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REPLENISHMENT AT SEA

ATP 16

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LETTER OF PROMULGATION

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON 25, D.C.

26 May 1955

LETTER OF PROMULGATION

1. ATP 16, REPLENISHMENT AT SEA, is an Unclassified Nonregistered Publication.

2. ATP 16 shall become EFFECTIVE when so ordered by the Chief of Naval Operations.

3. This publication may be carried in aircraft for use therein.

BROOKE SCHUMM
Captain, U. S. Navy
Director, Surface Type Warfare

LIST OF EFFECTIVE PAGES

SUBJECT MATTER	PAGE NUMBERS	EFFECTIVE PAGES
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LETTER OF PROMULGATION	III (REVERSE BLANK)	ORIGINAL
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RECORD OF CHANGES AND CORRECTIONS	IX and X	ORIGINAL
INSTRUCTIONS	XII (OBVERSE BLANK)	ORIGINAL
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REPLENISHMENT AT SEA

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RECORD OF CHANGES AND CORRECTIONS

SHORT TITLE OF CHANGE, REGISTER NUMBER, IF ANY	DATE OF ITEM	DATE OF ENTRY	NAME OF COMMAND (Authorized Abbreviation)	RANK or RATE	SIGNATURE
Errata - NRP	22 June 1955	7 July 55	Nav Sec Sta.	GS 5	V. S. Johnson
Err. #2 - NRP	28 June '55	"	"	"	V.S.J.

RECORD OF CHANGES AND CORRECTIONS

SHORT TITLE OF CHANGE, REGISTER NUMBER, IF ANY	DATE OF ITEM	DATE OF ENTRY	NAME OF COMMAND (Authorized Abbreviation)	RANK or RATE	SIGNATURE

INSTRUCTIONS

Replenishment at Sea, ATP 16, presents the techniques by which transfers of liquid and solid cargoes are made by ships underway or in port. It is designed as a guide for use by NATO navies in carrying out replenishment operations either between two combatant ships, or between a combatant and specially equipped merchant ship, of different nations.

Basic information regarding maneuvering, signaling, night replenishment, and safety precautions is provided in the first two chapters. Chapters three and four describe the procedures for transferring liquids, solids, and personnel at sea. Appendix A is designed for use when combatant and merchant ships are carrying out transfer at sea. Detailed drawings as well as photographs of the various rigs in use augment the comprehensive instructions on the procedures. Appendix B consists of a table of equivalent terms. These two appendixes repeat much material from the main body of the book because they will be issued as a separate book to specially equipped merchant ships who will carry out transfer at sea.

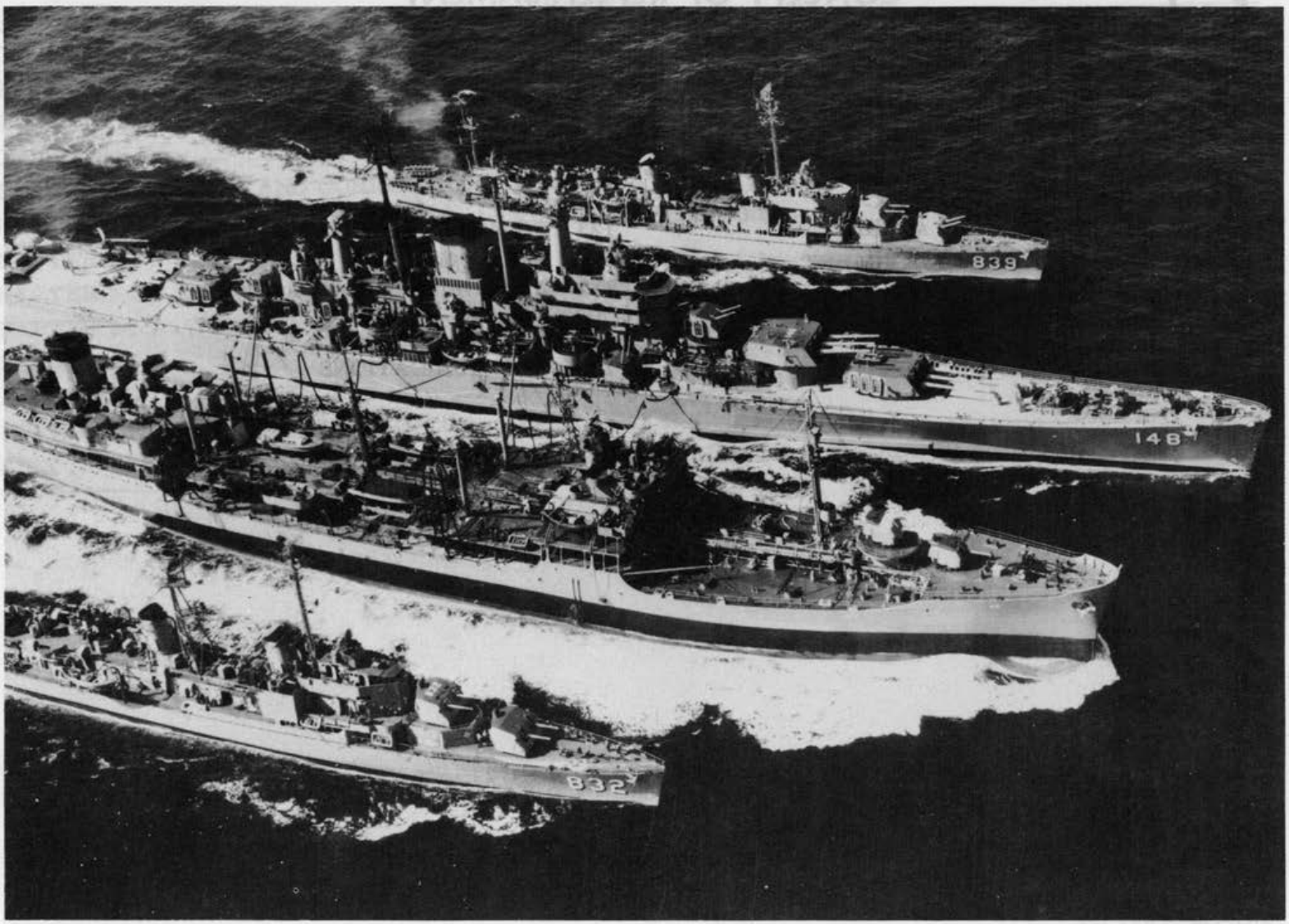
The procedures and instructions herein are to be followed by NATO naval units when operating together. Individual nations are to issue a letter of promulgation to include the method of accounting for and maintaining custody of this publication, and to provide for making the contents legally effective within their navies.

Holders of ATP 16 are warned that this document contains information affecting the mutual defense of their nation and of their allies. The transmission of this document or the revelation of its contents in any manner to an unauthorized person is prohibited.

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CONCEPT OF REPLENISHMENT

CHAPTER 1



CHAPTER 1

CONCEPT OF REPLENISHMENT

CONTENTS

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CHAPTER 1

Concept of Replenishment

100 THE ABILITY TO STAY AT SEA

A fundamental mission of a navy is to keep the vital sea routes of supply open for general use. Sending the various ships of the fleet out to sea is merely the first step in accomplishing this mission. Once the ships are at sea, considerable attention must thereafter be given to keeping them there, well-stocked and ready to go into action on any of the numerous and complex tasks for which they were built. A system of supply lines within supply lines is established, requiring operating procedures which make up a large part of the subject of logistics. One such procedure is replenishment at sea: a branch of naval science embodying the minute and exacting operations that take place when ships are engaged in the underway transfer of fuel, munitions, supplies, and men.

a. Military Concept. Transfers between ships cruising side by side in the open seas are processes completely military in concept and application. Nowhere in civilian sailing can we find anything to compare with them. The tramp steamer crosses from West Africa to New Orleans by means of the fuel and stores it has on board; there it replenishes in port for the return journey. Only military ships are required to stay at sea for longer periods than that, and to do it they must be replenished regularly. Fueling at sea will continue to be an important naval operation until such time as the propulsion of vessels by nuclear power has become a universal working reality and ships no longer require conventional fuels.

b. Potentialities of Replenishment. In theory, a ship could remain at sea for the entire period between major overhauls or drydocking. She could be refueled by fleet oilers whenever necessary; ammunition and supply ships could fulfill her every need in the way of repair parts for her machinery, shells for her guns, and food and clothing for her crew; the crew themselves could be taken off and put aboard in a system of rotation. Although the reasons for avoiding such a practice are obvious, the very fact that it is theoretically possible indicates the great potentialities of replenishment.

From the point of view of the fleet as a whole, seakeeping capability depends directly on the replenishment of its least self-sufficient ships. Thus the destroyer, so often used to screen a formation of

capital ships, has only a fraction of their fuel capacity. Since destroyers are a necessary part of a task force, the large ships of that force are limited not so much by their own endurance as by their ability to refuel their screen destroyers.

110 PRINCIPLES OF REPLENISHMENT

In itself, the act of rigging and sending over a hose from an oiler to a destroyer for the purpose of transferring fuel is a minor undertaking. Nevertheless, refueling has its strategic and tactical aspects. If fueling is carried out improperly it may work against the best interests of the unit, the group or the force involved, or even against the over-all safety of the fleet. Certain general principles have been established as operational guides, whether a replenishment ship is assigned to replenish a full-strength combat force or simply one ship.

The guiding principle can be simply stated: Every effort consistent with safety must be made to reduce to a minimum the time required to accomplish replenishment. Fueling or loading at sea must be accomplished with as little deviation from the primary mission as practicable. For example, if the primary mission of the combat force requires it to proceed north, the secondary mission, replenishment, should be accomplished by the replenishment group while on a northerly course. On the other hand, if it is better for the combat force to deviate from its primary direction of advance because engaging in replenishment operations on such a course would add to its vulnerability, the replenishment group must proceed to whatever point of safety or in whatever direction the combat force chooses.

Ships trussed together with a complex arrangement of lines, hoses, and telephone connections are vulnerable to attack by aircraft and submarines. This danger is increased by the difficulty of making changes in course while replenishment is underway; especially since hazards exist due to open storage compartments, exposed material, and men working under the tension created by the unusual proximity of their ships.

During replenishment operations there is a much greater danger of collision than under normal conditions. Such an ordinarily inconsequential thing as propeller current can be dangerous to two ships about to close one another for replenishment. During this operation the chances are increased of a man's being washed overboard or being caught in the bight of a line and pulled into the water. These considerations emphasize the fact that safety measures, familiarity with the job at hand, and the principles of good seamanship are of the utmost importance in replenishment operations.

The moment a ship arrives alongside, the

proper connections have to be made, transfer of goods must begin, and the process must continue without interruption until the last line is returned and all is secure again. A replenishment schedule is required before the operations are begun. Receiving ships and delivering ships should be able to keep rig changes to a minimum. Each delivering ship will have the necessary cargo ready to go over the side, and will assume responsibility for handling the rigs.

120 COMMAND AND ORGANIZATION

The following articles present a brief summary of the command and organization for replenishment operations. For further information, see Chapter 19 of ATP 1.

121 OFFICER IN TACTICAL COMMAND. The OTC during replenishment operations will be either the underway replenishment group commander or the supported force commander, depending on which of the two is the senior officer. Regardless of seniority, however, the requirements of the supported force are the primary considerations.

122 ORGANIZATION OF AN UNDERWAY REPLENISHMENT GROUP. When the commander of an underway replenishment group is given the number of task groups to be replenished and their specific requirements, he divides his group into the requisite number of units, each comprising the types of supply ships best suited to the logistic needs of the task group to which it is assigned. A temporary commander and a temporary unit number are designated by the underway replenishment group commander for each replenishment unit.

123 SUPPLY AND ACCOUNTING RESPONSIBILITIES. After replenishment, the supplying ship will notify the receiving ship by telephone or visual signal how much was supplied and send invoices for the material transferred as soon as possible. Quantities invoiced shall be considered conclusive unless a gross error is believed to exist.

