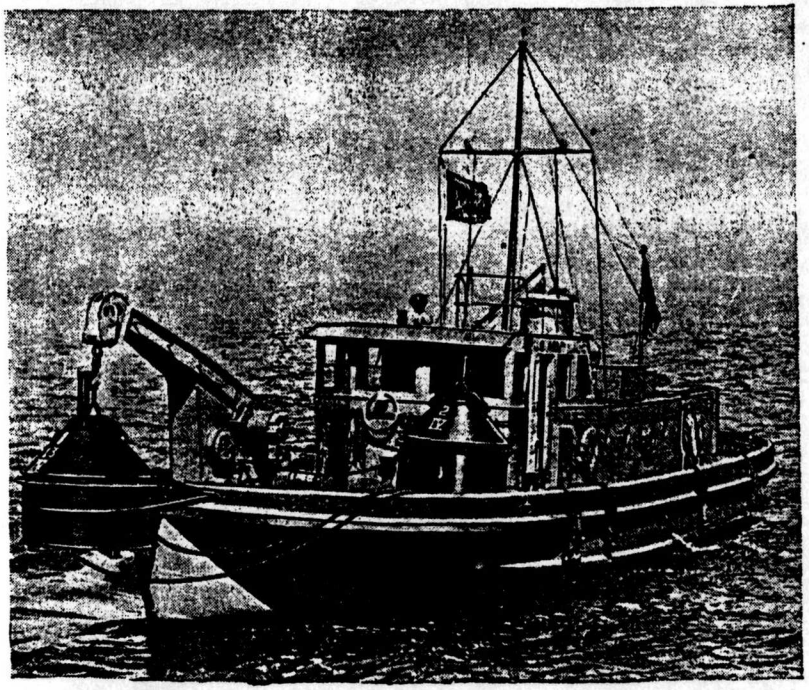


Figure 42. Carrying two mines on DB boat.

135. **LOADING DB BOAT FOR MINE PLANTING.**

a. Loading mines. (1) The mine is swung to the bow of the DB boat by the wharf crane and transferred to a trip hook on the DB boat crane and a safety line of marline-covered, steel-wire rope. This safety line is run under the bail or around the mine case below the corrugated section. The safety line is then passed through the bow chocks and both ends of the line are fastened to the forward cleats. This safety line supports the greater portion of the mine's weight and hence relieves the strain on the DB boat crane. Two mines may be carried in this manner, one on each side of the bow of the boat.

(2) DB boats equipped with 2½-ton cranes can carry the mines on deck. (See fig. 41.) This heavier crane is capable of supporting the mines without the aid of a safety rope and is high enough to allow it to move mines about the deck.

b. Loading cable. While the mines are being loaded on the bow of the DB boat, a portion of the planking

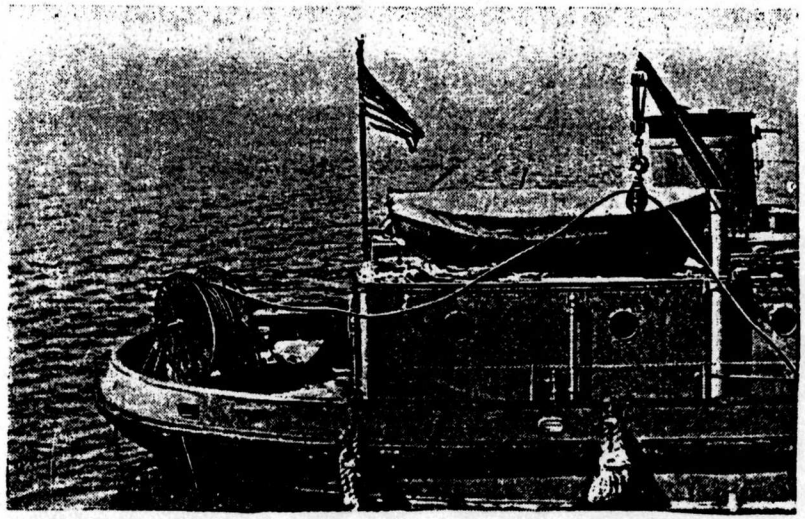


Figure 43. Location of cable reel on DB boat.

is removed from the afterdeck and a pair of cable reel jacks set up where the planking was removed. As soon as the mines are safely in place, the cable, wound on raising rope reels, is swung into place on the jacks by the wharf crane. Sufficient cable is unreeled to allow the cable to be passed through a snatch block. This snatch block is suspended from the lifeboat davit which is just astern of the point at which the raising rope is secured to the cable. This allows sufficient slack cable for the planting of the mine and full maneuverability of the boat. The slack cable, with attached raising rope, is coiled along the side deck so that it will pay out readily as the mine is lowered into position.

c. The mine buoys and mine buoy rope, if used, are attached to the mine case and handled in the same manner as they are aboard a regular planter.

136. PLANTING MINES WITH A DB BOAT. a. When everything is in readiness for planting, the DB boat functioning as a planter takes its position facing the line of mines and the safety line is removed from the mine to be planted. Using either marking buoys or radio direction for control, the DB boat maneuvers into position and the mine is lowered to the bottom by means of the crane and tripped when it reaches the bottom. The boat then proceeds to lay the mine cable and passes the distribution box end of the cable to the boat functioning as a distribution box boat. The location of the planted mine is plotted in the usual manner. Succeeding mines are planted in the same manner as the first mine. The limited deck space of the DB boat has a capacity of only two mines, with their mine cable, at one time.

b. If necessary to lay shore cable, a DB boat can handle one reel of shore cable at a time in the same manner as mine cable is handled.

137. PICKING UP MINES WITH DB BOATS. a. The distribution box of the mine to be picked up is raised aboard the boat that is functioning as a distribution box boat and the mine cable removed. The DB

boat, functioning as a planter, then moves in and takes the end of the mine cable from the distribution box boat and picks up the cable until the raising rope is reached. The raising rope is attached to the boat crane and the mine lifted until it can be reached for attaching a safety line. The safety line is attached as in paragraph 135. The mine should be lifted just high enough in the water for its weight to be supported by the safety line. However, the higher the mine rides in the water, the easier it is to maneuver the boat while returning the mine to the wharf. By use of the capstan, the safety line may be employed, in conjunction with the DB boat crane, to lift the mine clear of the water. *On DB boats equipped with 1½-ton cranes, no attempt should be made to lift the mine clear of the water by means of the crane alone.* The mine cable and raising rope are removed from the mine after the mine has been unloaded from the DB boat.

b. On DB boats equipped with 2½-ton cranes the mine may be raised on deck with the crane. The mine is then carried to the wharf on the deck of the DB boat. No safety line is necessary as the 2½-ton crane is capable of handling the full weight of the mine. A DB boat equipped with this heavier crane is more suitable for use as a planter, as mines can be handled on the deck and raised or lowered by means of the crane alone. This makes for smoother and faster performance when the DB boat is functioning as a planter.

CHAPTER 8

OPERATION OF A MINE DEFENSE

Section I. GENERAL

138. INTRODUCTION. This section discusses the tactical responsibilities of the harbor defense commander and mine battalion commander and the intelligence procedure necessary to operate a controlled submarine mine defense. The general operation of the mine system and audio-reception system in the control of the submarine mine field is also discussed. Detailed technical operation of the mine system is covered in TM 9–405 and TM 9–406 and the detailed operation of the audio-reception system in TM 9–410.

139. HARBOR DEFENSE COMMANDER. The harbor defense commander is responsible for the tactical efficiency of the harbor defense. He prescribes the tactical status (par. 142) of the mine field. His decision is based on the category of defense, current estimate of the situation, and friendly shipping traffic (U. S. Navy considerations). *To accomplish its mission, the tactical efficiency of the controlled submarine mine defense should not be sacrificed by excessive safety measures for unidentified vessels in the mine field or friendly vessels not complying with regulations as to harbor entry.* During periods of contact with the enemy, the harbor defense commander will normally release control of the controlled submarine mine defense to the mine battalion commander. During other periods he may designate a harbor defense duty officer or the Army duty officer at the HECP to act for him until such time as he takes personal command of the situation.

The normal tactical chain of command is: harbor defense, mine battalion, and mine battery. This chain of command should be followed except in extreme emergency, in which case any headquarters not contacted originally due to lack of time will be contacted as soon afterward as possible and informed of the situation and any action taken. FM 4–5 lists further responsibilities and duties of the harbor defense commander.

140. MINE BATTALION COMMANDER. The mine battalion commander exercises direct tactical control over the mine field. When the harbor defense commander or his representative directs the mine field to be placed "On," the battalion commander orders the mine system set on *automatic fire,* or, if conditions of the mine field warrant, on *delay fire.* If the mine defense is released to the mine battalion commander for action, he assigns targets to the elements of his battalion and prescribes the control settings for the mine field. The mine battalion commander assists the harbor defense staff in the preparation of those sections of field orders and standing operating procedure (SOP) which deal with the control and operation of the mine field. He is also responsible for their proper execution and for the prompt reporting of intelligence derived from the underwater listening devices of the mine field. In the absence of the mine battalion commander, the next ranking mine officer acts for him and performs all duties required of the commander.

141. INTELLIGENCE PROCEDURE. a. Since the defense of a harbor must necessarily be a joint defense, close cooperation with the Navy is essential. This cooperation in local tactical operations is obtained through a harbor entrance control post (HECP). The HECP is a joint Army and Navy installation of the forces charged with the defense of a harbor. The Navy must recognize or identify all shipping before it enters the area designated by local joint Army and Navy action as the "protected area" and furnish timely warning of the approach of enemy vessels. In addition to its own

visual observation, radar, and audio-reception system, the harbor defense receives intelligence from the Navy. FM 4–5 discusses the relationship of the HECP to the harbor defense.

b. To obtain the maximum tactical efficiency of the controlled submarine mine defense, especially against enemy submarines, the harbor defense command post must have prior knowledge of all vessels approaching the mine field. This requires a continuous intelligence procedure between HECP and the harbor defense command post to insure the destruction of enemy vessels in the mine field and afford a reasonable measure of safety to friendly shipping. The intelligence procedure adopted must be one that will allow an armed mine (see note following c below for distinction between an armed mine and an actuated mine) to be fired with minimum delay. The decision to fire or not fire a mine must have been made by the harbor defense commander or his representative *prior* to the arming. However, when mines having a record of spurious armings become armed, they should not be fired unless there are indications from other sources that an enemy vessel could possibly have caused the arming. The officer or noncommissioned officer on duty in the casemate must be informed at all times as to the action to take in the event of an arming. If the casemate operator is required to check with higher headquarters before firing a mine that is armed, the effectiveness of the mine field is greatly reduced. Every attempt should be made to reduce the time between the arming and the subsequent firing of a mine. A suggested procedure to insure constant intelligence at the harbor defense command post is as follows:

(1) From all its sources of intelligence, HECP reports to the harbor defense command post the locations of all vessels in the area, giving negative reports if no vessels are present. The reports will vary with the amount of movement, but should be given with sufficient frequency to present a clear picture of the situation at all times. Emergency or priority reports should be transmitted without delay.

(2) This report should include the identity, position by rectangular or polar coordinates, and direction of travel of each vessel approaching or in the mine field. If there are no vessels in the area, a negative report is rendered.

(3) The duty officer in the harbor defense command post marks all vessel positions and time reported on a map overlay. The overlay should be renewed each time the duty officers change. The map on which the overlay is placed should be a large scale map of the local water area and have the individual mine positions plotted thereon (the regular harbor defense operations map may be employed). Duty officers and other personnel concerned must be briefed on the situation when they commence their tour of duty and the overlay should be renewed at this time.

(4) By consulting his overlay, the harbor defense duty officer sees the position of all vessels known to be in the area with respect to the mine field. This knowledge enables him to make decisions as to the tactical status of the mine field with minimum delay and confusion.

(5) The harbor defense duty officer keeps the mine battalion commander or the mine battalion duty officer informed of ship movements in or approaching the mine field. When the mine field is set on *automatic* or *delay fire,* the mine battalion commander will report immediately, by group and number, each mine that is fired. When the field setting is *"Safe,"* the mine duty officer will inform the harbor defense duty officer of any mine actuating or of any recording on the audio-reception system which is not explained by known activating factors.

c. The procedure discussed in b above covers a situation where the mine field is set on *automatic* or *delay fire* except when friendly shipping is passing through the mine field. With this procedure, firing power is taken off each line of mines just prior to the time a friendly vessel reaches the line, and the power is returned to the line immediately after the vessel passes. Where the category of defense is such as not to warrant

having the mine field set continuously on *automatic* or *delay fire* (except when friendly shipping is passing through the mine field), modification in the procedure may be made by the harbor defense commander. It must be remembered that any modification in the above procedure results in a corresponding loss of effectiveness of the controlled submarine mine defense and possible total ineffectiveness against enemy submarines. The Navy must be notified whenever the mine field is set on *automatic* or *delay fire*.

Note. An actuated mine is one whose detection device has been operated. A mine that has been actuated is safe for the passage of shipping. The word *actuated* is used to describe the condition of the selected mine when the mine group is set for *off*, *surveillance*, or *testing* on the mine control system.

An armed mine is one that has been selected as a result of actuation or manual operation and requires only the application of firing power to fire the mine. An armed mine is not safe for the passage of shipping. The word *armed* is used to describe the condition of the selected mine when the mine group is set for *automatic fire*, *delay fire*, or *observation fire* on the mine control system.

142. SETTINGS FOR CONTROL OF MINE SYSTEM. The mine system may be placed on any of the following control settings:

a. Off. No power of any kind applied to the system. This particular term should be qualified for this use to avoid confusion (see note, following f below).

b. Surveillance. Vessels may pass with safety over groups of mines set for *surveillance*. The casemate control signals when a mine has been actuated but the mine will not fire.

c. Testing. Vessels may pass with safety over groups of mines set for *testing*. The two types of *testing* are:

(1) Test of the continuity of mine selection circuits as made by the casemate operator in accordance with TM 9–405.

(2) Test of detection circuits by means of the "actuation test" prescribed in TM 4–235. This test is performed with the mine groups set on *surveillance* as described in b above.

d. Automatic fire. Mines are not safe for the passage of vessels. All mines in groups set for *automatic fire* will fire automatically when armed. *Automatic fire* is one setting of the mine groups when those groups are ordered "On."

e. Delay fire. (1) When groups of mines are set for *delay fire*, their portion of the mine field is not considered safe for the passage of vessels. Mine groups set for *delay fire* will signal when armed and then may either be fired or disarmed manually by the casemate operator.

