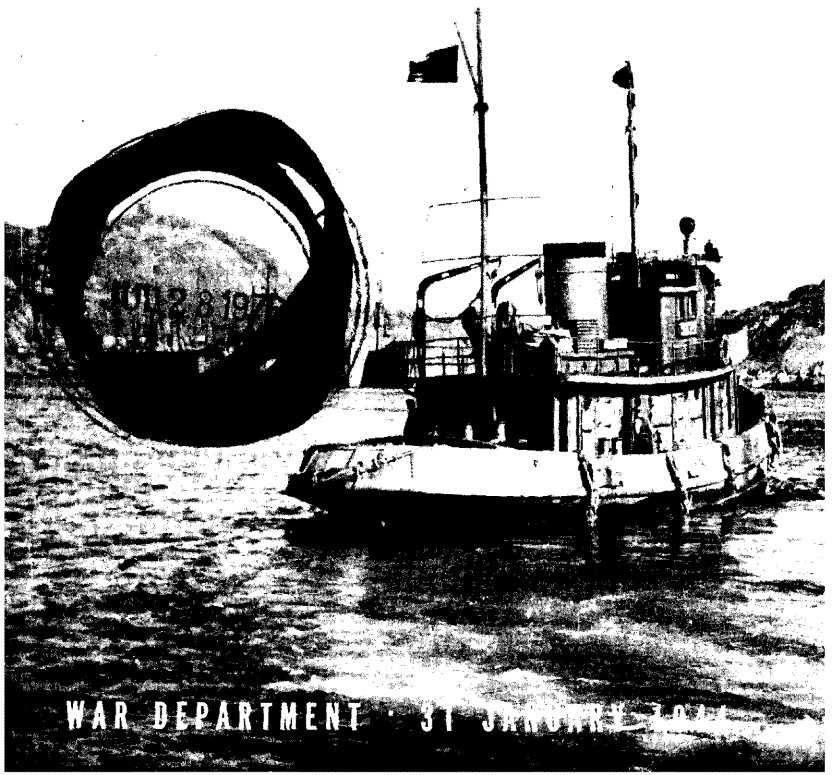
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WAR DEPARTMENT FIELD MANUAL

TRANSPORTATION CORPS

SMALL BOATS AND HARBOR CRAFT



JUL 2 8 1971

WAR DEPARTMENT · 31 JANUARY 1944

WAR DEPARTMENT,
WASHINGTON 25, D. C., 31 January 1944.

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OFFICIAL:

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

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(For explanation of symbols see FM 21–6.)

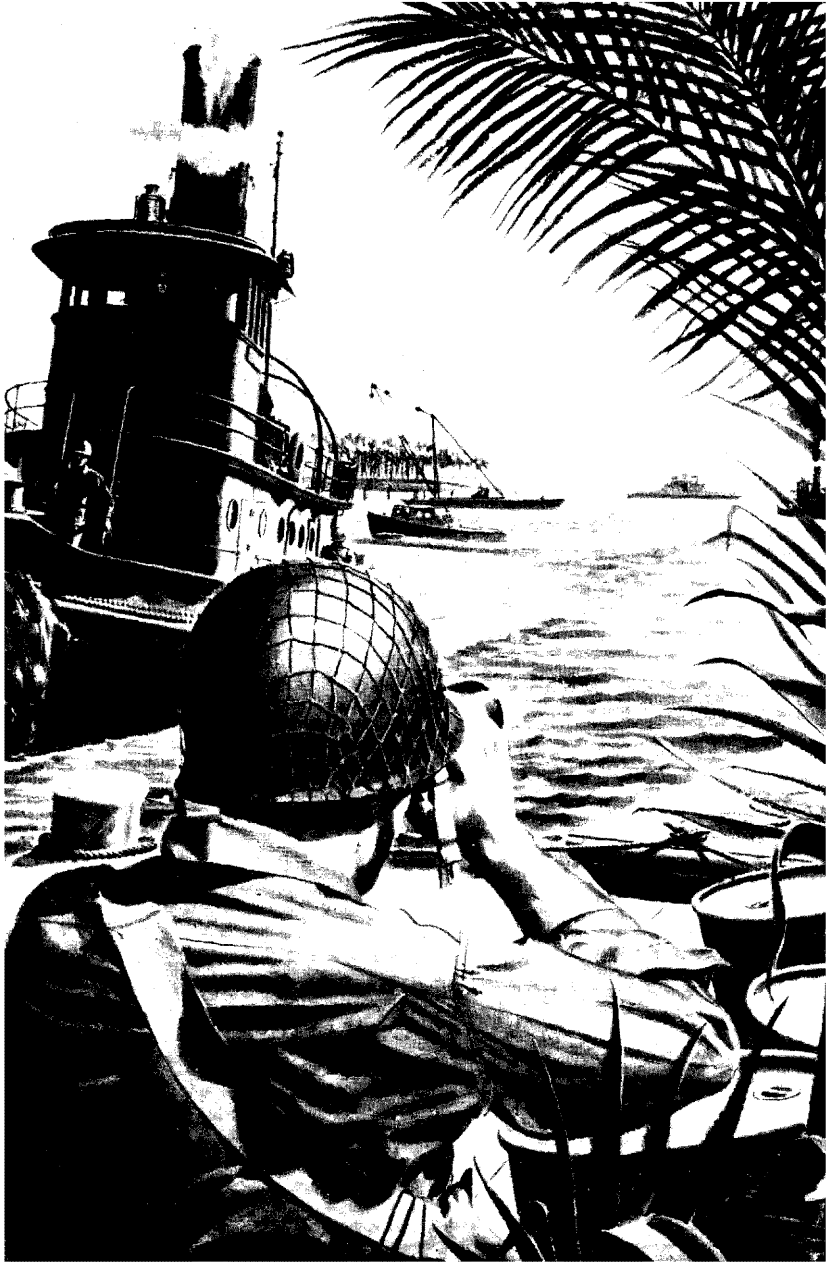
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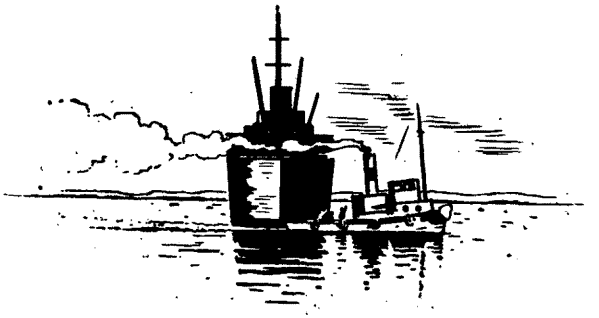
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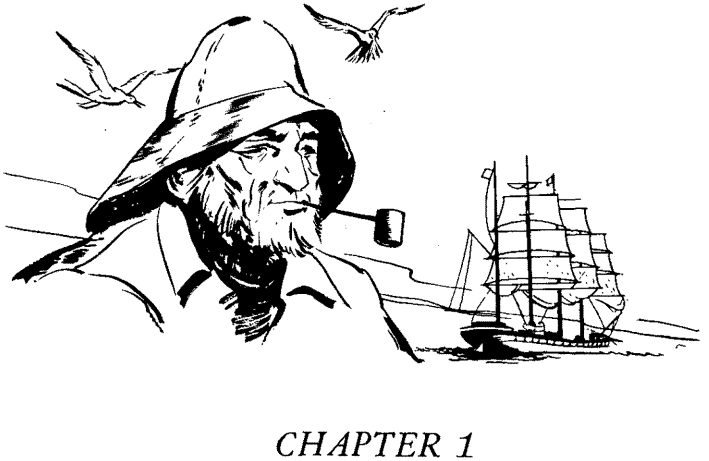


YOU'RE GOING TO BE

AN ARMY-SAILOR

Riding at anchor a half mile offshore at the debarkation port of Pogo Pogo is an Army freighter, newly arrived from Brisbane. In its hold and on its decks is a miscellaneous cargo of 105-mm. howitzers, caliber .30 ammunition, caterpillar bull-dozers, hypodermics, field boots, and beans—a fine assortment of things used in winning a war. Sailing that freighter safely into the harbor of Pogo Pogo was an achievement, but it was only a part of the operation. A lot of other things remain to be done, including the important job of ferrying that cargo on lighters and barges across that stretch of harbor water. These duties are the prime functions of an outfit in the Army known as the Harbor Boat Service. A part of the Transportation Corps to which you are assigned, the Harbor Boat Service, is a vital link in the chain of traffic which gets fighting men and material to the battle front in time and in shape to do the most good. You are, or are about to become, a part of that Service, and as a part of it you will have the distinction of being a combination soldier-sailor—an Army sailor.

The purpose of this book is to tell you what the Harbor Boat Service is, what it does, and what those who are assigned to it need to know.



CHAPTER 1

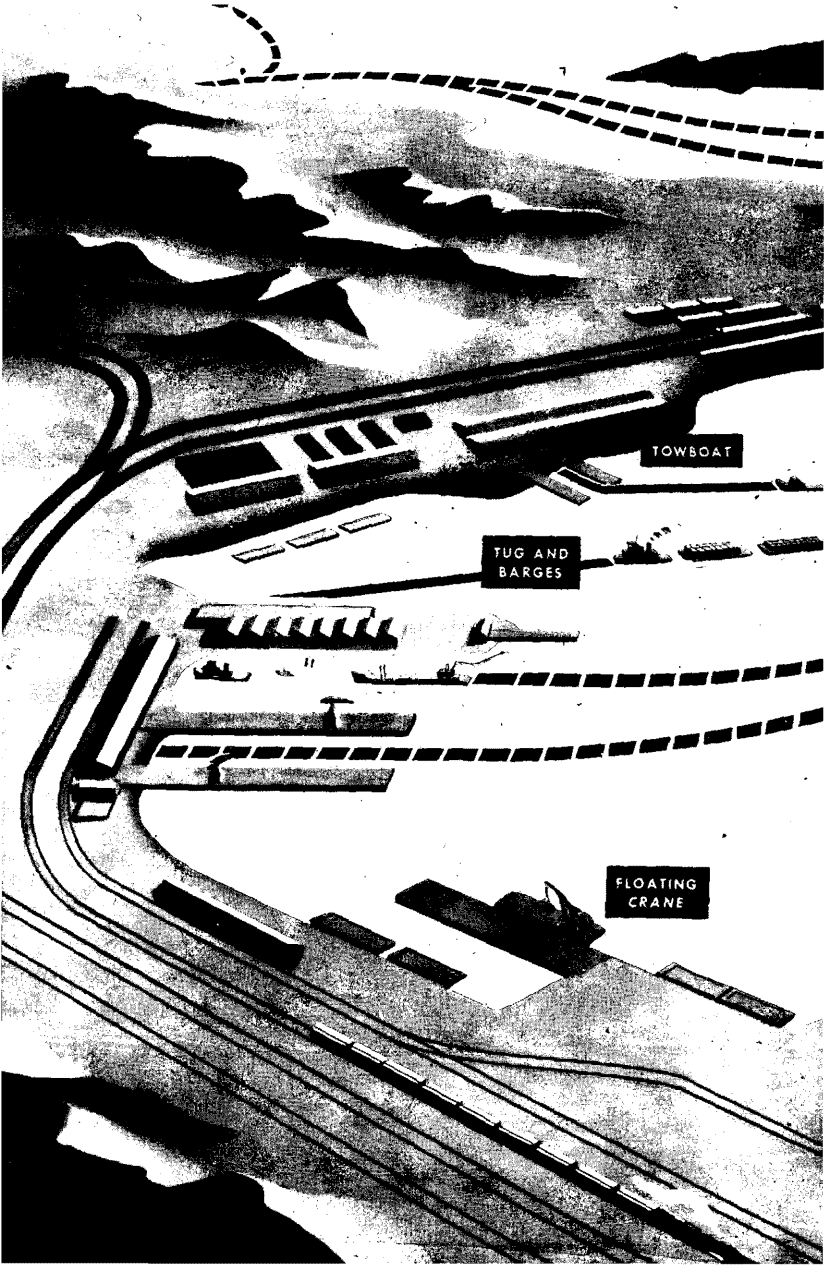
THE SEA . . . AND YOU

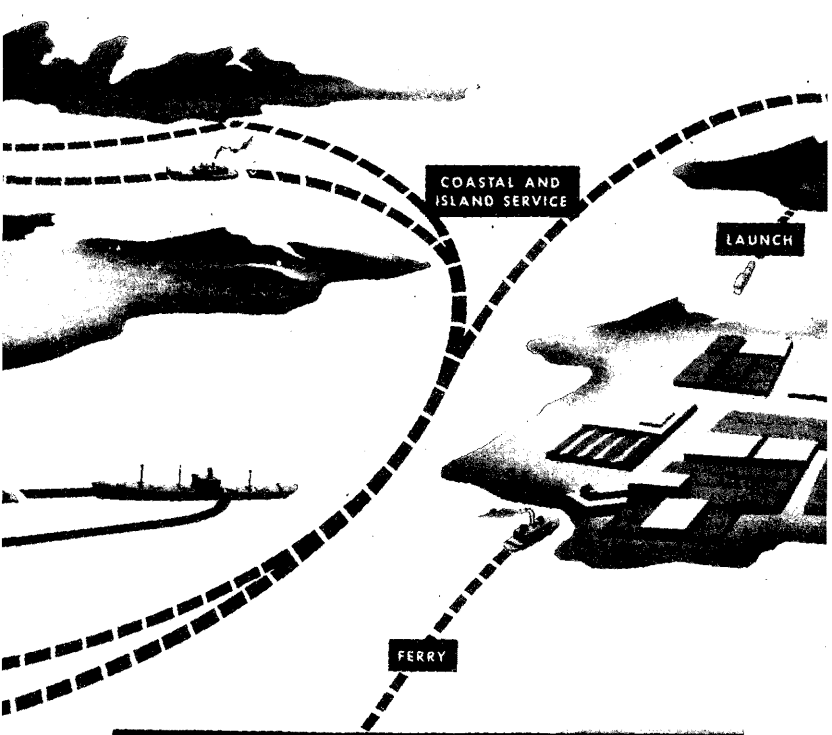
There is one thing to know at the start. You don't have to be an "old salt" to do a job in the Harbor Boat Service. Many of the men serving with it had never seen salt water before they joined the Army. They didn't need to, and neither do you. Men in the Harbor Boat Service will not have much to do with the big oceans. Transoceanic shipping is a function of another part of the Transportation Corps, and it is of no direct concern here. The Harbor Boat Service does what its name implies—it serves boats in harbors. The word harbor means "haven," and it describes a sheltered body of water, usually equipped with docking facilities, where a vessel may come to rest.

Sea duty will be either one of two kinds depending on where you are assigned, whether to a harbor craft company or a small boat company, both to be described later. If assigned to a harbor craft company your work will be largely within harbors in a theater of operations and will concern chiefly the transferring of

cargoes by barges and lighters from freighters and transports to shore. If assigned to a small boat company, you will be part of a crew on a vessel engaged in transporting Army supplies and personnel over relatively short distances, usually between islands or coastwise. An example would be a trip between New Guinea and Australia. It is the sort of work no one can learn just by reading a book. It is learn-by-doing work. There will be nothing in this manual which will tell exactly and precisely just what anyone is going to do or how it should be done. What will be found here is the general, over-all picture of the job to be done, the machinery which has been set up to do it, and how to go about getting it done.

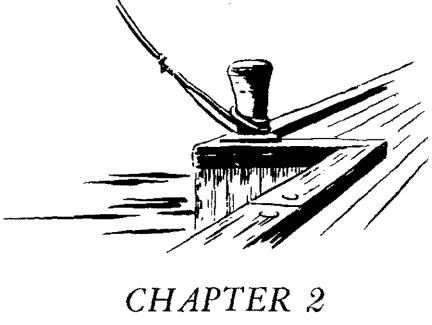



TOWBOAT
TUG AND BARGES
FLOATING CRANE



OPERATIONS IN A PORT

As explained on previous pages, the Harbor Boat Service includes several different types of units. This bird's-eye view of a typical overseas port shows the work of two of these. Here the operations of a harbor craft unit are indicated in a solid black line and the operations of a small boat unit in a broken line. Note that the former is busy unloading a freighter while the latter is operating the coastal and island service, the ferry, etc. The floating crane shown in the foreground is part of the equipment of the harbor craft unit.



CHAPTER 2

ORGANIZATION . . . THE SET-UP IN GENERAL

When it comes to organization, the harbor craft company and the small boat company have one important thing in common. They are both "tailor-made." This means that they are made to fit the job they are assigned to do. The number of sections and the number, size, and type of craft assigned to each, depend entirely on the circumstances surrounding the operation to be performed. A company operating in Alaska, for example, would have to be set up and equipped differently than one operating in the South Pacific islands. The organization charts of the companies appearing on pages 8 and 9, and 16 and 17 show typical units, which are composed from the boat crews, maintenance teams, and company headquarters in T/O 55–500. In actual operations the composition of these units may be changed considerably. The basic functions they perform, however, remain the same.

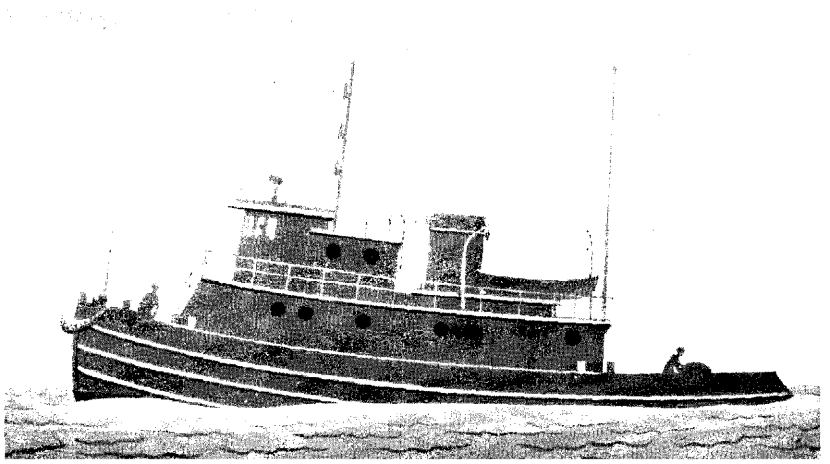
THE HARBOR CRAFT COMPANY

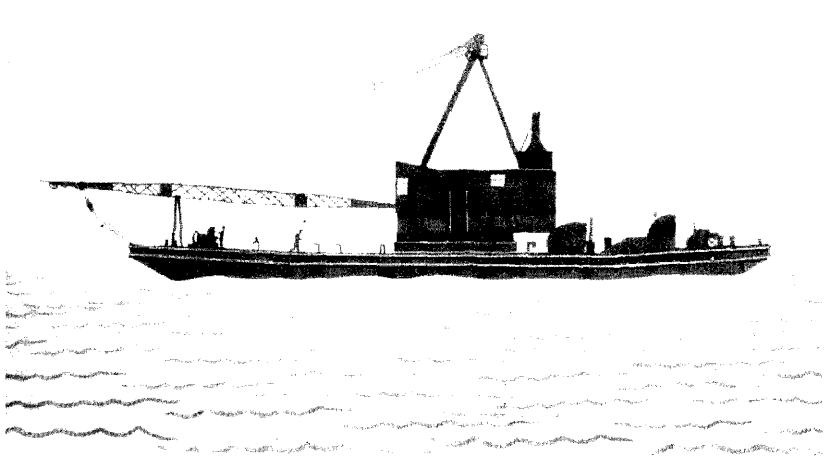
The harbor craft company is a military unit organized for the purpose of ferrying to shore cargo from freighters and transports arriving in theaters of operation. The vessels may either be riding at anchor offshore in the open sea or, which is the more likely, anchored in a harbor.

Cargo from the ships is loaded by Transportation Corps port company personnel onto the barges. Tugs, tow boats, or marine tractors then propel these barges to the shore for unloading. Any cargo too heavy for the vessel's gear to lift is handled by the 60-ton floating crane.