130 SEAMANSHIP

The ability of men to work together smoothly is no less important in a replenishment operation than it is in the rapid firing of an antiaircraft gun. Indeed, the necessity for adequate training is increased in transfer operations by the fact that crews from different ships and from different nations are called on to work together although they may never have had any contact with one another before. A high degree of teamwork and coordination must be achieved.

It has been pointed out that replenishment during

daylight and in fair seas is a comparatively simple operation, but increased difficulties at night and in bad weather call for the services of highly trained personnel. For this reason, replenishment drills are necessary.

The stop watch is useful during training, to measure the proficiency of the men involved in rigging and handling gear. Yet training must be flexible, for situations vary according to the weather and equipment; a lack of fully adequate gear is often encountered on ships smaller than destroyers. Although time is important, it should be emphasized in training that any attempt to reduce replenishment time below that which is consistent with safety may actually increase the over-all time by causing casualties to personnel and equipment.

131 MANEUVERING DURING ALONGSIDE REPLENISHMENT

a. Steaming Alongside. Of foremost importance is the procedure of maneuvering while steaming alongside (Figure 1-1). Seamanlike judgment is constantly necessary. Drawing in too close can inhibit steering control on one or both vessels, whereas drawing too far apart will put an undue strain on the rigs.

Variation in the velocity of flow of water around the hull of a ship underway creates areas of increased pressure in the vicinity of the bow and stern and decreased pressure (suction) amidships as shown in Figure 1-2a. When two ships are close to each other underway, these areas take on added importance because of the intermingling of pressure areas. Effects vary with the distance between hulls, size of the ships, and depth of water.

If the approaching ship (large or small) comes nearer than 80 feet, the replenishment ship must use radical rudder angles in order to maintain a steady course. A reduction of speed will occur as a result of the rudder angle, and this further complicates the problem for both ships. For example, during a close approach (less than 80 feet) by a large combatant to an AO type replenishment ship, the AO may require a rudder angle of as much as 25 degrees to maintain a steady course. Not only does this large amount of rudder increase the handling difficulties of the ship to be replenished, but it is dangerous if a rudder casualty should occur.

Figure 1-2b depicts the pressure distribution in the water about a ship underway. It also shows smaller ships in dangerous positions, where any changes in relative position will impose rapid changes in the interaction effects on their hulls. Either position may require quick rudder action by the smaller ship. Both positions become even more hazardous if speed is reduced (as when the smaller

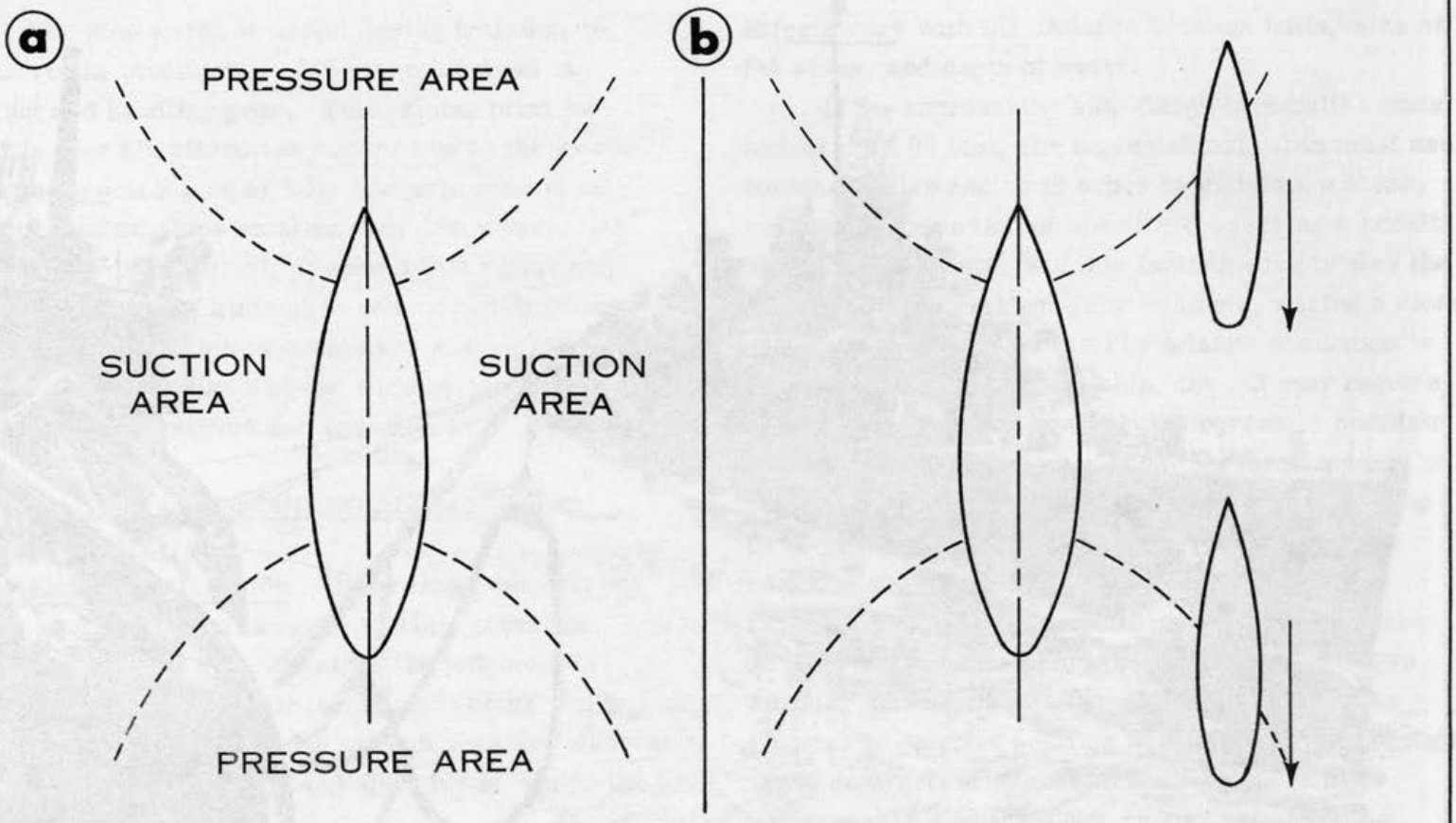
MAKING THE APPROACH

FIG. 1-1



DANGERS OF HULL WASH

FIG. 1-2



ship is required to drop back) because of her reduced maneuverability. The situation is further aggravated by radical speed changes when attempting to avoid collision.

Shallow water produces even more pronounced interaction between ships. Normally replenishment operations are conducted in relatively deep waters, but ships conducting exercises in various coastal training and operating areas, where the depths of water are less than 20 fathoms, should be particularly alert for this effect.

In order to reduce the effects of interaction to a minimum, the receiving ship should ensure that a ship separation of at least 100-120 feet is maintained during the approach. When the ship has settled down to its proper alongside position the required ship separation can gradually be attained and maintained. The best position for ships close aboard is exactly abeam. Receiving ships smaller than supplying ships will find the region between the bow and stern pressure areas to have the least adverse effect on ship-handling, when ship separation is about 80 feet.

b. Course and Speed. It is the responsibility of the OTC to select a suitable course and speed. For tactical or even strategic reasons, he may wish to head in a direction which is counter to good seamanship. Nevertheless, he must give careful consideration to the prevailing situation such as limiting weather conditions. When the wind and sea are moderate and in the same direction, the most widely accepted practice is to take a course generally into the wind, but if the wind and sea are not in the same direction, the dominant of the two will probably dictate the choice of course. When the wind is strong and the sea has not yet had a chance to build up, a downwind course may be best.

Maintaining alongside position is not entirely a matter of holding steady on course. Each ship may have to carry a certain amount of rudder, and slight changes in speed and rudder may have to be made. The receiving ship's departure can be executed so smartly that the hazardous pressures and undercurrents at work will hardly be noticed. Although the departing ship merely pulls ahead and simultaneously swings out to clear the delivering ship, the maneuver is sometimes complex, requiring skill and attention to details. The essentials of the replenishment maneuver are more fully outlined in Chapter 2.

132 REPLENISHMENT AT NIGHT. At night it is often impossible to observe the progress of activity on the deck of the ship opposite. What is easy to perform in daylight, such as placing a hose in a fueling trunk, maintaining the tension of lines, and working the controls on a winch, becomes difficult

in the dark. The approach, station keeping, communications, and the passing of rigs all present complications. As a result, replenishment must proceed more slowly and with greater caution at night. Increased attention to standardization of procedure and training of personnel is required.

140 COMMUNICATIONS

During replenishment it is necessary to exchange detailed data between ships. Pumping and other information must be passed quickly, and orders have to be given promptly when any change in the cruising situation is necessary. The conning officer of the controlling ship is actually guiding both ships, for he maintains his own position while the conning officer of the ship opposite keeps station on him.

The three usual devices by which ships engaging in replenishment can communicate are, in the order of their importance, the sound-powered telephone, hand-signals, and megaphones. The sound-powered telephone is preferable once the ships are joined, but radio, flag hoist, and visual light signals may be used as necessary. Each transfer station maintains telephone communications with its corresponding station on the other ship. Telephones are also used from bridge to bridge. The electric megaphone or loud hailer is useful in the final stage of the approach, just before telephones have been connected. To complete the communication setup, a signalman holding flags (day time) or flashlights (night) is stationed at each transfer point on both ships. He stands by for visual signaling if telephone service fails.

REPLENISHMENT PROCEDURES

CHAPTER 2



CHAPTER 2

REPLENISHMENT PROCEDURES

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250 REPLENISHMENT DURING COLD WEATHER

CHAPTER 2
Replenishment Procedures

200 MANEUVERING CHARACTERISTICS OF REPLENISHMENT SHIPS

The majority of auxiliary vessels whose duty it is to supply combat ships at sea are either non-standard types built by the various Navies, or ships acquired from other sources and converted to Naval use. Since little uniformity exists among these ships, their tactical qualities differ in many respects.

Maneuvering in formation with replenishment vessels imposes certain limitations on the combatant ships. For instance, the usual auxiliary ships do not have the power and manageability of combatant ships and are often restricted to particularly low speeds when their pumps or other deck machinery are in use. Then, too, fleet oilers proceeding on a cross-wind course tend to head into the wind.

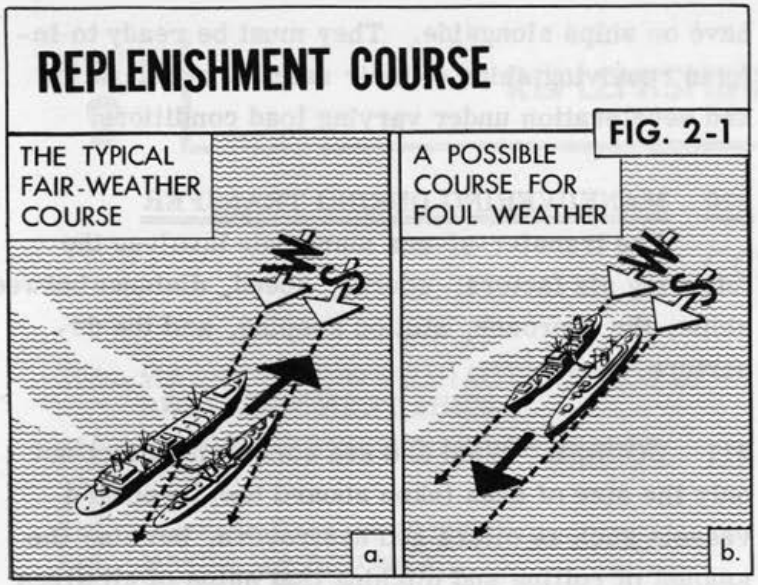
The commanding officers of replenishment vessels, on the other hand, must know what effects the maneuvering characteristics of their ships will have on ships alongside. They must be ready to inform receiving ships of their rates of acceleration and deceleration under varying load conditions.

210 MANEUVERING DURING TRANSFER

The transfer-at-sea maneuver involves the following six factors: course, speed, distance between ships, the approach, station keeping, and the departure.