(2) In certain tactical situations, controlled submarine mine fields may be subject to shelling, bombing, or other explosions. In these situations, if the groups of mines were set on *automatic fire*, many of the mines would be fired by these explosions. Storms or severe hydrographic conditions may also cause ground mines to arm and fire if they are set on *automatic fire*. In either case, the loss of these mines would not only weaken the mine field but might disclose to an enemy the approximate locations of the lines of controlled mines. To prevent the firing of mines caused by explosions, storms, or severe hydrographic conditions, the groups of mines should be set for *delay fire*, and the decision to fire or disarm mines that become armed should be dependent on prior intelligence furnished the casemate duty officer (par. 141) and the signature of the audio-reception system (par. 144) in that casemate.

f. Observation fire. Fire by manual selection of the mine to be fired at the order of the range section. Used when firing at specific targets or vessels which will not arm a mine. In *observation fire*, the target is tracked by means of the horizontal or vertical base system of position finding or by radar. The target is tracked and its course is plotted on the plotting board, employing the same procedure used in seacoast artillery gun batteries (FM 4–15). Target relocation with respect to a directing point is unnecessary in controlled submarine mine plotting. Two items of data must be known during *observation fire* before a mine can be fired effec-

tively: first, the mine to fire; and second, the time to fire the mine to destroy the target.

Note. Tactically speaking, the mine field is said to be "Safe" under conditions a, b, and c, and "On" under conditions d, e, and f above. A mine field is normally set on "Surveillance" when it is "Safe," except for periods when maintenance operations are taking place in the mine field or tests of the mine field are being conducted. When the setting of a mine group is "On," it will be standing operating procedure to fire on any vessel in that group.

143. PLOTTING ROOM PROCEDURE DURING OBSERVATION FIRE. With the position of each mine in the field accurately plotted and marked on the plotting board, the following operations are performed in the plotting room to furnish data necessary for the effective firing of a mine:

a. The plotter estimates the future course of the target, based upon at least the last three plotted points (15-second time interval normally used) and any reports of directional change of the target course as reported by the observers. He then announces which group the target will pass over. In case of doubt as to which group the target will pass over (such as when a target passes between two groups), this prediction will be withheld until the mine has been chosen.

b. If the group is announced at this time, the assistant plotter, who is connected directly to the casemate by telephone, relays this information to the casemate operator. This step speeds up the procedure and reduces the possibility of error.

c. When the plotter estimates that the target is 30 to 45 seconds travel from the line of mines, he calls out, "Prediction, next bell."

d. When the next time interval bell rings, the assistant plotter starts his stop watch and the plotter plots the location of the target. The plotter extends his estimated future course of the target and announces which mine will be closest to this course when the target is over the group. The assistant plotter relays to the casemate the number of the mine selected by the plotter to be fired.

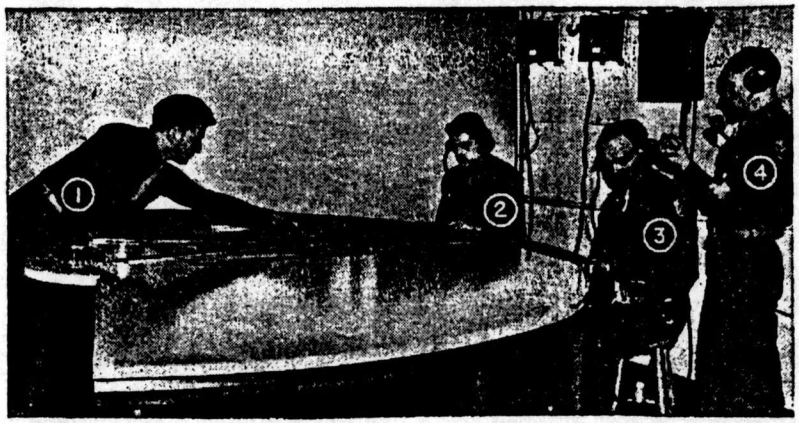
e. The time for the order to fire is then computed. (1) If the prediction ruler is used, the plotter calls out the speed of the target and the distance to the mine. The assistant plotter computes, on the rule, the exact time for firing the mine.

(2) If the mine predictor M1916 is used, the plotter predicts direct from the plotting board as follows. (See fig. 45):

(*a*) The plotter places the predictor over the plot of the course, keeping the last plotted point under the *zero line* and the horizontal lines parallel to the course. He then slides the predictor, keeping the horizontal lines parallel to the course, until the *index line* is on the next preceding plotted point.

(*b*) He then looks along the horizontal line that is over the estimated future course of the target until he comes to the mine, nearest the estimated future course, which will cause probable destruction of the target when fired. He then calls out this mine number and the time it will take the target to travel from the last plotted point to the mine as read from the predictor.

f. The assistant plotter watches his stop watch and when the predicted time has elapsed commands: FIRE,



1. Plotter
2. M^1 armsetter.
3. M^2 armsetter.
4. Assistant plotter.

Figure 44. Plotting board detail.

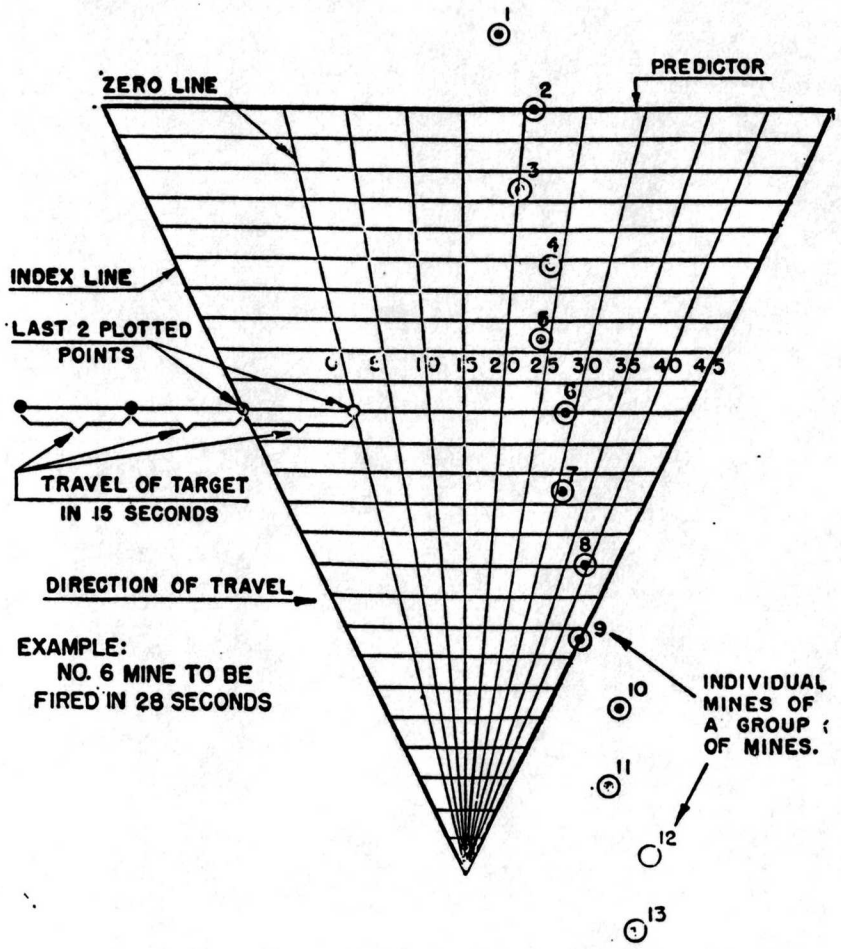


Figure 45. Use of mine predictor M1916.

to the casemate operator. He may reduce this time by one to three seconds to allow for communication and reaction lag.

Note. If the casemate is equipped with a means for time interval signaling, the above procedure may be modified in the following manner. The assistant plotter relays the following data to the casemate operator: "Prediction, next bell;" the group and number of the mine to be fired; and the time of firing. The casemate operator, who is equipped with a stop watch, then fires the selected mine at the proper time. This method eliminates a possible dead time in communications of 1 or 2 seconds.

144. OPERATION OF AUDIO-RECEPTION SYSTEM M1. **a. Initial setting.** After planting the audio-reception system, set the volume control by connecting all elements together and having a DB boat or planter run several courses back and forth across each hydrophone. The volume control on the main amplifier should be set to produce nearly a full scale deflection on the graphic recorder at maximum sound output. This will allow for a full scale signature upon the passage of a large vessel at maximum sound output. (Check this when the first large vessel crosses over or between the hydrophones.)

b. Operational setting. After the initial setting, adjust the setting to such a point that the background noise level appearing on the graphic recorder, without ships in the field, is approximately 0.5 milliampere and ship signals show as high a ratio as possible. *Avoid*

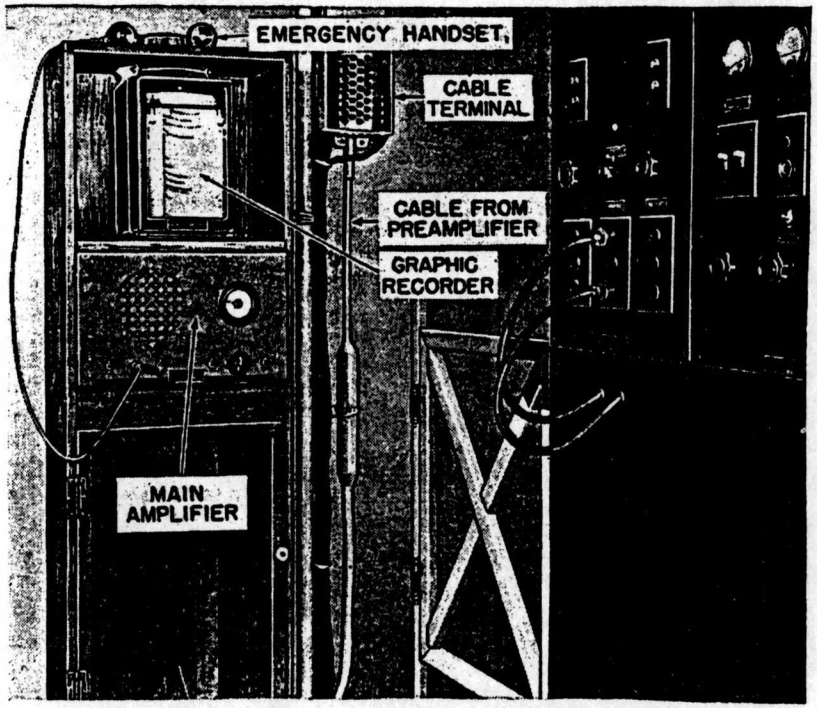


Figure 46. Installation of casemate elements of audio-reception system M1.

dial twisting and variation in the setting of volume control.

c. **Normal operation.** The audio-reception system warns of the approach of vessels except those designed for quiet operation but does not tell their direction. When a vessel approaches, the beat of the propellers will be heard. This sound will increase in volume until the stern of the vessel has passed the line of hydrophones. The audio-reception system is normally turned "On," at all times. Operating personnel are able to determine whether or not a mine is armed by a vessel and, with training, can identify the class of vessel from the characteristic sounds and signatures produced by the vessel.

Section II. STANDING OPERATION PROCEDURE FOR OPERATION OF MINE FIELD

145. GENERAL. a. Each element of a harbor defense must be employed to perform its mission with maximum efficiency under all situations. To make this possible, a standing operating procedure (SOP) must be drawn up by the harbor defense commander detailing the action to be taken in all possible situations that may arise in the defense of the harbor. This SOP should be sufficiently detailed to eliminate doubt as to the action to be taken in the situations covered, but it must also be flexible to allow for the exercise of individual initiative when unforeseen situations arise.

b. The harbor defense commander may prepare the SOP for the operation of the mine field in detail or in the form of general requirements. If his SOP is in the latter form, the mine battalion commander is responsible for the preparation of the detailed SOP for operation of the mine field and will comply with any requirements or policies set forth by the harbor defense commander.

146. PREPARATION OF SOP FOR OPERATION OF MINE FIELD. The following subparagraphs discuss the major topics which must be covered in an SOP for the operation of the mine field. Consult FM 4–5 for instructions and form to follow in the preparation of an SOP.

a. Relationship of the HECP to the mine command, particularly when the HECP operates as a harbor defense command post at any time. (See FM 4–5 and Navy Department Publication 1 (A).) Include procedure for furnishing intelligence to elements of the mine command (sec. I, chap. 8).

b. Definitions of the terms "Safe" and "On," when referring to the status of the mine field. "Safe" will mean vessels may pass through the field safely. "On" will mean that any vessel entering the field can be fired upon.

c. Officers having authority to order change of tactical setting of the mine field. This will normally be the harbor defense commander or his representative. These commands should be delivered directly to the battalion commander or his representative. The harbor defense command post and HECP should be notified immediately when a change has been made in the control setting of the mine field by the casemate.

d. Providing illumination, radar surveillance, and seacoast artillery protection for the mine field.

e. Steps that should be taken to determine the cause of mines arming or firing.

f. Conditions under which elements of the mine field are on different control settings at any one time. Under these conditions, precautions should be taken to insure the safety of friendly shipping.

g. Control settings of the mine field, including methods of fire to be employed under all conditions which may arise.

h. Position finding system, including alternate systems.

i. Mine field tests. (1) Casemate personnel should make tests of all mine selection circuits at least once each day. Technical details of this test are covered in TM 9–420.

(2) The mine planter or a DB boat should be run over each mine in the field at least once each month to insure that the magnetic detection circuit is operating ("Actuation Test" as prescribed in TM 4–235).

j. Communications, standard and emergency methods. Provisions for employment of *action orders* (FM 4–5)

should be made in the event of total loss of communications.

k. Records. (1) In addition to the casemate log (par. 69), a chronological record of all conversations, orders, and occurrences relating to the mine field should be kept in the casemate. This record includes the status of the field when each relief is changed. This status should be checked and initialled by the duty officer in the casemate.

(2) A chronological record should also be kept in the plotting room, showing all orders, information, and conversations received and transmitted. This record should show time, origin, and destination of all entries. A second record should be kept, showing the name, nationality, type, course, and time of passage of all ships passing through the mine field, together with any additional information as to the actuation of the mine field by the ships.

l. Enemy countermining and sweeping. (1) Enemy countermining is the attempt to destroy a mine field through the use of shells, bombs, depth charges, and the exploding of mines, the force of the explosions being aimed at detonating the mines of the field. During these countermining attempts, set the mine field on *delay fire*. Mines armed by the explosions may be disarmed by casemate personnel without firing. The audio-reception system distinguishes between the sound of a vessel and the sounds caused by enemy countermining measures, and casemate personnel can act accordingly.

(2) Enemy mine sweeping operations may be stopped by fire from rapid-fire shore batteries or made ineffective by taking power off the mine field while sweeping operations are in progress. The mine sweeping vessel may also be destroyed by mine action, using observation fire. The method employed will depend on whether or not the mine field must be kept in operation during sweeping operations.

m. Employment and deployment of the mine flotilla.

n. Local security measures.

o. Protective security measures.