The composition of the company will depend on the circumstances surrounding the job to be done. The number and size

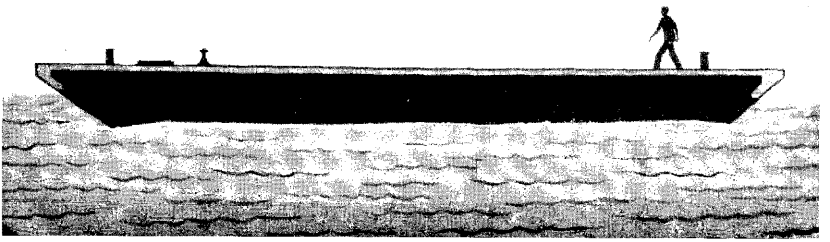
Small Tug. This small tug is 74 feet long and is driven by a 400-horsepower Diesel engine. She is used for pulling heavy tows and for maneuvering small vessels in the harbor. The master is assisted by the chief engineer, the mate, and the assistant engineer. The balance of the crew consists of four able seamen and two oilers. This vessel and others illustrated in this section are used by personnel of the harbor craft company.

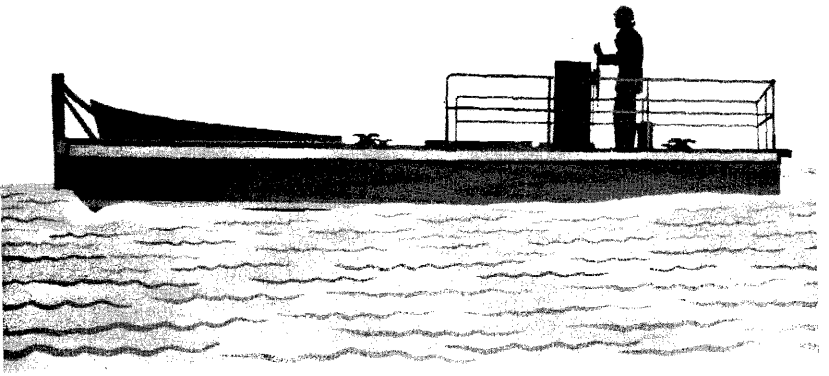




Floating Crane. The 60-ton floating crane is mounted on a 110-foot barge and is powered by a steam engine. The master commands a crew consisting of the chief engineer, a mate, an assistant engineer, two oilers, and four able seamen.

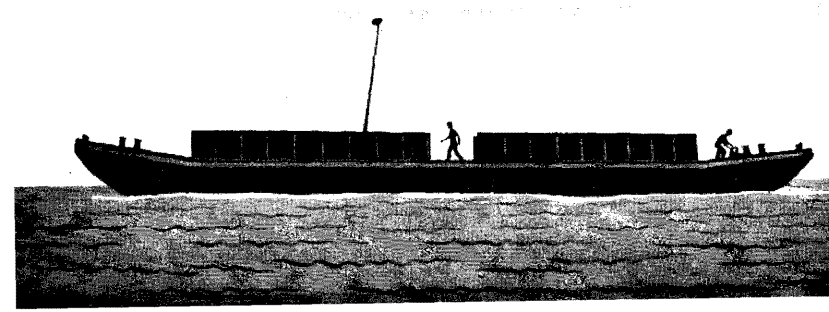
Knock-Down Barge. The knock-down barge is 63 feet long, is made of wood and, as its name implies, may be disassembled for easy transport from place to place. Her crew consists of four able seamen.

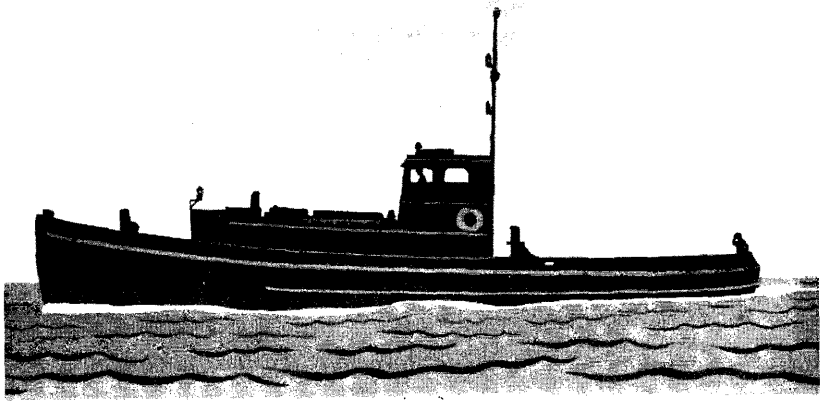




Marine Tractor. A marine tractor is a specially designed and developed vessel which is powered by two gasoline engines, each of which drives a propeller. Although small, she is extremely powerful and is used to push and pull loaded barges for short distances. Two operators are assigned.

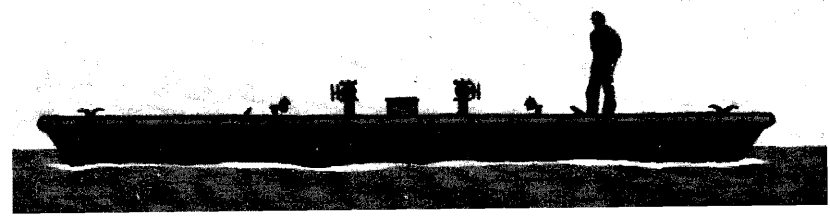
Cargo Barge. This standard Army cargo barge is 110 feet long, is made of wood or steel, and is not self-propelled. She is used to carry general cargo and is manned by a barge captain, an assistant barge captain, and four able seamen.

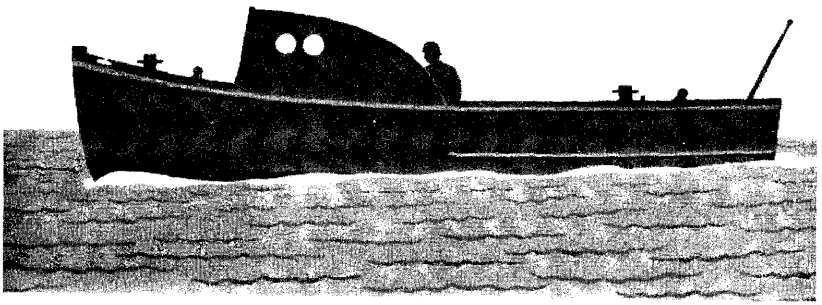




Large Motor Towboat. This towboat is 46 feet long and is powered by a gasoline engine. She is used to tow medium-sized barges. The master has a crew consisting of an engineer, a mate, an assistant engineer, and two able seamen.

Cargo and Oil Barge. Cargo and oil barge is a specially constructed, all-steel barge, 45 feet long. She is a combination vessel carrying either a cargo of oil or other liquid below deck, or regular cargo on deck. The crew consists of four able seamen.





Small Motor Towboat. This gasoline or Diesel-powered boat is 26 feet long and is used for towing light loads. The master has one assistant.

of tugs and tow boats, barges, and floating cranes will be determined entirely by the amount and nature of the supplies to be unloaded and the facilities and physical make-up of the locality.

Headquarters personnel will perform the usual administrative and housekeeping functions.

The maintenance and repair section, composed entirely of specialists, will keep the craft and other equipment of the company in good working order.

THE SMALL BOAT COMPANY

The small boat company is a military unit organized for the purpose of hauling cargo and passengers to bases along the coasts or on nearby islands within the theater. The size and type of vessels assigned to it will be determined by the amount

ORGANIZATION OF TYPICAL

Har Cft

COMDG OFFICER

COMPANY HQ

HQ SECTION

Consists of the necessary officer and enlisted personnel (clerks, mess, supply, drivers, etc.) for the usual administrative and housekeeping duties.

MAINTENANCE & REPAIR SECTION

Maintenance officer with necessary enlisted men (mechanics, plumbers, welders, etc.).

FLOATING CRANE



60-TON FLOATING CRANE (110')

Master and engineer assisted by personnel required to operate crane.

BARGES



CARGO BARGES 100' (6)

Barge captains, assistants and able seamen for each barge.



KNOCKDOWN BARGES 63' (9)

Able seamen assigned to each barge.



CARGO AND OIL BARGES 45' (5)

Able seamen assigned to each barge.

HARBOR CRAFT COMPANY

TUGS

SMALL TUG SECTION



74' TUGS (2)

For each tug—a Master, mate, engineer, assistant engineer, oilers and able seamen.

MARINE TRACTOR SECTION



MARINE TRACTORS (2)

For each tractor, a tractor driver.

SMALL MOTOR TOW BOAT SECTION



26' MOTOR TOW BOAT (1)

Master and assistant operator.

LARGE MOTOR TOW BOAT SECTION



46' MOTOR TOW BOATS (3)

For each tow boat—a master, engineer, mate, assistant engineer and able seamen.

and nature of the cargoes and the number of troops or other personnel to be transported.

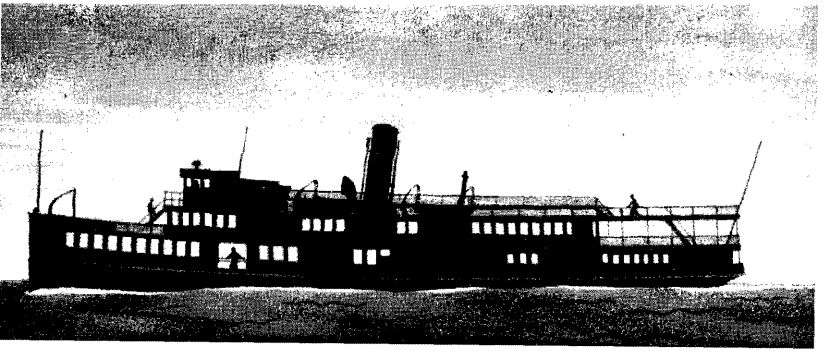
Each company will have a company headquarters which will perform the usual administrative and housekeeping duties. However, company headquarters may remain inactive if the company is attached to another Transportation Corps organization or if, for some other reason, it is not required.

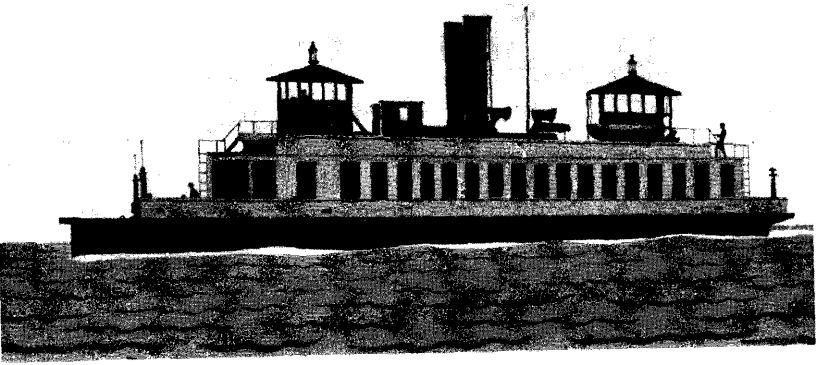
Unless the small boat company is operating from a port where adequate maintenance and repair personnel is available, maintenance and repair sections or teams, or combinations of the two, will be assigned according to the number and type of vessels to be serviced.

Radio communication for these boats will be furnished by Signal Corps personnel.

Medical service will be furnished by dispensaries or station hospitals attached to the port from which the company operates.

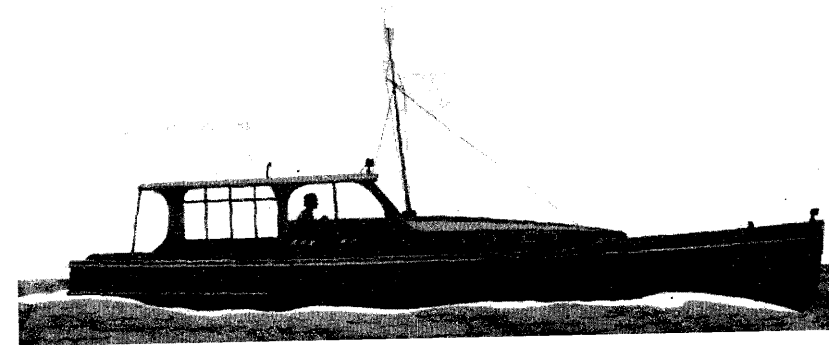
Freight-Passenger Vessel (125–175 feet). This combination freight-and-passenger vessel is used to transport cargo and personnel in interisland and coastwise waters. She is a Class A vessel, 125 to 175 feet long, may be of wood or steel, and may be powered by either steam or Diesel engines. The ship's master is assisted by the chief engineer and mate, the chief assistant engineer, second mate, and second assistant engineer. If the vessel is equipped with one or more guns, a gun commander is assigned. The balance of the crew consists of one cook, who also functions as supply sergeant, six able seamen, three oilers, and one cook's helper.

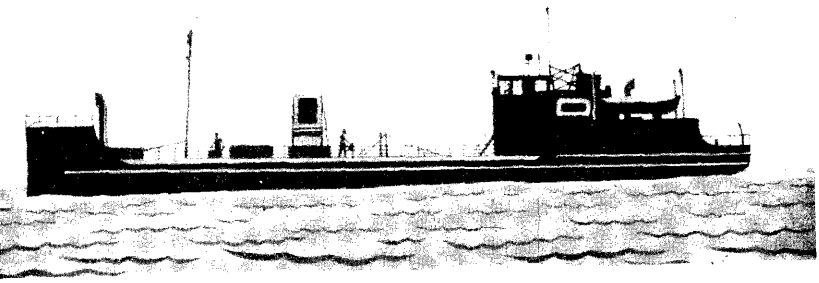




Large Ferryboat. Ferryboats, similar to those used in civilian life, also are used by the Army. If 100 feet or over, they are considered as Class A vessels and carry the same crew as the freight-passenger vessels, except that ordinarily no gun commander or cooks are assigned.

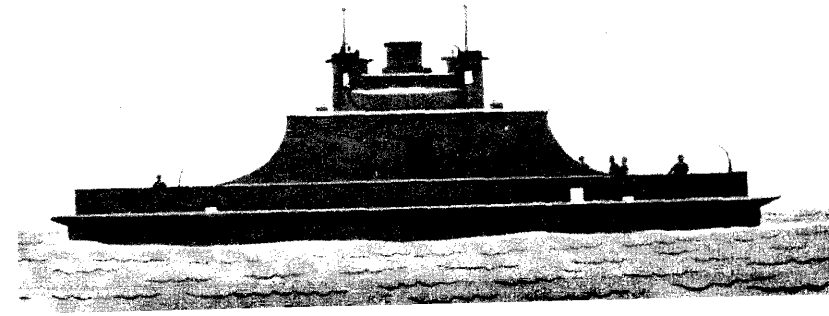
Motor Launches (under 50 feet). Motor launches in Class D are similar to those of Class C, except for their smaller size. They are manned by the master, engineer, and one able seaman.

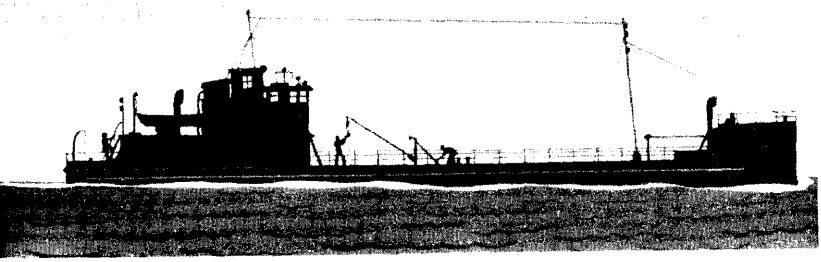




Class A Tanker. Class A tankers, used in transporting petroleum products, are 150 feet or over. They are made of steel and especially designed for the type of cargo they are to carry. They are manned by the same crew as other Class A vessels.

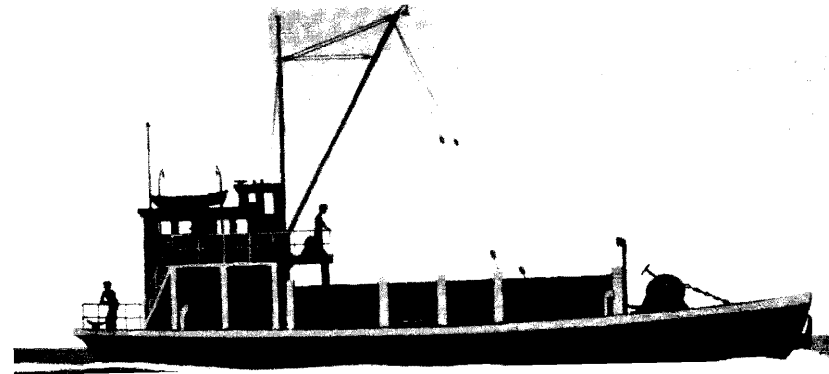
Ferryboat (100 feet). Small ferryboats are used to transport personnel and vehicles where larger vessels are not required. Ferryboats less than 100 feet long are in Class B and, except for the cooks, carry the same complement of officers and men as Class B cargo and freight-passenger vessels.

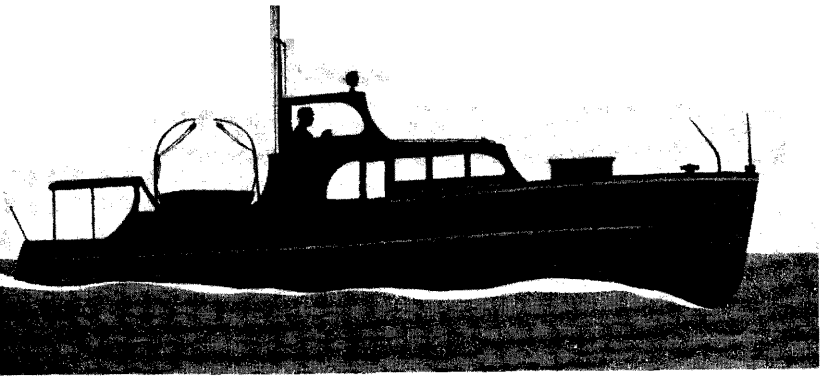




Barge, Self-Propelled (100 feet). These barges usually are of steel, propelled by Diesel or gasoline engines, and are used to carry all types of cargo at slow speeds. Falling into Class B, they carry the same crew as Class B freight-passenger vessels.

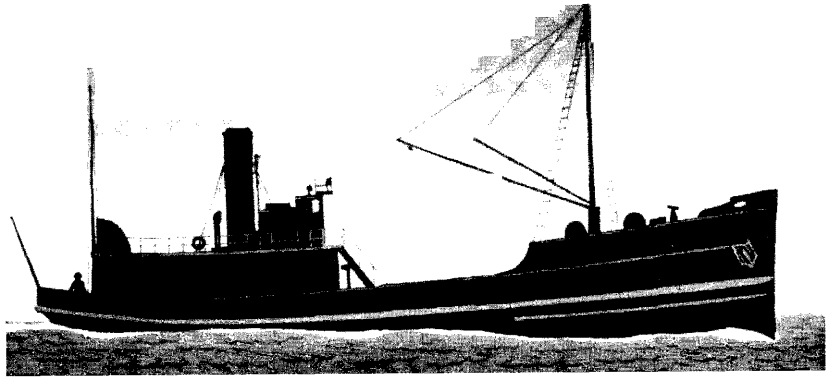
Barge, Self-Propelled (100 feet). Self-propelled barges under 100 feet are in Class C. They may carry cranes or cargo-handling gear, such as the one illustrated. They usually are propelled by Diesel engines and are used in short hauls in fairly smooth waters. The master is assisted by the engineer and two able seamen.

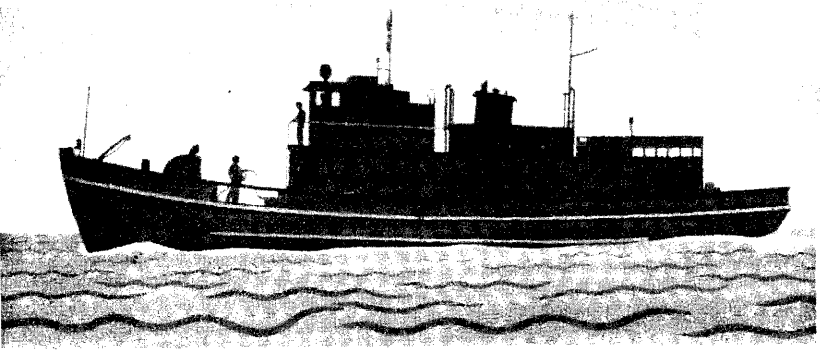




Motor Launches (50 feet and over). Motor launches over 50 feet are also Class C boats and usually are manned by the same crew as the small, self-propelled barges. They are used for transporting personnel and cargo. Because of their construction and powerful motors, they are capable of fairly high speeds.