211 COURSE. Wind and sea conditions affect not only the size of seas taken aboard low-freeboard vessels such as oilers and destroyers, but also the amount of rolling and pitching that ships of all sizes will encounter. A good choice of replenishment course and speed will provide for the maximum ability of ships to stay alongside each other and will ensure a minimum of stress on intership rigging.

a. Wind and Sea. Replenishment courses are chosen in relation to the wind and sea (see Figure 2-1). Heading with the wind from one to two points on the port bow during fair weather will give destroyer-type vessels on the starboard side of oilers or cargo ships some advantage of a lee. But in some cases a downwind foul-weather course may prove workable as long as the wind is stronger than the rise and fall of the sea. As the sea becomes more and more difficult, light ships will experience an



increasing degree of yaw, so it is wise to keep as much distance as practicable between ships under such conditions. In fueling operations, the span-wire or the jackstay rig provide for this situation by allowing ships to open out to 180 feet or 250 feet respectively. At this distance they can experience considerable yaw with minimum danger to themselves or to the equipment. However, if yaw becomes really excessive, the vessels must come together enough to prevent sudden tension on span wires and hose rigs.

Particular care in choosing the course for fueling submarines at sea is essential, since the submarine is required to have men on the main deck during the operation and the low freeboard makes this hazardous except in relatively calm sea conditions.

b. Making Changes in Course. From the point of view of safety, it is inadvisable to make any large changes of course during fueling or replenishment, for such maneuvers are difficult under the best of conditions. However, large changes can be made under certain circumstances if good judgment is used and the proper procedure is followed.

No matter how broad an over-all turn is to be made, the force ordinarily should alter course in steps, each of about 20^{o}. Individual supplying ships should effect this alteration in increments of 5^{o} each, any ships replenishing from them being controlled by them to conform and keep station on them. When giving the executive signal for each 5^{o} there is less confusion if the supplying ship states "1st", "2nd", "3rd" or "last 5^{o}". After every turn, the ships should steady on a course long enough to allow stabilization of the formation. Each controlling ship must also keep a close watch on the guide and adjacent vessels, in order not to embarrass them.

Assuming that a change of course during replenishment seems necessary in order to avoid imminent danger, it is still advisable to keep in mind that the damage which can occur in making the turn might well be greater than the danger to be avoided. If such turns are mandatory, they

should be executed in the following manner. The controlling ship maintains engine revolutions and makes the turn with a constant rudder angle; the other ship (or ships) if outboard of the direction of turn, increases speed about 2 knots, or if inboard of the direction of turn decreases speed about 2 knots, at the same time adjusting rudder angle to keep the stern at a constant distance from the stern of the controlling ship; then speed is adjusted to regain proper fore-and-aft position.

In making any turn while ships are joined together, the safest method of giving orders to the steersman is to order him to "Come right (or left)" to a specified compass course.

While turning, the delivering ship should keep the receiving ship constantly advised of its compass heading by telephone so that the commanding officer of the receiving ship can properly adjust his rate of turn.

212 SPEED. Generally speaking, it is advisable to carry out replenishment operations while at speeds between 10 and 15 knots. Weather conditions influence the choice just as they do in deciding on a course. Pumps and deck machinery on delivering vessels should be operated at full capacity, and this, too, limits the possible cruising speed. In any case, however, speeds of less than 8 knots are not advisable because steering control is then greatly diminished. When one fast combat ship is replenishing another, a speed higher than 15 knots may well be used if the weather permits.

213 DISTANCE BETWEEN SHIPS. The distance between ships should be that at which replenishment operations can be accomplished with the greatest facility and safety. This distance will vary with wind and sea, the ability of vessels to maneuver while alongside, and the type of transfer rig being used. With high-lines or jackstay rigs, burton rigs, house-fall rigs, and others by which supplies, ammunition, and personnel are transferred, a distance of 60 to 80 feet should be maintained. Approximately the same span is to be held when fueling by the close-in method. If conditions warrant, ships may be opened out to 140 to 250 feet when using the span-wire or jackstay methods of fueling. The optimum distance for transferring fuel or stores, according to the rig used is:

RIG	DISTANCE (feet)
Span Wire	100 - 180
Close in	60 - 80
Large derrick	100 - 120
Small derrick	80 - 110
Crane	80 - 110
High line	60 - 80
House Fall	60 - 80
Burton	60 - 80
Jackstay	100 - 120

214 MAKING THE APPROACH. Receiving ships are usually combatant types whose high power and maneuverability make them more suitable than replenishing ships for executing the approach. Normally, therefore, the delivering ship makes the approach. However, refrigerator store cargo ships and general stores issue cargo ships will complete the final approach when replenishing large attack/fleet aircraft carriers because of obstructions to view from the bridge of these carriers when in this phase of the maneuver. As the carrier reaches her approximate position alongside she will assume the guide, and maintain a steady course and speed, while the refrigerator or stores issue cargo ship keeps station on her during the remainder of the replenishment operation. Otherwise the delivering ship will make the approach only when ordered by proper authority.

a. Alongside Replenishment. The approach is executed as follows (see Figure 2-2). When steady on course and speed, the delivering ship (or receiving ship when the delivering ship makes the approach) will hoist the signal flag ROGER at the dip on the side rigged. She will hoist ROGER close-up when ready to make deliveries. The receiving ship, having taken station about 300 yards on the quarter, or 400 yards abreast the supplying ship, will hoist ROGER at the dip on the side rigged when ready to come alongside. She will hoist ROGER close-up when commencing her approach. A speed of 3 to 5 knots greater than that of the delivering ship would be used in easing alongside, to end up on a parallel course. Care must be taken not to overrun, and both conning officers should be alert to the possible ill-effects of interaction. (See paragraph 131a.) The conning officer normally should conn the ship by giving the helmsman courses to steer—the amount of rudder rarely need be specified. Ships using magnetic compasses should make wider than normal approaches and be prepared for the deflection of the compass that usually occurs alongside another ship.

The delivering ship will send over the distance line, messengers, and telephone lines as early as practicable. As soon as the ships are in proper relative position and have settled down, the lines and transfer rigs should be passed and connected. Both ships will haul down ROGER when the first line has been secured. During the transfer of flammable or explosive items, such as gasoline, fuel oil, and ammunition, each ship involved will fly BAKER at the fore.

b. Astern Replenishment

(1) Float Method. When the tanker is steady on fueling course and speed she will hoist ROGER at the dip on the side from which hose will be streamed. The receiving ship takes station about 500 yards

APPROACH, RIDING ALONGSIDE, AND DEPARTURE

FIG. 2-2

a. DELIVERING SHIP STEADY ON COURSE AND SPEED. FLIES ROGER AT THE DIP (ON RIGGED SIDE).

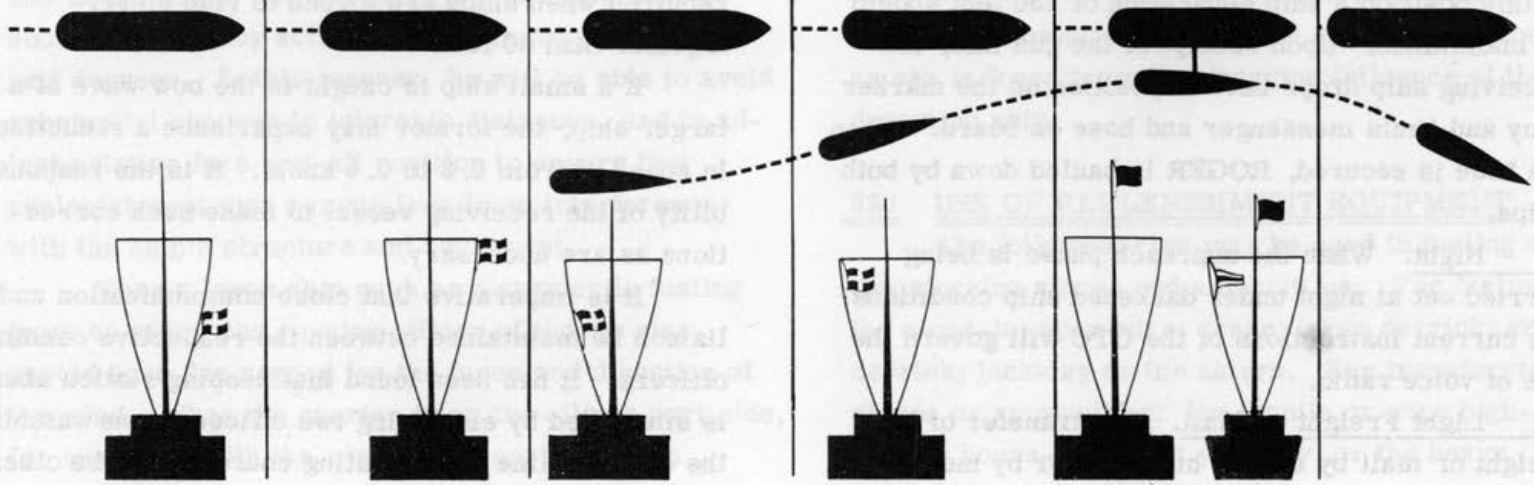
b. DELIVERING SHIP READY TO RECEIVE. FLIES ROGER CLOSE-UP.

c. RECEIVING SHIP READY TO MAKE HER APPROACH. FLIES ROGER AT THE DIP (ON RIGGED SIDE).

d. COMMENCING APPROACH. RECEIVING SHIP HOISTS ROGER CLOSE-UP.

e. AS FIRST LINE IS SECURED, BOTH HAUL DOWN ROGER. BOTH FLY BAKER AT THE FORE IF TRANSFERRING FUEL OR AMMUNITION. FIFTEEN MINUTES BEFORE DISENGAGING, RECEIVING SHIP HOISTS PREP AT DIP. ON DISENGAGING, RECEIVING SHIP HOISTS PREP CLOSE-UP.

f. ON DEPARTURE, RECEIVING SHIP CLEARS AHEAD AND AWAY. WHEN CLEAR OF DELIVERING SHIP, RECEIVING SHIP HAULS DOWN PREP.



astern the delivery ship and, when in all respects ready to close and take the hose, hoists ROGER at the dip on that side of the yardarm from which she will take the hose on board. When the delivery ship is rigged and ready she will hoist ROGER close-up. The receiving ship increases her speed 3 to 5 knots above the delivery ship's speed and hoists ROGER close-up to indicate she is commencing approach on the marker buoy. Position is maintained on the marker buoy streamed from the weather quarter of the delivery ship. When the hose is secured, ROGER is hauled down by both ships.

(2) Gun Line Method. The initial procedures are the same as for the float method except that the approach is made on the tanker's quarter in order to receive the gun line and attached messenger. While in this position a ship separation of 150 feet should be maintained. Upon receipt of the gun line, the receiving ship drops back to position on the marker buoy and hauls messenger and hose on board. When the hose is secured, ROGER is hauled down by both ships.

c. Night. When the approach phase is being carried out at night under darkened ship conditions, the current instructions of the OTC will govern the use of voice radio.

d. Light Freight or Mail. For transfer of light freight or mail by manila high-line or by messenger between combatant ships, it is usually most expeditious to use the forward transfer station of the receiving ship and the after transfer station of the delivering ship. In this case, the receiving ship takes its position with its bow overlapping the delivering ship's stern, so that its forward transfer station is abreast (for manila high-line transfers), or about 30° abaft (for messenger transfers), of the after transfer station of the delivering ship.

215 STATION KEEPING. In order to keep station while alongside, a small amount of continuous rudder toward the other ship is usually necessary. However, the size and load of both vessels, sea and wind conditions, speed, and proximity will tend to vary the angle. Greater rudder angles will definitely be required when ships are forced to ride closer together than 60 feet.

If a small ship is caught in the bow wave of a larger ship, the former may experience a reduction in speed of from 0. 3 to 0. 6 knots. It is the responsibility of the receiving vessel to make such corrections as are necessary.