CHAPTER 9

DESTRUCTION OF MATERIEL

147. GENERAL. Although a mine field must be kept in operation as long as possible, tactical situations may arise when abandonment of the controlled submarine mine field and allied installations will be necessary. Destruction of the mine field and installations will be accomplished only upon orders of the harbor defense commander or, if communication with the harbor defense commander is impossible, when capture of the area by the enemy is imminent. Destruction then must be as complete as the available time, equipment, and personnel will permit. If thorough destruction of all parts cannot be completed, the parts essential to the operation or use of the matériel, particularly those which cannot be easily duplicated, should be destroyed or removed.

148. MINE FIELDS. The following methods are given for the destruction of mine fields:

a. Using the M3 mine system—

(1) Set up the system for observation fire.

(2) Shut off 110-volt, d-c power from all groups but one.

(3) Tie down the INTERLOCK RESET key.

(4) Select first mine.

(5) Hold down three mine keys to the right of the mine which is to be fired.

(6) Close the group FIRING switch.

(7) Open the group FIRING switch after the mine has been fired and the fuse cleared.

(8) Open the group OPERATION switch.

(9) Close the group OPERATION switch. (The system will step to the next mine.)

(10) Repeat steps (5), (6), (7), (8), and (9).

(11) When the entire group has been fired, shut off 110-volt, d-c power from that group.

(12) Repeat steps (2) to (11) for every other group until the mine field has been destroyed.

Note. If mines become armed from the shock of explosion, cut the connection between the 2,700-ohm resistance and the No. 2 winding of the control relay on all group panels. Hold down the INTERLOCK RESET key, select the first mine in each group, and close the group FIRING switch. The system will automatically step through the group of mines, firing each in turn.

b. Using the emergency mine control M4—

(1) Remove the rear cover of the operating panel.

(2) Block the limiting relay into operating position with a wooden matchstick or similar object. (The limiting relay is the lower right-hand relay in the right-hand set of control relays as seen from the rear of the panel.)

(3) Set up the system for observation fire; select the first group and the first mine in the group.

(4) Close the FIRING-CLEARING POWER switch. Wait until the green light, "Mine fired or cleared," comes on indicating a cleared fuse.

(5) Depress the next mine key.

(6) Open and then close the FIRING-CLEARING POWER switch.

(7) Repeat steps (5) and (6) until the group is destroyed.

(8) Depress and release the selection key of the next group and raise the DISARM key. The system will select the next group.

(9) Repeat steps (4), (5), (6), (7), and (8) until the entire mine field is fired.

149. CASEMATE. a. Mine controls. Smash all electrical equipment including dials and tubes with a heavy hammer or crowbar. Render all heavy equipment useless. Cut all shore cables below such marks as may identify them.

b. Power equipment. As soon as a notification to destroy equipment is received, puncture the crankcase for quick draining, cut the fan belt, and operate the engines at high speed. Immediately before leaving the casemate, proceed as follows: fire 30-caliber bullets into all windings on generators and engines, deform or smash all parts readily accessible, puncture fuel tanks, and pour gasoline or oil over the engine and ignite.

c. Documents. Saturate all documents, blueprints, manuals, and books with gasoline or oil and burn them. This may be done outside the casemate while the equipment inside is being smashed.

d. Casemate structure. Place a 450-pound charge of TNT in a 32-inch mine case M1. Bypass the firing device with leads to the detonators. Place this mine in the center of the casemate operating room. Pile all loose equipment around the mine case. String two leads from the detonator to a protected location at least 500 feet from the casemate. When all is clear, fire the mine by means of a 6-volt battery or magneto.

150. FIRE CONTROL AND PLOTTING ROOM EQUIPMENT. a. All items of fire control equipment (including azimuth instruments, depression position finders, and binoculars) are difficult to replace. For this reason they should be destroyed only if there is no chance to evacuate them. If personnel are evacuated, they should carry this equipment with them. If evacuation is not possible, fire control equipment must be destroyed thoroughly.

b. Observation instruments. Remove and smash all optical parts of observation instruments. Destroy the bases of instruments and smash data transmission and aided-tracking devices.

c. Communications equipment. Smash and burn all telephones, switchboards, radio transmitters, receivers, and all other equipment.

d. Plotting room equipment. Smash all metal and electrical parts of plotting room equipment. Pile all charts, manuals, slide rules, blueprints, and wooden instruments together with the smashed metal and electrical parts and saturate the pile with gasoline or oil and burn.

151. MINE PROPERTY. Total destruction of all mine property will prove impracticable unless considerable time is allowed for its destruction. Destruction of all motors and generators should be accomplished as prescribed for casemate power equipment. Group all loaded mines together. Connect leads in parallel to the detonators and run a firing lead to a place of safety. Smash all mine property which may be of use to the enemy and pile it on the loaded mines. Detonate the loaded mines by use of a 6-volt storage battery or magneto.

152. SHORE STRUCTURES. Destroy by fire or explosion all buildings that house equipment which may aid the enemy. Destruction must be as complete as time permits. It is especially important that all magazines be exploded or burned.

153. BOATS. Destroy the engines, sink the boat, and burn any part of the boat protruding above the surface of the water.

154. PLANS FOR DESTRUCTION OF MATERIEL. Commanding officers are responsible for the preparation of plans that provide for the complete destruction of matériel. The methods that have been outlined in this chapter are offered as suggestions and may be varied according to the local situation. *Plans for destruction of matériel should cover the use of equipment and material that are actually on hand.* Plans must also take into consideration the personnel available and the probable length of time in which destruction can be accomplished. The location of equipment and material for use in destruction of matériel should be listed to facilitate destruction.

APPENDIX I

NON WAR DEPARTMENT CORRELATED REFERENCES

Section I. PUBLICATIONS

U. S. NAVY DEPARTMENT, BUREAU OF NAVAL PERSONNEL

General

The Bluejacket's Manual, United States Navy.
Introduction to Engineering and Damage Control.
Seamanship.

Training Courses and Progress Tests

Seamanship Branch:

Apprentice Seaman
Seaman 1c
Coxswain
Boatswain's Mate 2c
Boatswain's Mate 1c and Chief
Quartermaster 3c
Quartermaster 2c
Quartermaster 1c and Chief

Engineering Branch:

Fireman 2c and 1c
Machinist's Mate 2c
Machinist's Mate 1c and Chief
Water Tender 2c
Water Tender 1c and Chief
Electrician's Mate 3c
Electrician's Mate 2c
Electrician's Mate 1c and Chief

Communications Branch:

Radioman 3c
Radioman 2c
Radioman 1c and Chief
Signalman 3c
Signalman 2c
Signalman 1c and Chief

Special Branch:

Storekeeper 3c
Storekeeper 2c
Storekeeper 1c and Chief
Off. Cooks and Stewards

General Course:

Gyroscopic Compasses.

U. S. NAVY DEPARTMENT, HYDROGRAPHIC OFFICE

American Practical Navigator, Bowditch, N. 1943.
Internation Code of Signals. Visual, vol. 1, Am. ed.

U. S. COAST GUARD

Laws Governing Marine Inspection.
Light List (Issued for each locality.)
Nautical Rules of the Road.
Vessel Inspection—Bays, Sounds, and Lakes other than the Great Lakes.
Vessel Inspection—Ocean and Coastwise.

U. S. DEPARTMENT OF COMMERCE

Manual for Lifeboatmen and Able Seamen.
Motorboats, and Certain Vessels Propelled by Machinery other than by Steam, more than 65 Feet in Length.
Rules to Prevent Collision of Vessels and Pilot Rules for Certain Inland Waters of the Atlantic and Pacific Coasts and the Coast of the Gulf of Mexico.

Note. Publications listed as Department of Commerce publications are now distributed by the Commandant, U. S. Coast Guard.

Section II. TRAINING FILMS

NAVY

*MN 39 a–b	Mine Sweeping Operations. Sweeping Moored Mines. Part I. Influence Mines. (Confidential.)
MN 39 c–d	Streaming the Mark V Magnetic Sweep Gear. (Confidential.)
MN 39 e	Recovery of the Mark V Sweep Gear. (Confidential.)
MN 39 f	Mine Sweeping Operations. Part I. Sweeping for Acoustic Mines. (Confidential.)
MN 39 g	Mine Sweeping Operations. Sweeping Moored Mines. The O Type Sweep Gear. (Confidential.)
MN 42 a	Diesel Engines.
MN 43 u	Construction of Diesel Engines.
MN 45 u	Diesel Lubrication and Cooling Systems.
MN 46 u	Diesel Engine Fuel Systems.
MN 202 a	Rules of the Nautical Road. Halifax Incident.
MN 202 j	Rules of the Nautical Road. Whistle Signals for Approaching Vessels.
MN 202 k	Rules of the Nautical Road. Meeting Steam Vessels.
MN 202 n	Rules of the Nautical Road. The Overtaking Situation.
MN 202 o	Rules of the Nautical Road. Barranger-Weems Incident.
MN 202 p	Rules of the Nautical Road. Taurus-Gulf Trade Incident.
MN 202 r	Rules of the Nautical Road. Crossing Steam Vessels.
MN 202 v	Rules of the Nautical Road. Part I. Rules in Fog. Part II. Fog Rules for Vessels at Anchor.
MN 202 x	Rules of the Nautical Road. Special Circumstances.
MN 202 z	Rules of the Nautical Road. Special Steering and Sailing Rules.
MN 606 b	H.M. Minelayer.

* The designation MN signifies the following:
M—The film is a motion picture.
N—It was produced expressly for use by the United States Navy.

APPENDIX II

FORMS SUGGESTED FOR LOCAL USE

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1. The forms listed in this appendix are suggested as guides for mine battalion officers in the various phases of controlled submarine mining. The titles of the suggested forms with a description or use for each one are listed in the following subparagraphs.

a. Suggested forms that appear in other publications. (The publication is listed in each instance.) (1) *Diesel-Electric Generator Operation Record.* This is a record of the maintenance and operation of the casemate Diesel-electric generators. It is kept at the mine casemate for 1 year for the information of tactical and technical inspectors. (See TM 9–405.)

(2) *Record of Test of M5 Firing Devices.* This record is kept at the mine casemate for 1 year for the information of tactical and technical inspectors. (See TM 9–405.)

(3) *Cable Operations Record Form.* This is a running history of every reel and shorter length of cable issued to a mine defense. It becomes part of the permanent record of each length of cable and accompanies it in the event of shipment. Whenever a cable is cut, a new record is started for the new length of cable. (See TM 9–415.)

(4) *Quarterly Test of Group Panel Relays.* This serves as a check list for the regular test of the group panel relays. (See TM 9–405.)

(5) *Quarterly Test of Supervisory Panel Relays and Motor Magnet.* This is a running log of the tests and operations of a supervisory panel. (See TM 9–405.)

(6) *Casemate Hourly Test.* This records the mine casemate operations under routine operating conditions. (See TM 9–405.)

(7) *Service Record of Firing Device.* This record is a complete history of each firing device used. It is kept in the casemate and is maintained to date until the firing device is discarded or shipped back to the Submarine Mine Depot, at which time it accompanies the firing device. (See TM 9–405.)

(8) *Service Record of Selector Assembly M3.* This is a running log of the tests and operation of a selector assembly. (See TM 9–405.)

b. Suggested forms that do not appear in other publications. (1) *Bill of material, ground mine.* This form is used as a work sheet to estimate the material required to plant a group of mines in a given location.

(2) *Mine operations and intelligence report.* This report is used as the running log of the plotting room. It lists all intelligence which passes through the room and records all operations in and around the mine field.

(3) *Mine assembly check sheet.* This check sheet is used to make certain that all necessary operations are performed. It is designed to eliminate mistakes in mine assembling operations.

(4) *Record of mine assembly.* This form is used to make certain all necessary operations are performed and also to fix responsibility for each operation.

(5) *Record of mine assembly and matériel.* Preferable to (3) above if more detail is desired.

(6) *Cable requirements for harbor defenses.* This form is a local record made for each mine project, showing the figures used in the computation of cable requirements for planting and maintaining the mine field. It is for local information only, and should be kept by the mine property officer as part of the substantiating data for the working program.

c. Samples of the forms recommended for local construction and use in b above that do not appear in other publications are listed on the following pages.

BILL OF MATERIAL
Ground Mines

Mine Group No.——— Fort ———

Amount	Unit	Article	Project requirement	Substitute requirement	Mine No.	Mine case size	Water depth feet	Mine cable feet	Raising rope feet	Firing device assemb.
	Ea.	*Anchor			1					
	Ea.	Mine Case			2					
	Ft.	Mine Cable			3					
	Ft.	Shore Cable			4					
	Ft.	Raising Rope			5					
	Ea.	**Clips			6					
	Ea.	Thimbles			7					
	Ea.	Shackles			8					
	Ea.	Cable Clamps			9					
	Ea.	Firing Dev. Assembly			10					
	Ea.	Firing Dev. Assembly			11					
	Ea.	Booster Can			12					
	Ea.	Junction Box			13					
	Ea.	Dist. Box								
	Ea.	Selector Box								
	Lb.	Explosive								
	Ea.	Gaskets								

Azimuths to:	DB	No. 1	No. 7	No. 13
M′				
M″				

Total

* For D.B. Boat Anchor.
** Three clips used to fix thimble in raising rope.

Date .....

Signature .....

.....

SMD Form No. 64 (3-2-43)

MINE OPERATIONS AND INTELLIGENCE REPORT

Station..... Battery..... Date.....

From	To	Target	Area	Direction	Time	Message	Initials

MINE ASSEMBLY CHECK SHEET

MINE..... GROUP.....
Coil rod .....
Firing device.....
Mine case M.....

Operation	Date	Remarks	Initials
1. Mine case air tested.....			
2. Mine case assembled for fit.....			
3. Bottom strap installed			
4. Coil rod housing (72-inch rod) installed			
5. Coil rod fitted (48-inch installed)			
6. Bottom strap clamps tightened....			
7. Conduit fastened to mine cylinder and coil rod fixture.....			
8. Coil rod leads (48-inch rod) pulled through conduit			
9. Mine case loaded			
10. Round rubber gasket inserted in groove			
11. Collector strap attached to 72-inch coil rod and rod inserted in case			
12. Coil rod installed (72-inch rod) and leads pulled through conduit			
13. Top cover fastened securely in place			
14. Booster can in place with leads attached to firing device.....			
15. Firing device in place with red leads attached to coil rod leads			
16. Firing device grounded to screw at bottom front of mine cylinder			
17. Round rubber gasket in groove....			
18. Turkshead lead through stuffing box			
19. Side cover securely fastened in place			

RECORD OF MINE ASSEMBLY

Mine Number.....

1. Collector Straps:
   - Size top .....
   - Size bottom .....
   - Extension .....
   - Installed by .....

2. Coil Rods:
   - Size .....
   - Serial Number .....
   - Date Installed .....
   - Installed by .....
   - *Flake, Powder .....