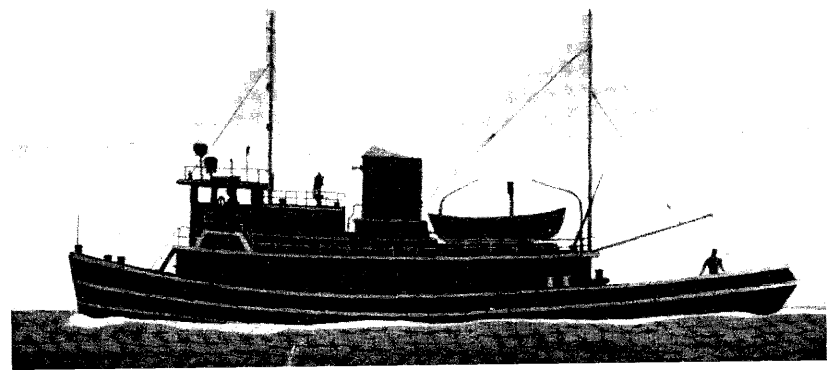
Water Boat. Water boats are especially constructed for use in transporting of fresh water to bases where the water supply is lacking or inadequate. They are usually about 100 feet long and carry the same crew as a Class B freight-passenger vessel.





Freight-Passenger Vessels (125 feet). Freight-passenger vessels less than 125 feet in length are in Class B. Their mission is to transport personnel and cargo for short distances in inter-island and coastwise waters. The master has a crew consisting of the first mate, the chief engineer, the first assistant engineer, a cook and cook's helper, four able seamen, and an oiler.

Seagoing Tugboat (100 feet). A seagoing tugboat is a sturdy, heavily powered vessel usually 100 feet or more long. She is in the Class A vessel category, carrying the same crew as that outlined for the Class A freight-passenger vessels.



ORGANIZATION OF THE



COMDG
OFFICER

COMPANY HQ

Consists of the necessary officer and enlisted personnel (clerks, mess, supply, drivers, etc.) for the usual administrative and housekeeping duties.

REPAIR TEAM

Consists of specialists such as—marine mechanic, rigger, ship fitter, blacksmith, welder, carpenter, painter, etc. Can operate independently to repair vessels.

MAINTENANCE TEAM

Consists of specialists such as—marine mechanic, electrician, marine engine mechanic, ship fitter, carpenter, etc. Can operate independently to maintain vessels.

MAINTENANCE & REPAIR SECTION

Consists of officer and enlisted personnel specialists such as—master marine mechanic, ship's carpenters, electricians, machinists, marine engine mechanics, riggers, ship fitters, welders, blacksmiths, painters, pipe fitters, stock clerks, etc., in sufficient numbers to maintain and repair vessels of company.

SMALL BOAT COMPANY

BOAT CREWS

CLASS A



Freight-passenger vessels (125'-175')



Ferry boats (100' and over)



Tanker (150' and over)



Seagoing tugs (100' and over)

CREW FOR EACH VESSEL:

Master, chief engineer, mate, first assistant engineer, second mate, second assistant engineer, gun commander, cook (also acts as mess and supply), able seamen, oilers, cook's helpers.

CLASS B



Freight-passenger vessels (less than 125')



Ferry boats (less than 100')



Water boats



Barges self-propelling (over 100')

CREW FOR EACH VESSEL:

Master, mate, chief engineer, assistant engineer, cook, able seamen, oiler, cook's helper (also able seaman).

CLASS C



Motor Launches (50' and over) Crew for Each Vessel:

Master, engineer, able seaman.

CLASS D



Motor Launches (Under 50') Crew for each Launch:

Master, engineer, mate, able seamen.

PERSONNEL

The titles of the positions shown in the two organization charts on pages 12 and 13, and 20 and 21 have specific duties attached to them. Here are brief summaries of those duties.

Unit Commander. Commands a unit of harbor craft or small boats; supervises operations of tugboats, motor tow boats, marine tractors, floating cranes, cargo barges, oil barges, ferryboats, small tankers, and freight and passenger vessels; assigns crews for operating shifts and issues orders to crews; inspects tugs and equipment and oversea loading of cargo barges; plans towing procedures and hook-ups; directs placing and moving of floating cranes and supervises crews in rigging and operating cranes; keeps log of tug and barge movements and conditions; prepares reports of unit activities and is responsible for its administration, training, supply equipment, transportation, and security; requisitions supplies.

Master or Mate. Directs navigation, repair, and maintenance of various types of vessels, and is responsible for the safety, conduct, and training of all technical personnel; supervises crew in navigating, manning guns, and maintaining equipment; inspects vessel to insure proper stowage of cargo and equipment and fitness for operations; supervises arrangements of deck machinery; inspects conditions; plots prescribed course from maps and maintains a chart of location; keeps log of operations; prepares specifications for repair and maintenance work; directs communication between ships and from ship to shore.

Chief Engineer. Directs and supervises activities of engine room crew; supervises repairs and operations of engines, pumps, injectors, condensers, boilers, electrical equipment, refrigerating and sanitary equipment, deck machinery, and steam connections; starts, stops, and controls speed of power equipment; ascertains that correct water level is maintained in boilers; keeps log of performance of equipment on voyage; supervises rigging of emergency repairs at sea and permanent minor repairs when

laid up in port; supervises fueling of vessel; requisitions engine room supplies and keeps inventories; stands watch in engine room; may operate steam or Diesel engines.

Ship Maintenance and Repair Officer. Plans and supervises maintenance and repair of vessels, excluding mechanical and electrical equipment; inspects vessels to determine extent and nature of repairs to hulls and superstructures, and prepares working drawings and specifications; inspects repair operations for quality of materials and workmanship and conformance with requirements; coordinates shop and inspection procedures to insure serviceable conditions of vessels and equipment; arranges for docking of vessels for underwater repairs; maintains records and files of operations performed by outside contractors of Army maintenance shops; requisitions supplies for repairs; directs the conversion of cargo ships to troop transports.

Diesel Mechanic. Repairs, adjusts, and replaces defective parts in Diesel motor assembly; diagnoses Diesel engine trouble, disassembles engine, makes necessary adjustments, and reassembles engine and adjusts fuel and air valves.

Blacksmith. Forges metal articles and parts; repairs frames, springs, general machinery, and chains; tempers steel; dresses tools.

Crane Operator. Lifts and moves heavy objects with any type of Diesel, gasoline, or steam-powered crane; manipulates levers and pedals to rotate crane upon its chassis, to raise and lower crane boom, and to raise and lower the load line and anything attached to it.

Able Seaman. Performs all regular and emergency duties required in deck service; lowers, steers, and handles lifeboat; splices rope; makes minor repairs and depth soundings, and performs other routine duties.

Electrician. Lays out, assembles, installs, tests, and maintains electrical fixtures, apparatus, control equipment, and wiring.

Marine Engineer. Under supervision of chief engineer, takes complete charge of operation of engines, boilers, electrical, refrigerating, and sanitary equipment, all deck machinery, and steam connections.

Machinist. Operates all types of machine tools including lathes, milling machines, planers, and shapers, and uses all machinist's hand tools; works from blueprints and written specifications, using charts and tables in connection with planning shop work; understands properties of metals and is capable of shaping metal parts to precise dimensions.

Oiler. Oils main engines, auxiliaries, and electric motors.

Painter. Does all types of painting required on vessels.

Pipe Fitter. Lays out and does general work necessary in installations of permanent or temporary fittings of fuel, air, or water pipes, fillings, low-pressure steam pipe, and boiler and pump connections.

Rigger. Sets up, braces, and rigs hoisting equipment; splices rope or steel cable; erects and hangs working platforms; reeves and runs rope and guy wire for operating power equipment and moving heavy materials; does all types of general rigging work.

Carpenter. Does all general woodwork jobs, including the making of repairs, and of new wooden structures when required.

Welder. Joins metal parts to fabricate various articles or to repair broken objects; sets up and operates all welding apparatus.

Master Mechanic, Marine. Supervises or assists in supervision of maintenance and repair of marine Diesel and gasoline engines and auxiliary equipment on military vessels; inspects boilers, electrical refrigerating and sanitary equipment, deck machinery, and other machinery and equipment; prepares reports on repair operations; may instruct ship fitters in work pertaining to hull repairs; may supervise or assist in supervision of installation of marine engines and installation and operation

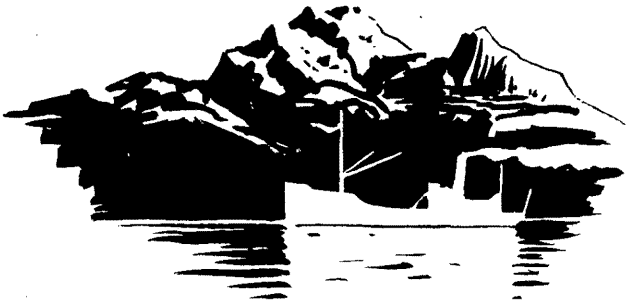
of repair facilities; may keep log of performance of equipment on voyages, requisition supplies, and supervise fueling.

Mechanic, Marine Engine. Maintains and repairs all types of marine engines and equipment; checks operation of machinery; reports on repair operations, labor, and material; and keeps log of performance of equipment on voyages.

Machinist's Helper. Assists machinist in construction and repair of metal parts, tools, and machinery, using blueprints and written specifications under general supervision of machinist.

Motorboat Operator. Operates and maintains small vessels powered by gasoline, Diesel, or steam engines; knows navigation within harbors, and use of nautical charts.

Ship Fitter. Makes templates and lay-outs for special forms; marks rivet holes to be punched or drilled; assembles plates, bottom frames, side frames, and brackets for bilge and decks, watertight and nonwatertight floors, bulkheads, clips for vertical keel, longitudinal stringers and brackets; lays out deck plates and tie plates, clips, angles, and beams for inner bottom plates, angles, and all foundation work.



CHAPTER 3

OPERATING A SHIP— BASIC SEAMANSHIP

Men assigned to the Harbor Boat Service may start in as oilers or as able seamen and end up as chief engineers or masters, but no matter what duties they are assigned to do, all will have to know something about operating a ship.

The art or skill of working on a ship is known as seamanship. It is quite a business, running all the way from how to tie up at a dock to steering a course from New York to Capetown. Many things will seem strange at first, and a little confusing. But it will not take long to learn them because it will be found that there is a good, sensible reason for everything and for the way everything is done. All men will be well trained in the basics, such as rope splicing, signaling, steering, piloting,

and so on. Other things like the language, how to live with others in a small space, the do's and don'ts, will be picked up gradually and, for the most part, by each man on his own.

It will be the aim of this chapter to give some general information and some hints along these lines so that newly assigned men will not feel so much like strangers when they get aboard. It will touch on such matters as the language of the sea, discipline and courtesy aboard ship, and rules of the road at sea.

LANGUAGE

Men who go to sea have a language of their own. Like the language of any profession or trade, it is understood by those who have used and developed it, and it fits their needs very well. But like any other specialized lingo, it is strange to the newcomer. Do not be afraid of it; you will pick it up fast. Always feel that it is your duty to ask questions. If someone uses a word you do not understand, ask what it means.

A boat is always a SHE or a HER. When you get on a vessel you are ABOARD or ON BOARD her. When you stand in the middle of her you are AMIDSHIPS, and when you look up toward the front end you are looking FORWARD, or toward the Bow. The side of the vessel on your right hand as you look forward is the STARBOARD side, and the left is the PORT. When you turn around and face the rear you are facing the STERN, or AFT.

Looking from bow to stern is FORE-AND-AFT. From port to starboard, or across the middle, is ATHWARTSHIPS. The width of a vessel is known as the BEAM. The length is L. W. L. or LENGTH AT WATERLINE, or L. O. A., LENGTH OVER ALL.

You are standing on DECK. The side of the vessel between the deck and the waterline is TOPSIDES. From the deck to water level is known as FREEBOARD. Any housing on the deck is known as the SUPERSTRUCTURE.

The lowest part of the vessel is the BILGE, and water which collects in it is called BILGE WATER. The KEEL is the bottom center line of the vessel and is its backbone. The SKEG is a strong timber (in wooden vessels) running straight off below the keel. The DRAFT of a boat is the depth of water required to float her. In less water than that, she will go aground.

An ANCHOR is a device which grips the bottom of the sea and holds the vessel fast. When you pull up the anchor you WEIGH anchor, and after that you are UNDER WEIGH or UNDER WAY. The white, bubbly foam you leave behind is your WAKE. Vessels are steered by RUDDERS. The COMPASS is the instrument which shows the direction you are going.

When a vessel moves forward she moves AHEAD, and when she goes backward she goes ASTERN. A vessel has HEADWAY when she is moving forward, STERNWAY when moving backward. STEERAGE WAY is the slowest speed at which a vessel can be controlled by her rudder. WINDWARD or TO WEATHER means the direction from which the wind is blowing. LEEWARD (loo'ard) means the opposite—the direction toward which the wind is blowing. LEEWAY is the drift of a vessel to leeward caused by the wind.

Something roughly at right angles to a vessel's fore-and-aft line is ABEAM the boat. Something halfway between ahead and abeam is BROAD ON THE (STARBOARD OR PORT) BOW. Something halfway between astern and abeam is BROAD ON THE (STARBOARD or PORT) QUARTER. When another boat comes up next to yours she is ALONGSIDE. If a ship or other object is away off and partly below the horizon, she is HULL DOWN.

When a vessel is tied up she is MADE FAST. You cast a LINE, not a rope. Lines used in making fast are run off through CHOCKS, and the fixture you tie up to is a CLEAT, a BITT, or a BOLLARD. Small and medium-sized boats put out FENDERS when they dock to protect the sides from chafing or being STOVE IN.

It is difficult to know where to stop in talking about sea terms. These few samples will do for a while, but in the back

of this book there is a list of frequently used sea words and terms. Study the list whenever the opportunity presents itself.

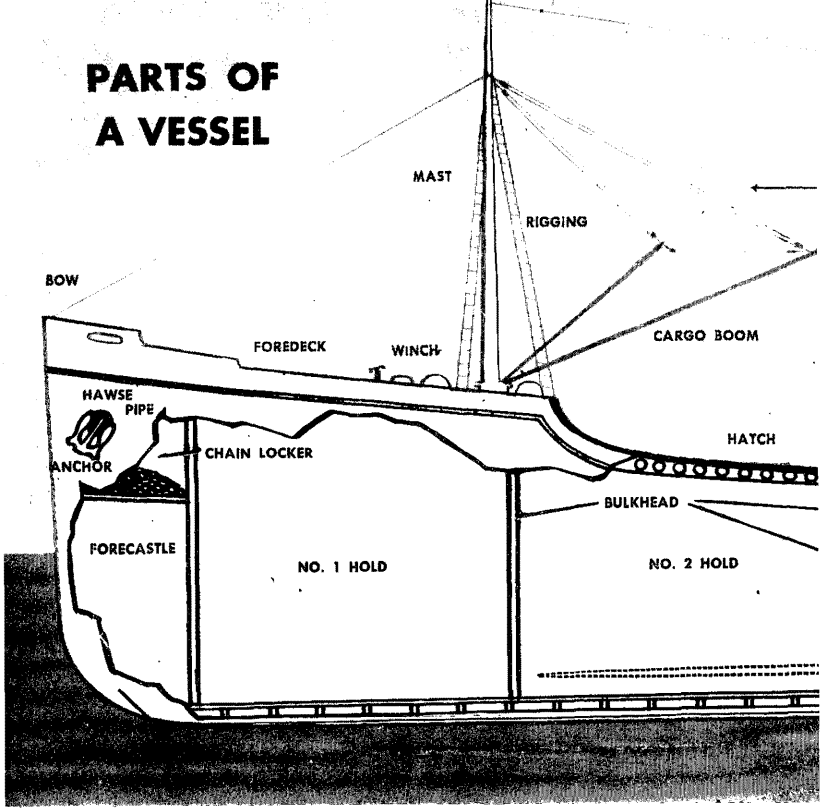
DISCIPLINE AND COURTESY

Discipline is willing obedience to a leader. The leader aboard ship is the master. Out of hearing, never to his face, he is called the "old man" or "skipper," regardless of his age. He is the Boss. His word is law at all times, and it must be obeyed. This goes for all vessels, rowboats to battleships, and regardless of who may be aboard. Your ship may be carrying a group of generals, but that makes no difference. The master is still the boss, and what he says goes. He is in full charge of everyone and everything aboard, and in case of accident or loss he is held accountable. On large ships where mates and engineers are assigned to help the master, they take their orders from the master and pass them down the line to the crew members.

Discipline aboard ship is vital. A voyage can be pleasant to all hands or can be disagreeable and dangerous depending on the degree of discipline in force. All hands are expected to do their part, and for those who think and act otherwise there are severe penalties.

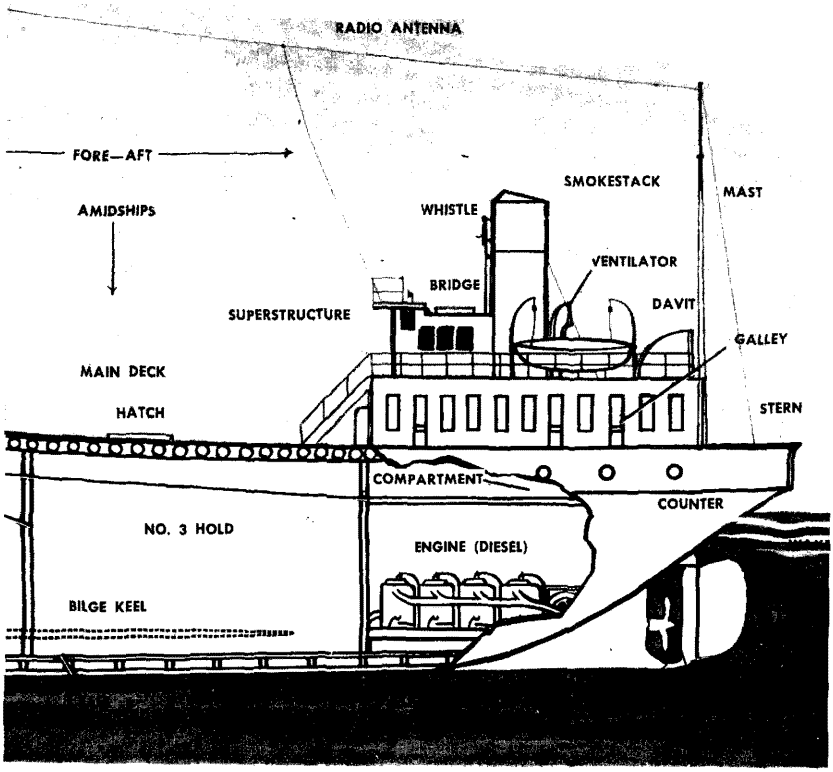
Courtesy is just a matter of being decent and civil to others. This is particularly important aboard ship where there is only a little room to move around in. Military and naval courtesy is not much different from the courtesy men show each other in civil life except that certain procedures have become standardized. Most of these common practices are familiar to all who have had basic training. But to help you get off on the right foot, a few pointers on what to do and how to act will be given in the following paragraphs.

When first going aboard ship, as you reach the top of the gangplank, be sure to salute the colors. When going ashore, do the same thing.



After saluting the colors, step aboard and report to the commanding or executive officer (through the deck officer on watch). Don't forget to salute the deck officer if he is a commissioned officer. Give your name, rate, and the capacity of your assignment. You will have the necessary orders of your assignment to the vessel, and these should be turned over to the deck officer.

Having reported, the next step will be the assignment of quarters. Most of the vessels in the Harbor Boat Service are small, and there may be times when you may feel a bit cramped aboard them. Don't expect all the comforts of home when



living aboard ship. Your first few days aboard will type you with your fellow crew members and with your officers. It is important to make a good first impression. Do this by being as agreeable as you can no matter what happens.