It is imperative that close communication and liaison be maintained between the respective conning officers. It has been found that keeping station abeam is simplified by employing two officers: one watching the distance line and adjusting course, and the other

adjusting speed by watching a mark in the other ship or by observing the angle that the distance line makes with the ship's side. When fueling astern, a marker buoy is provided by the delivering ship, on which the receiving ship keeps station. Good station keeping can be achieved by intelligent anticipation and attention of the officers concerned. Critical situations can arise only too quickly if attention is distracted in any way. If the delivering ship has to change her course or speed, or if she is encountering difficulty in steering, immediate notice must be given to the receiving vessel. The conning officer of the receiving vessel should stand where he will be able to see not only his own compass heading, but the relative movement between the two ships as well. He should employ only the most experienced steersmen and throttlemen, and his orders to the steersmen should be given by actual course, in degrees or in half degrees. In this manner, he will be able to avoid substantial changes in intership distances, and to adjust relative fore-and-aft position to ensure that replenishment rigs remain free from interference with the ship's structure and equipment.

When a large ship such as a carrier is fueling from an oiler, the conning officer of the carrier should have due regard for the force and direction of the wind. When the carrier is on the oiler's port side, for example, with the wind on the port bow, the carrier forms a lee for the oiler. The carrier, therefore, must assume a course which will maintain station on the oiler by allowing for the influence of the wind.

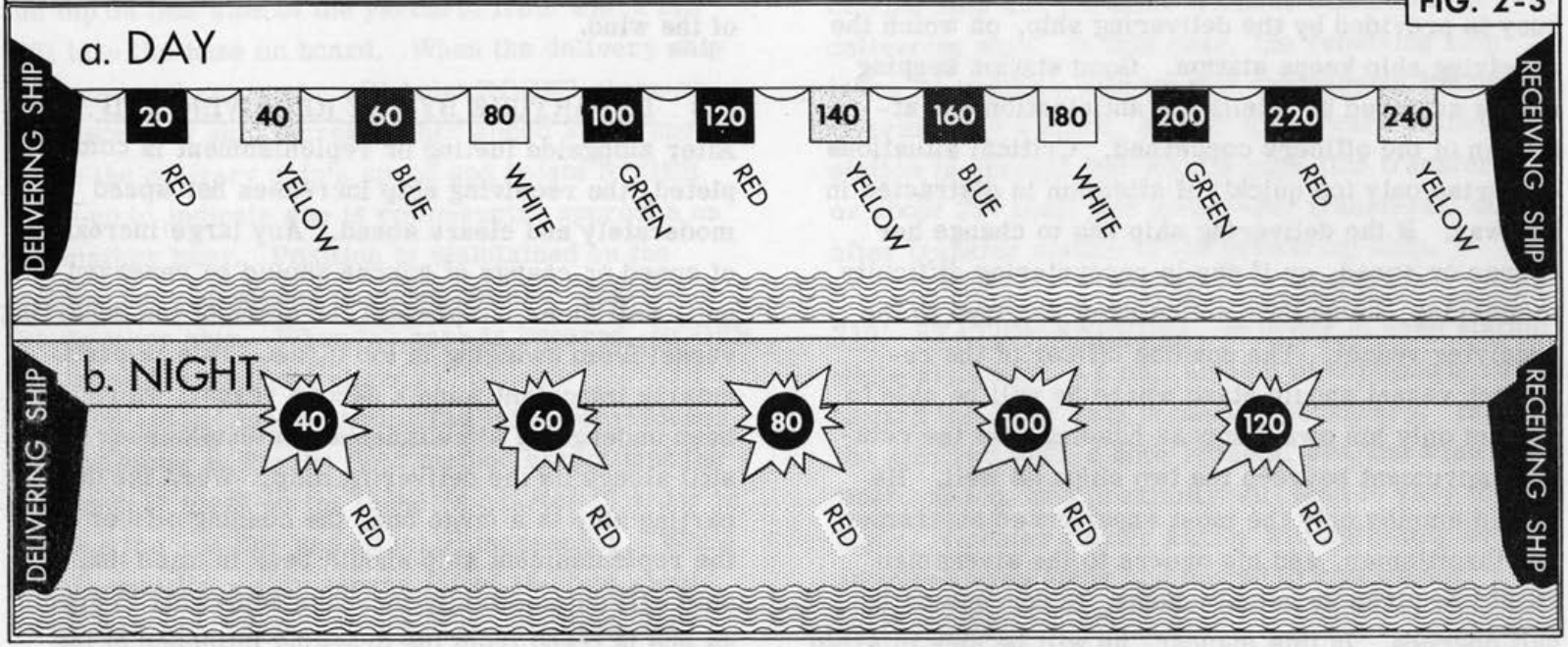
216 DEPARTURE BY THE RECEIVING SHIP. After alongside fueling or replenishment is completed, the receiving ship increases her speed moderately and clears ahead. Any large increase of speed or change of course should be reserved until well clear, to prevent the stern of the departing vessel from swinging in too close. This is particularly important when a second vessel, which has been undergoing simultaneous replenishment, is still alongside the delivering ship. When the departing ship is a large one, the conning officer of the replenishment ship should bear in mind that his ship will automatically increase somewhat in speed as she is freed from the dragging influence of the departing ship.

220 USE OF REPLENISHMENT EQUIPMENT

The following rigs may be used in fueling or transferring stores and ammunition. For fueling: the close-in; span wire; crane; large derrick; small derrick; jackstay or the astern. For transferring stores or ammunition: the manila or wire high-line; burton; house-fall; light jackstay; or the heavy

DISTANCE-LINE MARKINGS

FIG. 2-3



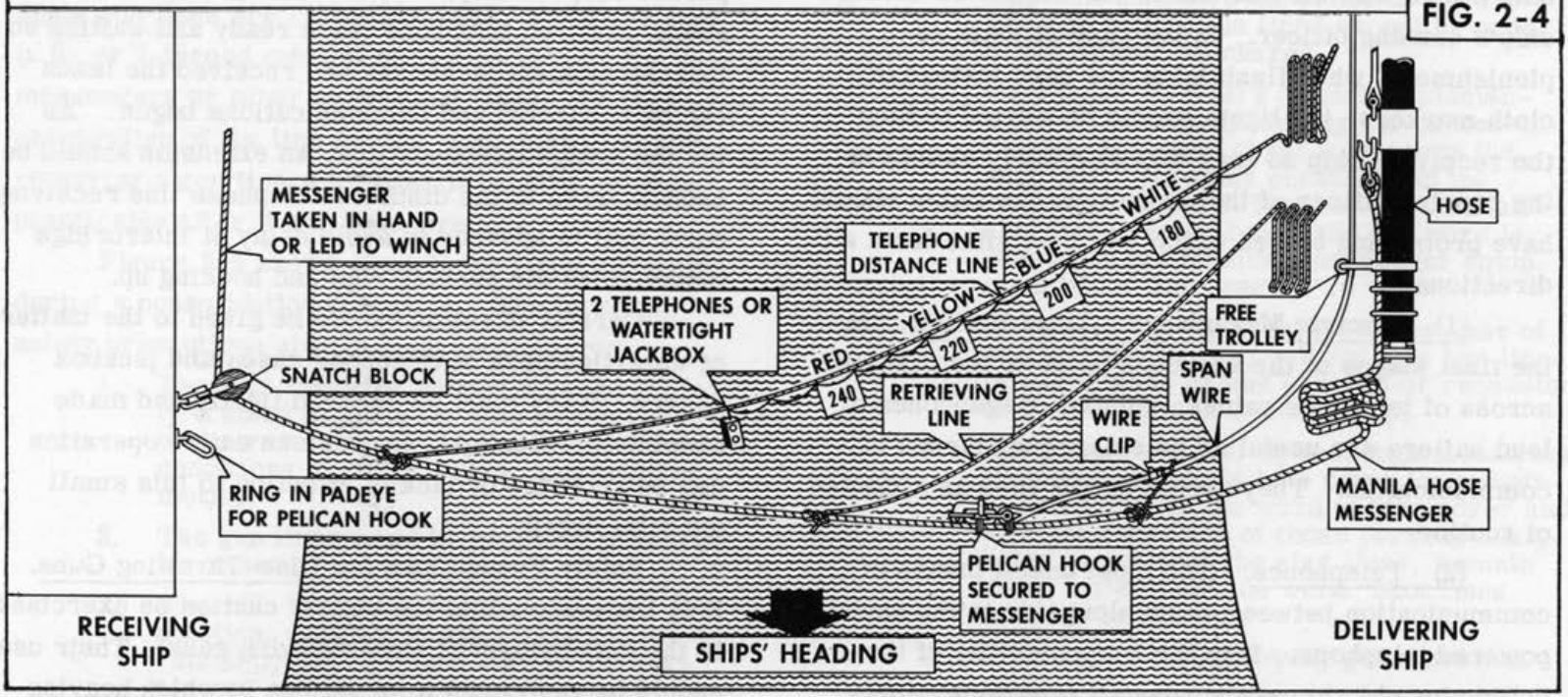
jackstay. Appendix B lists terms for uniform interpretation of rigging. When practicable, the receiving ship will make up all rigs for return to the supplying ship in the same manner as they are received to avoid undue delay between successive ships replenishing from the same supplying ship.

Certain protective devices should be used with any of these rigs. Heavy fenders, made up of groups of three fenders each, are required on delivering ships to protect the sides on which deliveries are being made. They are suspended from the deck by vertical lines and held in place by fore-and-aft preventers. All personnel on exposed topside stations must be dressed in inherently buoyant life jackets during replenishment operations.

a. Distance Line. The distance line, among the first to be passed across, serves as an indicator for the distance between ships. By watching it, the conning officer of the receiving ship will know immediately that his vessel is coming in too close

PASSING THE DISTANCE LINE

FIG. 2-4



or going out too far. The distance line is a light 1 1/2 inch manila line having, in daylight, colored cloth or painted canvas markers (8 x 10 inches) with numerals clearly shown thereon, or at night having clusters of red flashlights, to indicate the distance in feet. Markings for the distance line are given in Figure 2-3. The method by which it is brought across is shown in Figure 2-4.

b. Communications. The telephone cables for communication between conning stations and forward transfer stations should be stopped along the distance line, making it a combined distance-telephone line. It is passed by the delivering ship to the receiving ship, and the receiving ship tends it, always keeping it taut. The zero end is secured to the rail of the delivering ship. The running end is held over the

rail of the receiving ship, at right angles to the ship's fore-and-aft line and in view of the receiving ship's conning officer. In the case of night replenishment, when flashlights are used instead of cloth markers, the lights should be affixed to face the receiving ship so they will be clearly visible to the conning officer of that vessel; or the lights should have protruding lenses which will be visible from all directions.

(1) Electric Megaphones—Loud Hailers. In the final stages of the approach prior to the passing across of telephone cables, electric megaphones or loud hailers are useful as an emergency means of communication. They should not be used as a matter of routine.

(2) Telephones. The most useful means of communication between ships alongside is the sound-powered telephone. It is the responsibility of the delivering ship to pass across all telephone cables, including the telephones in watertight cases or watertight jackboxes where the telephone systems of the ship are compatible. The telephone cable for both the bridge and forward stations should be stopped to the distance line, as shown in Figure 2-4. If the watertight jackboxes are used in lieu of telephones, this particular telephone line is a combined three-conductor cable with a watertight, double jackbox on its outboard end. It should have receptacles clearly marked for bridge and transfer-station phones respectively. The receiving ship shall have sound-powered telephone leads ready and waiting so that the moment jackboxes are received the leads can be connected and communications begun. As for the bridge telephone line, an extension should be brought down to the distance-telephone line receiving point well in advance to avoid delay of interbridge instructions for passing rigs and hooking up.

Careful attention should be given to the matter of watertightness of telephone cases and jackbox covers. They must be secured tightly and made absolutely watertight, because an entire operation can be retarded by lack of attention to this small but vital detail.

c. Safety Precautions for Line-Throwing Guns. It is imperative that the utmost caution be exercised in the employment of line-throwing guns. Their use should be restricted to situations in which heaving lines are impractical.