3. Coil Rod Housing:
   - Date Installed .....
   - Installed by .....

4. TNT:
   - Lot Number .....
   - No. Pounds Loaded....
   - Date Loaded .....
   - Loaded by .....

5. Booster Can:
   - *Brass, Phenolic, Molded
   - Date Installed .....
   - Installed by .....

6. Firing Device:
   - FG or BDE.....
   - Serial Number .....
   - Installed by .....
   - Date Installed .....

7. Top Cover:
   - Installed by .....
   - Date Installed .....

8. Side Cover:
   - Installed by .....
   - Date Installed .....

* Underline one.

REMARKS: .....

.....

.....

.....

.....

.....

Checked by .....

Date .....

RECORD OF MINE ASSEMBLY & MATERIEL

Group Number.....Mine Number.....

1. Mine Case:
   - Type .....
   - Serial No. .....
   - Date last air test....lbs.
   - Tested and passed by...
   - Condition inside .....
   - Condition mine cylinder .....
   - Condition outside .....
   - Cap screw holes clean...
   - All cap screws present..
   - Amount of ballast wt...
   - Ballast *lead-iron-concrete; inside—outside .....
   - Checked by .....
   - Date .....

2. Collector Straps:
   - Condition of bottom...
   - Condition of studs.....
   - Scraped & brushed for good strap-case contact .....
   - Size top strap.....
   - Size bottom .....
   - Extension .....
   - Date installed .....
   - Installed by .....

3. Coil Rod Housing:
   - Alignment .....
   - Flex. cable .....
   - Cond. wire .....
   - Date installed .....
   - Installed by .....

4. TNT: (Main charge)
   - *Flake or Granular.
   - Gasket in place.....
   - Cap screws in place....
   - Housing plugged .....
   - Lot number .....
   - No. pounds loaded.....
   - Date loaded .....
   - Loaded by .....

5. Coil Rods:
   - Size .....
   - Serial No. .....
   - Insul. resistance .....
   - Cond. resistance .....
   - Tested by .....
   - Date installed .....
   - Installed by .....

6. Top Cover and Bail:
   - Groove clean .....
   - Gasket *new or old.....
   - Cap screw holes clean...
   - All threads in order....
   - Diametrically opposite cap screws tightened .....
   - Installed by .....
   - Date installed .....

7. Booster Can:
   - *Brass, plastic, phenolic .....
   - Loaded by .....
   - Detonators wire electrically in parallel by..
   - Date installed .....
   - Installed by .....

8. Firing Device:
   - FG or BDE .....
   - Serial No. .....
   - Sens. relay oper. R..... L.....
   - Tested by .....
   - Cushions, *hair or rubber .....
   - Booster connections ....
   - Coil rod connections....
   - Ground connection.....
   - Date installed .....
   - Installed by .....

9. Side Cover:

Groove clean .....

Gasket old or new.....

Cap screw holes clean..

Follower insert threads in order .....

Diamet. opposite cap screws tightened ....

Mine lead wire, rubber packing, brass gland, and steel follower assembled and properly tightened .....

Thumb joint on mine lead made by .....

Date installed .....

Installed by .....

* Underline appropriate term.

(OVER)

REMARKS: .....

.....

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.....

Checked by .....N.C.O. in charge.

Checked by .....Officer in charge.

INSTRUCTIONS: This report must be filled out in a neat and legible manner for each mine prepared for planting. This form must be complete! Soft pencil or ink will be used.

Specific data, figures, underlining, initials, names, and dates will be filled in where appropriate.

Those items checking "condition" will be filled in as follows: a (√) will indicate "Satisfactory." An (x) will indicate "Unsatisfactory." When an item is originally found unsatisfactory—but is corrected to be satisfactory, it will be checked x√ and appropriate comments made under Remarks. All "condition" checks will be initialed by the person passing judgment. Blanks for "Installed by——" will contain the rank and last name of appropriate persons.

When booster cans, firing devices, coil rods, etc., are tested or adjusted by personnel *other* than those doing the installing, the appropriate device should be tagged by the person in charge of testing and all necessary information recorded so that assembly personnel may transfer the data from each tag to this form.

.....

.....

Commanding

CABLE REQUIREMENTS FOR HARBOR DEFENSES

FORT .....

OF ..... DATE .....

Group No.	To nearest 10 feet land cable	To nearest 100 feet, submarine cable	
		Shore cable	Mine cable
1.			
2.			
3.			
4.			
5.			
Audio Reception System M1, set 1			
Total, initial installation, set 2			
Reserve—%			
Total requirements			

.....

Mine Property Officer

APPENDIX III

CHECK LIST OF PLANTING EQUIPMENT FOR VESSELS OF MINE FLOTILLA

---

a. Mine planters.
- Anchors, buoy.
- Ax.
- Box, tool, steel, 8½ x 21 x 7 5/16 inches.
- Buoys, mine.
- Cement, rubber.
- Chisel, cold, 1-inch.
- Clamps, cable.
- Clips, for mooring and raising ropes.
- Collars, turk's-head (extra).
- Cutter, cable.
- Dies, number and letter set.
- Extractor, fuse.
- File, flat, bastard, 10-inch.
- Followers, steel (extra).
- Frame, hacksaw, adjustable, pistol-grip.
- Gauge, air pressure, 20-pound to 160-pound.
- Glands, brass (extra).
- Gloves, rubberized canvas.
- Hammer, machinist's ball-peen, 1-pound.
- Hammer, Smith's, 3-pound.
- Handle, socket wrench, speeder, ½-inch square drive.
- Irons, grappling, 2-prong.
- Knives (one for each member of planting section).
- Lines, heaving (5/16-inch-diameter manila).
- Line, hook (1⅝-inch-diameter manila).
- Marline.
- Marlinespike.
- Packings, rubber (extra).
- Pliers, 8-inch, side-cutting

- Pliers, 6-inch, wire-stripping.
- Reel and line, sounding.
- Rope:
  - For stoppers (1-inch-diameter manila).
  - Mooring (marline-covered steel).
  - Raising (marline-covered steel).
- Screw driver, heavy-duty, common, (5 to 8 inches).
- Shackles, complete with cotter pins.
- Sleeves, splicing.
- Sounding lead.
- Strippers, wire.
- Tags, cable, band type.
- Tape:
  - Friction.
  - Rubber.
- Thimbles.
- Tool, air-valve repair.
- Tool, crimping.
- Waste, cotton.
- Wire:
  - Galvanized iron, No. 14.
  - Loading.
- Wrench, d.h.o.e., 13/16-inch x ⅞-inch.
- Wrench, d.h.o.e., 1⅛-inch x 1¼-inch.
- Wrench, pipe, small, 8-inch.
- Wrench, screw, monkey, 6-inch x ⅞-inch opening.
- Wrench, single end, ¾-inch.
- Wrench, socket, (complete set) 9/16-, 13/16-, ⅞-, 15/16-, 1-, and 1⅛-inch.

Note. T/A 4–4 lists total allowances of tools shown above.

b. DB boats.
- Anchors:
  - Boat.
  - Marking buoy.
- Ax.
- Boat:
  - Hooks.
  - Telephone.

Buoys:
  Marking.
  Mine, for junction boxes.
Cement, rubber.
Clamps, cable.
Clips, for mooring and raising ropes.
Collars, turk's-head (extra).

Flags:
  Red, danger.
  Signal.
Followers, steel (extra).
Gauge, air.
Glands, brass (extra).
Hacksaw with blades.
Hammers.
Irons, grappling, 5-prong.
Junction boxes.
Knives (one for each member of DB boat crew).
Lines, heaving ($\frac{5}{16}$-inch-diameter manila).
Marline.
Marlinespike.
Mine buoy rope cutter M1 (if used).
Notebook and pencil.
Packings, rubber (extra).
Pliers (one for each member of DB boat crew).
Pump, air.

Rope:
  For stoppers (1-inch-diameter manila).
  Mine buoy ($\frac{5}{8}$-inch-diameter manila).
Mooring (marline-covered steel).
  Raising (marline-covered steel).
Screw drivers, small and large.

Screws:
    Cap:
      $\frac{3}{4}$-inch by 2-inch, spare, for distribution box cover.
      $\frac{3}{8}$-inch by $\frac{3}{4}$-inch, spare for selector box cover.
    Slotted, $\frac{3}{8}$-inch by 1-inch, spare, for selector box base.

Shackles, complete with cotter pins.
Sleeves, splicing.
Snatch blocks.
Sounding lead.
Strippers, wire.

Tape:
  Friction.
  Rubber.
Thimbles.
Tool, crimping.

Washers:
  Brass, for rosettes.
  Insulating, for rosettes.
Waste, cotton.
Water, drinking (for DB boats without fresh water tanks).

Wire:
  Galvanized iron, No. 14.
  Loading.

Wrenches:
  Monkey.
  Open end.
  Socket brace, for selector box cover and distribution box cover.

c. Yawls.

Anchor:
  Boat.
  Line.
Boat hook.
Buoys, mine (extra).
Cement, rubber.
Flags, red, for plotting mine position.
Irons, grappling, 5-prong (if required).
Junction boxes.
Knives (one for each member of crew).
Lines, heaving ($\frac{5}{16}$-inch diameter manila).
Marline.

Messenger line.
Notebook and pencil.
Pliers (one for each member of crew).
Radio set SCR–536.

Rope:
  For mine buoys (5/8-inch-diameter manila).
  For stoppers (1-inch-diameter manila).
Slate (for marking submergences if required).
Snatch block.
Sounding lead.
Strippers, wire.

Tape:
  Friction.
  Rubber.
Waste, cotton.

Wrenches:
  Monkey.
  Open end.

APPENDIX IV

SAFETY PRECAUTIONS FOR HANDLING EXPLOSIVES

1. GENERAL. When proper safety precautions are observed, the handling of controlled submarine mine explosives is not unduly hazardous. (See TM 9–1900 and 9–2900 for complete safety precautions and regulations.) This section considers the most important safety precautions with specific reference to the mine loading room. The harbor defense commander is responsible for the observation of proper safety precautions in the mine project and for the necessary inspections and the preparation and submission of reports.

2. INSPECTIONS. The mine battalion commander makes at least two periodic inspections a year of all submarine mine explosives stored within his jurisdiction and submits a report to the harbor defense commander. Mine battery commanders and battery officers make at least monthly inspections to enforce compliance with regulations.

3. GENERAL SAFETY PRECAUTIONS. a. Building zones. Loading rooms and magazines must be located a safe distance from inhabited buildings, public railroads, and public highways in accordance with the stipulations of the quantity—distance tables prescribed in current regulations. These tables apply to the storage and handling of explosives and loaded mines.

b. Magazines. The type and quantity of material which may be stored in a magazine are directly dependent upon current quantity-distance requirements. Magazines will not be loaded in excess of the limits specified. However, it is desirable that advantage be

taken of the maximum storage volume available in the magazines. Magazines should be separated from each other and also from other installations in conformity with the quantity-distance tables. No operation in which hazardous materials are involved, other than operations incident to storage, will be permitted in storage magazine. A copy of safety regulations concerning storage and handling of explosives will be prominently displayed in all magazines.

c. **Lighting fixtures.** Lighting installations for rooms containing explosives or explosive dust should be equipped with fixtures designed and constructed to prevent the entrance of dust to the interior of the fixture. The fixtures should be of such design or construction that the maximum temperature at any point on the exterior surface of the fixture will not exceed 228°F. at 80° F. ambient temperature. Lighting fixtures should have the approval of Underwriters' Laboratories, Inc., or other approved testing laboratories. No portable lights other than approved electric lanterns and flashlights will be used in magazines or around explosives in cars, motor trucks, or boats.

d. **Smoking.** Smoking is prohibited in buildings or in the vicinity of buildings containing explosives or other hazardous materials. Smoking while wearing clothing contaminated by explosives is prohibited. Smoking areas should be designated and strictly regulated by the commanding officer.

e. **Inflammable devices in vicinity of explosives.** No person will be allowed to take matches, lighters, or other fire, flame, or spark-producing devices into a magazine, magazine area, or building containing explosives except by written authority of the commanding officer.

4. **STORAGE.** Whenever a quantity of bulk TNT is placed in magazines, trucks, freight cars, or loading rooms, it is considered to be in storage and the following rules will be observed:

a. TNT will not be exposed to dampness or to the direct rays of the sun for any unnecessary prolonged period.

b. Boxes of TNT will be stored in a clean, dry, well-ventilated magazine.

c. Boxes of TNT will be segregated by lot and stored in an upright position so that all sides may be examined.

d. A 2-inch space will be maintained between the bottom of the stack and the floor for ventilation and protection from water and dampness. Stacks will not be piled higher than the eaves.

e. Methods used for stacking will provide for proper ventilation in all parts of the stack. Dunnage will be used where necessary to maintain stability of the stacks. Dunnage should be level and the boxes should not be stacked so high that containers in the lower layers will be crushed or deformed.

f. Aisles will be arranged and maintained so that units in the stacks can be inspected, inventoried, and removed for shipment or tests.

g. Partially filled boxes will be tightly closed, marked plainly, and placed in conspicuous places on top of the proper stacks.

h. Inflammable material, such as empty boxes, paint, oil, waste, and excess dunnage will be eliminated in magazines.

5. **HANDLING.** a. TNT should be handled carefully. Containers filled with TNT will not be tumbled, dragged, thrown, walked across the floor, or dropped on each other or on the floor.

b. Never open TNT containers in a magazine in which other explosives or ammunition are stored. This should be done at least 100 feet from a magazine.

c. All tools used for opening, repairing, or closing containers filled with TNT will be of nonferrous or nonsparking materials.

d. Shovels and scoops made of copper or aluminum or other nonsparking material will be used when handling granulated or flake TNT.

6. **EXPOSURE.** TNT is toxic when inhaled or absorbed. Therefore, it is necessary that precautions be

taken by those continually engaged in loading or unloading mines.

a. New structures provided for handling TNT and loading mines will be provided with exhaust ventilation to prevent the accumulation of dangerous concentrations of TNT dust.

b. The number of persons engaged in loading mines will be at a minimum consistent with operating necessity. Personnel not essential to the operation will not be allowed in the vicinity.

c. Mechanical filter respirators approved by the U. S. Bureau of Mines will be worn by all personnel engaged continually in loading or unloading mines. These respirators must be serviced and cleaned daily.

d. Shoes prescribed for this use or shoes with soft soles and heels of leather or rubber, free from metal plates or nails, will be worn by all personnel handling or loading TNT.

e. Personnel will change all clothing before and after handling TNT. Clothing worn during these operations will be laundered daily.

f. Personnel working with TNT will be required to take a shower bath, using an approved TNT neutralizing soap, such as sodium sulphite solution or soap mixture, upon completion of the work.

g. Personnel continually engaged in handling loose TNT will be given a physical examination every 3 weeks or at the conclusion of any shorter periods of exposure.

7. CONTAMINATED TNT. a. Carefully examine the TNT while it is being removed from a mine case. If found contaminated, make a detailed report to the Ordnance Department, Army Service Forces, Submarine Mine Depot.

b. Disposal of contaminated TNT. Contaminated TNT will be destroyed by burning or as otherwise prescribed in controlling regulations. The explosive to be burned will be removed from containers and spread in a thin layer, not more than 3 or 4 inches thick. A train of inflammable material will be used to ignite the explosive. Not more than 500 pounds will be burned at one time. Safety precautions prescribed in TM 9–1900 will be observed.