If you have any spare time during the first few days aboard, take time out to know your vessel. It is the Army's plan to standardize Harbor Boat Service vessels as far as possible, so that you will know your way around whether you are on a 74-foot tugboat or a 175-foot freight-passenger vessel. Know where the life preservers are stowed, and where the fire fighting equipment is.

When spoken to by an officer, come to attention unless you are busy with a job and cannot leave it. If an order is given, it must be carried out at once even though you think it could be done better some other way. Do what is ordered without hesitation. When a command is given, it is to be executed on the double.

Always be prompt in reporting for a change of watch and upon return from shore leave.

Never impose on officers, and keep away from their quarters unless strictly on business. Whenever possible, refrain from having business with officers until they show themselves on deck. Officers will stay away from crew quarters unless on inspection tours or in an emergency. If officers must be visited in their quarters, the visit should be brief. Do not loll around. State your business quickly and leave.

And men who want to stay on good terms with their fellow shipmates and officers will NOT WHISTLE WHILE ON BOARD.

TRAFFIC RULES OF THE SEA

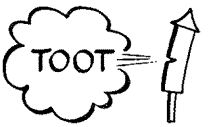
There are traffic rules for ships just as there are traffic rules for automobiles. The purpose for them is the same. They have been written to prevent accidents. Although these rules basically are simple, over the years they have multiplied and have been expanded to a point where at present they are voluminous. It is not necessary to become familiar with all of them immediately, but it is necessary to know the fundamentals. This section will outline briefly what is essential.

Above all, there are two things to remember. Here they are:

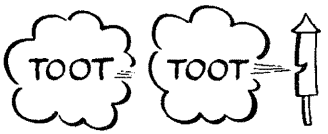
1. Safety will come from obeying the rules. Stick to them, yielding only in cases of extreme emergency. Be cautious; don't take chances.

2. Always stand by a ship in trouble. Never leave the scene of an accident until there is absolutely nothing else that can be done to help, particularly if lives are at stake.

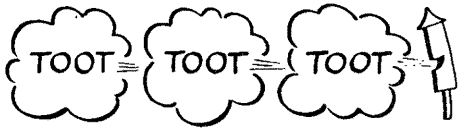
Whistle Signals. Ships tell each other what they are going to do by sounding whistle signals. Here they are:



ONE short blast: "I am directing my course to starboard (right)."



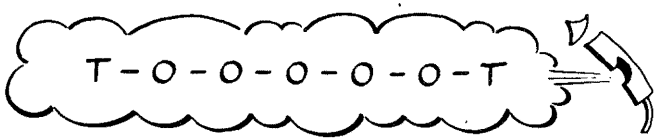
TWO short blasts: "I am directing my course to port (left)."



THREE short blasts: "I am going astern (back)."



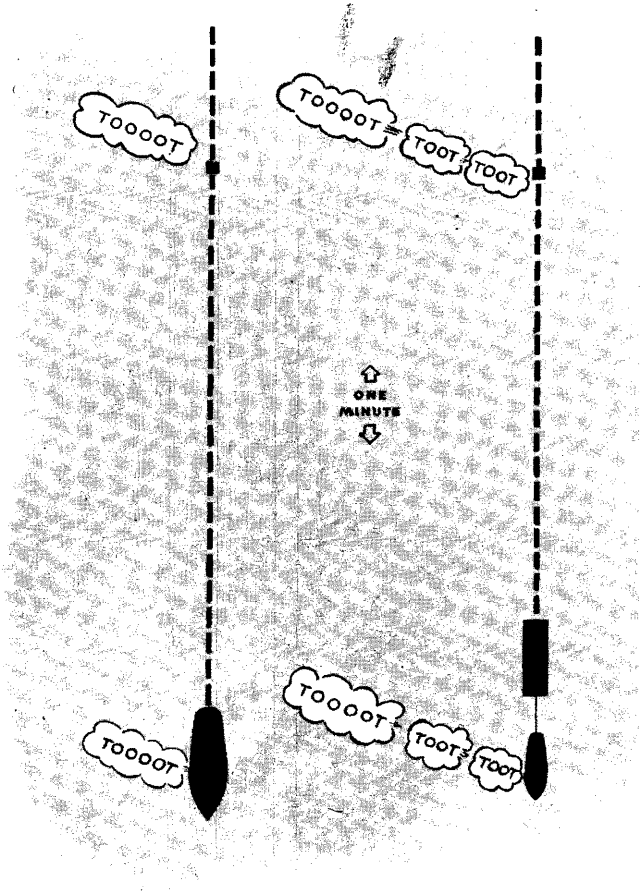
FOUR or more short blasts: "Distress."



ONE PROLONGED blast: Sounded when leaving dock or slip.

All of these signals must be answered with a similar signal or with a distress signal.

Fog Signals. In foggy weather, ships let each other know where they are by sounding their whistles.



ONE PROLONGED blast lasting 4 to 6 seconds sounded once every minute.

ONE PROLONGED blast and TWO SHORT blasts sounded once every minute when towing or being towed.

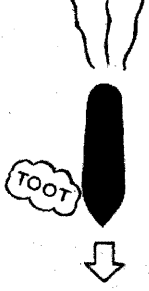
Rules of the Road at Sea. Ninety percent of collisions at sea grow out of careless disregard for or plain ignorance of a few simple traffic rules. The more important of these rules are shown in a series of pictures on the following pages. These rules must be learned. The man who will not study them and know them, and keep on refreshing his memory, will find no short-cut method to help him. These vital rules actually must be learned at sea, where the constant passing of vessels, sail and steam, drives home their meaning. Memorize the rules from the illustrations that follow, and visualize them at sea.



APPROACHING HEAD ON

When approaching head on, or nearly so, each vessel will alter her course to starboard (right). The ships pass each other on their own port (left) sides.

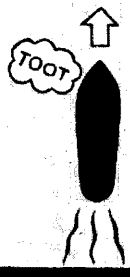
Whistle Signal. *One* short blast, one vessel answering the other.

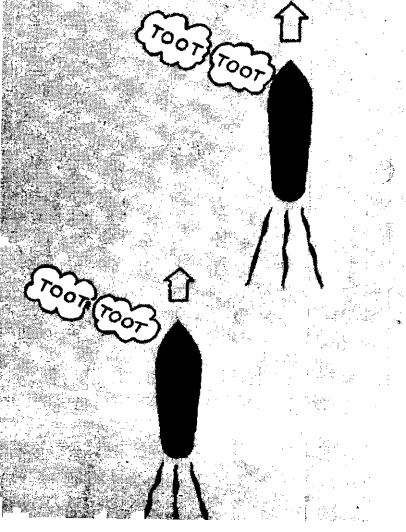


PASSING CLEAR

If two vessels are approaching each other in such a way that they may pass clear and without danger of collision, they may keep on their respective courses.

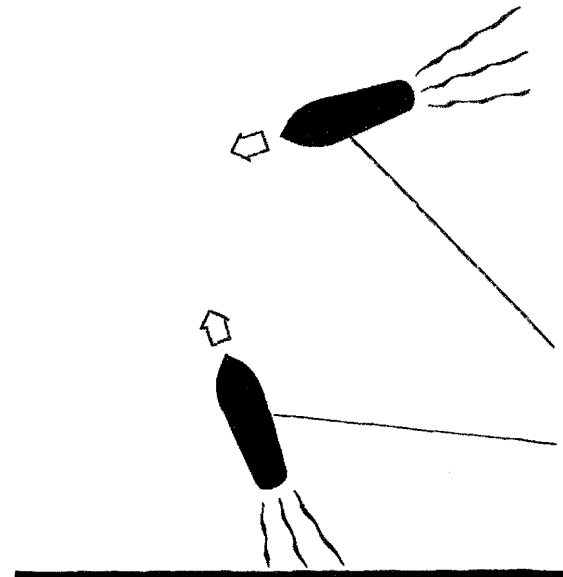
Whistle Signal. One short blast, one vessel answering the other.





OVERTAKING

When one vessel is overtaking another, the overtaking vessel must signify her intention of passing on the starboard (right) side by sounding *one* short blast of her whistle. If she intends to pass on the port (left) she must sound *two* short blasts. She may proceed to overtake only after these signals have been answered by the same number of blasts by the vessel to be overtaken. If the signals are not answered, the overtaking vessel will not pass.

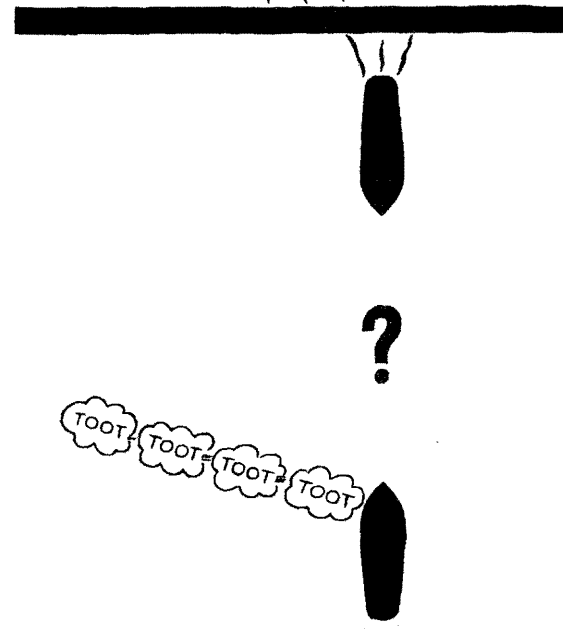


CROSSING-RIGHT-OF-WAY

When two vessels are about to cross each other, the one which has the other on her own starboard (right) side will keep out of the way and let the other go ahead.

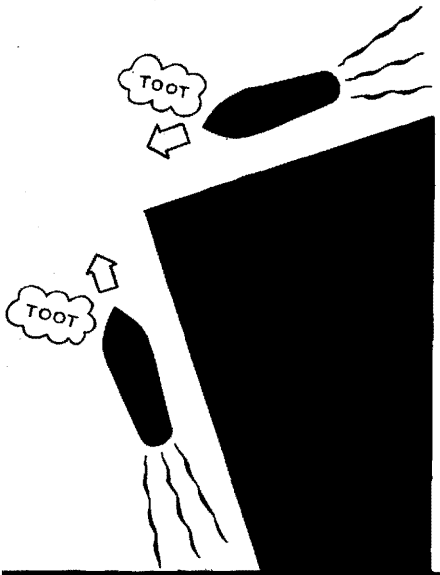
This ship has the right-of-way and may proceed.

This one has the other on her starboard (right) side and must keep out of the way.



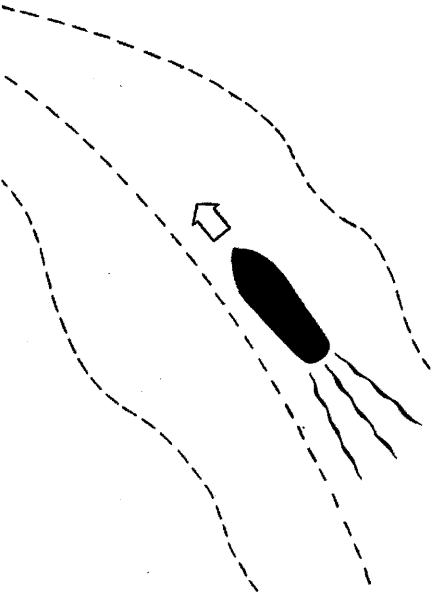
WHEN IN DOUBT

When two vessels are approaching each other and either one does not understand the course or intention of the other, the vessel in doubt will give four or more short and rapid blasts of her whistle. It makes no difference which one sounds the alarm. It usually is done by the vessel whose master first becomes alert to the danger. The signal must be given at several lengths distant.



MEETING AT INTERSECTION

When a vessel is approaching a short bend or curve, or is coming out of a dock or slip, she will signal by one long blast of the whistle. This will be answered by a similar blast given by any approaching vessel within hearing distance.



KEEP TO THE RIGHT

In narrow channel every vessel, when it is safe and practical to do so, will keep to that side of the fairway or midchannel which is on her starboard (right) side.

Buoys. Buoys (variously pronounced "boo-ees" and "boys") are traffic markers like white lines and signs on roads. Although there are several kinds of buoys, they all perform the same function. That function is to guide vessels into safe passageways. The difference in their shapes depends on tides, current, and local conditions. Those pictured here show the ones seen in United States waters. Markings in foreign waters vary widely. Whenever possible, it is advisable to consult local authorities for buoy markings before entering such waters.

A good general rule to follow in being guided by buoys is this: When coming in from seaward to a harbor or landing, keep all red buoys on your starboard (right) side, and all black buoys on your port (left) side. The reverse applies when you are heading seaward from a harbor or landing.

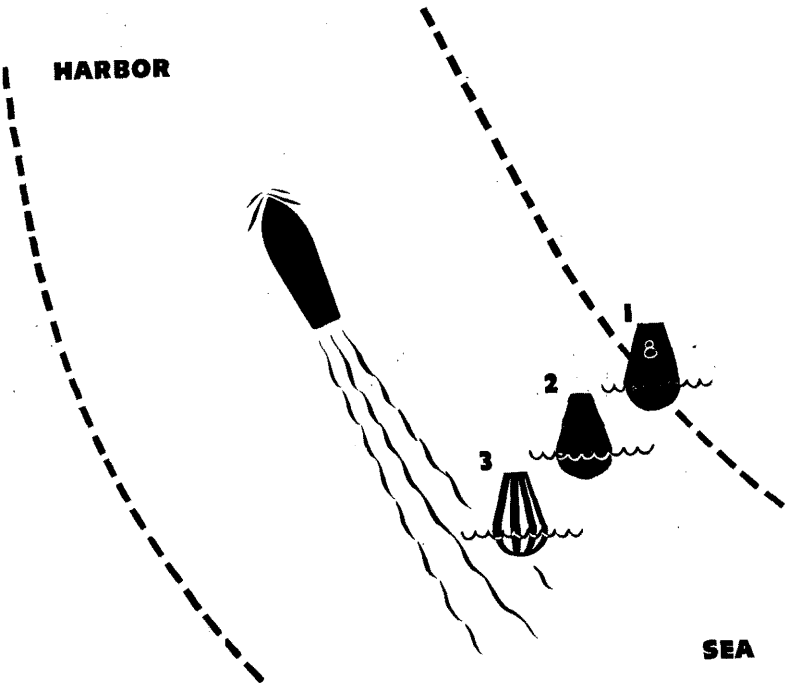
In addition to the buoys pictured here, there are some with special colors. Remember these:

WHITE—Buoys painted white indicate where to anchor.

YELLOW—Buoys painted yellow indicate areas set apart for quarantine purposes.



NUN BUOYS



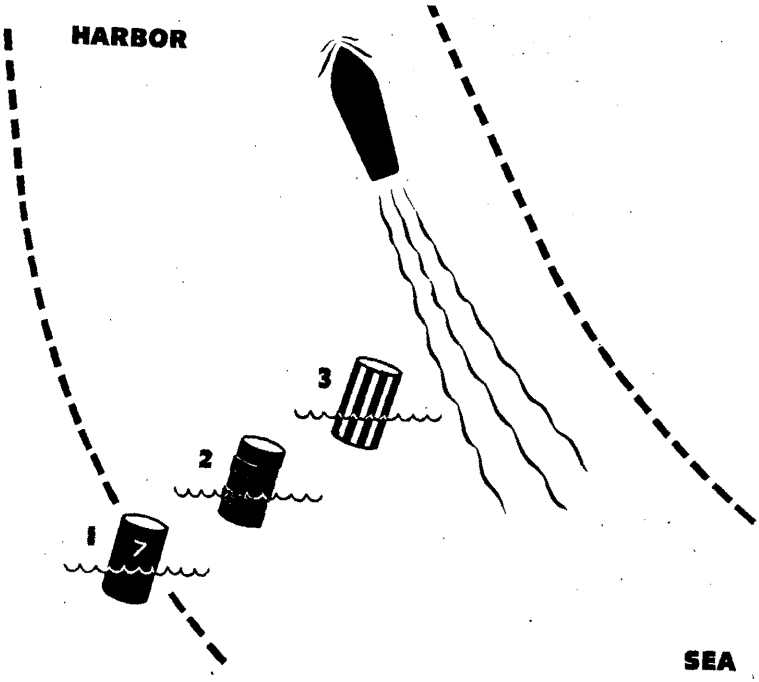
1. Painted red and carries an even number. It marks the starboard (right) side of the channel. Ships steer to port (left).

2. Indicates obstruction. Painted red and black horizontal stripes, the red being on top. Ships steer to port (left).

3. Midchannel nun. Painted black and white vertical stripes. Ships may pass on either side.

NUN BUOYS NEVER ARE PLACED ON THE PORT SIDE OF A CHANNEL

CAN BUOYS



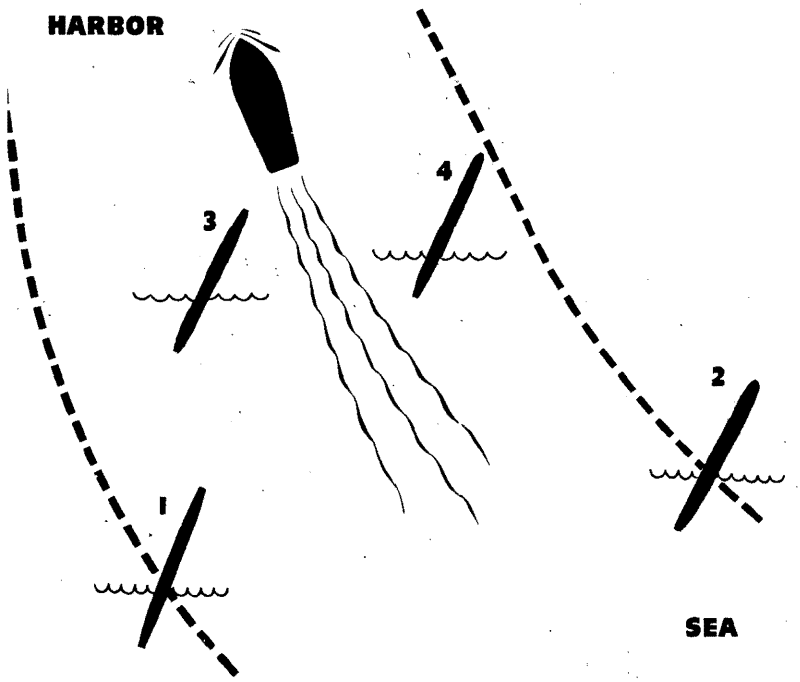
1. Painted black and carries an odd number. It marks the port (left) side of channel. Ships steer to starboard (right).

2. Indicates obstruction. Painted black and red horizontal stripes, the black being on top. Ships steer to starboard (right).

3. Midchannel can. Painted black and white vertical stripes. Ships may pass on either side.

CAN BUOYS NEVER ARE PLACED ON THE STARBOARD SIDE OF A CHANNEL

SPAR BUOYS

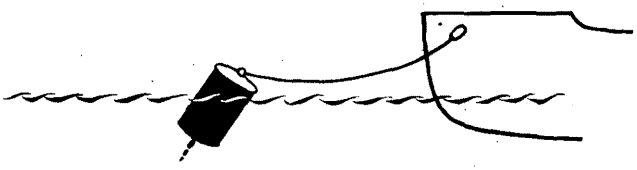


1. When black and carrying an odd number, it marks the port (left) side of channel. Ships steer to starboard (right).

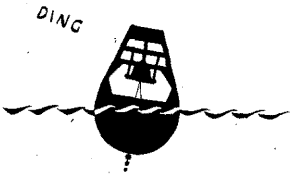
2. When red and carrying an even number, it marks the starboard (right) side of channel. Ships steer to port (left).

3. Indicates obstruction. When black and red horizontal stripes, black being the top color, it indicates ship should steer to starboard (right).

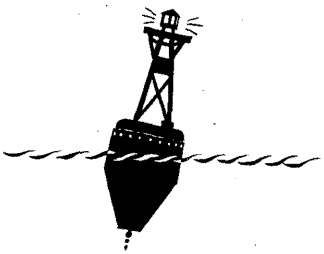
4. Also indicates obstruction, but when painted red and black horizontal strips, red being the top color, indicates ships should steer to port (left).