The delivering ship shall fire the gun lines to all types of receiving ships except carriers. The danger inherent in firing gun lines into the lower decks of carriers, where supplies are received, makes it necessary for carriers to fire the gun lines to the delivering ships. To ensure easy identification, all line-throwing gun crew members will wear red helmets and highly visible red jackets (red painted

life jackets until special ones are received) during daylight, and luminous tape on their helmets at night. Since gun lines are relatively weak, a heaving line (a 6- or 9-thread manila) should be bent on for passing messengers or other subsequent lines. To facilitate preparation of the line for the next relay, the ship receiving a gun line shall pass it back as soon as practicable after it has been fired.

Figure 2-5 shows a gun being fired properly during a consolidation operation. The following safety precautions always must be observed:

1. The line-throwing gunner must be thoroughly trained to place the line within easy reach of the receiving ship's crew, under existing conditions of range, wind, and relative motion.
2. The gun lines must be properly prepared for running.
3. When the receiving ship reaches the proper position, both ships shall pass the word "Stand by for shot line - all hands take cover," over the loud hailer and topside loud speaker equipment.
4. The officer-in-charge at each replenishment station in the firing ship will sound a one-blast signal on a mouth whistle or will pass the word "Stand by" on the electric megaphone. The officer-in-charge of the corresponding station in the receiving ship will reply with a two-blast signal on a mouth whistle or will pass the word "Ready" on the electric megaphone when he is in all respects ready to receive the shot-line and all of his crew have taken cover. After ascertaining that all hands in the vicinity of the target area are under cover, the officer-in-charge on the firing ship will then give the order to "fire". The gun will not be fired except by order of the officer-in-charge.
5. Only those members of each replenishment station designated by the officer-in-charge will leave cover to recover the shot line. No other personnel in the receiving ship will leave cover until all shot lines are on board and the word is passed on the topside loudspeaker equipment "Shot lines secure".
6. The receiving ship (except in the case of an aircraft carrier) will not fire her line-throwing guns unless ordered or requested to do so by the delivering ship.
7. Ships must ensure, by thorough indoctrination, that all hands take cover immediately on receipt of the word to take cover and, with the exception of those persons designated to retrieve the shot lines, remain under cover until the word "Shot lines secure" is passed.

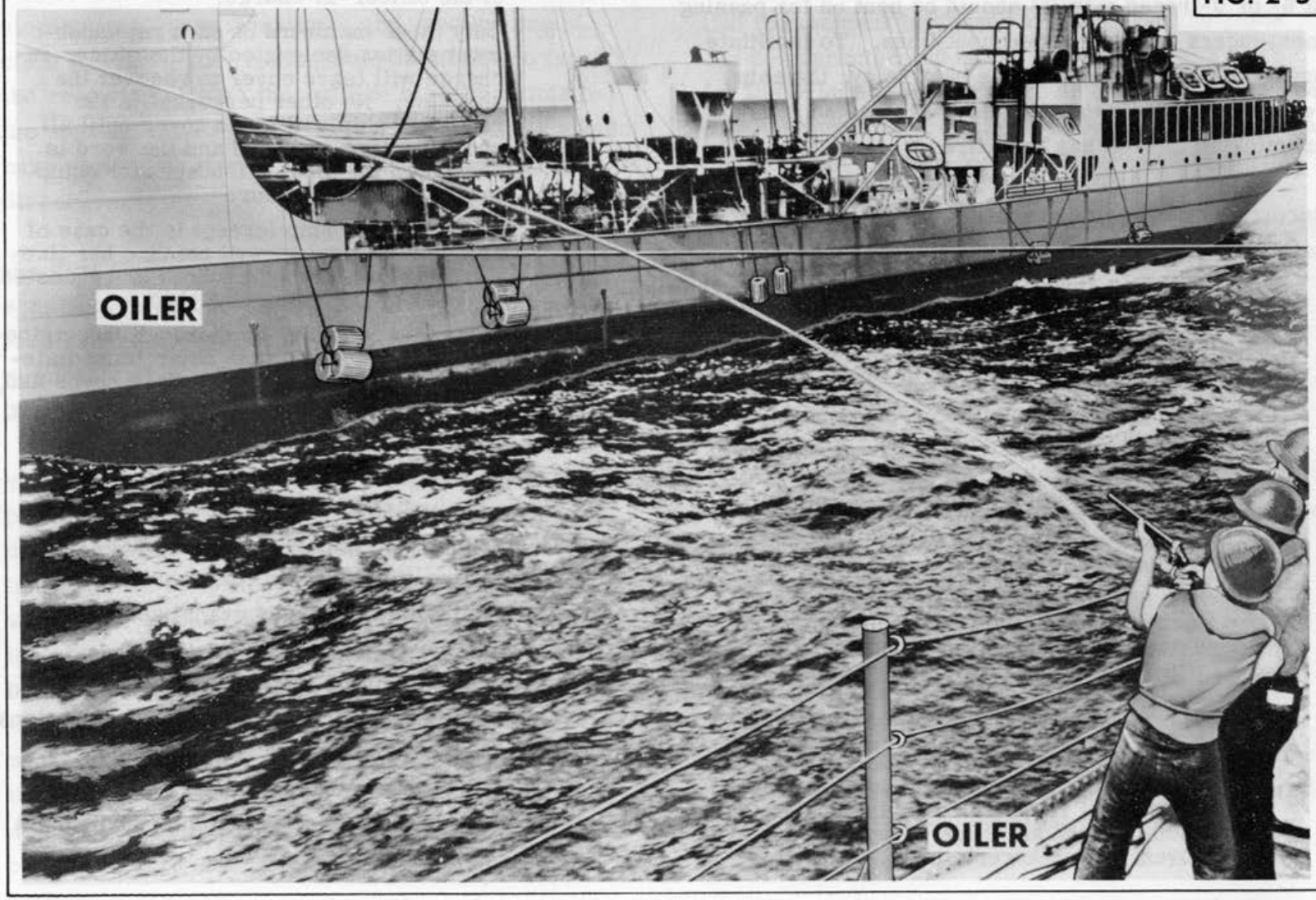
Since the use of line-throwing guns involves danger, a special line consisting of a monkey fist attached to a line-throwing gun line should be employed as a substitute whenever practicable.

230 COMMUNICATIONS PROCEDURES

One of the essentials in coordinating operations of ships carrying out underway replenishment is careful planning for communications. Ordinarily the sound-powered telephone is the chief instrument

FIRING THE LINE-THROWING GUN

FIG. 2-5



used to pass information, but standby methods should also be prepared.

231 HAND SIGNALS. If sound-powered telephones fail, there is a system of flag signals for daylight and light signals for night use which is shown in Figure 2-6. This standby method requires signalmen to be stationed near the transfer points where they can observe closely what is going on. To indicate acknowledgement and to avoid error, all signals are to be repeated by the ship receiving them.

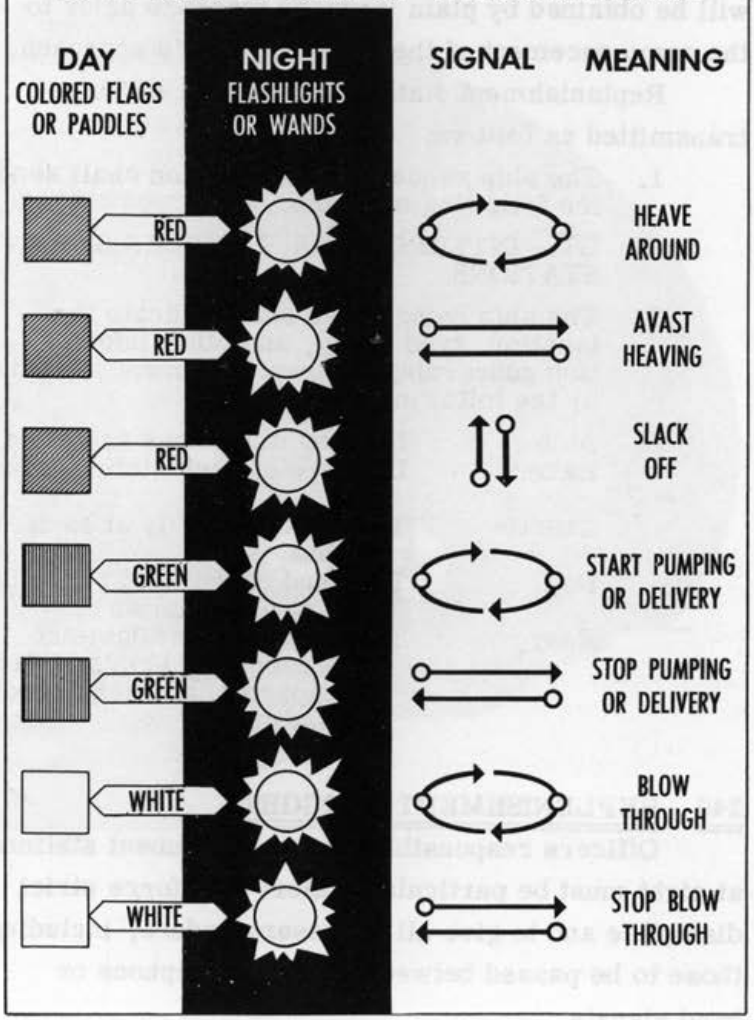
For astern fueling, control of operations will be by means of the following signals displayed at the fueling stations in both ships:

SIGNAL		MEANING	
Day	Night	Receiving Ship	Delivery Ship
White flag	White light	Hose connected. Start pumping.	Pumping started.
Red flag	Red light	Stop pumping or blowing hose.	Pumping or blowing through has stopped.
Yellow flag	Yellow light	Blow down the hose.	Blowing down started.

STAND-BY HAND AND LIGHT SIGNALS

FIG. 2-6

TO BE USED IN CASE OF TELEPHONE FAILURE



232 MESSAGES DESIGNATING REPLENISHMENT STATIONS. Whenever the delivering or receiving ship must obtain information concerning the location of either's replenishment stations, such information will be obtained by plain language message prior to the commencement of the receiving ship's approach.

Replenishment station information will be transmitted as follows:

1. The ship requesting information shall send the following message:

   BT - INTERROGATORY REPLENISHMENT STATIONS.

2. The ship being asked shall indicate the location, type of rig, and other information concerning her replenishment stations by the following designations:

Able	Number of stations available
Baker	Distance of each station from bow
Charlie	Type of commodity at each station
Dog	Type and capacity of rig to be used at each station
Easy	Type of fitting available at each receiving ship's station, its capacity, and height above the station.

240 REPLENISHMENT AT NIGHT

Officers responsible for replenishment stations at night must be particularly alert to enforce strict discipline and to give all necessary orders, including those to be passed between ships by telephone or hand signals.

241 NIGHT LIGHTING MEASURES

a. Approach and Station Keeping. To assist the receiving ship to make a night approach and maintain station on the delivering ship, the following lights shall be carried:

1. One dim red light (1-cell flashlight) atop each of the after kingposts, so hooded as to reflect downward and outward at a 45° angle. These lights are to serve as range lights to assist in alongside station keeping.
2. Two shaded, red, 50-watt hull contour lights suspended from the top rail at the break of the poop and the turn of the bow
3. Two dim, red, 50-watt lights on aircraft carriers when receiving, located along the forward starboard deck edge so as to form a range of the carrier's fore and aft axis. These lights will not only assist in making the approach and maintaining station, but will prevent vertigo from too long an observation of a single light.
4. Dimmed red truck and screened wake lights to be shown by the replenishment ship only during the approach of the receiving ship. They will be turned off after the latter has settled down in position alongside.