8. BLASTING CAPS, DETONATORS. a. Magazines for the storage of blasting caps should be small to limit loss in case the magazine is destroyed. Storage of all blasting caps of one type in a single magazine should be avoided to prevent possible loss of the entire stock in case of accident. The quantity in any one magazine should be kept to a minimum consistent with the storage space available.

b. The temperature within the magazine should not exceed 100°F. Blasting caps are sensitive to shock, friction, and heat. Caps may be stored with fuzes and primers but *not* with other high explosives.

c. Detonators are also sensitive to shock. They must be handled carefully. They must not be thrown or dropped on the floor or on other containers.

d. Detonating caps must not be disassembled for any purpose, as such action by inexperienced personnel may result in an explosion.

e. Examine caps for formation of green copper fulminate on the outside. Such caps should be disposed of immediately.

f. Paper cartons which have been opened must be resealed. Containers must not be opened or repaired in a magazine containing explosives. This work must be done in a nearby empty magazine, an empty loading room, or, during clear wheather, in the open at sufficient distance to comply with quantity-distance requirements. It should never be done less than 100 feet from any building containing explosives.

g. Detonating caps must be tested, prior to assembly in boosters, with a bridge-megger or a Leeds and Northrup faultfinder. The allowable measured resistance for serviceable detonating caps should be obtained from the Submarine Mine Depot before testing. *When labels on containers indicate that caps are manufactured under any other specification than U. S. Army Specification*

No. 50–78–2A, the normal resistance and the tolerances therefrom will be secured from the Submarine Mine Depot prior to making tests of the caps. Caps will be tested, one at a time, behind a 1-inch wooden wall or other similar barricade. All leads will be shorted after testing and when in storage.

h. Destroy blasting caps which have been removed from planted mines.

9. FIRE. a. If fire occurs in a magazine where TNT is stored in wooden boxes, the explosives will usually burn quietly. However, they may detonate. If the fire has gained headway before being discovered, no attempt should be made to fight it. Instead, the efforts of fire-fighting forces should be directed toward preventing the spread of fire to other magazines. Fire-fighting forces must not go closer than adjacent magazines and must protect themselves against a possible explosion by taking advantage of available cover or by lying flat on the ground.

b. An attempt should be made to put out a fire in a magazine where blasting caps are stored. Tests of blasting caps stored in boxes have shown that a fire will cause the caps to detonate a box at a time. Usually a detonated blasting cap will not travel more than 200 yards. If the fire cannot be controlled, the magazine should be abandoned and the efforts of the fire-fighting forces directed toward protecting adjacent magazines. Personnel fighting the fire should seek cover as described in a above.

10. TRUCKING. a. A truck used for transportation of explosives must be kept in good operating condition. TNT and blasting caps (detonators) will not be transported on the same truck at the same time. A truck with a metal body floor or metal strips in the body floor must not be used in the transportation of TNT unless a wooden floor or lattice is provided. A truck loaded with TNT must display signs marked EXPLOSIVES on each side and on the rear in letters at least 3 inches high on a background of sharply contrasting color.

When loaded with explosives, a truck must not stop at any point where a fire is or may be burning, or near administrative buildings, quarters, and barracks. A truck so loaded must not be left unguarded. The proper maintenance and inspection of trucks will be prescribed by the commanding officer.

b. Motor vehicles or other equipment using an internal combustion engine, or other equipment capable of producing sparks, must not enter loading rooms or magazines.

11. LOADING ROOMS. Certain special precautions are necessary for loading rooms. The following precautions and procedures must be followed:

a. Loading rooms must not be heated by a heating system employing an open flame, or by a heating system which produces a room temperature in excess of 100°F. or a temperature on the heated surface of the equipment greater than 228°F. A free circulation of fresh air must be maintained in the building. *Electrical machinery of any type capable of producing a spark must not be installed in loading rooms.*

b. During loading and unloading operations, the aisles and exits of loading buildings must not be blocked, and the doors must not be fastened except with anti-panic hardware.

c. The floors of the loading room should be kept wet during loading and unloading operations. The entire room should be washed down periodically to prevent accumulation of TNT dust.

d. Waste materials, sweepings, or refuse contaminated with hazardous materials must not be left in or near loading rooms. As soon as practicable, such materials should be removed (in closed containers) to the burning ground designated by the commanding officer and destroyed in small quantities under careful supervision. Contaminated waste must not be buried or thrown in any stream or tidewater unless it is decomposed by or is soluble in water.

e. Paints, oils, and water unnecessary to operations must not be permitted to remain in loading rooms. Oily waste must be kept in approved waste cans.

f. All loading rooms must be kept clean and orderly, and their immediate surroundings must be clear of rubbish, undergrowth, or other combustible material. Explosive or highly inflammable dust must not be permitted to accumulate.

g. Safety regulations pertaining to the loading room will be prominently displayed in all loading rooms.

12. LOADING MINE CASES. Limit the amount of TNT in the loading room to the amount needed to load one mine (3,000 lbs) if practicable, and in no event exceed the amount necessary to load two mines (6,000 lbs). When filling the mine case, all cover screws must be inserted into their proper holes to prevent TNT from getting into threaded recesses. Before replacing covers, brush all particles of TNT from finished surfaces and from screw threads with a brush made of nonsparking material to prevent possible detonation when seating cover screws or other threaded items.

13. SAFETY PRECAUTIONS. a. General. TNT may be unloaded from mines without danger when the usual precautions are observed. However, when disassembly operations on loaded mines or loaded components of a mine require the exertion of more force than that required for assembly, such work should be done in a separate area behind proper barricades on one mine at a time.

b. Special care must be exercised to remove all TNT from the mine case. This is necessary in order to eliminate the hazards of explosion or fire that may exist while the mine case is being handled. Dust or small particles of TNT remaining within the mine case may be picked up or removed by wiping with a rag lightly moistened with acetone. Water should not be used to remove TNT from within the mine case. Each mine case will be inspected for complete removal of TNT.

14. BOOSTERS. a. Boosters must not be assembled until needed.

b. Booster cans may be filled and detonators installed in a separate loading room; however, this work may be done in or near the loading room at a time when no loaded mines or full boxes of TNT are in the same building.

c. The loaded booster must not be inserted into the mine cylinder until just prior to loading the mine on the planter.

d. Boosters or loaded mines must not be tested electrically under any circumstances before they are planted in the mine field.

e. The storage of boosters loaded with TNT or blasting caps is prohibited.

f. Boosters must not be disassembled when other explosives or loaded mines are present.

APPENDIX V

CHECK LISTS USEFUL IN SUBMARINE MINING

Section I. GENERAL

The following check lists may be used as inspection guides for mine battalion, mine planter, and mine battery officers in the various phases of controlled submarine mining. These forms cover standard equipment and installations only. The compilation of additional check lists for phases of controlled submarine mining not covered by the following forms is recommended. Where applicable, the use of the preventive maintenance forms listed in TM 55–320 is recommended.

Section II. CHECK LISTS FOR MINE SERVICE PRACTICE

BATTERY COMMANDER'S CHECK LIST FOR MINE SERVICE PRACTICE

1. Study records of previous submarine mine target practices.
2. Read material on controlled submarine mine service practices contained in TM 4–235.
3. Study records of previous firings by the battery regarding the nature, causes, and probability of malfunctioning of matériel.
4. Decide upon measures to be taken in the event of matériel failure.
5. Decide upon conditions under which target will be subjected to fire in target practice.

6. Decide upon approximate prediction interval to be used.
7. Decide upon amount of time to be added or subtracted from the predicted time to compensate for various time factors.
8. Plan a procedure to be followed under unusual circumstances or in case of emergency.
9. Drill range sections in firing method to be used.
10. Procure service practice forms for recorders and officials. (See TM 4–235.)
11. Provide orientation data computed for sites of officials' observing instruments.
12. Devise a procedure to notify officials (who are to observe the deviations and azimuths of the target) as to when a mine is to be fired, which target is to be fired upon, and to be alert for the warning, "Prepare for splash."
13. Provide a proper system for recording during target practice all data necessary for the target practice analysis and for a complete record of the battery performance.
14. Check all casemate equipment with the casemate officer.
15. Check orientation of all position finding elements.
16. Check all communications.
17. Conduct at least one submine practice as a rehearsal for the service practice, firing the same number of shots and using the probable courses that will be used for the service practice. Keep all records, perform all operations, and analyze the practice in the identical manner prescribed for the service practice.
18. Correct any deficiencies evidenced by the submine practice analysis.
19. Repeat checks 14, 15, and 16 immediately prior to service practice.

EXECUTIVE OFFICER'S CHECK LIST FOR MINE SERVICE PRACTICE

1. Arrange for repair of mine field, when necessary.
2. Procure red streamers for the safety officer and the tug officer.

3. Check the accuracy of the range rakes to be used.
4. Check with the range officer to see that all position finding instruments are oriented.
5. Check with range officer the accuracy of the plot of the mine field on the plotting board.
6. Check with the casemate officer to see that the casemate is in order.
7. Check with an observing station to see that no control buoys are in the mine field.
8. Check with the tug officer, before the target towing vessel leaves the wharf, to see that the towline is over 1,000 yards long. Also remind the tug officer to mark the towline where it joins the ship and to make arrangements to have the towline measured when the towing vessel returns to the wharf.
9. Check all communication lines and ship-to-shore communications.
10. Synchronize all watches prior to the time the target is reported, "On course."
11. Supervise all radio conversation with the towing vessel after the target is "On course."
12. Notify the towing vessel, "Prediction, next bell," by radio at the proper time.
13. With a stop watch, check the prediction interval from the prediction bell to the command FIRE. Also note the exact time of firing.
14. Assist the battery commander with records of repairs required and of the malfunctioning of any matériel after the mine has been fired.
15. Assist the battery commander in preparing the target practice report.

RANGE OFFICER'S CHECK LIST FOR MINE SERVICE PRACTICE

1. Provide a means for recording all data from the plotting room and observation stations which are necessary for the analysis of practice. (See TM 4–235.)
2. Make arrangements to secure records from the observation station details and officials immediately after the practice.
3. Test the functioning of the plotting room with drills of the procedure to be employed for the practice.
4. Be prepared to check on the plotting board the angle between the path of the target and the line of mines. This acute angle should not be less than 50°.
5. For submine firing, plot the location of the submines after the tide has changed and is established as flood or ebb.
6. With the battery commander, decide on the amount of time to be added or subtracted from the predicted time to compensate for various time factors.
7. Check the orientation of the plotting board, observation instruments, and other position finding devices used.
8. See that extra plotting paper and pencils are available in the plotting room.
9. Verify the accuracy of all scales and the recorded azimuths of the individual mines.
10. Be prepared to measure the towline as prescribed in TM 4–235.
11. Check communications.

CHECK LIST FOR OFFICER IN CHARGE OF PREPARING UNDERWATER EQUIPMENT FOR MINE SERVICE PRACTICE

1. Check the time schedule set up by the battery commander or higher authority.
2. Set up a working schedule with your key NCO's, furnishing them with available information that they may intelligently perform their portion of the work.
3. Check the safety measures for the handling of explosives and detonators. Insure that these measures are being observed.
4. Check with the casemate to see that firing devices and coil rods are tested and will be available when needed.
5. See that the proper measurements (depth of water) have been furnished for cutting cables and raising ropes.

6. Check with the storeroom keeper to see that cables of desired length are on hand and that a list of cable to be used is furnished the NCO in charge of preparing the cables.

7. See that tests have been properly made on all equipment. These tests include the air test of mine cases, and the electrical test of cables, detonators, firing devices, and coil rods.

8. Make an over-all check of an assembled and loaded mine. Check for completeness of all watertight seals. (It is a good idea to open at least one watertight joint per group as an additional check, making sure to reseal it.)

9. Check with the mine planter commander on the time, place, and manner of loading the mine planter and DB boat.

10. Have all underwater equipment ready on the docks for loading the mine planter and the DB boat.

11. Check to see that the DB boats and yawls are properly equipped for the particular job and for emergencies which may arise.

Section III. CHECK LISTS FOR MINE INSTALLATIONS, STRUCTURES, AND EQUIPMENT

MINE STOREROOM

1. Check all articles of equipment to see that they are properly arranged and classified on shelves or in bins, labeled with the proper name and code number, and easily accessible.

2. Be sure that all property is promptly removed from shipping containers upon arrival and thoroughly checked by the mine property officer for quantity and condition.

3. Check to see if there is property on hand which has not been removed from shipping containers and checked for quantity and condition.

4. Be sure that the mine property officer and all enlisted men on duty as property clerks are thoroughly familiar with the use and nomenclature of the property they handle.

5. See that cable record cards are complete and up to date.

6. See that proper steps are being taken to expedite disposition and replacement of all unserviceable property.

7. Inquire when mine cases were last air-tested.

8. See that mine cases are stored in such a manner that space is conserved as much as possible.

9. Inspect machined surfaces, interiors, and exteriors to insure that they are in good condition.

10. Check mine cases to insure that they are complete with all nuts, washers, keys, stud bolts, and covers.

11. See that anchors are in good condition.

12. See that anchor bails are in satisfactory condition.

13. Check the method of placing anchors on mine cars or otherwise moving anchors from storeroom to dock. A crane or similar apparatus should be used.

14. Check to see that grommets on anchors have been replaced by anchor rings.

15. See that raising ropes can be shackled to the side bail of the anchor.

16. Check all marline-covered, steel-wire mooring and raising rope for proper tarring. See that all rope has been inspected and retarred within 5 years.

17. See that manila rope is properly stored.

18. See if all shackles and similar equipment are properly oiled or greased before being stored.

19. See that nuts can be screwed down by hand on all clip U-bolts.

20. Check the air compressor for condition, proper location, and moveability.

21. Check to see that partially used cans of paint are stored in one room.

22. See that the mine storeroom is kept as dry as possible, and that the floor is kept free of tar and oil from cable and ropes.

23. Determine that the elevator is in excellent running condition. (Applicable to buildings with elevators.)

24. Determine if the overloading precautions for the upper floor are carried out.

25. See that all marking buoys are painted yellow and black (black on the cap end) before being planted.

26. Insure that a test plug is available for air-testing the marking buoys.

27. Determine if there is at least one man on duty at all times to act as security guard and to issue equipment in case of emergency.

28. See that all classified documents are properly safeguarded. (See AR 380–5.)

29. See that the filing system in the office is maintained in accordance with current Army Regulations.

30. Determine if Submarine Mine Depot memorandums and changes to manuals are up to date and are brought to the attention of all concerned.

31. See that an enlisted man, other than the clerk, is detailed to issue all tools and small equipment.

32. See that property, storage facilities, and records are in condition to be turned over to another officer with a minimum of delay.