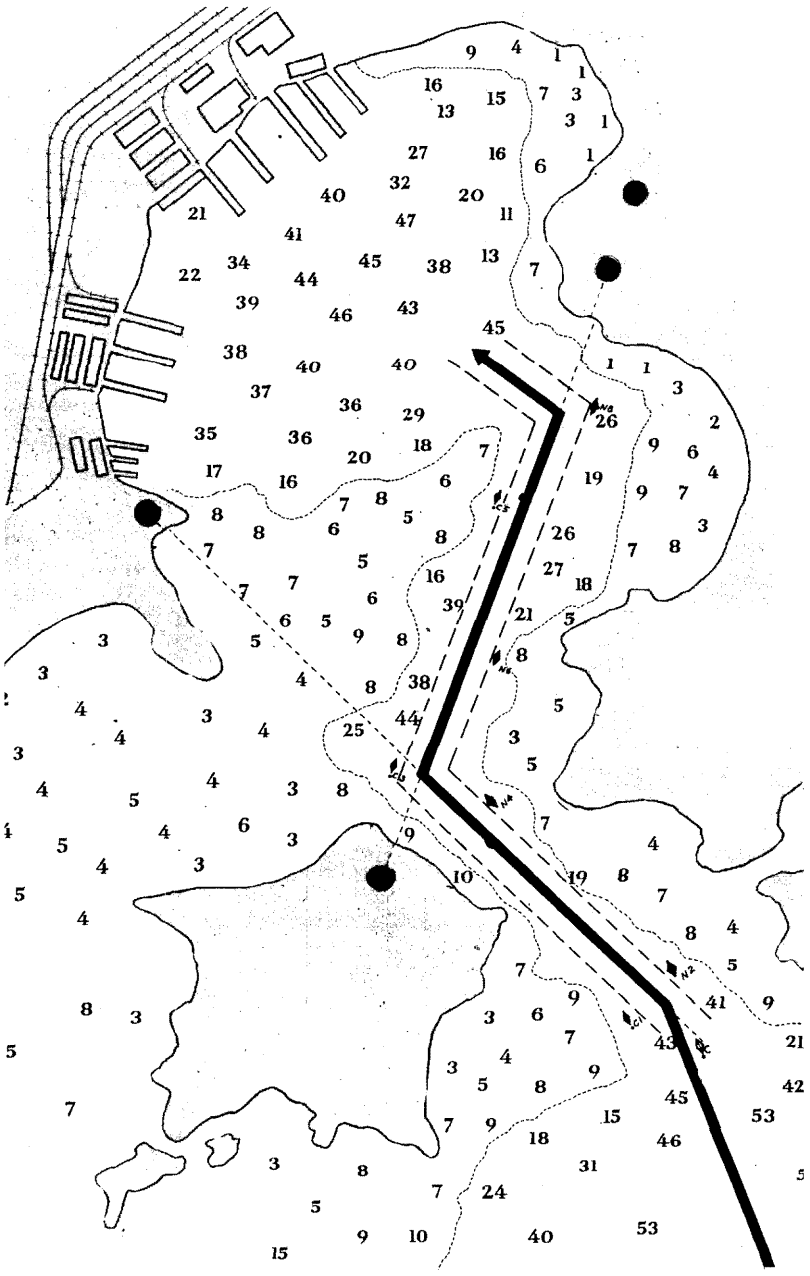
Mooring Buoy. A can buoy with a ring on top to which ships may tie up.



Bell Buoy. A buoy fitted with a bell. Used to indicate entrance to a harbor. Those painted black and carrying an odd number indicate that ships should steer to starboard (right). Those painted red and carrying an even number indicate that ships should steer to port (left).



Light or Whistle Buoys. Those painted black and carrying an odd number flash either white or green and indicate ships should steer to starboard (right). Those painted red and carrying an even number flash white or red and indicate that ships should steer to port (left).



CHART

This is a typical harbor. It is included here simply to illustrate how buoys are used and how essential they are. Note the little numerals all over the harbor. Each one shows the depth of the water in feet, at that point. The pilot doesn't try to bring his vessel into port around the left-hand side of the island because the water there is too shallow. Instead, he follows the deep-water channel and his course is shown by the heavy black arrow. But how does he know where this channel is? He knows because the buoys guide him. He enters between Buoys C1 and N2. After he has passed N4 he swings to starboard in order to pass close to N6. If it is night, he knows when to turn and what course to follow by watching until he can see the red light on the island (he can see it only from a certain position because of the way it is shielded). And at night he sets his course by the range lights on the mainland. After he reaches N8 he changes course to port and heads toward his berth with deep water all the way.

SOUNDINGS IN FEET AT MEAN LOW WATER

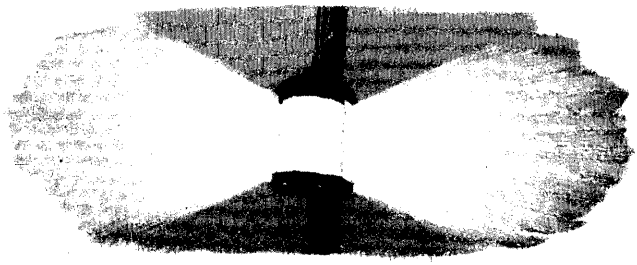
Scale $\frac{1}{5000}$

	Island Point	*Shore Island*	*Deep Hole*
TIDES (*referred to mean low water*):			
Mean high water	1.5 ft	1.7 ft	3.6 ft
Mean sea level	0.8 ft	0.8 ft	1.8 ft
Lowest tide to be expected	−2.0 ft	−2.0 ft	−2.0 ft

ABBREVIATIONS:
Lights: F=fixed; R=red; FL=flashing; QK=quick.
Buoys: C=can; N=nun.

AUTHORITIES:
Surveys 1887 to 1942.
Surveys by U. S. Engineers to 1942, and other sources.

CURRENTS:
In the narrow port Shore Island Channel the current velocity at times exceeds 4 knots. For times of slacks and times and velocities of strengths, The Current Tables, Atlantic Coast, should be consulted.

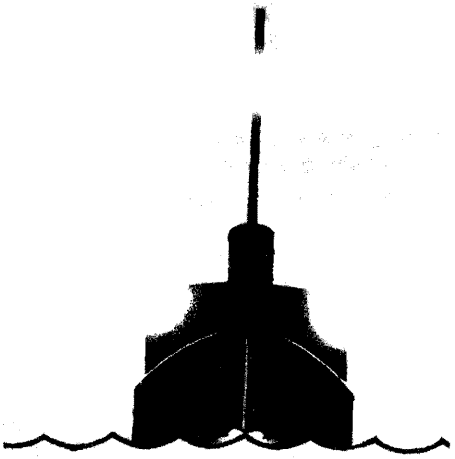


Riding Lights. From sunset to sunrise, and also during periods of poor visibility, vessels must carry lights so that their positions and their directions may be seen. Rules governing the display of these lights are simple, but they are of great importance and must be mastered as soon as possible. The rules must be complied with in all weathers When the appropriate lights are being displayed no other lights which may be mistaken for them shall be exhibited.

The illustrations and descriptions of these lighting rules given here touch on the essentials of immediate interest to personnel of the Harbor Boat Service. They are not to be considered as substitutes for the official International Rules of the Road at Sea, the U. S. Inland Rules, the Pilot Rules, or local marine rules applying in foreign harbors and waterways.

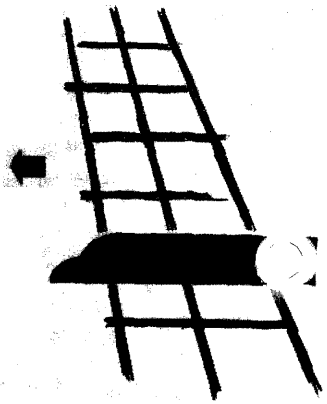
The rules which cover situations most frequently encountered are illustrated on the following pages. They should be learned immediately, and their application should be carefully observed at all times. Refresh your acquaintance with them whenever time permits—at least once a month.

For thorough familiarity, the rules should be studied in their entirety and preferably in their original form. The basic regulations will be found in the authorities mentioned above. Consult them as soon as possible.

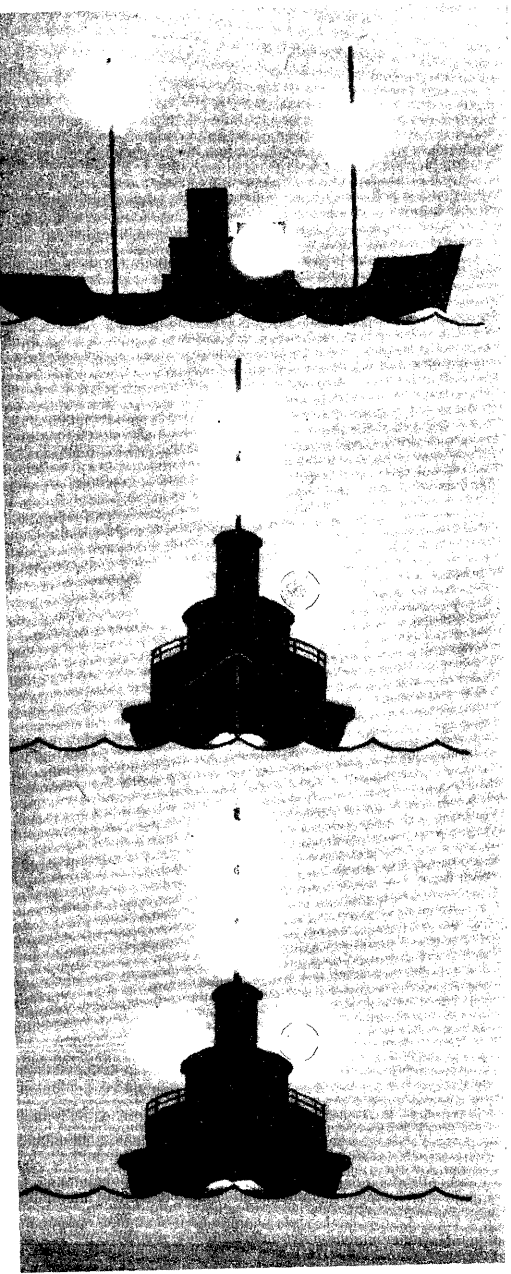


MASTHEAD LIGHT AND SIDE LIGHTS

When under way, a vessel will carry on the front of her foremast or, if she has no foremast, on the fore part of the vessel, a bright white light. It will be placed not less than 20 feet nor more than 40 feet above the hull, and must be capable of throwing an unbroken light over an arc of 20 points of the compass, 10 points on each side of the vessel.



In addition, the vessel will carry on her starboard (right) side a green light, and on her port (left) side a red light. Both of these lights will be placed in such a way that they throw a light from directly ahead to two points abaft the beam on their respective sides, and must be capable of being seen for 2 miles. They also must be fitted with inboard screens projecting at least 3 feet forward from the light in order to prevent the lights from being seen across the bow.



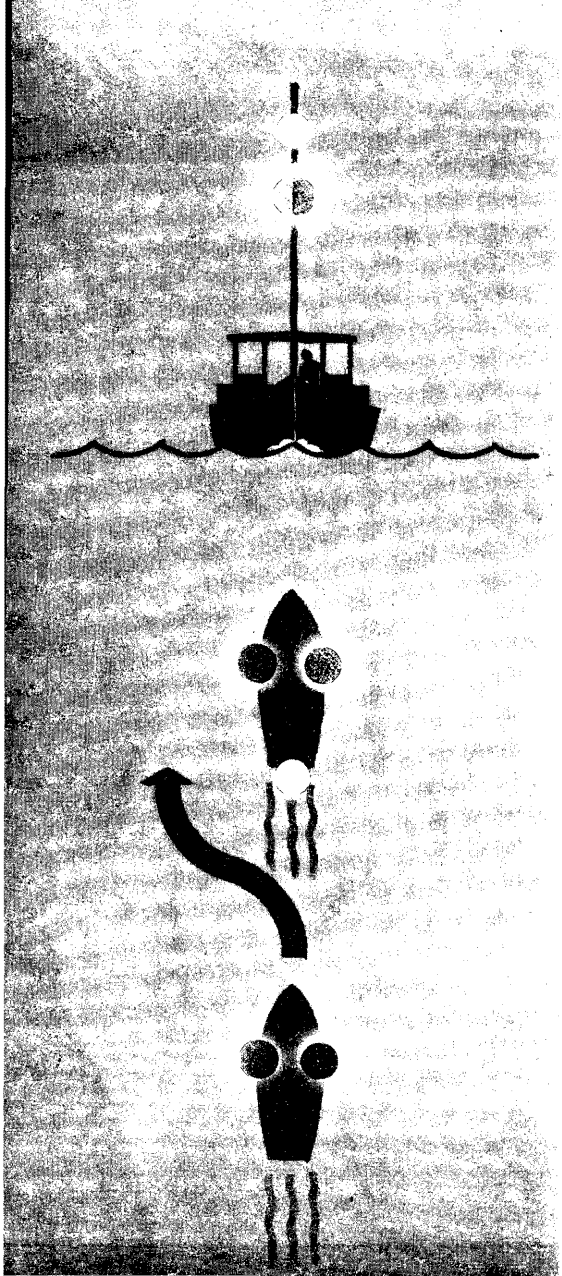
RANGE LIGHTS

When under way, a vessel may carry an additional white light similar to the masthead light described above. It must be placed in line with the keel at least 15 feet higher and to the stern of the other white light. It is compulsory to show this second white light in inland waters of the United States.

WHEN TOWING

When towing, a vessel will carry in addition to her side lights, two bright white lights, one over the other on her foremast or on the forepart of the vessel. The lights will be not less than 6 feet apart. If more than one vessel is being towed or the distance from the stern of the towing vessel to the end of the tow is over 600 feet, a third white light must be carried. This will be placed 6 feet above or below the other two lights.

The towing vessel also may carry a small white light abaft the funnel or aftermast for the tow to steer by. This light must not be visible forward of the beam.



SMALL VESSELS

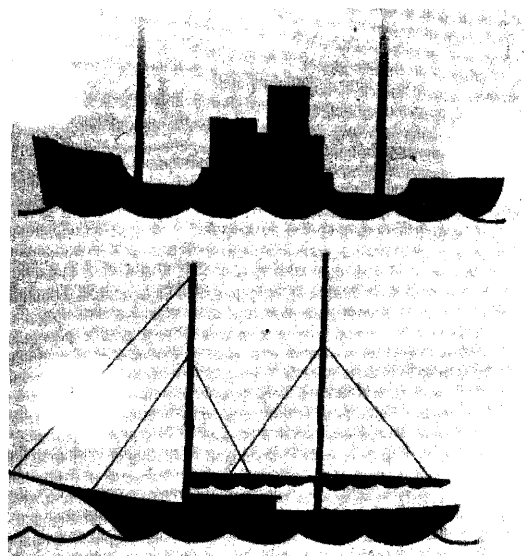
Vessels of less than 40 gross tons will not be required to carry the lights described above. If they do not carry these lights, however, they will carry the following:

1. A bright white light in the forepart of the vessel where it best may be seen. It shall be 9 feet above the gunwale, unless the vessel is very small. The light must be visible for 2 miles.

2. A combined lantern showing a green light and a red light from directly ahead to two points abaft the beam on their proper sides. This lantern must be placed not less than 3 feet below the white light.

OVERTAKING

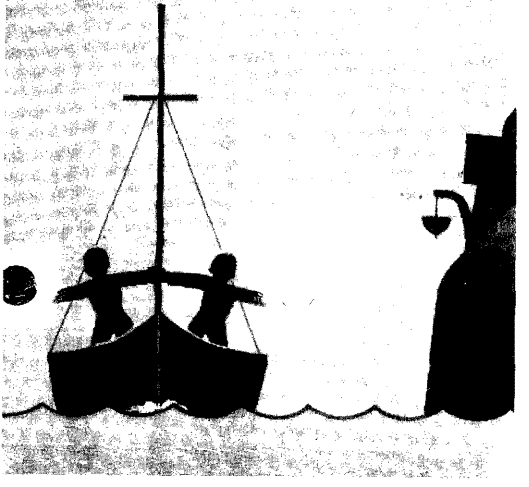
A vessel which is being overtaken will show to the overtaking vessel a white or flare-up light. This light will be carried at the same level as the side lights, or as nearly so as possible.



ANCHOR LIGHTS

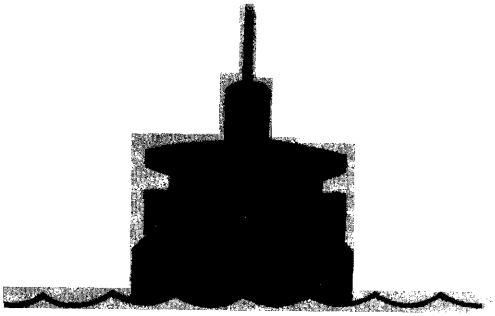
When at anchor, a large vessel (over 150 feet long) will carry in the forepart of the vessel, between 20 and 40 feet above the hull, a white light visible in all directions for at least 1 mile. In addition, the vessel will carry at the stern another white light not less than 15 feet lower than the forward light.

Small boats (less than 150 feet long) when at anchor will carry, where it may best be seen and not more than 20 feet above the hull, a white light in a lantern. The light must be visible all around for at least 1 mile.



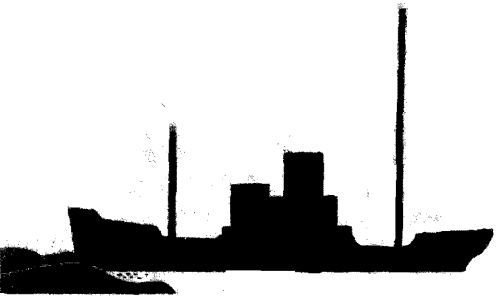
PORTABLE SIDE LIGHTS

When a small vessel finds that it is impossible because of bad weather to fix green and red side lights, portable lanterns will be kept lighted and ready for use. They must be shown on their respective sides upon the approach of another vessel. The green must not be seen on the port side, nor the red on the starboard.



NOT UNDER COMMAND

When a vessel is not under command because of accident, she will carry two red lights on her foremast. They will be placed one over the other in a vertical line, and must be not less than 6 feet apart. They must be visible from all directions for at least 2 miles. In the daytime, two black balls at least 2 feet in diameter and not less than 6 feet apart will be shown instead of the lights. If the vessel not under command is making way, she will show her port and starboard lights.



AGROUND

When a vessel is aground in or near a fairway, she will carry the white lights fore and aft prescribed for a vessel at anchor. In addition, she will carry the two red lights on the foremast prescribed for a vessel not under command. Port and starboard lights will not be shown.

For years, men who have gone to sea have found it helpful in learning these important rules and their application, to commit to memory a short poem called "Aids to Memory," written by Thomas Gray. You might do the same. Here it is:

When both side lights you see ahead,
Port your helm and show your RED,
GREEN to GREEN or RED to RED,
Perfect safety—go ahead!

If to your starboard RED appear,
It is your duty to keep clear,
To act as judgment says is proper—
To port, or starboard, back or stop her!

But when upon your port is seen
A steamer's starboard light is GREEN,
There's not so much for you to do,
For GREEN to port keeps clear of you.

Both in safety and in doubt,
Always keep a good lookout.
In danger with no room to turn,
Ease her! Stop her! Go astern!

CHAPTER 4

KEEPING SHIPSHAPE

A boat is a floating town. It has its own government, its own law enforcing agency, water supply system, lighting system, sanitary service, and so on—all packed into a few small spaces. To maintain the efficiency of a vessel as a whole, the things which go into making it up must be kept "shipshape." The business of keeping shipshape involves many duties with which you soon will become familiar. They come under the general heading of Maintenance and Repair, and are vital to your own personal safety and security. This chapter will describe briefly the maintenance and repair of boats up to approximately 175 feet long, and also of the equipment usually found on them. This will give a general idea of what is involved. Details will be learned on the job.

First of all, what are maintenance and repair?

Maintenance for our purposes here means keeping marine equipment in good, sound, operating condition by taking precautionary measures at regular intervals. Maintenance is something done to prevent trouble, like putting antifreeze into an automobile radiator before the water freezes.