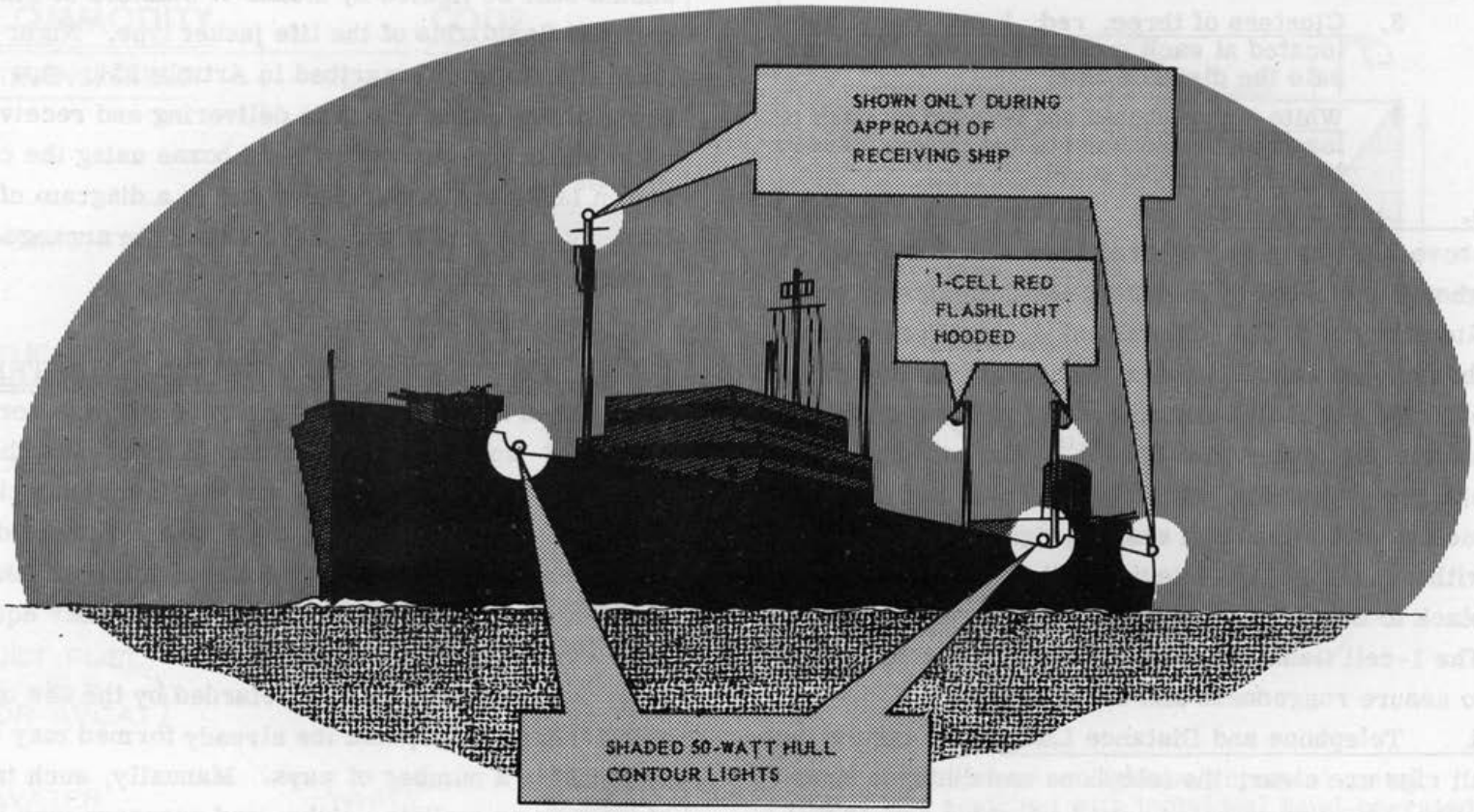
Figure 2-7 shows these lights in use.

b. Aids to Personnel. To assist personnel in handling cargo and working the rigs, the following lighting measures should be taken:

1. Red cargo lights should illuminate working areas on deck and in the holds. Those lights above-deck should be provided with shields.

NIGHT LIGHTING

FIG. 2-7



2. Clusters of three, red, 1-cell flashlights, clipped on or taped on, should illuminate all cargo hooks, nets, transfer chairs, trolley blocks, and hose saddle (trough) blocks.

3. Clusters of three, red, 1-cell flashlights, located at each marker flag should illuminate the distance line.

4. White lights should not be used on dark or foggy nights because of the danger caused by their blinding effect.

c. Light Specifications. The red lights described above shall have red colored lenses or filters which, when illuminated by International Commission on Illumination (I. C. I.) Illuminant A, shall pass less than one percent of light of wavelength shorter than 5800 A^{o} and shall pass at least 90 percent of light of wavelength longer than 6800 A^{o}. Cargo light shields shall be cylindrical with a length equal to 1 1/4 diameters of the lens and shall fit tightly to the lens without leakage; the interior will be painted dead black to assist in eliminating upward reflected light. The 1-cell flashlights should be specially designed to assure ruggedness and durability.

d. Telephone and Distance Lines. To assure that all rigs are clear, the telephone and distance lines will not be disconnected until both ships report that all other lines are clear.

Under darkened-ship conditions, illumination cannot be allowed to jeopardize security. However, if the tactical situation permits, properly shielded red lights may be employed at handling areas. In this case, critical parts of the replenishment gear should still be lighted by means of clusters of single-cell red flashlights of the life jacket type. Night hand signals are prescribed in Article 231. Appropriate transfer points in delivering and receiving ships shall be indicated by light boxes using the code shown in Figure 2-8. Figure 2-9 is a diagram of the light box, and Figure 2-10 shows the arrangement for night lighting.

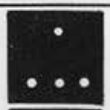
250 REPLENISHMENT DURING COLD WEATHER

When ships are operating in rough water or high seas and the air temperatures are below the freezing point of sea water, ice will form on deck and topside structures at a rapid rate. The solid ice coating may grow eight or more inches an hour, thus covering many hoses, fittings, and other equipment used in replenishment.

Ice formation may be retarded by the use of anti-icing coatings, and ice already formed may be removed in a number of ways. Manually, such instruments as mallets, clubs, and scrapers may be used if special care is taken to avoid or minimize damage to ice-covered equipment. The steam jet (lance) is helpful in freeing restricted items, such

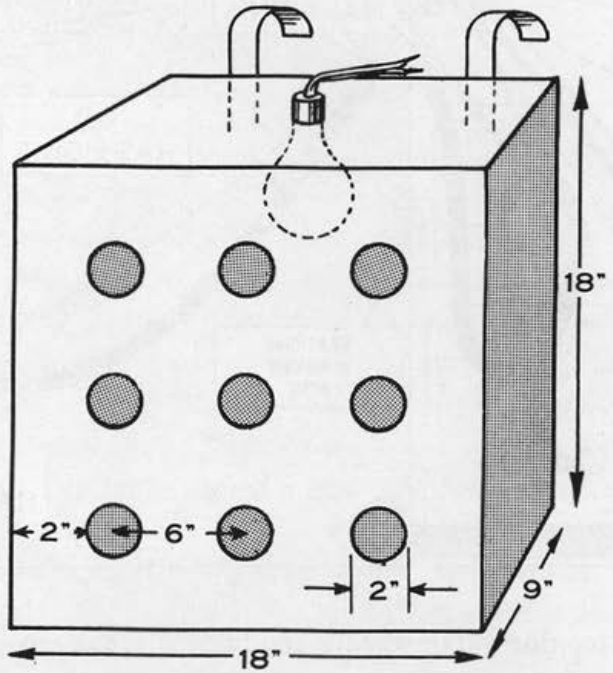
STATION MARKER CODE

FIG. 2-8

COMMODITY TRANSFERRED	CODE DAY (3 FOOT SQUARE BUNTING)	CODE NIGHT (RED LIGHT BOX)
AMMUNITION	GREEN	
FUEL OIL	RED	
DIESEL OIL	BLUE	
AVGAS	YELLOW	
JET FUEL (JP-5 OR AVCAT)	YELLOW-BLUE TRIANGLES	
WATER	WHITE	
STORES	GREEN	

LIGHT BOX

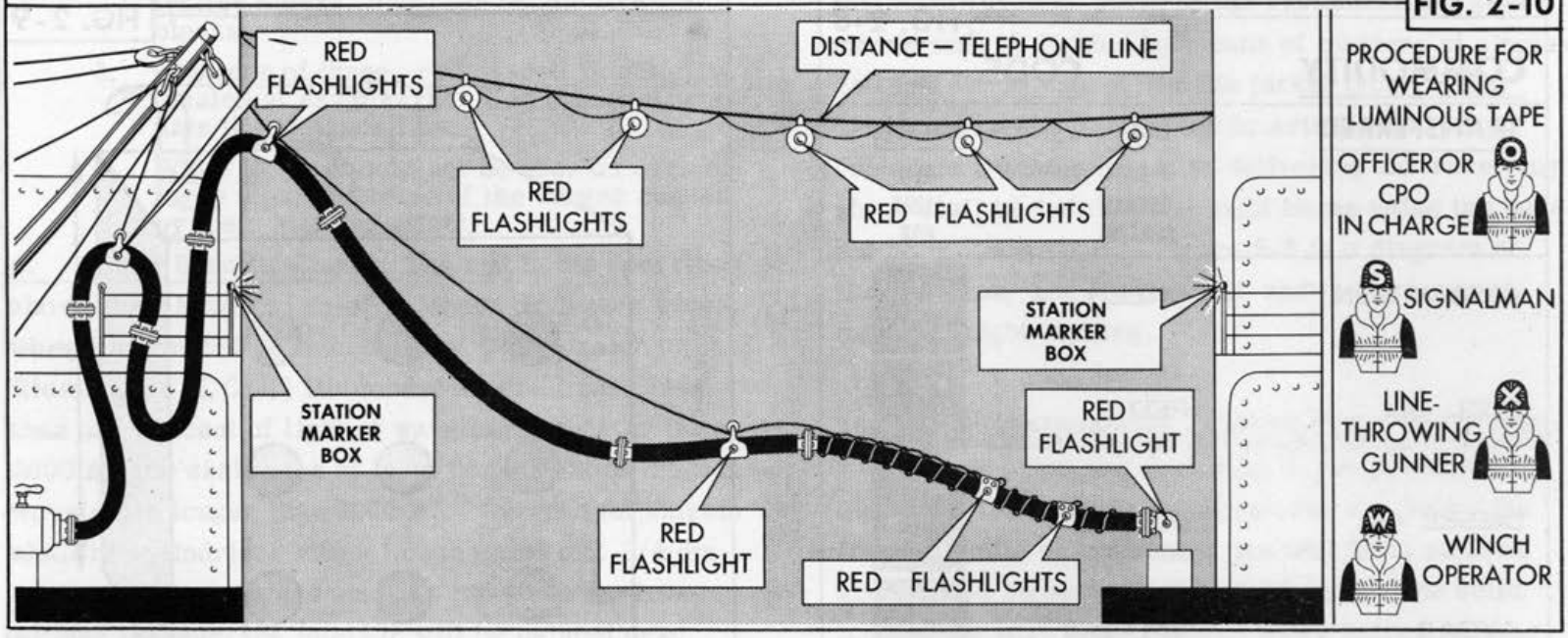
FIG. 2-9



Box is of plywood or light weight sheet metal. Holes are equipped with individual hand-operated shutters and are covered on the inside with red Lucite. Interior of box to be painted with high gloss white enamel and illuminated by 25-watt light shielded to prevent direct emission of the light.

NIGHT LIGHTING SETUP

FIG. 2-10



as topside valve wheels and fueling trunk covers. Firehose streams are useful for undercutting and weakening heavy accumulated ice so that it can be removed manually. Snow should be removed by brooms and shovels before it has a chance to become trampled and hardened.

REFUELING AT SEA

CHAPTER 3



CHAPTER 3

REFUELING AT SEA

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316 Astern Fueling

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321 Departmental Check-Off List: Oilers
322 Check-Off List: Receiving Ships

CHAPTER 3
Refueling at Sea

300 DELIVERY OF LIQUIDS

Fueling at sea involves the delivery of bulk fuel (including diesel oil and aviation fuels) by hose; lubricating oil in drums by jackstay or high-line rig; and industrial gases in bottles (such as carbon dioxide, oxygen, acetylene, helium, hydrogen, and Freon) by jackstay or high-line rig. Water may be delivered in conjunction with a fueling operation on a not-to-delay basis. Figure 3-1 gives a liquid conversion table.