LOADING ROOM

1. Check loading room to see that no property or equipment is stored therein other than the prescribed loading tools and equipment.

2. Check loading room for adequate ventilation.

3. Insure that no fire hazards are in the immediate vicinity of the loading room.

4. Insure that the loading room is clean and free of all inflammable material and adequately supplied with fire extinguishers.

5. See that tools and equipment are kept in excellent condition and are neatly stored.

6. See that all tools for opening TNT boxes are made of nonsparking material.

7. See that the crane is in excellent condition. If electric-powered, see that it is explosion-proof and that all electric wires and connections are of the special type used in explosive storerooms.

8. See that the loading room detail wears rubber-soled shoes or shoes free from metal that may cause sparks.

9. See that "No smoking" signs are posted in and around the loading room.

10. See that the loading room floor is kept clean while loading operations are in progress.

11. See that a telephone is available.

12. See that personnel are familiar with all loading room duties and safety precautions.

13. Be sure that a guard is placed over any loaded mines when left overnight.

14. Be sure that all explosives are stored and handled in accordance with current regulations.

CABLE TANK HOUSE

1. Check pumping and draining facilities to insure that they are adequate for filling and emptying tanks during any tidal conditions.

2. Determine if cable tanks are dependent upon an outside source of power for filling the tanks.

3. Insure that the interior of the cable tank house is properly protected from the direct rays of the sun.

4. See that cable is so arranged in the tanks that it can be tested easily and with no undue movement.

5. See that the ends of all cables are out of water and properly tagged and thumb-jointed.

6. Check storage of figures-of-eight to insure that they are stored in such a manner as to be available for use without rewinding.

7. Check all cable reels for serviceability and proper numbering.

8. See that cable tanks are cleaned out at frequent intervals.

9. Insure that faulty cables are kept in a separate tank from good cables.

10. See that the cable tank crane has a capacity of 5 tons or more and that it is in satisfactory condition.

11. See that faulty cables are being reconditioned as soon as possible.

12. See if any property other than cable is stored in the cable tanks.

13. Be sure that fire fighting equipment is handy.

14. See that cables are always tested under water before using.

15. See if all stored cable is completely submerged in salt water.

16. See that lighting facilities are adequate.

MINE WHARF

1. Determine that the mine wharf is not being used by other agencies to the extent of interfering with submarine mine work.

2. Check wharf for presence of heavy items of property other than submarine mine property.

3. See that handling machinery (cranes, hoists, etc.) is adequate.

4. Check the mine wharf for—

a. Artificial lighting adequate for loading and refueling vessels at night.

b. Fresh water facilities.

c. Telephone facilities for wharf and planter.

5. See that the wharf and rolling stock are in proper condition to handle the heaviest necessary loads (up to a concentrated load of 10 tons).

6. Check the mechanical condition of the cranes and other handling equipment and insure that they are capable of safely handling the loads for which they were designed.

7. Insure that competent crane operators are available in the mine battery.

8. Determine if the planter can be loaded fore and aft simultaneously.

9. Check stringers and pilings alongside the wharf where the planter is tied up to see that they are in good condition.

10. Check the depth of the water to insure that the mine planter can tie up regardless of the tide.

11. Check the location of the wharf and small boat anchorage for protection from storms.

12. Insure that the channel approaches are deep enough for the planter to navigate under all conditions of tide.

13. Insure that the small boat anchorage is deep enough for DB boats to navigate.

14. Insure that facilities are available for the safe and rapid refueling of mine yawls and DB boats.

15. Check the fuel storage system to see that it is adequate and that it insures a supply of clean, water-free fuel for vessels under all weather conditions.

ROLLING STOCK

1. Check mine cars and tracks for serviceability.

2. See that cars are of sufficient size to carry reels of cable, anchors, mines, and other matériel.

3. Check availability of creosote for use on planking for mine cars (tropical stations only).

4. See that a spur is run to the cable tank and loading room with the main track running through the storeroom.

5. Check availability of a small towing engine.

POWER PLANT AND MINE CASEMATE DIESEL-ELECTRIC SETS AND MOTOR GENERATORS

1. Check Diesel power plants for proper installation.

2. Check bases for proper construction and insulation against vibration.

3. Check mufflers for proper location close to the engine.

4. Check exhaust piping for sharp bends, small pipe, or small radius curves which build up a back pressure. Insure that pipe size is doubled if exhaust pipe is more than 20 feet long.

5. Check exhaust pipes for installation of water traps with drain cocks.

6. Check power plants for proper location with respect to air passages or windows to take full advantage of ventilation and air cooling.

7. See that power plant log is complete and up-to-date.

8. Inspect power plant to determine, by its appearance and operation, if it is in first-class condition.

9. Check all important wiring running from the power plant to the power panel to insure that it is completely protected by armor or conduit.

10. See that a battery-charging set is installed in the casemate.

11. Examine Diesel engine for evidence of overheating.

12. Check 5-kva. alternator bearings for proper lubrication and evidence of overlubrication.

13. Insure that motor-generator sets are readily accessible for greasing.

14. See that the fuel line from tank to Diesel engine is so installed that it cannot be accidentally broken.

15. See that Diesel fuel oil tanks can be conveniently drained, cleaned, and filled.

16. See that spare parts for the Diesel-electric set are on hand and properly cared for.

17. Check number of engineers on duty.

18. See that engineers have satisfactorily completed a course in Diesel engine operation and maintenance.

19. See that nonacid type fire extinguishers have been properly installed at the engine room exit.

20. Check engine records to see if regular weekly operating period for engines is observed.

M3 Distribution Panel

1. Check all apparatus appearing on the panel for proper functioning.

2. See that 250-ohm field rheostats for Diesel-electric generator have been installed.

M3 Power Panel

1. Check all apparatus appearing on the panel for proper functioning.

2. Check preheating period for vacuum tubes before power is applied to any panel. (This period should be at least 30 seconds.)

M3 Group Panel

See that mine indicators are being used.

M3 Supervisory Panel

Check all apparatus appearing on the panel for proper functioning.

Selector Box M4

1. See that the original terminals in all selector boxes have been replaced by 1½-inch, flat, fillister-head screws to accommodate the shockproof type of selector assembly connector.

2. Insure that casemate personnel have been instructed in the proper method of installing the shockproof connector.

M3 System Equipment, General

1. See that panel frames are securely fastened to the floor.

2. Check dust covers on the rear of the panels for proper fitting and fastening and see that they are kept in place.

3. Examine the cable terminations at the M3 panels to see that they were installed in a workmanlike manner.

4. Check heater lamp leads from power panel to group frame for neat installation.

5. See that heater circuit is maintained and kept in operation at all times.

6. See that connecting cords for the spare power and supervisory panels are kept in good condition.

7. See that casemate grounds are tested and maintained at the proper values.

M3 System, Operation

1. See that all members of the casemate detail operate the M3 system in the prescribed manner.

2. Determine if provision has been made to utilize spare panels and spare test rack groups for training casemate operators without interference with the planted groups.

3. Insure that daily, weekly, and monthly maintenance and operation test records are complete and up to date.

4. See that monthly operations reports on projects having planted groups are complete and up to date.

5. Insure that a CAS-trained casemate electrician is in charge of the casemate and that he has not been assigned other duties not connected with submarine mining.

6. Insure that a sufficient number of trained casemate electricians are available to permit operation on a 24-hour alert status.

Casemate, General

1. See that the casemate actually has on hand all tools allowed by the T/A and that they are in serviceable condition.

2. See that spare parts are properly tagged and stored.

3. See that manuals, instructions, and drawings associated with the M3 system are available in the casemate and properly safeguarded. (See AR 380–5.)

4. Insure that the casemate is clean and kept in good condition and verify that no part is polished or painted in unauthorized style.

5. See that quarterly routining of relays is being properly carried out and that the relay data sheets are complete and up-to-date.

6. Insure that locally generated casemate power is not being used for nontactical or unauthorized purposes, such as electric lights, personal radios, heaters, and other personal conveniences.

7. Verify that the casemate is dry, heated, bombproof, splinterproof, and gasproof.

8. Determine what changes the casemate requires to make it more serviceable and more comfortable.

9. Determine if the noise of engines interferes with communication or commands in the casemate.

10. See that a nonacid type fire extinguisher has been installed in the rear of the mine control panels.

11. Determine if the *post power service switch* will open *all* lines in the incoming power circuits.

12. See that a post telephone is installed in the casemate.

13. See that personnel stationed in the casemate are armed.

MINE BATTALION AND BATTERY COMMAND POSTS AND BATTERY OBSERVATION STATIONS

1. Check the following:

a. General appearance, cleanliness, and neatness of exterior and interior of the building.

b. Condition of all observation instruments and communication equipment.

c. Orientation of observation instruments. (See FM 4–15.)

d. Functioning of communications equipment.

2. Check to see that the following are posted or are available and maintained up to date:

a. Manning table.

b. Written instructions for manning personnel.

c. Signal operating instructions.

d. Telephone directory (administrative and tactical).

e. Tide table (mine battalion and battery CP's only).

f. Orientation data for observation instruments.

g. Terminal jack number on the fire control switchboard for all elements of the mine command.

h. Data on flags of all nations and illustrations of representative types of warships that may be operating in the area.

i. International flag signals.

j. Mine battalion record book (mine battalion CP only).

k. Map of water area (hydrographic chart preferable).

PLOTTING ROOM

1. Check general appearance for neatness and orderliness.
2. See that heating, lighting, and ventilating systems are adequate.
3. Determine if gasproofing has been accomplished.
4. See that all necessary position finding equipment is on hand.
5. Insure that plotting board is oriented accurately.
6. If the mine predictor M1916 is used, see that it is constructed to correspond to the time interval used.
7. See that all communications equipment is maintained in satisfactory working order.
8. Determine that provisions have been made for emergency communications and lighting.
9. If a mine field is planted, see that it is properly plotted on the plotting board.
10. See that stop watches are on hand and are in working order.
11. Insure that the supply of pencils, plotting paper, and recorder's forms is adequate.
12. Determine that check point data for the plotting board are available.
13. See that an up-to-date manning table is posted.
14. Insure that operating instructions (SOP) for personnel are available.
15. See that signal operating instructions (SOI) are kept current and are available.
16. See that the plotting room log is maintained as required.
17. Insure that personnel are trained in more than one method of position finding.

CABLE HUTS

1. Determine how many cables there are in the harbor defense.
2. Determine how many shore cables are terminated in each cable hut. (Normally, the number should not exceed 4 single-conductor cables.)
3. See that the cable huts are splinterproof.
4. Insure that cable huts are properly located.
5. See that the cable huts are properly guarded if the mine field is planted.
6. Insure that the connections between the shore cable and land cable conductors are watertight.

BOATHOUSES

1. In addition to the points covered in the general requirements for the inspection of structures, see that the pilings are sound and properly braced, and that sills are securely bolted thereto.
2. Verify that the arrangement of catwalks is such that the outside of all mine yawls are accessible when they are hoisted out of the water.
3. See that skids and blocks are available to support each mine yawl without strain when it is hoisted out of the water.
4. See that the ladder or gangway to the water level is securely fastened and in good condition.
5. See that all boat-hoisting apparatus is adequate and in good condition.
6. Insure that gasoline, oil, or oil waste is not left in the boathouses.
7. Insure that regulations for the use and operation of small boats are posted.
8. Insure that boats can be accommodated at all states of tide, wind, or weather.

Section IV. CHECK LISTS FOR MINE FLOTILLA

MINE PLANTER

Main Deck

1. Examine deck, rail, and scuppers for cleanliness and condition.
2. Examine mooring lines for condition and anti-chaffing gear.
3. Inspect cleats, capstans, catheads, controllers, cable reel mechanism, and king reel.
4. Examine all reversible-socket pad eyes and fixed pad eyes on the main deck and forecastle.
5. Check the condition of the heel plate locks for the catheads.
6. Check the condition of the davits. Test operation of the davit turning mechanisms and hoisting gear.
7. Examine the main boom operating mechanism for lubrication of control levers and sheaves. Check condition of wire rope. Test the operation of the boom.
8. Examine lazarette escape hatch for serviceability and condition.
9. Examine foredeck cargo hatch covers for serviceability and condition.
10. Check the condition of the jack staff and Jack (if flying).
11. Check the condition of the flag staff and Ensign (if flying).
12. Check the condition and operation of the anchors, anchor chain, and anchor capstans.
13. Check cleanliness and condition of the main deck house exterior and lights in portholes.

Upper Decks

1. Check for general cleanliness and condition of the decks and bulkheads (exterior).
2. Examine the lifeboats and life rafts and check for condition and completeness of lifeboat and life raft equipment.

3. Examine the lifeboat davits, noting particularly the condition of blocks, ropes, and worm turning gears.
4. Examine life rings for serviceability. Check operation of attached electric lights.
5. Examine the after-boom operating mechanism for lubrication of sheaves and serviceability of cable. Test the operation of the boom.
6. Check machine guns for cleanliness, condition, and preservation.
7. Look aloft and check the condition of the smoke-stack, masts, shrouds, halyards, and aerials.
8. Check the condition of extra life preservers contained in boxes on boat deck.

Pilot House, Chart Room, and Radio Room

1. Check the operation of the searchlight, signal lights, and all lights necessary for navigation.
2. Test ship's whistle and fog horn.
3. Check the condition of the compasses and all navigating instruments and equipment.
4. Inspect the signal flags for proper condition and completeness.
5. Check the operation of the loud-speaker system and the ship's telephone system.
6. Check to see if *Pilot Rules* and *Station Bills* are posted.
7. Inspect the chart room for orderliness.
8. Check that navigational and harbor charts are being kept up to date.
9. Check that the chronometer is in order and that a record book is kept thereon.
10. Check the condition and operation of the radio equipment; check the files of messages sent and received for completeness and accuracy.

Galley and Mess

1. Inspect for general cleanliness and neatness of galley and personnel.
2. Examine the utensils, crockery, and other equipment for cleanliness and condition.

3. Test food in the process of preparation.
4. Inspect sink, counters, stove, and equipment for cleanliness and general condition.
5. Inspect the menus for quality, quantity, and variety of food.
6. Inspect main refrigerator compartments and contents for cleanliness, neatness of storage arrangement, and condition. Verify that a sufficient stock of supplies is on hand for limited operations away from base.
7. See that the food handlers have been given the required physical examination and that the results are posted in the galley.

Quarters

1. Inspect the bunks for neatness and the bedding for cleanliness.
2. Check for presence of vermin.
3. Inspect lockers for neatness of arrangement.
4. Inspect for general appearance and cleanliness of all quarters.
5. Check the lighting and ventilation.