Repair means removing damaged parts and replacing or renewing them with new parts in order to restore the whole to a sound operating condition. Repair is something done after trouble has occurred, like fixing up an old, worn-out engine so that it operates like a new engine. There is a definite relation-

ship between the two. The more maintenance a piece of marine equipment gets, the less repair it needs.

Consider maintenance first. Maintenance differs with circumstances. Sometimes your assignment may be to a wooden vessel and other times to a steel one, and it may involve work either above decks or below. But no matter where or what is done, it will soon be found that there are four watchwords to good maintenance. They are: CLEANLINESS, ORDERLINESS, VENTILATION, and PAINTING. This is what they mean on a vessel:

CLEANLINESS

Keeping a vessel clean is the first and most important step to proper maintenance. Here is what must be done to keep a vessel clean:

Decks. Wash and scrub decks often with fresh water. If fresh water is not obtainable, use salt water. A fire pump and hose may be used for this purpose. Clean decks prevent the tracking of mud and filth throughout the boat. When necessary and if possible, canvas or cocoa matting should be laid on the deck wherever people walk. Washing decks on wooden vessels not only keeps them clean but prevents them from drying out; thus there will be no leakage into spaces below. In this connection, the calking in seams and butts of wooden vessels should be inspected often and, when necessary, should be hawsed down and payed with seam compound. Missing or loose deck plugs should be replaced without delay. These plugs cover and protect fastenings which secure the deck planking, and when replaced they must be properly bedded in thick white lead in order to maintain water tightness on the deck. Drain holes should be kept clean so that water may flow out freely. Limbers or other drainage holes should be kept open, thus helping to prevent leaks into spaces below. Pools of water should not be allowed to stand on deck; they should be mopped up.

Topsides. Topsides and superstructure should be washed often. Use fresh water when possible. If topsides and superstructure become very dirty, a small amount of washing soda added to the wash water will help in the cleaning. Do not use too much soda because it hurts the paint. Parts washed with soda and water should be given a final wash down with fresh water.

Inside. Quarters must be cleaned every day, close attention being given to dark corners and spaces blocked by lockers, furniture, and other things. Dust, dirt, and filth collecting in these spaces will result in unsanitary conditions which may breed vermin, and which will undoubtedly result in dry rot on wooden vessels. Galley and mess rooms and all galley equipment must be spotless.

Bilges. The rounding parts of a vessel's bottom are known as the bilges. Dirty bilges are a fire hazard, produce disagreeable smells, and are harmful to vessels. Keep bilges clean and well aired. Oil or gasoline must not be allowed to collect in bilges. Keep bilges pumped dry.

ORDERLINESS

Deck and engine room gear carelessly left around a vessel has resulted in loss of life. For your own protection, keep your ship orderly. There is a place for everything aboard your vessel, and everything must be kept in its proper place. All gear and equipment must be put away when not in use so that it will be on hand when needed. Crew quarters must not be cluttered up with odds and ends. Storerooms and lockers should have shelves, hooks, and other fixtures. Lines must be neatly coiled and, if possible, stowed on gratings so that they may be kept dry and that the deck underneath will be dry too. Because a vessel is constantly in motion, all gear must be fastened down so that it will not become loose or adrift in a

seaway. Keep all life raft and lifeboat gear and provisions in place, in good shape and properly stowed, and give close attention to lifeboat davits and gear. A lifeboat or life raft may be needed only once, but if ever it is needed, its occupants will be thankful that its gear and equipment are both complete and in good condition.

VENTILATION

Wooden vessels are subject to dry rot. This process eats away the wooden fibers, weakening the wood and making it structurally unsound. Dry rot thrives in damp places. The sensible thing to do to prevent dry rot is to keep things dry. The best way to keep things dry is to air them out. This means ventilation. On sunny days, open up hatches, escape scuttles, manholes, and doors so that clean, dry air may circulate all around. Stagnant, dead air takes on a bad smell. Get rid of it. This is especially important in the bow of the boat and in the stern where the areas are cramped and circulation of air is usually poor. When it can be done, bring all lines and ropes on deck. Loop them loosely, lay them about, and let them dry out. Clean and air out storerooms when you can. Since sea air is moist, clothing, bedding, and other fabrics will mildew if not exposed to the sun once in a while.

PAINTING

Paint is a preservative as well as a decorative material. Its primary function, when applied to wood, is to prevent the wood from deteriorating from the effects of the weather, salt air and water, sun, etc. On wooden vessel bottoms, it has the further effect of protecting these bottoms against attacks by teredos or other marine borers. These marine borers are generally known by the collective term of worms or shipworms.

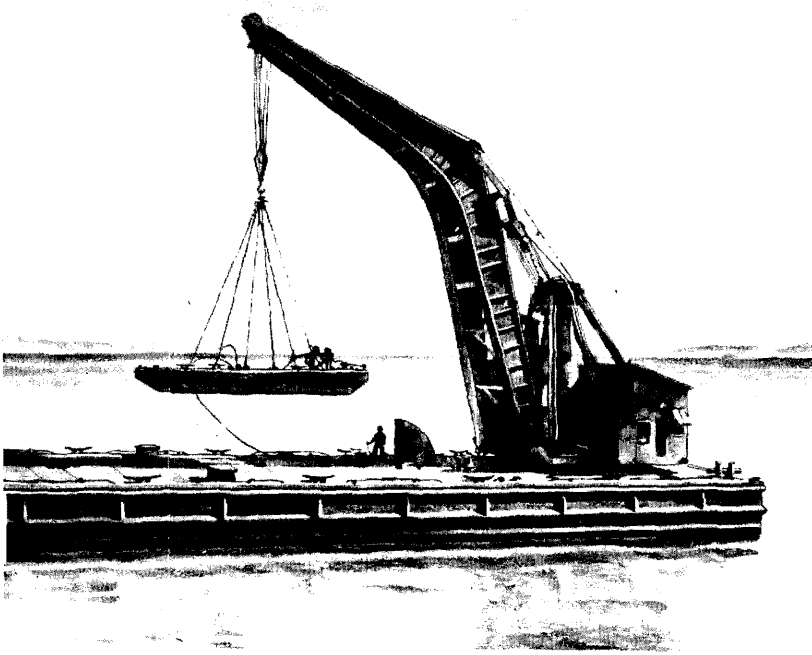
Steel vessels are usually given a priming coat of red lead or zinc chromate. This type of paint forms a dense film over the steel, and prevents moisture from coming into contact with the metal and causing rust. This red lead or zinc chromate provides a good base for the final coats of colored paint. The bottoms of steel vessels are protected with specially compounded anticorrosive and antifouling paints. The anticorrosive is applied directly to the hull, and, as its name implies, is used to prevent the hull from deteriorating. The antifouling paint is applied over the anticorrosive, and its function is to prevent barnacles, marine vegetation, and other growths from clinging to the ship's bottom. When unprotected or left in the water too long, a vessel will accumulate a growth of "sea whiskers" to such an extent that her speed will be materially reduced. Keep a full supply of standard brand marine paints aboard. Apply them when necessary.

REPAIR

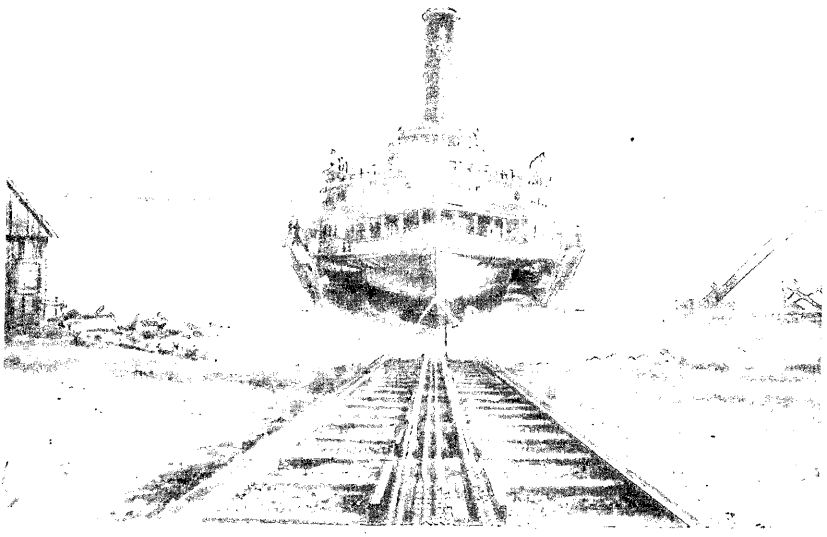
Now for the important business of repair. Generally speaking, a vessel requires repairs if one of the following four conditions exists:

1. When it has been so badly damaged by accident, enemy attack, fire, or other catastrophe that it cannot operate properly.
2. When it is so unseaworthy that to use it might result in loss of the vessel or loss of life of crew members.
3. When its condition is such that to continue to use it would make more extensive and expensive repairs necessary later.
4. When it is due for a routine overhaul. These routine overhauls should be made at intervals of 3 to 6 months for wooden vessels and 6 to 9 months for steel.

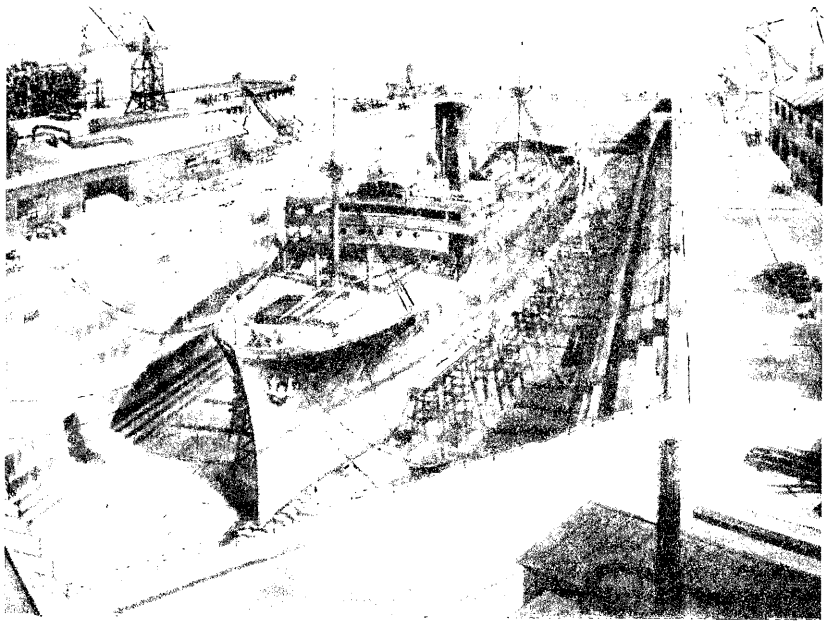
Removing a vessel from the water is quite an operation, requiring the use of special equipment. The four following pages illustrate and describe the four chief means by which the vessels are taken out of the water.



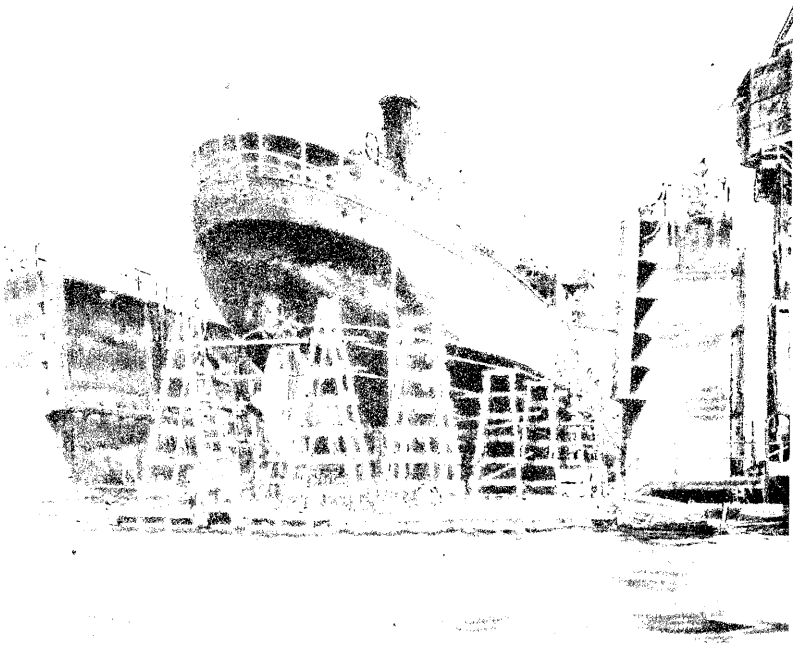
This is a CRANE. It may be used to hoist boats out of the water when the weight of the vessel is less than the lifting capacity of the crane. Slings are thrown around the boat and made secure. Then the whole is pulled up and swung around to a strong and suitably built cradle on dock. Care must be taken to avoid crushing or straining the boat when it is in the crane slings. House or superstructures must be protected by sling spreaders. Ordinarily no boat over 50 feet long is hauled out of the water by crane, and in most cases 30 feet is a maximum safe limit.



This is a MARINE RAILWAY. It is in four parts—track, cradle, machinery, and chains. The cradle, operated by machinery and chains, runs down the track and under the water until a vessel can be floated over it. The boat is centered on keel blocks and bilge blocks are fitted to her sides for support. When secure, vessel and cradle are hauled up the tracks to a point high and dry inshore. Most marine railways have a capacity of 1,000 tons or less.



This is a **GRAVING DOCK.** It is a large, concrete-lined pit fitted with keel and bilge blocks and located near a waterway. The dock is separated from the water by a removable gate. When a ship is to be docked, the dock is filled with water and the gate opened. The ship is floated in and spotted over the keel blocks. The gate is closed and the water pumped out. As the ship settles, the pumps are stopped and the bilge blocks are put in position. Then the rest of the water is removed. Graving docks usually are for very large vessels, like liners and battleships.



This is a **FLOATING DRYDOCK.** It is like a square vessel with high sides and no bow or stern. Before a boat is to be put into it, valves in the dock are opened and water floods in until the dock sinks low enough to allow the vessel to be floated over it and then spotted over keel blocks. Valves are closed and some of the water is pumped out. Bilge blocks are set under the vessel, making it secure. The remainder of the water is pumped out and the dock rises, the vessel rising with the dock until the floor of the drydock is above the water level and the ship is entirely clear of the water. Floating drydocks, usually built in sections, handle all but the largest ships.

Work on the hull. The real work begins when the boat is on dock. The first thing to be done is to clean the bottom. This is a scraping and washing operation and must be done while the boat is still wet and before the barnacles and other growths have had a chance to dry tightly to the hull. The barnacles, loose paint, weeds, and other foul matter are scraped off with a triangular or hoe type scraper. Then the bottom is scrubbed with a stiff brush and washed with fresh water at 50 to 60 pounds pressure. There are many things that have to be done that require special training and experience. That will come on the job. Here is a brief check list of the more important repair operations for wooden hulls:

1. Test planking and calking in seams and butts. This is done in various ways, like tapping the planking with a hammer to detect rotted areas or pushing the blade of a knife or ice pick into planking to determine degree of softness of outside portions. Where necessary, take old calking out and drive new in, and recement seams. This is not a difficult operation, but it calls for some experience.

2. Take out strainer plates, clean, and replace. These plates are attached to the outside of the hull below the water line and are easily recognizable. This is a simple job.

3. Grind in underwater valves. This requires the services of an experienced machinist, and usually is done by the shipyard.

4. Examine rudder, take up any slackness in bearing or gudgeons, and overhaul or replace worn parts.

5. Check propeller, and remove for repair if necessary; check fit on shafts and harden up propeller nuts. This job usually is done by experienced machinists, or by crew members under supervision, providing the proper tools are available.

6. Renew packing in rudder stuffing box and in shaft stuffing boxes. This is also a job for an experienced machinist, though crew members may assist.

7. Examine the bottom for worm holes. When found, the holes should be lightly burned out with an acetylene flame

and then filled in with cement. Renew any missing or badly worn sections of keel shoe.

8. Carefully check for soundness the stem, horntimber and other large structural pieces.

9. Check shafting and shaft bearings. Renew or remetal bearings where necessary. If shafts are believed to be out of line, they can be tested for trueness in a lathe. Replace shafting carefully and align all external portions before floating vessel. Internal alignment should be accomplished after vessel has been refloated. It is usual to disconnect the engine from shafting on a wooden vessel prior to docking, in order to prevent strain on the shafting system if the vessel changes shape when being removed from the water.

10. Remove eroded or "dead" zinc plates, if any, and replace with new. These plates usually are attached aft close to metal fittings. They are used to counteract electrolysis, and when they are eroded to such an extent that they no longer perform their function they are considered dead.

Here is a brief list of the more important steel hull repair operations:

1. When necessary, rivets should be tested. This is accomplished with a small hammer called a testing hammer, and it will be worth your while to watch an experienced hull man test rivets so that, when it becomes necessary, you can do this work yourself. It is not difficult, but is merely a matter of gaining experience.

2. Weld or recalk leaky seams or butts. These are jobs requiring a knowledge of the welding trade and usually will be performed by specially trained workers.

3. Test steel plates for thickness. Considerable experience will be necessary before this operation may be performed competently.

4. That portion of the hull between a foot above the deep load line and a foot below the light load line should be examined closely for corrosion. This area gets the full effects of salt air and water. Deeply pitted sections should

be filled in with weld and the surface ground to a smooth finish.

5. Remove docking plugs and flush compartment drains with hot water.

6. Remove and clean strainer plates. While these plates are off, clean and paint the sea chests. These are short connections between openings in the hull below the waterline and valves inside the vessel.

7. Grind and repack sea valves.

8. Take up any slackness in rudder bearings and replace worn parts.

9. Remove propellers for overhaul if necessary.

10. Check shafting and fit on propeller shafts and harden up propeller nuts.

11. Rewood or renew stern tube bearing if worn.

12. Renew packing in rudder stuffing box and shaft stuffing boxes.

13. Remove eroded or "dead" zinc plates and replace with new.

At the time the underwater repairs are being effected, the vessel is usually painted. A wooden vessel is given a touch-up coat of copper paint on the bare spots, and one complete over-all coat of copper paint. The vessel is then usually refloated before the paint has an opportunity to dry. This is most important, as most copper paints lose their effectiveness if allowed to dry before the vessel is refloated. Check carefully on the brand of paint you are using, so that you will know whether to allow the paint to dry or whether the vessel is to be refloated while the paint is still wet. A steel vessel is given a touch-up coat of anticorrosive on the bare spots, and a complete over-all coat of anticorrosive, then a complete over-all coat of antifouling. Certain antifouling paints must be allowed to dry before the vessel is refloated, while others require that the vessel be placed back in the water before the paint is dry. Check this point on the brand of paint that you are using.

Work after refloating. Once the vessel is back in the water, the topsides, superstructure, and interior should be attended to. There are so many things to watch out for that it would make little sense to try to list them all here. The thing to do is to look everything over, noticing especially those parts clearly in need of repair. Make a list of the things requiring attention. Then figure out the best way those things can be done. Make sure before starting that the necessary tools and equipment are available and also that there is enough skilled and unskilled help to do it.

Do not be satisfied with a patch job. In most cases patch jobs will not last and may lead to trouble later. A vessel is not like a house. A boat floats and is constantly in motion. When a repair job is finished, examine it closely to be sure it is done well.

It must be remembered that considerable quantities of inflammable material always are to be found around a shipyard—paint, grease, rope, wood, and rags. Unless extreme care is taken, fires start quickly. Guard against fire constantly when vessels are on dock. It is advisable to have a fire inspector around when a forge or open flame torch is to be used.

Work in engine room. A vessel is no better than its power plant, and a power plant is no better than the care and attention it gets from those who run it. Engine room maintenance and repair require skill, and this comes only by study and practice and long experience. The best books available on engines and auxiliary equipment usually are the ones which come with each piece of machinery. These manufacturers' manuals, which may also be published as War Department Technical Manuals, are prepared by men who have spent their whole lives taking apart and putting together the machinery that you will be working on. The manuals are the Bibles of engine room personnel. When something goes wrong, get out the appropriate manual and study the overhaul procedure. Decide on the tools to be used and the parts to be replaced. Be sure that everything is within easy reach before taking

anything apart. By following the manual closely at each stage you will not go far wrong. Spend as much time on the engine as necessary, but do not neglect the rest of the engine room equipment. Generators, compressors, auxiliary engines, wiring, piping, electrical devices, and other equipment in the engine room are vital and they must be well taken care of.