Fleet oilers generally carry out the operation by using two hoses when fueling cruisers and battleships, but additional hoses are required when carriers are provided with Avgas and jet fuel. One or two hoses are used for destroyers, depending on the nationality of the ship.

Prior to refueling or replenishment operations, receiving ships should be informed of the name of the oilers from which they will refuel, the type of rig that will be used, and the side from which they will receive. This information will enable the receiving

LIQUID CONVERSION TABLE

FIG. 3-1

Item	Tons			Liters	Cu. Meters	Gallons		U.S. Barrels	Cu. Ft.
	Metric 1000 kg	Long 2240 lbs	Short 2000 lb			U.S.	Imperial		
Fuel Oil	1	0.984	1.102	1050	1.050	277	230.65	6.59	37
Avgas	"	"	"	1390	1.390	366	304.85	8.71	49
JP-5	"	"	"	1250	1.250	329	274.40	7.84	44
Diesel Oil	"	"	"	1190	1.190	314	261.80	7.48	42
Water	"	"	"	1000	1.000	269	220.15	6.29	35.3

ships to be rigged properly and their crews to be thoroughly instructed in the type of gear they will receive.

301 STANDARDIZATION OF FUELING RIGS

Fundamentally, the point of connection of fueling rigs must be standardized by resolving the differences in flanged or threaded design of the fueling connection.

a. Abeam Methods. When replenishing liquid products by any of the abeam methods, the following systems of connection will be employed to effect standardization.

(1) Transfer of Furnace Fuel Oil, Jet Fuel, and Diesel Oil. Existing hoses may be used. Connections will be made by means of a cast iron breakable spool with an 11-inch outside diameter flange (similar to U.S. Navy's shown in Figure 3-2), except when the receiving ship is equipped with fueling trunks. In this case, the supplying ship's hose must terminate in a 15 or 30 foot length of wire stiffened or British type buoyant hose with end or end fitting less than 9 1/8 inches in diameter in order to fit into the fueling trunk.

(2) Transfer of Avgas. Existing hoses will be used. Connections will be made by nonferrous adapters having an 11-inch over-all diameter flange which conforms with the bolting shown in Figure 3-3.

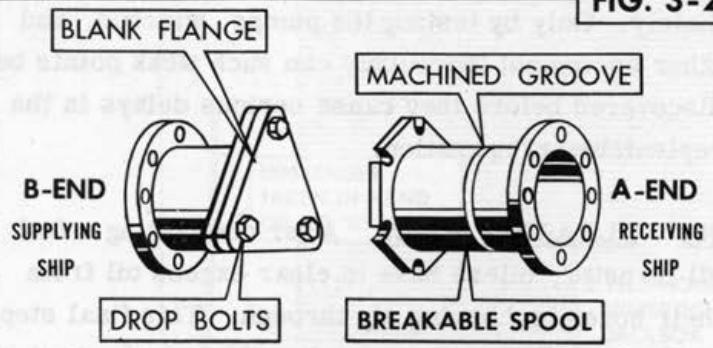
(3) Transfer of Water. Existing hoses will be used. Connection will be made by the NATO Standard 6 1/2-inch outside diameter flanged adapters (based on DNC 15/262) bolted together. Alternatively, the supply ship's hose may be led straight into the receiving ship's tank. Watering is considered to be a secondary objective to be carried out within the time allotted to fueling; its omission must be accepted if the connections will not fit.

b. Astern Method. When using the astern method, only buoyant hose similar to that used by the Royal Navy, fitted with screw couplings and streamlined end connections, is practicable. The necessary specifications for hoses, connections, adapters, and other fittings are described in Article A-111. It is to be noted that in the astern method, standardization is based on the use of the British thread. Therefore, ships equipped with fueling connections rather than fueling trunks must provide themselves with suitable adapters as indicated in Appendix A.

c. Rigs. Although there is no intention of standardizing the rigs, the nations have agreed to employ one or more of the following methods: close-in, span-wire, jackstay, small derrick, large derrick, crane, or astern. In order to expedite receiving, connecting up, and disengaging operations, a complete description of these rigs and detailed instructions in their use are given in the following articles.

6-INCH QUICK-RELEASE COUPLING

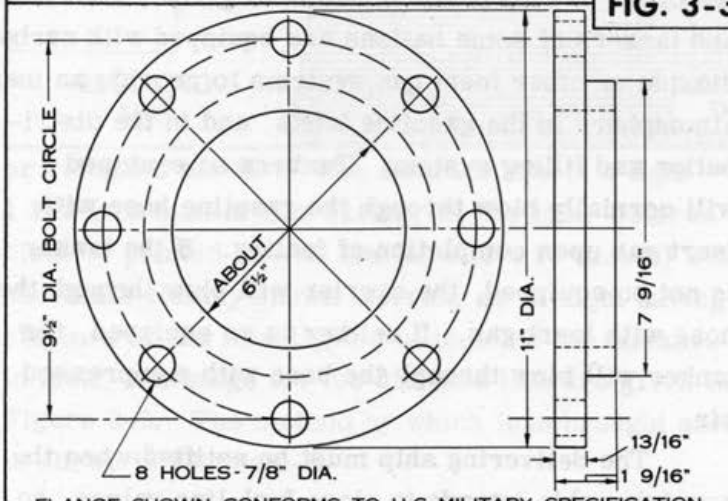
FIG. 3-2



BUSHIPS NO. FS S5501-169238

6-INCH NONFERROUS FLANGE FOR AVGAS FUELING

FIG. 3-3



FLANGE SHOWN CONFORMS TO U.S. MILITARY SPECIFICATION MIL-H-15523A AND IS A U.S. COMMERCIAL STANDARD.

d. In Port. The transfer of liquid products such as furnace fuels, jet fuel, Avgas, diesel oil, lubricating oil, and water between ships in harbor will be made by the same methods outlined here.

e. Merchant Tankers. When merchant tankers are used for fleet replenishment they should in general be fitted to transfer by at least one of the above listed abeam methods and also by the astern method.

302 DEBALLASTING AND DISTRIBUTING FUEL ON BOARD. In the normal course of cruising, a ship retains her stability and liquid-protection characteristics by replacing the fuel consumed with water ballast. Deballasting and redistributing fuel are therefore among the most important preparations aboard a ship about to be refueled at sea. When a ship is deballasted, her ability to control underwater damage and to withstand heavy weather is considerably diminished. In smaller ships such as destroyers, or in any ship carrying a heavy load, deballasting may result in unsafe stability conditions.

Consequently, in order to evaluate the degree of risk, it is essential that each commanding officer be aware of the effects of deballasting in his own vessel under given conditions of loading. By constantly improving replenishment procedures, he can help to reduce the time that each particular tank remains empty. Those tanks having the most harmful

effect on stability should be evacuated last and filled first. Standard national ballasting instructions must be adhered to strictly. Due consideration should be given to free-surface effect during the operation.

The supported task force commander should assist destroyer and other small-ship commanders in reducing the time their ships remain deballasted. He should publish his fueling schedule early enough for each commanding officer to estimate his own time requirements to ensure that completion of deballasting coincides as nearly as practicable with the scheduled start of fueling. On the other hand, senior officers must be kept informed by commanding officers of any unusual or unsafe conditions in their ships, so that these matters can be taken into account when the fueling schedule is prepared.

In order to reduce fueling time, each receiving ship should have her fuel so distributed in tanks on board at the time of going alongside that approximately the same amount of time will be required for filling at each receiving station. Before going alongside, receiving ships using two fueling hoses should have their fuel equally distributed fore and aft in order to shorten over-all pumping time.

Preparations on board the delivering ship should also take into account proper ballasting and distribution of fuel, in order to ensure the maintenance of trim and to permit maximum pumping rates. The fuel should be preheated as necessary. Faulty material or equipment discovered during the make-ready inspection of rigs and gear must be repaired immediately. Only by testing the pumps, winches, and other equipment thoroughly can such weak points be discovered before they cause serious delays in the replenishment operation.

303 CLEARING HOSES. After completing a fuel oil transfer, oilers have to clear excess oil from their hoses by blowing air through. This final step of blowing oil into the receiving ship's tank requires about three minutes to complete, and the receiving ship must not disconnect or remove the hose from the fueling trunk for at least that length of time after the order to stop pumping has been given. Carriers and tankers of some nations are equipped with carbon dioxide or other inert gas systems to provide an inert atmosphere in the gasoline tanks and in the distribution and filling system. Tankers so equipped will normally blow through the gasoline hose with inert gas upon completion of fueling. If the tanker is not so equipped, the carrier will blow through the hose with inert gas. If neither is so equipped, the tanker will blow through the hose with compressed air.

The delivering ship must be notified when the receiving ship intends to close fuel-line valves, so

that pumps may be slowed down as needed to prevent rupture of the hoses by high pressure. After fueling astern during bad weather conditions the clearing of hoses of all types of fuel may be expedited by using the "suck and blow" method. In this method, after the tank filling valves are closed, the receiving ship "blows through" the hose, while the supplying ship takes a back-suction with her transfer pumps. This method is not applicable to ships equipped with fuel oil trunks.

304 EMERGENCY BREAKAWAY. During refueling, emergencies may arise to make a sudden cessation of operations necessary. For this reason, a sufficient number of men must be stationed and ready to disengage couplings, span wires, riding lines, and other lines with dispatch. Such tools as sledge hammers, axes, and knives should always be on hand for emergency use. The delivering ship has to be ready to stop pumping the moment an emergency becomes apparent, or when breakaway is ordered. Fueling rigs will suffer severe time consuming damage if improperly released at the breakaway signal.

310 PROCEDURES FOR COMMON HOSE RIGS

The following articles describe the manner of assembling various fueling rigs and the methods of using them.

311 CLOSE-IN FUELING. The close-in method is used when fueling destroyers and smaller ships from warships or specially designated merchant tankers in a convoy (see Figure 3-4).

The hose in this rig is supported by boom whips and bight lines which lead from saddles on the hose to booms or other high projections on one or both ships. Combatants rigged for the close-in method may use hoses and rigs of different sizes and lengths depending upon the individual ship's capabilities. Tackles manned by personnel are at times used for the saddle whips, as shown in Figure 3-4. However, the manner of rigging, passing, and tending are basically the same as those employed on a tanker, as described in the following paragraphs.

a. Replenishment Ship. The following check-off list serves as a guide in making up the hose and lines for fueling by the close-in method.