Miscellaneous

1. Examine the paint lockers for cleanliness and proper storage of paint.
2. Check the condition of the hull and the bulkheads.
3. Examine and operate the anchor winch and the steering engine.
4. Check the sanitary condition of all lavatories, fountains, and closets.
5. Check all faucets, valves, and settings for leaks.
6. Inspect the ship's log for the following:
   a. Trips.
   b. Oil and water consumption.
   c. Time spent in operations other than Submarine Mining, determining whether these trips were actually necessary. See that the Master and the Commanding Officer sign the log in accordance with AR 90–150.

7. Inspect training schedules and verify that training is in accordance with MTP 4–9.
8. Examine medical supplies for adequacy and verify presence of a Stokes litter.
9. See that a sufficient number of life preservers is aboard. Check the condition of the individual life preserver lights.

Engine Room

1. Inspect appropriate sections for polish of brightwork; neatness and cleanliness of lockers; burnishing of the bright parts of the engine; and the condition of gauges, telegraphs, and bells.
2. Examine engines at rest and in operation for general condition and lubrication.
3. Examine all appropriate auxiliaries in the same manner as the main engines were examined.
4. Examine the machine shop for completeness of tools, neatness of arrangement, and condition of power machinery.
5. Examine the generators during operation for silent and efficient operation, cleanliness, condition of commutators, brushes, and lubrication.
6. Check under the floor plates, particularly at the bilges, for the presence of oil and excess bilge water.
7. Note the condition of the lagging on piping and other surfaces where lagging is installed.
8. Examine the main swtichboard for cleanliness and dryness, and note whether or not all circuits are properly marked.
9. Examine fuel oil pumps and heaters for cleanliness and oil leaks.
10. Inspect boilers for leaks.
11. Inspect the fuel oil transfer pump.
12. Check the date of the last boiler cleaning, and determine if any scale was found at the time of cleaning; also check condition of fire brick and inspect boiler tubes for leaks or plugged tubes.
13. Inspect the fire fighting equipment.
14. Examine shafts for lubrication and general condition.

15. Check the last required report of boiler inspection for the condition of the boilers; check the record of the boiler feed water analysis.

16. Check condition of all blowers.

17. Check standard and emergency communications between bridge and engine room.

18. Check emergency steering equipment.

19. Inspect all emergency generating equipment while operating.

20. Examine engine log for data on all machinery, operation and repairs, fuel consumption, and maintenance data.

Operation

1. Sound, "Man overboard," and have the lifeboat lowered, manned, and operated. Take time to verify the training of the crew.

2. Sound, "Fire Call," and have all pumps and hose operated. Examine hose for leaks. Note the operation of the crew during the drill.

3. Order the machine guns (or battle stations) manned. Inspect the guns and ammunition, and check the state of training of the crew. If possible, have the guns fired.

4. Inspect gas masks and hold a gas mask drill.

5. Inspect the individual weapons of the crew.

CHECK LIST FOR INSPECTING A DISTRIBUTION BOX BOAT

General

The following check list for the inspection of a distribution box boat is intended to indicate not only the scope of a complete inspection but also the logical procedure to be followed in sequence by the inspecting officer. The coxswain should be notified several hours in advance if it is the inspector's desire to check engine operation by running the engines. The check list is arranged in accordance with the structural arrangement of all distribution box boats numbered 65 and higher. All steel and iron work should be inspected in every hold, compartment, and bilge section to see that it is free from rust, well painted, and clean.

Main Deck

1. Inspect the main deck plating for wear, damage, and watertight fit.

2. Have the deck plating removed from the working well and inspect the working well, scuppers, DB working table, underside of crane rails for wear or damage to teeth, and also the underside of the crane for moisture or deterioration of electrical equipment.

3. Check the two lockers, opening aft of the working well, for orderly arrangement.

4. Examine and operate the crane hoist, rack the crane forward, check the cable reel and fairlead hood, and question the crew on the operation of the crane.

5. Examine and operate the vertical winch (capstan). See that the brass drum is free from corrosion and that it runs smoothly and quietly. Insure that the controls do not stick on any of the resistance points.

6. Check rope storage lockers.

7. See that at least one ship's anchor is present and that it is large enough to hold the vessel under normal conditions. Insure that the anchor rope consists of approximately 200 feet of 1½-inch-diameter manila rope and a 12-foot section of galvanized chain with shackle for attachment to the anchor.

8. Check the cowl vents, mooring chocks and bits, removable chain railing, and scuppers for serviceability.

9. Check the water in the trim and peak tanks; be sure it is not salt water.

Aft Deck

1. Inspect the deck grating for damage and wear.

2. Check the rudder shaft in the lazarette, noting any leakage or moisture.

3. Have the slatted grating removed and the spare tiller installed.

Pilot House

1. Check the condition of navigational equipment.
2. Inquire of the coxswain as to any shortage of navigational equipment.
3. Try out the directional loud-speaker system if the boat is so equipped.
4. Ask to see the tools and spare parts used in mine planting.
5. Have the engines started, make a trial run, and check the operation from the pilot house.
6. Test the spotlight and sound the whistle.
7. Inspect the log book and check the entries.
8. Check the pilot house windows to see that they open and close properly and easily.
9. See that required notices, such as pilot and safety first rules and station bills, are posted under glass.

Radio Room

1. Check to see that the table and radio are securely fastened and that the SCR–281–A is installed on a shockproof mount.
2. Ask to see the d. c.–a. c. motor-generator set for the radio, the crystals in the set (should be at least two), the spare set of vacuum tubes, and the set of spare parts.
3. See that the main engine is running and then have the set put into operation. Check the reception and transmission for clearness and distinctness.
4. Ask to see a record of the messages received and transmitted.

Crew's Quarters

1. Go below to the crew's quarters by way of the inclined ladder from the pilot house to the engine room and then forward through the watertight door. Examine the watertight door for operation and serviceability.
2. Inspect for general cleanliness.
3. Carefully inspect bedding for vermin and check the condition of the pillows and mattresses.

4. See that life preservers are serviceable and in sufficient number. See that all life preservers have the stamp of governmental approval upon them. (Life preservers not in perfect condition are not considered serviceable.)
5. Send a member of the crew through the escape hatch to verify its serviceability.
6. Note the condition of the heating, lighting, and ventilating systems.
7. Inspect the lavatory, check the operation of the toilet, and examine for cleanliness and proper painting.

Engine Room

1. Inspect the general lay-out of the engine room.
2. Have the main engine started.

a. Question the engineer on its operation.

b. Ask about any recent break-downs or emergency repairs.

c. Have the engineer trace the flow of the cooling water and of the lubricating oil.

d. Continue back along the engine shaft. See that the shaft turns freely and quietly in the bearings.

e. Check the oil pressure, engine temperature, and ammeter in the starting battery circuit.

f. Listen to engine operation for noise indicating excessive wear or need of adjustment.

g. Ask the engineer if the proper quality and quantity of lubricating oil is consumed and how frequently the lubricating oil is changed.

h. Ask to see lubricating oil, fuel oil, and air filter elements.

i. Ask the engineer if any chemicals are added to the cooling water to prevent scale formation, or if any trouble is encountered in cooling the jacket water. (The temperature of the water leaving the jackets should be 160° to 170°F.)

j. Question the engineer as to whether the clutch and reduction-reversing gearing is giving any trouble.

k. Examine the shaft, bearings, couplings, and stern tube stuffing box.

3. Inspect the drip pans under the lubricating oil, fuel oil, and kerosene tanks for drippings or spillage. Check for any leakage around the propeller shaft. Inquire as to what disposal is made of oil drippings from pans. (Drippings should be dumped overboard aft, if at sea, or placed ashore at the properly designated place, if at wharf.)

4. Come forward on the starboard side and inspect the intake manifold, the fire and bilge pump, and the discharge line with the check valve.

5. Inspect the work bench and tools; check them against the posted list.

6. Question the engineer regarding the serviceability and maintenance of all storage batteries. Require him to verify statements with a hydrometer reading. Note the level of the electrolyte above the plates.

7. See that all name plates on machinery, motors, pumps, controls, etc., are unpainted and legible and that there is no paint on electrical terminals. Check all gears for freedom from paint and for proper lubrication.

8. See that the water tanks are examined, cleaned, etc., when in dry dock.

9. Question the operator to see that he understands the importance of proper engine room ventilation, both from the standpoint of safety and from the standpoint of the supply of air to the engine necessary for its operation.

Note. The first step before attempting to start an oil or gasoline engine is to ventilate the engine room to rid it of possible oil vapor which might cause an explosion. The batteries, when on charge, also give off an inflammable gas. Since the engine takes its air from the engine room for combustion, it is necessary to have good ventilation.

10. Question the operator on the method of taking on and handling fuel oil. Examine fuel oil storage tanks to see if the proper provisions have been made for venting and draining the tanks.

11. Inspect the engine room log book and see if instructional literature on engines and auxiliaries is on hand.

12. Have the operator explain the switchboard. Check to see if the crane can be operated off the 110-volt storage batteries. (The crane should not be so connected.)

13. Examine the sheave wheels for the rudder control cables.

14. Have the Diesel-electric generator set started. Check the generator output voltage. Note any undue noise or vibration.

15. Have the engineer demonstrate the fire drill as far as it concerns the engine room. (The engine room should be equipped with a CO_2 fire extinguisher, and the crew should understand its operation.)

16. Take up at least one floor plate over the bilge and inspect the bilge carefully for the presence of oil or inflammable vapors.

17. Leave the engine room through the steps alongside the generator.

Galley

1. Have all lockers and drawers opened and inspect for strict cleanliness, proper arrangement, and freedom from roaches.

2. Inspect the stove for cleanliness, polish, and operation. Carefully inspect the top for unauthorized articles and dirt.

3. Inspect the sink and refrigerator for cleanliness and operation.

4. Examine all crockery and table silver for cleanliness.

5. Inspect the galley floor and test the floor drains by pouring a bucket of water into the drain and noting how fast it will drain.

6. Examine the fuel-oil-fired hot water boiler. Check the operation of the thermostat relief valve and the electric-driven circulator. Question the crew on the suitability of the heater.

7. Inquire as to the method of eliminating flies, roaches, and other insects.

Mess Room and Passage

1. Inspect the oak mess table and the chairs and condiment shelves.
2. Inspect the flooring, verifying that it is sanitary and well-sealed to the deck plates.
3. Check to see that the air ports can be locked open as well as locked watertight.
4. Check the operation of the sliding hatch over the passageway from the mess room to the afterdeck.

Deckhouse and Roof

1. Go forward on the starboard side; notice the condition of the deckhouse.
2. Require the operation of the hand bilge pump.
3. Order an "Abandon Ship" drill and have the lifeboat lowered to the water. Check to see that the boat davit operates smoothly. Gears should be free from paint and well lubricated. See that the lifeboat is properly marked. Check the lifeboat equipment, falls, etc.
4. Check the range light on the aft mast. Verify that its light can be seen in all directions. Go forward and check the red-and-green running light and also the bow light on the top of the pilot house.
5. See that the radio antenna is clear from all obstructions.
6. Examine the roof of the pilot house for wear or damage.
7. Look back from the pilot house to the stack and note the condition of the engine exhaust pipes. Also note whether or not the whistle is securely fastened to the stack.
8. Return to the main deck and examine the fuel filling and sounding pipes.

Fire Fighting Apparatus

1. See that adequate equipment is available.
2. Require a fire drill with the operation of hoses. Verify that the hoses are properly connected and handled.

Hull

1. Examine the paint for rust spots or spots where the paint has been scraped off.
2. Check for excessive marine growth.
3. Check for screens and the condition of the glass of the port holes.
4. Check for loose, dented, or damaged plates.

Armament

1. See that the machine gun is set up. Have it fired, if possible.
2. Inspect rifles.
3. Inspect ammunition.

CHECK LIST FOR INSPECTING A MINE YAWL

1. See that the paint is in good condition. Note conditions of the hull with regard to marine growth.
2. Examine both the outer and inner woodwork of the hull, decking, engine housing, and coamings for soundness. Plunge the end of a sharp tool, such as an ice pick or a knife blade, into any suspicious looking plank or woodwork to see if it is rotten. (Paint is useless over rotten woodwork.)
3. Check condition of engine bed.
4. See that cleats, chocks, and towing bits are intact and well secured.
5. See that bow and stern painters of at least 5/8-inch-diameter manila rope are on hand and neatly coiled.
6. Ask to see the boat anchor and line. See that there are at least 100 feet of anchor line.
7. *a.* Inspect gas or fuel tanks, gauge, and filling pipes.

b. Question the operator as to the method of taking on and handling fuel, especially gasoline.

c. See that yawls, in cold weather, are refueled to capacity immediately upon return from a trip in order to prevent condensation in fuel tanks.

8. *a.* Have the combination running light connected at the bow and the white range light connected at the stern. Check for operation and proper locking fit.

b. Examine the steering cables and require the emergency tiller to be shipped.

9. Inspect the demountable canvas shelter cover while in place.

10. Check the following equipment:

a. Boat hook.

b. Six stopper lines.

c. Life preservers (3 to 6). There should be one each for the maximum number of persons carried.

d. Fog horn.

e. Fire extinguishers. See that hand fire extinguishers are fully charged. Inquire when they were last filled. If the extinguishers are of the CO_2 type, see that the crew understands how to operate them.

f. Compass (if required for local conditions).

g. Two red marking flags.

h. Sounding line, legibly marked.

i. Bumper or fenders to protect the sides.

11. Inspect the engine and starting equipment.

a. Check the fuel filters to see that they are clean. Question the operator as to the maintenance schedule for various filters.

b. See that the oil is at the proper level in the air filters and that the filters are not clogged. Question the operator as to whether the proper quality and quantity of lubricating oil is supplied, how much lubricating oil is consumed, and how often it is changed. See that the engine cooling system is operating satisfactorily.

c. Check the water level in the battery and have the engineer take a hydrometer reading.

d. Check all fuel and water lines for leaks.

e. Inspect the bilges to see that they are reasonably dry, clean, and free from oil or gasoline.

f. Check the stuffing box for leaks.

g. Have the coxswain start the engine; observe the actions of the engine. (The hatch covers should be opened in gasoline-powered boats.) Question the operator to insure that he understands the importance of proper engine and bilge ventilation prior to attempting to start the engine.

h. Inspect the engine while running and check for any undue noise or vibration. Have the operator demonstrate the reversing gear.

i. Inquire how often the oil level is checked. Ask to see a sample of the oil in the base. Verify that it is clean.

j. Examine the revolution indicator and see that it operates.

k. Require the operation of the throttle on the dash.

l. Check to see if the shaft is bent.

12. Require the coxswain to take the boat out for a short run to check the boat handling and operation.

13. Require the lockers at the bow and stern to be opened. See that gear is neatly stowed, serviceable, and cared for properly.

14. Check boat's log book.

PREVENTIVE MAINTENANCE CHECK LIST FOR WEEKLY INSPECTION OF BOATS

Date.....