The most important single factor in engine maintenance is proper lubrication. The operation of an engine without proper lubrication will result in serious damage or complete destruction. The best guides to proper lubrication are the manuals mentioned above. Constant reference to them is emphasized until familarity with the lubricating systems of your engines reaches a point where diligent watchfulness and care become second nature. Beyond that, there is little to be told that will not soon be found out while on the job. Remember that the four watchwords to good maintenance mentioned earlier in this chapter have just as much weight in the engine room as they have on deck. They are—

CLEANLINESS—Keep engine room and the area around it spotless.
VENTILATION—Remember that gasoline and other fuel fumes are heavier than air. They settle down low. Always air out the room before starting engines.

ODERLINESS—Have a place for everything and keep everything in its place.

PAINTING—Touch up bare spots at all times and repaint larger areas when necessary.

There are times when a vessel must put into a commercially operated shipyard for repairs. When this happens, the master and the chief engineer will see to it that the jobs needed to be done are done. The yard manager will be given a short, written statement by the master and the chief engineer covering the repairs to be made to the parts of the vessel they are directly responsible for. All statements of this nature should have a paragraph in them saying that the repairs will have to be done to the satisfaction of the ship's officer who will supervise the work.

Men put in charge of such jobs must watch the repair work carefully. They will see to it that all the material used measures up to Army requirements, and that the workmanship is good. The repairs should be done in logical order, one thing following the other. If topside work can be done at the same time the bottom is being attended to, have it done, but otherwise postpone deck work until the vessel is refloated. Do not let any part be closed up before being satisfied that the work is well done. Complaints should be made directly to the yard foreman. Do not argue with the men actually doing the work. Let the shipyard officials know that they will be paid only for the work called for in the statements prepared by the master and chief engineer. The yard will not be reimbursed for anything done beyond that.

Constant watch must be kept to guard against fire.

Helpful books. This chapter has only touched upon the highlights of marine maintenance and repair. It is a subject best learned by practical experience. However, these notes together with the maintenance and lubrication manuals and with other reference books describing the subject in detail, will provide a good background for an intelligent approach to the practical work. The following books are readily available and should be of considerable help to all harbor craft and small boat personnel:

How to Abandon Ship, Cornell Maritime Press.
Merchant Marine Officers' Handbook, Cornell Maritime Press.
Ship Repair and Alteration, Cornell Maritime Press.
Modern Marine Electricity, Cornell Maritime Press.
Marine Electrical Installation, Cornell Maritime Press.
Modern Marine Engineer's Manual, Vol. 1, Cornell Maritime Press.
Modern Marine Pipefitting, Cornell Maritime Press.
Purser's Manual and Marine Storekeeping, Cornell Maritime Press.
Modern Shipfitter's Handbook, Cornell Maritime Press.
Modern Marine Refrigeration, Cornell Maritime Press.
Practical Principles of Naval Architecture, Cornell Maritime Press.
Primer of Ship Blueprint Reading, Cornell Maritime Press.
Diesel Handbook, Diesel Engineer Institute.
Practical Marine Diesel Engineering, Ford.
Standard Seamanship for the Merchant Service, D. Van Nostrand Co., Inc.

THE SUMMING UP

This manual has told briefly, in words and pictures, the story of harbor craft and small boats—what they are, what they do, and what those who are assigned to them need to know. There is much more to the story than that. What appears here is an outline of action, a prelude to the real thing. The rest must wait until the history of this war is written. Then will be made known the facts of the invasions of distant shores, the movements of men and material, and the whole strategy of the Mediterranean and the Pacific. From those facts will come the full force and shape of the mission of harbor craft and small boats and the story of their achievement. You figure in as an important part of this mission. You are well trained and well equipped. You know your job. Do it well.

APPENDIX

GLOSSARY OF SEA TERMS AND WORDS

Abaft—Toward the stern of a ship.

Abeam—At right angles to the keel.

Aboard—On or in a ship.

Abreast—Side by side; over against; opposite to.

Accommodation Ladder—Steps slung at the gangway leading down the ship's side to a point near the water, for boarding the ship from small boats.

Aft—Near or toward the stern.

Aloft—In the top or upper rigging.

Amidships—In the vicinity of the middle portion of a vessel.

Anchor—A heavy metal implement attached to a vessel for holding it at rest in the water.

Anchor, Sea—A conical-shaped canvas bag carried in each lifeboat. When placed overboard it keeps the boat head-on into the sea and spreads oil from a container placed inside the bag. Sometimes called an oil spreader.

Anchor, Stream—A lightweight anchor used when mooring in a narrow channel or harbor to prevent the vessel's stern from swinging with the current or the tide.

Athwartship—Across a vessel; from side to side.

Backstay—Rope support extending from all mast levels, except the lower, to the vessel's side at some distance abaft the mast.

Balanced Rudder—A rudder with its axis between the forward and after edge.

Ballast Tanks—Compartments which may be flooded when necessary to add weight to produce a change in trim or in stability of the ship.

Ballast Water—Sea water, confined to double bottom tanks, peak tanks, and other designated compartments, for use in obtaining satisfactory draft, trim, or stability.

Batten—A strip of wood or steel used in securing tarpaulins in place. To secure by means of battens, as to "batten down a hatch."

Battens, Cargo—Wood planks or steel shapes fitted to the inside of frames in a hold to keep the cargo away from the shell plating; the strips of wood or steel used to prevent shifting of cargo.

Battens, Seam—Wood seam straps which connect the edges of small boats having a single thickness of planking; give additional stiffness to the plank, are continuous, and frames are notched out to fit over them.

Beam—Extreme width of a vessel. Also an athwartship or longitudinal member of the vessel's structure supporting the deck.

Beam Knee—A bracket between a frame or stiffener and the end of a beam; a beam arm.

Beam Line—A line showing the points of intersection between the top edge of the beam and the molded frame line.

Bell—A device for telling time and for use as a signal in fog.

Below—Underneath the surface of the water; underneath a deck or decks.

Berth—A place where vessels dock, moor, or anchor; a bed or place to sleep.

Between Decks—The space between any two decks, not necessarily adjacent. Frequently expressed as "tween decks."

Bight—A loop or bend in a rope; strictly, any part between two ends of a rope.

Bilge—The rounded portion of a vessel's shell which connects the bottom with the side. To open a vessel's lower body to the sea.

Bilge Plates—The curved shell plates that fit the bilge.

Bilges—The lowest portion of a vessel inside the hull, considering the inner bottom where fitted as the bottom hull limit.

Binnacle—A stand or case for housing a compass so that it may be conveniently consulted.

Bitter End—The inboard end of a vessel's anchor chain which is made fast in the chain locker.

Bitts—A term applied to short metal or wood columns extending up from base plate secured to a deck or bulwark rail or placed on a pier. Also applied to timbers extended up through and a short distance above a deck to secure and belay ropes, hawsers, cables, etc. Also called bollards.

Blind Pulley—A circular block of hard wood with rounded edges perforated by several holes having grooves running from them to one side of the block. Commonly called "dead eyes."

Blinker Lights—Two electric lanterns secured at the ends of the signal yard and operated by controllers and a telegraph key for use in night signaling by code.

Block—The name given to a pulley or sheave, or a system of pulleys or sheaves, mounted in a frame or shell and used for moving objects by means of ropes.

Block, Cheek—A half steel block with a single sheave bolted to a mast or other object which serves as the other half shell or cheek. Usually used in connection with halyards.

Block, Fiddle—A block having two sheaves of different diameters placed in the same plane one above the other.

Block, Snatch—A single sheave block having one side of the frame hinged so that it can be opened to allow the bight of the rope to be placed on the sheave, thus avoiding the necessity of threading the end of the rope through the swallow of the block. Usually used as a fair lead around obstructions.

Bobstays—The chains or ropes attached underneath the outer end of the bowsprit and led aft to the stem to prevent the bowsprit from jumping up. Where two are fitted they are called the inner and the cap bobstays; when three are fitted they are called the inner, the middle, and the cap bobstays.

Booby Hatch—An access hatch from weather deck protected from sea and weather by a hood. The hood is often fitted with a sliding cover to facilitate access.

Boom—A term applied to a spar used in handling cargo.

Boom Table—An outrigger attached to a mast or a structure built up around a mast from the deck to support the heel bearings of booms and to provide proper working clearances when a number of booms are installed on or around one mast.

Boss—The curved, swelling portion of the vessel's underwater hull around the propeller shaft.

Boss Plate—The plate that covers the boss.

Bottom—The portion of the vessel's shell between the keel and the lower turn of the bilge.

Bottom, Outer—A term applied to the bottoms shell plating in a double bottom ship.

Bottom Plating—That part of the shell plating which is below the water line. More specifically, the immersed shell plating from bilge to bilge.

Bow—The forward end of the ship. The sides of the vessel at and for some distance abaft the stem, designated as the right-hand or starboard bow, and the left-hand or port bow.

Bow Lines—A rope leading from the vessel's bow to another vessel or to a wharf for the purpose of hauling her ahead or for securing her.

Break of Forecastle or Poop—The point at which the partial decks known as the forecastle and poop are discontinued.

Bridge—A high transverse platform, often forming the top of a bridge house extending from side to side of the ship, and from which a good view of the weather deck may be had.

Brow—A gangplank, usually fitted with rollers at the end resting on the wharf to allow for the movement of the vessel with the tide.

Bulkhead—A term applied to any one of the partition walls which subdivide the interior of a ship into compartments or rooms. The various types of bulkheads are distinguished by the addition of a word or words explaining the location, use, kind of material, or method of fabrication, such as fore peak, longitudinal, transverse, watertight, wire mesh, pilaster, etc.

Bulwark—A term applied to the strake of shell plating or the side planking above a weather deck. It helps to keep the dock dry and also serves as a guard against losing deck cargo or men overboard.

Bulwark Stay—A brace extending from the deck to a point near the top of the bulwark to keep it rigid.

Bunk—A built-in berth or bed.

Bunker—A compartment used for the stowage of coal or oil fuel.

Buoyancy—Ability to float.

Cabin—The interior of a deck house, usually the space set aside for the use of officers and passengers.

Calking—The operation of jamming material into the contact area to make a joint watertight or oiltight.

Camel—Generally, a floating wooden fender to keep vessels away from wharves. A decked vessel having great stability designed for use in lifting sunken vessels or structures. A submersible float used for the same purpose by submerging, attaching, and pumping out.

Capstan, Steam—A vertical drum or barrel operated by a steam engine and used for handling heavy anchor chains, heavy hawsers, etc.

Captain—*a. Military.* An officer of the Army or Marine Corps ranking below a major and above a lieutenant.

b. Naval. An officer who commands or is entitled to command a man-of-war. He ranks next above a commander and below a rear admiral, and with a colonel in the Army or Marine Corps.

c. Nautical. The commanding officer, or master, of a vessel, no matter what his rank; a title of courtesy.

Cargo—Merchandise or goods accepted for transportation by ship.

Cargo Boom—A heavy boom used in loading cargo. (*See* Boom.)

Cargo Hatch—A large opening in the deck to permit loading of cargo.

Cargo Mat—Coverings usually square and made of manila rope, used to protect the deck covering while taking stores, etc., on board.

Cargo Net—A square net, made in various sizes of manila or wire rope, used in connection with the vessel's hoisting appliances to load cargo, etc., aboard the vessel.

Cargo Port—An opening in the side of a vessel of two or more decks through which cargo is moved.

Castings, Engine and Boiler Rooms—The walls or partitions forming trunks above the engine and boiler spaces, providing air and ventilation and inclosing the uptakes.

Ceiling—A term applied to the planking with which the inside of a vessel is sheathed. Also applied to the sheet metal or wood sheathings in quarters and storerooms.

Ceiling, Floor—Planking fitted on top of the floors or double bottom in the cargo holds.

Ceiling Hold—Thick strakes of planking fastened to the inside flanges or edges of the framing in the cargo holds.

Center Line—The middle line of the ship from stem to stern as shown in any water-line view.

Chain Locker—Compartment in forward lower portion of ship in which anchor chain is stowed.

Chain Locker Pipe: Chain Pipe—The iron-bound opening or section of pipe leading from the chain locker to the deck through which the chain cable passes.

Chains—Usually refers to heavy chains attached to the anchor. Also applied to the lower parts of standing rigging which are attached to the chain plates.

Chain Stopper—A device used to secure the chain cable when riding at anchor, thereby relieving the strain on the windlass, and also for securing the anchor in the housing position in the hawsepipe. Commonly called "devil's claw."

Chart House—A small room adjacent to the bridge in which charts and navigating instruments are kept.

Chock—A term applied to oval-shaped castings, either open or closed on top, and fitted with or without rollers, through which hawsers and lines are passed. Also applied to blocks of wood used as connecting or reinforcing pieces, filling pieces, and supports for lifeboats. Also applied to the brackets fitted to boiler paddles to prevent fore and aft motion and to small brackets on the webs of frames, beams, and stiffeners to prevent tipping of the member.

Clamp—A metal fitting used to grip and hold wire ropes.

Cleats—Pieces of wood or metal, of various shapes according to their uses, usually having two projecting arms or horns upon which to belay ropes. The term "cavil" is sometimes applied to a cleat of extra size and strength.

Coaming, Hatch—A frame bounding a hatch for the purpose of stiffening the edges of the opening and forming the support for the covers. In a steel ship it generally consists of a strake of strong vertical plating completely bounding the edges of a deck opening.

Coaming, House—A term applied to a narrow vertical plate bounding the top and bottom of a deck house, made somewhat thicker than the side plating and forming a frame for the base and top of the house. Also applied to the heavy timbers which form the foundation of a wood deck house.

Cofferdams—Void or empty spaces separating two or more compartments for the purpose of insulation, or to prevent the contents of one compartment from entering another.

Collier—A vessel designed for the carrying of coal.

Collision Mat—A large covering used to close an aperture in a vessel's side resulting from collision.

Companionway—A hatchway or opening in a deck provided with a set of steps or ladders leading from one deck level to another.

Compass—An instrument designed to indicate the magnetic north or the true north. The *Mariner's compass* consists essentially of a magnetized pointer, free to turn horizontally on a pivot or on the surface of a liquid, and tending to point to the magnetic north. The *gyrostatic compass* is not magnetized, but uses the principle of the gyroscope and points to the true north.

Compass, Radio—A device used to determine the direction from which a radio wave is sent and the location of the sending station.

Counter—That part of a ship's stern which overhangs the stern post, usually that part above the water line.

Cradle—A support of wood or metal shaped to fit the object which is stowed upon it.

Cradle, Boat—The heavy wood or metal supports for a ship's boat, cut to fit the shape of the hull of the boat and usually faced with leather, in which the boat is stowed.

Compartment—A subdivision of space or room in a ship.

Cradle, Marine Railway—The carriage on which the ship rests when being docked on a marine railway.

Crane—A machine used for hoisting and moving heavy material or portions of structures or machines.

Cross Trees—A term applied to athwartship pieces fitted over the trees on a mast. They serve as a foundation for a platform at the top of a mast or as a support for outriggers.

Crow's Nest—A look-out station attached to a mast.

Crutch—A term applied to a support for a boom; also applied to the jaw of a boom or gaff.

Cutwater—The forward edge of the stem at or near the water line.

Davit—A device used to lower and raise ship's boats or other objects.

Deadlight—A metal shutter fitted to protect the glass in a fixed or port light. Often incorrectly applied to a fixed light in a deck, bulkhead, or shell.

Deadweight Cargo—The number of tons remaining after deducting from the deadweight the weight of fuel, water, stores, dunnage, and crew and their effects necessary for use on a voyage. Also called "useful" or "paying" deadweight, "deadload" or "burden."

Deck—The floorlike planking or covering of any tier of beams above the inner bottom forming a floor, either in the hull or superstructure of a vessel. Designated by their location as upper deck, main deck, etc., and forward lower deck, after superstructure deck, etc.

Deck House—A partial superstructure that does not extend from side to side of a vessel as do the bridge, poop, and forecastle.

Deck Machinery—A term applied to capstans, windlasses, winches, and miscellaneous machinery located on deck.

Deck Planks, or Planking—Wood sheathing or covering on a deck.

Derrick—A device consisting of a king post, boom with variable topping lift, and necessary rigging for hoisting heavy weights.

Displacement—The volume of fluid displaced by a freely floating and unrestrained vessel, expressed either in cubic feet or in tons of water.

Dock—A basin for the reception of vessels.

Dockyard—A shipyard or plant where ships are constructed or repaired.

Dog—A short metal rod or bar fashioned to form a clamp or clip and used for holding watertight doors, manholes, or pieces of work in place.

Dolphin—Several piles bound together, situated either at the corner of a pier or out in the stream, used for docking and warping vessels. Also applied to single piles and bollards on piers that are used in docking and warping.

Donkey Engine—A small gas, steam, or electric auxiliary engine on the deck used for lifting.

Draft (Draught)—The depth of the vessel below the water line measured vertically to the lowest part of the hull, propellers, or other reference point. When measured to the lowest projecting portion of the vessel, it is called the "draft, forward"; and when measured at the stern, the "draft, aft"; the average of the "draft, forward" and the "draft, aft," is the "draft, mean"; and the mean draft, when in full load condition, is the "draft, load."

Draft Marks—Numbers placed on each side of a vessel near the bow and stern and often admidships, to indicate the distance from the number to the bottom of the keel or a fixed reference point. These numbers are 6 inches high, are spaced 12 inches bottom to bottom vertically, and are located as close to the bow and stern as possible.

Drag—The designed excess of draft, aft, over that forward, measured from the designer's water line. The drag is constant and should not be confused with trim.

Dunnage—Material such as blocks, boards, paper, burlap, etc., necessary for the safe stowage of stores and cargo; also used in reference to staging; used by workman during building or repair operations.

Engine Room—Space where the main engines of a ship are located.

Even Keel—The plane of flotation either coincident with or parallel to the designed water line.

Fake or Flake—To lay a rope or chain down in long bights side by side or in coils in regular order so that it will run out clear or can be easily and rapidly paid out. Also one complete circle of a coil of rope.

Fall—By common usage, the entire length of rope used in a tackle; sometimes limited in application to that end to which the power is applied. The end secured to the block is the standing part, the opposite end, the hauling part.

Fast—A rope or chain used to moor a vessel to a wharf, designated in accordance with the end of the boat with which it is used as bow-fast or stern-fast.

Fathom—A nautical unit of length used in measuring cordage, chains, depths, etc. The length varies in different countries, being 6 feet in the United States and in Great Britain.

Fender—A device fastened to or hung over the sides of a vessel to prevent rubbing or chafing against other vessels or piers.

Fore—Parts of a ship at or adjacent to the bow; also applied to parts of a ship lying between the midship section and stem, as fore body, fore hold, and foremast.

Fore and Aft—Lengthwise of a ship.

Forecastle—A short structure at the forward end of a vessel formed by carrying up the shell plating a deck height above the level of her uppermost complete deck and fitting a deck over the length of this structure. The name applied to the crew's quarters on a merchant ship when they are in the fore part of the vessel.

Fore Peak—The extreme forward end of the vessel below decks; forward trimming tanks.

Forward—In the direction of the stem.

Foul—Sea growth or foreign matter attached to the underwater portion of the outside of a vessel's shell. Also, obstructed or impeded by an interference, etc.

Founder—To sink as the result of entrance of water.

Freeboard—The vertical distance from the water line to the top of the weather deck at side.

Freeing Ports—Holes in the lower portion of a bulwark which allow deck wash to drain off.

Gaff—A spar to which the top of a fore-and-aft sail is attached.

Galley—Ship's kitchen.

Gangplank—A movable platform used in transferring passengers or cargo from a vessel to a deck.

Gangway—Place of exit from a vessel.

Gantline or Girtline—A rope reeving through a single block aloft and used for hoisting or lowering rigging, drying clothing and hammocks, etc.

Gaskets—Packing materials by which air, water, oil, or steam tightness is secured.

Gear—The total of all implements, apparatus, machinery, etc., pertaining to and used in the performance of any given operation, as "cleaning gear," "anchor gear," etc.

Gimbals—A device by which a vessel's compass, chronometer, etc., are suspended so as to remain in a constant horizontal position regardless of the roll or pitch of the vessel.