ENGINE DEPARTMENT

Number or designation of boat.....																
	S	U	S	U	S	U	S	U	S	U	S	U	S	U	S	U
Main Engine:																
1. Lube oil system.....																
2. Fuel system																
3. Cooling system																
4. Exhaust system																
5. Engine air system																
6. General condition																
Auxiliary Engine:																
1. Lube oil system																
2. Fuel system																
3. Cooling system																
4. Exhaust system																
5. Engine air system																
6. General condition																
Main Battery:																
1. Sp gr of pilot cell.....																
2. General condition																
Starting Battery:																
1. Sp gr of pilot cell.....																
2. General condition																
Fire Fighting Apparatus																
Switchboard, Wiring and Lighting.....																
Auxiliary Engine Room Machinery, Piping																
Engine Space, Shafting, Bilges and Fuel Tanks																
Deck Machinery																
Miscellaneous, Including Heating Plant..																
Tools and Spare Parts.....																

"S" Satisfactory. "U" Unsatisfactory.

REMARKS:

PREVENTIVE MAINTENANCE CHECK LIST FOR WEEKLY INSPECTION OF BOATS

Date..... DECK DEPARTMENT

Number or designation of boat.....														
	S	U	S	U	S	U	S	U	S	U	S	U	S	U
Hull														
Bilges														
Lockers														
Top, windshield														
Fire extinguisher														
Life preservers														
Running lights														
Steering gear														
Fog horn														
Tools														
Mooring lines														
Cleanliness														
Brightwork														
Supplies														

"S" Satisfactory "U" Unsatisfactory

REMARKS:

PREVENTIVE MAINTENANCE CHECK LIST FOR WEEKLY INSPECTION OF DB BOATS

Date..... DECK DEPARTMENT

Designation of Boat					Designation of boat				
	S	U	S	U		S	U	S	U
Hull plating					Pilot house				
Guard rails					Navigation equipment				
Hull paint					Steering gear				
Decks					Running lights				
DB well					Flags				
Crane					Log book				
Winch					Fire hose				
Chain locker					Fire extinguishers				
Deckhouse					Hydrants				
Galley					Life preservers				
Crew space					Life boat				
Toilet					Life boat equipment				
Lockers					Fire axes				
Interior paint					Hand pump				
Supplies					Mooring lines				
Lifebuoys					Running lines				

"S" Satisfactory "U" Unsatisfactory

REMARKS:

COXSWAIN'S PREVENTIVE MAINTENANCE CHECK LIST FOR WEEKLY INSPECTION OF DB BOATS

Boat: L..... Coxswain's name:..... Date:.....

Legend for Marking: V—Satisfactory
X—Adjustment required
XX—Repair or replacement required
O—Defect corrected

Mark		Remarks
	1. *Hull*	
.....	*a.* Paint	.....
.....	*b.* Marine growth	.....
.....	*c.* Screens, glass on port holes	.....
.....	*d.* Loose, dented or damaged plates	.....
	2. *Main Deck*	
.....	*a.* Plating	.....
.....	*b.* Working well, scuppers, DB working table	.....
.....	*c.* Two lockers (opening aft the working well)	.....
.....	*d.* Rope and storage lockers	.....
.....	*e.* Anchor	.....
.....	*f.* Cowl vents, chocks, and bitts	.....
.....	*g.* Trim and peak tanks (should not be salt water)	.....
	3. *Aft Deck*	
.....	*a.* Deck grating for damage and water	.....
.....	*b.* Rudder shaft and cables in the lazarette	.....
.....	*c.* Spare tiller	.....
	4. *Pilot House*	
.....	*a.* Navigational equipment	.....
.....	*b.* Tools and spare parts	.....
.....	*c.* Spotlight, bell and whistle	.....
.....	*d.* Pilot house windows	.....
.....	*e.* Navigational notices	.....
.....	*f.* Flags	.....
.....	(1) International signal	.....
.....	(2) Ensign	.....
	5. *Radio Room*	
.....	*a.* Radio	.....
.....	(1) Reception	.....
.....	(2) Transmission	.....
.....	(3) Spare parts	.....
.....	(4) Crystals	.....
.....	*b.* DC-AC motor generator set	.....
.....	*c.* Furniture and mount for radio	.....
.....	*d.* Log of messages	.....
	6. *Crew Quarters*	
.....	*a.* Cleanliness	.....
.....	*b.* Bedding	.....
.....	*c.* Lockers	.....
.....	*d.* Life preservers	.....
.....	*e.* Escape hatch	.....
.....	*f.* Heating, lighting and ventilation	.....
.....	*g.* Lavatory	.....
	7. *Galley*	
.....	*a.* Cleanliness	.....
.....	*b.* Stove	.....
.....	*c.* Sink	.....
.....	*d.* Refrigerator	.....
.....	*e.* Crockery and Silverware	.....
.....	*f.* Hot water boiler	.....
.....	*g.* Fire extinguisher	.....

Mark		Remarks
	8. *Mess Room and Passage*	
.....	*a.* Cleanliness	.....
.....	*b.* Table, chairs, shelves	.....
.....	*c.* Flooring	.....
.....	*d.* Airports	.....
.....	*e.* Sliding hatch over passageway	.....
	9. *Deck House and Roof*	
.....	*a.* Deck house	.....
.....	*b.* Hand bilge pump	.....
.....	*c.* Lifeboat	.....
.....	*d.* Ring life buoys	.....
.....	*e.* Roof	.....
.....	*f.* Fire buckets	.....
.....	*g.* Range light, colored lights, bow light	.....
.....	*h.* Radio antennae	.....
.....	*i.* Stack, engine exhaust pipes	.....

ENGINEER'S PREVENTIVE MAINTENANCE CHECK LIST FOR WEEKLY INSPECTION OF DB BOATS

Boat: L-..... Engineer's Name:..... Date:.....

Legend for marking: V—Satisfactory.
X—Adjustment required.
XX—Repair or replacement required.
O—Defect corrected.

Mark		Remarks
	1. *Main Engine* (*) *and Auxiliary Engine* (#)	
....*....#	*a.* Fuel Oil System	.....
....*....#	*b.* Lubricating oil system	.....
....*....#	*c.* Fresh water system	.....
....*....#	*d.* Salt water system	.....
....*....#	*e.* Exhaust system	.....
....*....#	*f.* Air intake system	.....
....*....#	*g.* Loose or missing bolts, nuts, cotter pins	.....
....*....#	*h.* First echelon lubrication	.....
....*....#	*i.* Auxiliaries	.....
....*....#	(1) Generator	.....
....*....#	(2) Starting motors	.....
....*....#	(3) Electric wiring	.....
....*....#	(4) Alarm system	.....
....*....#	*j.* Controls and meters	.....
....*....#	(1) Tachometer	.....
....*....#	(2) Ammeter	.....
....*....#	(3) Thermometer	.....
....*....#	(4) Telegraph	.....
....*....#	(5) Oil pressure	.....
.....	2. *Clutch and Reverse and Reduction Gear*	.....
.....	3. *Propeller Shaft and Bearings*	.....
	4. *Auxiliaries*	
.....	*a.* Fire pump	.....
.....	*b.* Bilge pump	.....
.....	*c.* Suction manifold	.....
.....	*d.* Discharge line and valves	.....
.....	*e.* Air compressor	.....
.....	5. *Work Bench, Tools, and Spare Parts*	.....
	6. *Storage Batteries* *110 Volt* *32 Volt*	
.....	*a.* Specific gravity	.....
.....	*b.* Water level	.....
.....	*c.* Cables and terminals	.....

(OVER)

Mark		Remarks
	7. *Switch Board*	
.....	*a.* Meters	.....
.....	*b.* Ground lights	.....
.....	*c.* Switches and fuses	.....
.....	*d.* Wiring	.....
	8. *Generator 110 Volt*	
.....	*a.* Controls	.....
.....	*b.* Operation	.....
.....	*c.* Vibration	.....
	9. *General Engineroom*	
.....	*a.* Bilge	.....
.....	*b.* Portable fire extinguishers	.....
.....	*c.* Lights	.....
.....	*d.* Paint	.....
.....	*e.* Ventilation	.....
.....	*f.* Water tight portholes and ceiling	.....
	g. Log	
.....	(1) Complete and up-to-date	.....
.....	(2) Total engine hours	.....
	10. *Deck Machinery*	
	a. Crane	
.....	(1) Controls	.....
.....	(2) Brake	.....
.....	(3) Drum and sheaves	.....
.....	(4) Track	.....
.....	(5) Traveling gear	.....
.....	(6) Electric wiring	.....
.....	(7) Lubrication	.....
	b. Vertical winch	
.....	(1) Controls and wiring	.....
.....	(2) Drum	.....
.....	(3) Lubrication	.....

COXSWAIN'S PREVENTIVE MAINTENANCE CHECK LIST FOR WEEKLY INSPECTION OF MINE YAWLS

Boat: M..... Coxswain's Name:..... Date:.....

Legend for marking: V—Satisfactory.
X—Adjustment required.
XX—Repair or replacement required.
O—Defect corrected.

Mark		Remarks
	1. *Hull*	
.....	*a.* Paint	.....
.....	*b.* Marine growth	.....
.....	*c.* Damaged boards or timbers	.....
	2. *Decking Engine Hatch, Coamings*	
.....	*a.* Paint	.....
.....	*b.* Damaged boards or timbers	.....
.....	3. *Chocks, Cleats, Towing Bit, Lifting-ring Shackles*	.....
.....	4. *Lines, Fenders and Bumpers*	.....
.....	5. *Anchor and Anchor Line*	.....
.....	6. *Forward Compartment*	.....
.....	7. *Stern Compartment*	.....
.....	8. Windshield and Shelter Covers	.....
.....	9. Steering Gear Mechanism and Cables	.....

Mark		Remarks
	10. *Bilge*	
.....	*a.* Water	.....
.....	*b.* Gasoline	.....
.....	*c.* Dirt and sediment	.....
	11. *Engine*	
.....	*a.* Fuel system	.....
.....	*b.* Lubricating oil system	.....
.....	*c.* Fresh water system	.....
.....	*d.* Salt water system	.....
.....	*e.* Exhaust system	.....
.....	*f.* Air intake system	.....
	g. Ignition system (gasoline engine)	
.....	(1) Spark plugs	.....
.....	(2) Distributor and wiring	.....
	h. Battery	
.....	(1) Cables and terminals	.....
.....	(2) Water level	.....
.....	(3) Specific gravity	.....
.....	*i.* Loose or missing bolts, nuts, cotter pins	.....
.....	*j.* First echelon lubrication	.....
	k. Auxiliaries	
.....	(1) Generator	.....
.....	(2) Starting motor	.....
.....	(3) Electric wiring	.....
	12. *Accessories*	
.....	*a.* Life preservers	.....
.....	*b.* Lights	.....
.....	(1) Combination bow	.....
.....	(2) Stern	.....
.....	(3) Dash	.....
.....	*c.* Fog horn and whistle	.....
.....	*d.* Boat hook	.....
.....	*e.* Fire extinguisher	.....
.....	*f.* Heaving line	.....
.....	*g.* Sounding line	.....
.....	*h.* Red marking flags on staffs	.....
	i. Tools	
.....	(1) Pliers	.....
.....	(2) Hammer	.....
.....	(3) Screw driver	.....
.....	(4) Adjustable wrench	.....
.....	*j.* Hand bilge pump	.....
	13. *Start Engine After Venting the Bilges and Engine Compartment*	
.....	*a.* Oil pressure gauge	.....
.....	*b.* Tachometer	.....
.....	*c.* Ammeter	.....
.....	*d.* Thermometer	.....
.....	*e.* Power bilge pump	.....
.....	*f.* Unusual engine noises	.....
.....	*g.* Clutch and reverse geaf	.....
.....	14. *First Echelon Lubrication*	.....
	15. *Log Book*	
.....	*a.* Complete and up-to-date	.....
.....	*b.* Total engine hours	.....

APPENDIX VI

GRAPHIC TEST FOR A PROPOSED BASE LINE

1. This appendix discusses a method of graphically testing a proposed base line for a mine battery that employs the horizontal base position finding system. For satisfcatory results in accuracy, a mine battery base line should afford a minimum angle of 15° intersection from its base-end stations to any point within the mine field that is covered by the base line.

2. To graphically test a proposed base line for a mine battery, proceed as follows (fig. 47):

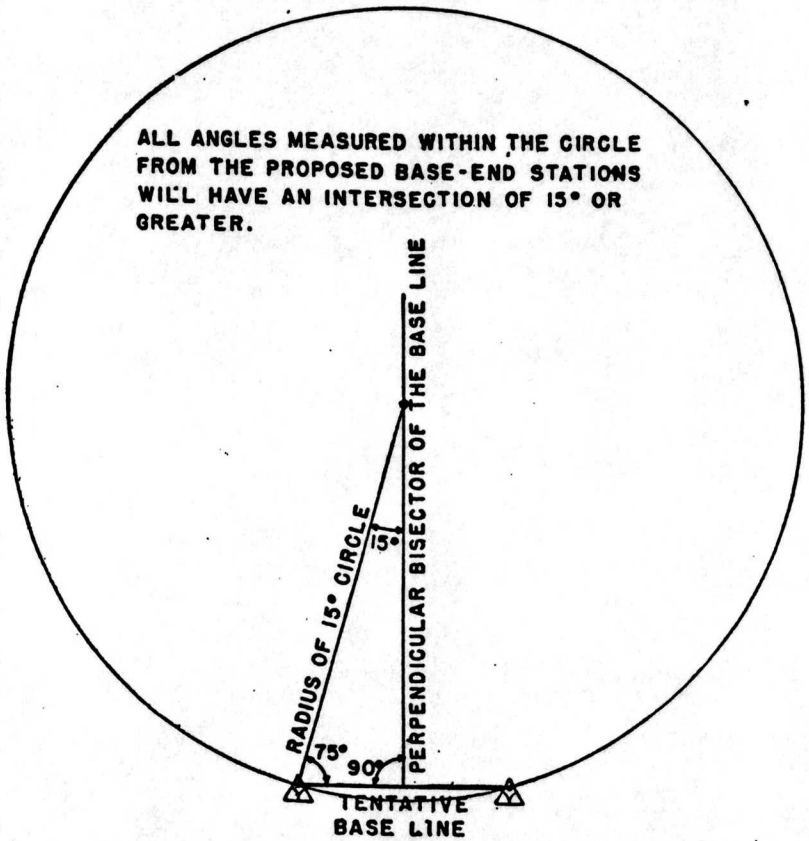


Figure 47. Graphic test for a proposed base line.

a. Select a tentative base line whose perpendicular bisector seaward passes through the center of the mine field that is to be covered by the base line.

b. With a protractor, lay off a line from one end of the base line making an angle of 75° with the base line. Extend this line to intersect the perpendicular bisector.

c. With this intersection as a center and the distance to the end of the base line as a radius, describe a circle. This is the minimum 15° intersection circle. The area within the circle represents the area covered by the base line that gives intersections of 15° or greater. The entire mine field covered by the base line should be within the 15° minimum intersection circle.

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Yawl. (*See* Mine yawl.)

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