Gooseneck—A swiveling fitting on the keep or mast end of a boom for connecting the boom to the mast. Also called a "Pacific iron."

Grommet—A wreath or ring of rope; fiber, usually soaked in red lead or some such substance, and used under the heads and nuts of bolts to secure tightness; a worked eye in canvas.

Ground Tackle—A general term for all anchors, cables, ropes, etc., used in the operation of mooring and unmooring a ship.

Gudgeon—A metal eye or socket attached to the stempost to receive the rudder pintle.

Guys—Wire or hemp ropes or chains to support booms, davits, etc., laterally employed in pairs. Guys to booms that carry sails are also known as backropes.

Gypsy—A small auxiliary drum usually fitted on one or both ends of a winch or windlass, also known as "niggerhead" or "cathead."

Halyards—Light lines used in hoisting signals, flags, etc. Also applied to the ropes used in hoisting gaffs, sails, or yards.

Hatch Cleats—Clips attached to the outside of the hatch coaming to hold the hatch battens and wedges which fasten the edges of the tarpaulin covers.

Hatch Covers or Hatches—Covers for closing the hatchway; in cargo ships, usually made of wood planks in sections; steel covers are used in naval ships.

Hatch Rests—The shelf fitted inside and just below the top of the coaming to support the hatch cover.

Hawse—The hawse hole; also the part of a vessel's bow in which the hawse holes for the anchor chains are located.

Hawse Bag—A conical-shaped canvas bag, stuffed with sawdust, oakum, or similar material, and fitted with a lanyard at apex and base, used for closing the hawse pipes around the chain to prevent shipping water through the pipes; also called a "jackass," "hawse plug," or "hawse block."

Hawse Bolster—A timber of metal bossing at the ends of a hawse pipe to ease the cable over the edges and to take the wear.

Hawse Hole—A hole in the bow through which a cable or chain passes.

Hawse Pipes—Tubes leading the anchor chain from the deck on which the windlass is located down and forward through the vessel's bow plating.

Head of a Ship—The fore end of a ship; term applied to a toilet on board a ship; ship trimmed by the head when drawing more water forward and less aft than contemplated in her design.

Heel—The inclination of a ship to one side.

Helm—The tiller, wheel, or steering gear, and rudder.

Hog—A scrub broom for scraping a ship's bottom under water.

Hogging—The distortion of a vessel's hull when her ends drop below normal position relative to midship portion.

Hog Sheer—The curve of the deck construction so that the middle is higher than the ends.

Hoist—To raise or elevate; any device employed for lifting weights.

Hold—Space between the lowermost deck and the bottom of a vessel, or top of the inner bottom if one is fitted; space below decks allotted for the stowage of cargo.

Hoods—Plates placed at the extreme forward or after ends of a vessel.

Hull—The framework of a vessel together with all decks, deck houses, and the inside and outside plating or planking, but exclusive of masts, yard, rigging, and all outfit or equipment.

Inboard—Toward the center, within the vessel's shell and below the weather decks.

Jack Ladder—A ladder with wooden steps and side ropes.

Jackstaff—Flagpole at the bow of a vessel.

Jacob's Ladder—A ladder having either fiber or wire rope or chain sides with wood or metal rungs attached at regular intervals.

Jury—A term applied to temporary structures, such as masts, rudders, etc., used in an emergency.

Keel—A center-line strength member running fore and aft along the bottom of a vessel and often referred to as the backbone.

Keel, Bilge—A fin fitted on the bottom of a ship at the turn of the bilge to reduce rolling.

King Post—A strong vertical post used to support a derrick boom. (*See* Samson Post.)

Knot—A unit of speed, equaling 1 nautical mile (6,080.20 feet) an hour.

Ladder—A framework consisting of two parallel sides connected by bars or steps which are spaced at intervals suitable for ascending or descending.

Ladder, Accommodations—A staircase suspended over the side of a vessel from a gangway to a point near the water to provide easy access to the deck from a small boat alongside.

Ladder, Companion—A staircase fitted as a means of access from a deck to the quarters.

Ladder, Sea—Rungs secured to the side of a vessel to form a ladder from the weather deck to the water.

Lanyard—The present use of this term generally is limited to a piece of rope or line having one end free and the other attached.

Leading Edge—That edge of a propeller blade which cuts the water when the screw is revolving in the ahead direction; that edge of a rudder, diving plane, or strut arm which faces toward the bow of the ship.

Length Over All—The length of a vessel measured from the foremost point of the stem to the aftermost part of the stern.

Light, Port—An opening in a vessel's side, provided with a glazed lid or cover.

Lighter—A large open barge used in loading and unloading vessels or in carrying freight around a harbor.

Limber Hole—A hole or slot in a frame or plate which prevents water from collecting.

Line—A general term for a rope.

Lines—The plans of a vessel that show its form.

List—The deviation of a vessel from the upright position.

Load Line—The line on the "lines plan" of a vessel representing the intersection of the vessel's form with the plane of the water's surface when the vessel is floating with her designed load on board; also applied to the actual intersection of the surface of the water with a vessel's side.

Locker—A storage compartment.

Magazine—Spaces or compartments devoted to the stowage of ammunition; often specifically applied to compartments for the stowage of powder as a distinction from shell stowage spaces.

Main Deck—The principal deck of the hull.

Manhole—A hole cut in decks, tanks, boilers, etc., to provide access.

Marlinespike—A pointed iron or steel tool used to separate the strands in splicing rope, and as a lever in putting on seizings.

Marline—A double-threaded, left-handed tarred cord, about ⅛ inch in diameter, made of a good grade of American hemp.

Mast—A long pole of steel or wood originally used for carrying sails and now used more as supports for rigging, cargo and boat-handling gear, and wireless equipment.

Mast Collar—A piece of wood or a steel shape formed into a ring and fitted around the mast hole in a deck.

Mast Hounds—The upper portion of the mast at which the outrigger or trestle trees are fitted; also applied to that portion at which the hound band for attaching the shrouds is fitted on masts without outrigger or trestle trees.

Mast Partners—Wood planking or steel plating worked around a mast hole to give side support to the mast.

Mast Step—The foundation on which a mast is erected.

Mooring—The anchoring of a vessel by securing her to a mooring buoy or to a wharf or pier.

Mooring Lines—The chains or ropes used to tie up a vessel.

Mushroom Ventilator—A ventilator the top of which is shaped like a mushroom and fitted with baffle plates permitting the passage of air and preventing the entrance of rain or spray.

Niggerhead—A small auxiliary drum on a winch. (*See* Gypsy.)

Oakum—Soft vegetable fiber such as hemp and jute impregnated with pine tar; used for calking and planking on wood decks of steel vessels and for calking all the planking on wood ships; also used for calking around pipes.

On Deck—In the open air.

Outboard—Away from the center toward the outside; outside the hull.

Overboard—Over the side of a vessel into the water.

Overhang—That portion of a vessel's bow or stern which projects beyond a perpendicular at the water line.

Overhaul—To repair or put in proper condition for operation; to overtake or close up the distance between one vessel and another moving in the same direction.

Painter—A length of rope secured at the bow of a small boat for use in towing or for making fast. Called also a bow-fast.

Panting—The pulsation in and out of the bow and stern plating as the ship alternately rises and plunges into the water.

Paravane—A special type of water kite which, when towed with wire rope from a fitting on the forefoot of a vessel, operates to ride out from the vessel's side and deflect mines which are moored in the path of the vessel and to cut them adrift so that they will rise to the surface.

Parceling—Narrow strips of canvas which are tarred and wound around ropes, following the lay and overlapping in order to shed water. The parceling is applied after worming, preparatory to serving.

Pawl—A short piece of metal so hinged as to engage in teeth or depressions of a revolving mechanism to prevent recoil; fitted to capstans, windlasses, etc. Also called "pall."

Paying—The operation of filling the seams of a wood deck with pitch, marine glue, etc.; also "paying out" applied to the operations of slacking away on a rope or chain.

Peak, Fore and After—The space at the extreme bow or stern, respectively, of a vessel below decks.

Peak Tank—Compartments at the extreme fore and aft ends of the vessel for any use either as void spaces or as trimming tanks.

Pelican Hook—A type of quick releasing hook used at the lower end of shrouds, on boat grips, and in similar work where fast work may be necessary.

Perlorus—A navigational instrument used in taking bearings, especially when the object to be sighted is not visible from the vessel's compass; also known as a "dumb compass."

Pillar—A vertical member of column giving support to a deck; also called a "stanchion."

Pilot House—A house designed for navigational purposes usually located forward of the midship section and so constructed as to command an unobstructed view in all directions except directly aft, where the smokestack interferes.

Pin, Belaying—A small iron or touchwood pin used in belaying or making fast the hauling parts of light running gear.

Pintles—Pins or bolts which hinge the rudder to the gudgeon on the stern post.

Pitch—The distance a propeller will advance during one revolution; the distance between the centers of the teeth of a gear wheel; axial advance of one convulsion of the thread on a screw; the spacing of rivets, etc.; also applied to tar, asphalt, and coal pitch used in paying seams of a deck.

Pitching—The alternate rising and falling motion of a vessel's bow in a nearly vertical plane as she meets the crests and troughs of the waves.

Plimsoll Mark—A mark painted on the side of a vessel designating the depth to which, under the maritime laws, the vessel may be loaded in different bodies of water during various seasons of the year.

Ponton—A scow-shaped vessel used in connection with engineering and military operations such as transporting men and equipment, bridge construction equipment, supports for temporary bridges, salvage work, etc.; also applied to cylindrical air and watertight tanks or floats used in salvage operations.

Poop—The structure or raised deck at the after end of a vessel.

Port—The left-hand side of a ship when looking from aft forward.

Port Gangway—An opening in the side plating, planking, or bulwark providing access or egress.

Porthole—A round window in the side or deck house of a vessel fitted with a hinged frame in which a thick glass is secured.

Quarter—The upper part of a vessel's sides near the stern; also portions of the vessel's sides about midway between the stem and midlength and between midlength and the stern. The part of a yard just outside the slings.

Quay—An artificial wall or bank, usually of stone, made toward the sea or at the side of a harbor or river for convenience in loading and unloading vessels; a wharf.

Raft, Life—A framework fitted with air chambers to support people cast on the sea.

Rail—The upper edge of the bulwarks; also applied to the tiers of guard rods running between the top rail and the deck where bulwarks are not fitted.

Rake—The fore and aft inclination from the vertical of a mast, smokestack, stempost, etc.

Rat Guard—A circular piece of metal made in two parts and fitted closely on hawsers and lines to prevent rats boarding or leaving a vessel while at a dock or wharf.

Ratlines—Short lengths of line secured to the shrouds parallel to the water line and serving as ladder rungs for the crew to ascend or descend.

Reeving—The act of passing the end of a rope or chain through an opening.

Ride—To float in a buoyant manner.

Rigging—A term used collectively for all the ropes and chains employed to support the masts, yards, and booms of a vessel, and to operate the movable parts.

Roll—Motion of the ship from side to side.

Rope Worming—Filling in the cantlines of a rope with marline.

Rudder—A device used in steering or maneuvering a vessel.

Rudder Bands—Bands placed on each side of a rudder to help brace it and tie it into the pintles.

Rudder Chains—The chains fastening a rudder to the stern.

Rudder Frame—A vertical main piece and the arms that project from it which form the frame of the rudder.

Rudder Post—(*See* Stern Post.)

Rudder Stock—A vertical shaft having a rudder attached to its lower end and having a yoke, quadrant, or tiller fitted to its upper portion, by which it may be turned.

Rudder Stops—Fittings attached to the vessel's structure or to shoulders on the rudder post to limit the swing of the rudder.

Rudder Trunk—A watertight casing fitted around a rudder stock between the counter shell plating and a platform or deck, usually fitted with a stuffing box at the upper end.

Running Rigging—Ropes which are hauled upon in order to handle and adjust sails, yards, cargo, etc., as distinguished from standing rigging which is fixed in place.

Sagging—The deformation caused when the middle portion of a structure or ship settles or sinks below its designed or accustomed position; the reverse of hogging.

Samson Post—A strong vertical post that supports cargo booms. (*See* King Post.)

Scupper Pipe—A pipe conducting the water from a deck scupper to a possition where it is discharged overboard.

Scuppers—Drains placed in the gutters or waterways on open decks and in corners of inclosed decks, and connected to pipes leading overboard.

Scuttle—A small opening generally fitted in decks to provide access; often termed "escape scuttles," and when fitted with means whereby the covers can be removed quickly to permit exit, are called "quick acting scuttles."

Scuttle Butt—A container for drinking water.

Sea Chest—An arrangement for supplying sea water to condensers and pumps, and for discharging waste water from the vessel to the sea.

Sea Cock, Sea Connection—A valve secured to the plating of the vessel below the water line for use in flooding tanks, magazines, etc.; to supply water to pumps, and for similar purposes.

Serve—To wrap any small stuff tightly around a rope which has been previously wormed and parceled.

Shackle Bolt—A pin or bolt that passes through both eyes of a shackle and completes the link.

Shaft, Shafting—The cylindrical forging, solid or tubular, used for transmission of rotary motion from the engine to the propellers.

Shaft Strut—A term applied to a bracket supporting the outboard after end of the propeller shaft and the propeller in twin- or multiple-screwed vessels having propeller shafts fitted off the center line.

Sheer—The longitudinal curve of a vessel's rails, decks, etc., the usual reference being to the vessel's side; however, in the case of a deck having a camber, its center line may also have a sheer. The amount by which the height of the weather deck at the after or forward perpendicular exceeds that at its lowest point.

Shelter Deck—A deck fitted from stem to stern on a relatively light superstructure.

Shipshape—Neat in appearance, and in good order.

Shore, Spur or Side—A piece of timber placed in a nearly horizontal position with one end against the side of the vessel and the other against the side of a drydock to keep the vessel at a desired distance from the face of the dock.

Shroud—A principal member of the standing rigging, consisting of hemp or wire ropes which extend from or near a masthead to the vessel's side, or to the rim of a top, to afford lateral support for the mast.

Skylight—An erection built on a deck, having glass lights in its top and fitted over an opening in the deck to admit light and air to a compartment below.

Slack—Not fully extended: to "slack away" means to pay out a rope or cable by carefully releasing the tension while still retaining control; to "slack off" means to ease up or lessen the degree of tautness.

Sling—A length of chain or rope or wire employed in handling weights with a crane or davit; the rods, chains, or ropes attached near the bow and stern of a small boat into which the davit or crane tackle is hooked; the chain or rope supporting the yard at the masthead.

Slip—The difference between the pitch of a propeller, or the mean circumference of a paddle wheel, and the advance of the vessel through the water corresponding to one revolution; also applied to the space a vessel occupies at a pier or at an anchorage.

Snubbing—Drawing in the water lines and diagonals of a vessel abruptly at their ends; the checking of a vessel's headway by means of an anchor and a short cable; the checking of a line or cable from running out by taking turns about a cleat, bitts, or similar fitting.

Span—The length of a member between its supports, as the span of a girder; a rope the ends of which are both made fast some distance apart; the bight having attached to it a topping lift, tackle, etc.; a line connecting two davit heads so that when one davit is turned the other follows.

Spar—A pole serving as a mast, boom gaff, yard bowsprit, etc.

Splice—A method of uniting the ends of two ropes by first unlaying the strands, then interweaving them so as to form a continuous rope.

Squatting—The increase in trim by the stern assumed by a vessel when running at high speed over that existing when she is at rest.

Stability, Range of—The number of degrees through which a vessel rolls or lists before losing stability.

Stanchions—Short columns or supports for desks, handrails, etc.

Standing Rigging—Rigging that is permanently secured.

Starboard—The right-hand side of the vessel when looking from aft forward.

Stateroom—A private room or cabin.

Stays—Ropes, supporting the lower masts, topmasts, top-gallant mast, etc., in a fore and aft direction.

Steering Gear—The wheels, leads, engine, and fittings by which the rudder is turned.

Stem—The bow frame forming the apex of the intersection of the forward sides of a vessel.

Stern—The after end of a vessel.

Stern Post—The main vertical post in the stern frame upon which the rudder is hung; also called "rudder post."

Stiff, Stiffness—Tendency of a vessel to remain upright; a measure of the rapidity with which she returns to that position after having been inclined from it.

Strake—One breadth of planks forming a continuous strip on the bottom or sides of a vessel, reaching from stem to stern. The planks or plates next to the keel are called the "garboard strakes"; the strakes at the bilge are the "bilge strakes."

Strut—A heavy arm or brace.

Sunk Forecastle, Sunk Poop—A forecastle or poop deck which is raised only a partial deck height above the level of the upper or weather deck.

Superstructure—A structure built above the uppermost complete deck; a pilot house, bridge, galley house, etc.

Swash Bulkheads—Longitudinal or transverse nontight bulkheads fitted in a tank to decrease the swashing action of the liquid contents. A plate serving this purpose is called a swash plate or baffle.

Swivel—A special link constructed in two parts which revolve on each other; used to prevent fouling due to turns or twists in chain, etc.

Tackle—Any combination of ropes and blocks that multiplies power. Also applied to a single whip which does not multiply power but simply changes direction.

Taff Rail—The rail around the top of the bulwark or rail stanchions on the after end of the weather deck.

Tail Shaft—The aft section of the shaft which receives the propeller.

Tarpaulin—Pliable canvas hatch covers and pieces of canvas used as a shelter for workmen or as a cover for deck equipment.

Taut—The condition of a rope, wire, or chain when under sufficient tension to cause it to assume a straight line.

Telemotor—A device for operating the valves of the steering engine from the pilot house.

Thwarts—Boards extending across a rowboat just below the gunwale to stiffen the boat and provide seats.

Tiller—An arm attached to the rudder head for operating the rudder.

Tonnage, Gross—The entire internal cubic capacity of a vessel expressed in "tons" of 100 cubic feet each.

Tonnage, Net—The internal cubic capacity of a vessel which remains after the capacities of certain specified spaces have been deducted from the gross tonnage; not be confused with displacement.

Topside—The portion of the side of the hull which is above the designed water line.

Trim—The arithmetical sum of the drafts forward and aft above and below the mean water line.

Turnbuckles—A link used to pull objects together.

Umbrella—A metal shield secured to the outer casing of the smokestack to keep out the weather.

Upper Deck—Generally applied to the uppermost continuous weather decks.

Unship—To remove anything from its accustomed or stowage place; to take apart.

Uptake—A sheet-metal conduit connecting the boiler smoke box with the base of the smokestack.

Valve—Device used for controlling or shutting off the passage of a fluid or gas into or out of a container or through a pipe.

Vane—A fly made of bunting and carried at the masthead or truck which indicates the direction of the wind.

Vang—Ropes secured to the outer end of a cargo boom used for guiding, swinging, and holding the boom in a desired position; also applied to ropes secured to the after end of a gaff and led to each side of the vessel to steady the gaff when the sail is not set.

Visor—A small awning running around the pilot house over the windows or air ports to exclude rain, spray, and the glare of the sun.

Warp—A light hawser or tow rope.

Wash Plates—Plates fitted fore and aft between floors to check the rush of bilge water from side to side when the ship is rolling.

Water Line—Used also to describe the line of intersection of the surface of the water with the hull of the vessel at any draft and any condition of trim.

Watershed—A fitting on the outside of the shell of a vessel over an air port or a window to prevent water running down the vessel's side from entering the opening.

Watertight Compartment—A space or compartment constructed in such a manner as to prevent the leakage of water.

Waterway—A narrow channel along the edge of the deck for the collection and disposal of water.

Weather Deck—The upper awning, shade, or shelter deck, or the uppermost continuous deck, exclusive of forecastle, bridge, or poop, exposed to the weather.

Whip—Any tackle used for hoisting light weights.

Winch—A hoisting or pulling machine used principally in the handling, hoisting, and lowering of cargo from a wharf or lighter to the hold of a vessel and vice versa.

Windlass—Apparatus used in handling heavy anchor chains, hawsers, etc.

Worming—Filling the cantlines of a rope with tarred small stuff to give the rope a smoother surface and to aid in excluding moisture from its interior.

Yoke—A frame or bar having its center portion bored and keyed or otherwise constructed for attachment to the rudder stock.