(1) The Hose (6-inch internal diameter) consists of the following:

Oiler's inboard end: one 50-foot length, collapsible

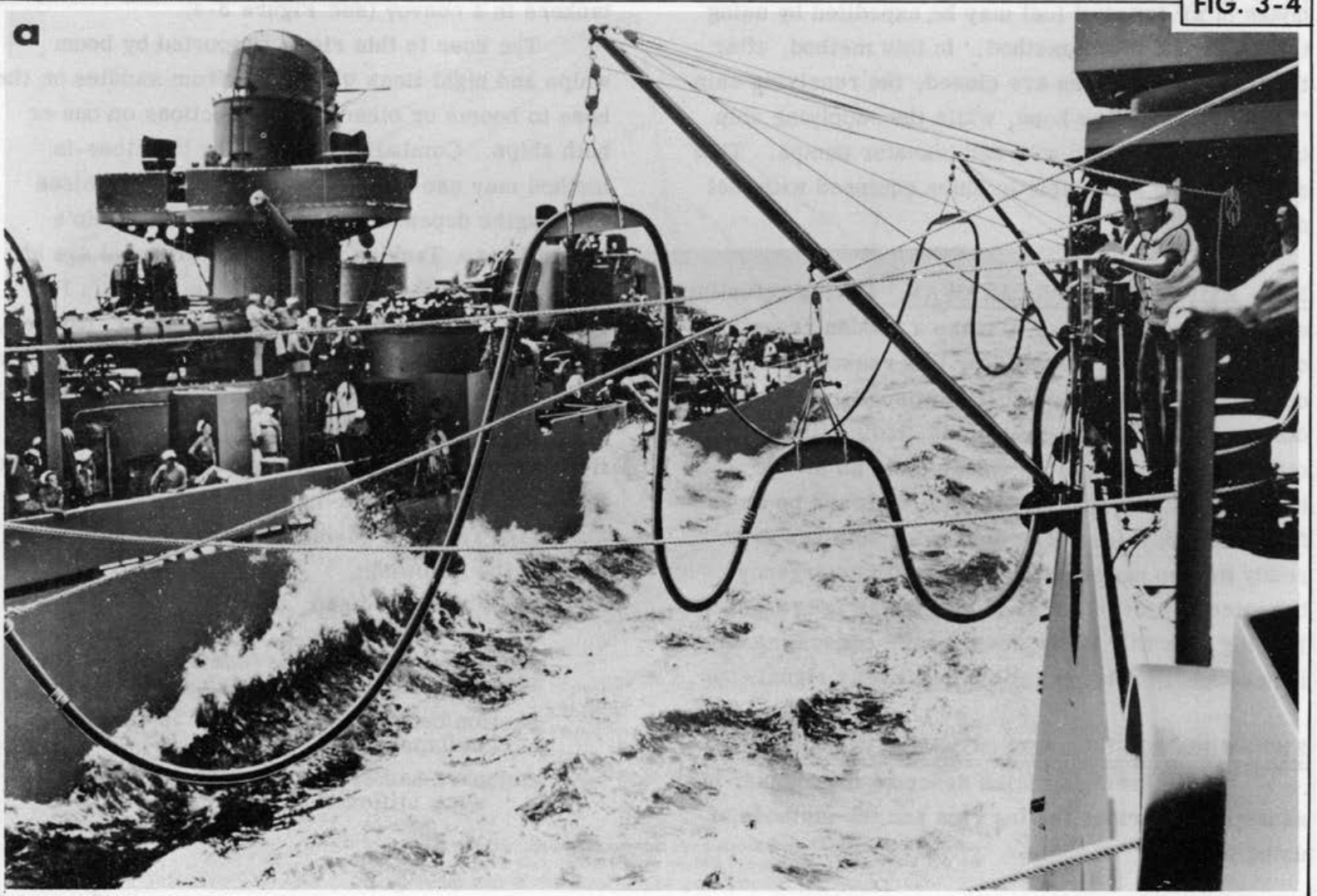
Inboard saddle section: one 20-foot length, wire stiffened

Section between saddles: one 50-foot length, collapsible

Outboard saddle section: one 20-foot length, wire stiffened

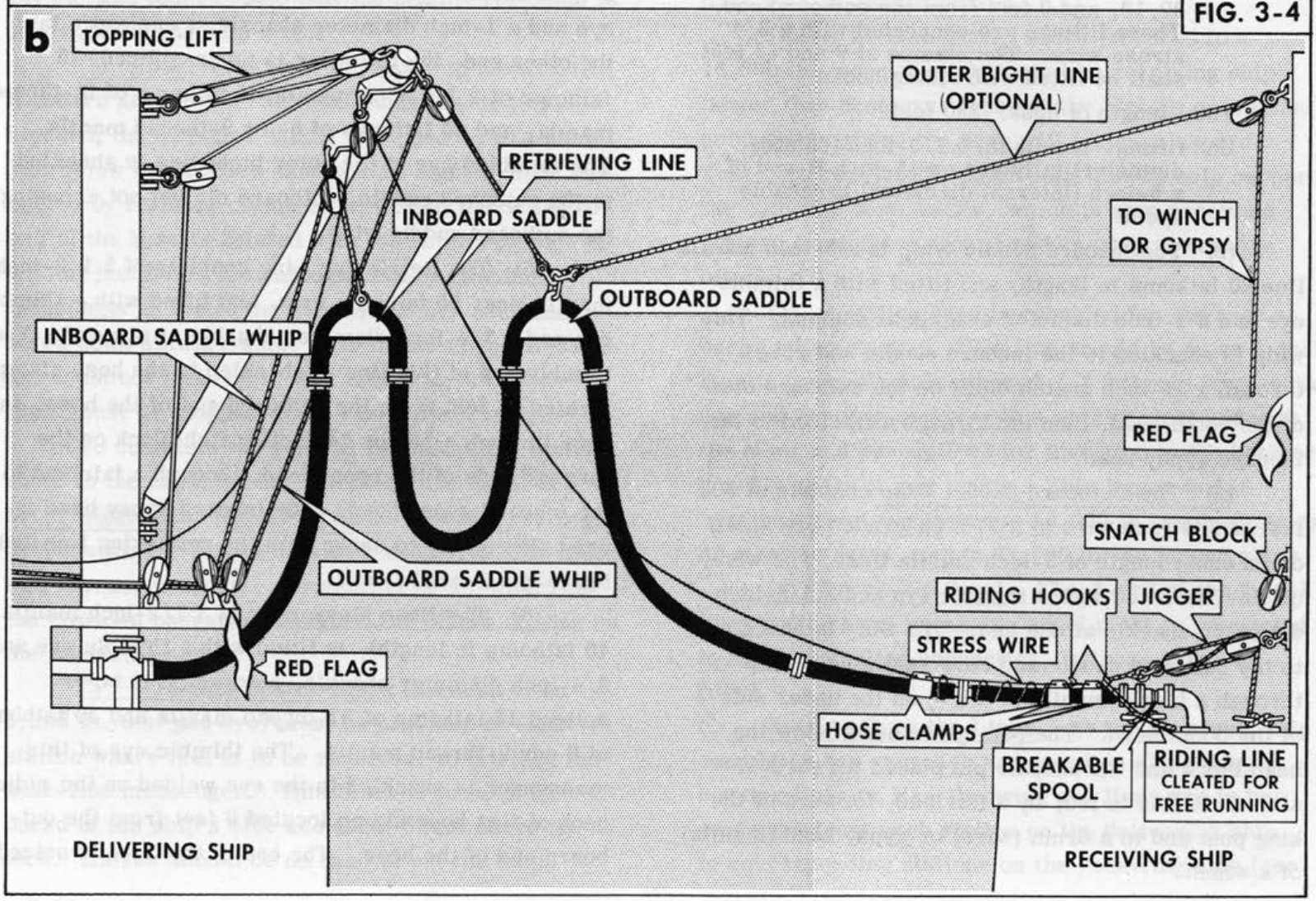
CLOSE-IN FUELING

FIG. 3-4



CLOSE-IN FUELING

FIG. 3-4



Extension: one 50-foot length, collapsible

Outboard section: two 20-foot lengths, wire stiffened with hose clamps attached at 30, 13, and 9 feet from the outboard end. These fittings are connected with a 3/4" stress wire. The clamps at 9 and 13 feet shall be fitted with riding hooks

Total length of hose: 230 feet

End fitting: maximum 9 1/8-inch (outside diameter) tailpiece or 11-inch B-end of a 6-inch (internal diameter) breakable spool.

(2) The Inboard Saddle Whip is a 5-inch manila line 40 fathoms in length, and fitted with a thimble eye and a 1-inch diameter shackle at one end. This whip is shackled to the inboard saddle and rove through a 14-inch snatch block on the outboard side of the boom head, then led through a fairlead to the inboard gypsy head.

(3) The Outboard Saddle Whip consists of 300 feet of 3/4-inch wire (6 x 37 high-grade plow steel) or an equal length of 5-inch manila line. The wire, or line, is fitted with a thimble eye and a 5/8-inch diameter shackle at one end. The whip is shackled to the outboard saddle and rove as a single whip through a block (manila or wire) on the under side of the boom head. The pad eye is used below the head block and the shackle pin placed forward-to-aft. This line is led, by a fairlead, forward of the king post and to a drum (wire) or gypsy head (manila) of a winch.

(4) An Outer Bight Line is used only when fueling vessels larger than destroyer types. It is a 5-inch manila, 50 fathoms long, fitted with a thimble eye and a 1-inch diameter shackle at one end. Into the other end, the following is taper-spliced; 15 fathoms of 2 1/2-inch manila, 15 fathoms of 21-thread manila, and 30 fathoms of 6- or 9-thread manila. The thimbled eye of the outer bight line is shackled to the outboard saddle, outboard of, but not crossing, the outboard saddle whip.

(5) The Retrieving Line consists of 3 1/2-inch manila line, 50 fathoms long, and fitted with a thimble eye and a 3/4-inch diameter shackle at one end. The thimble eye of this line is shackled to the hose clamp located 30 feet from the outboard end of the hose, and rove through a 12- or 14-inch snatch block on the forward side of the boom head, through a fairlead to the inboard gypsy head. The inboard gypsy head is used alternately to serve both the retrieving line and the inboard saddle whip.

(6) The Hose Messenger (a 3 1/2-inch manila, 40 fathoms in length), is fitted with a thimble eye and 3/4-inch diameter shackle, onto which is taper-spliced 15 fathoms of 21-thread manila and 30 fathoms of 6- or 9-thread manila. The thimble eye of this messenger is shackled to the eye welded on the riding hook of that hose clamp located 9 feet from the outboard end of the hose. The end of the hose is seized

to the hose messenger with two turns of 21-thread.

(7) Fueling Boom. The fueling boom is swung out 90° and topped up so that the head of the boom is just clear of the ship's rail.

(8) Hose. The hose is topped up inboard to outboard as follows: the inboard saddle is two-blocked; the outboard saddle is topped up to a point just below the inboard saddle; that bight of hose supported by the hose clamp 30 feet from the outboard end of the hose is hoisted with the retrieving line to a point just below the outboard saddle; the hose messenger is led to the superstructure deck and faked down athwart-ship. The bights of the messenger must not be over 10 feet in length, and each bight must be stopped to the life rail securely.

To complete the general readiness for fueling, refer to the departmental check-off list in Article 321.

b. Rigging the Receiving Ship. Besides the regular preparation for fueling outlined in Article 322, a certain amount of special preparation is necessary for the close-in operation. Figure 3-8 shows rigging on the receiving ship.

(1) A 12-Inch Snatch Block (secured to an 8,000 lb. test pad eye) must be provided at each station where fuel is to be received, to fairlead the hose-line messenger. This block is to be placed inboard of the ship's side and about 6 feet above the deck. Knives should be on hand to cut the stops securing the hose to the messenger. When coupling is completed, the hose messenger is restopped to the hose with 21-thread manila.

(2) A 14-Inch Snatch Block (secured to a 16,000 lb. test pad eye) is used on receiving ships larger than destroyer types at the highest convenient point above where the hose will be taken aboard. This is to receive the outer bight line to help support the outboard hose saddle, which is also receiving support from the outboard saddle whip aboard the oiler.

(3) A Riding Line is provided for the hose at each fueling station. This line should be 4- or 5-inch manila (as applicable) about 3 1/2 fathoms long, with one end free for securing to a nearby cleat and with the other end eye-spliced for insertion in the hook or shackle of the jigger tackle. This jigger tackle requires a pad eye tested to 16,000 lb. on destroyers or smaller ships, and to 22,500 lb. on larger ships.

(4) Breakable Spool. The A-end of the 6-inch (inside diameter) breakable spool must be connected to the deck fueling connection, in those ships so fitted.

c. Sending Over the Lines. As the receiving ship completes her approach and steadies alongside, heaving lines or line-throwing gun lines are to be sent over from each station on the delivering ship to corresponding stations on the receiving ship (see

Figure 2-5). By means of these first lines the telephone cables, distance line, hose-line messengers, and outer bight lines are started over. If the oiler is having difficulty in getting her gun lines across, the receiving ship will use her own line-throwing guns promptly when requested by the delivering ship. If the receiving ship is a carrier, she will always fire the gun lines. In all cases, gun lines must be passed back at the earliest convenience to the ship furnishing them.

The moment that the oiler's telephones or telephone jackboxes reach the deck of the receiving ship, connections must be made and communications established. Tending the distance line, with its accompanying telephone cable, is undertaken at the same time.

d. Passing and Tending the Hose. The oiler pays out the hose messenger by hand as the receiving vessel draws it on board. It is then led, on the receiving ship, to the snatch block provided for it about 6 feet above the deck, and, finally, to a winch; or it is led through a fairlead on deck for heaving in by hand.

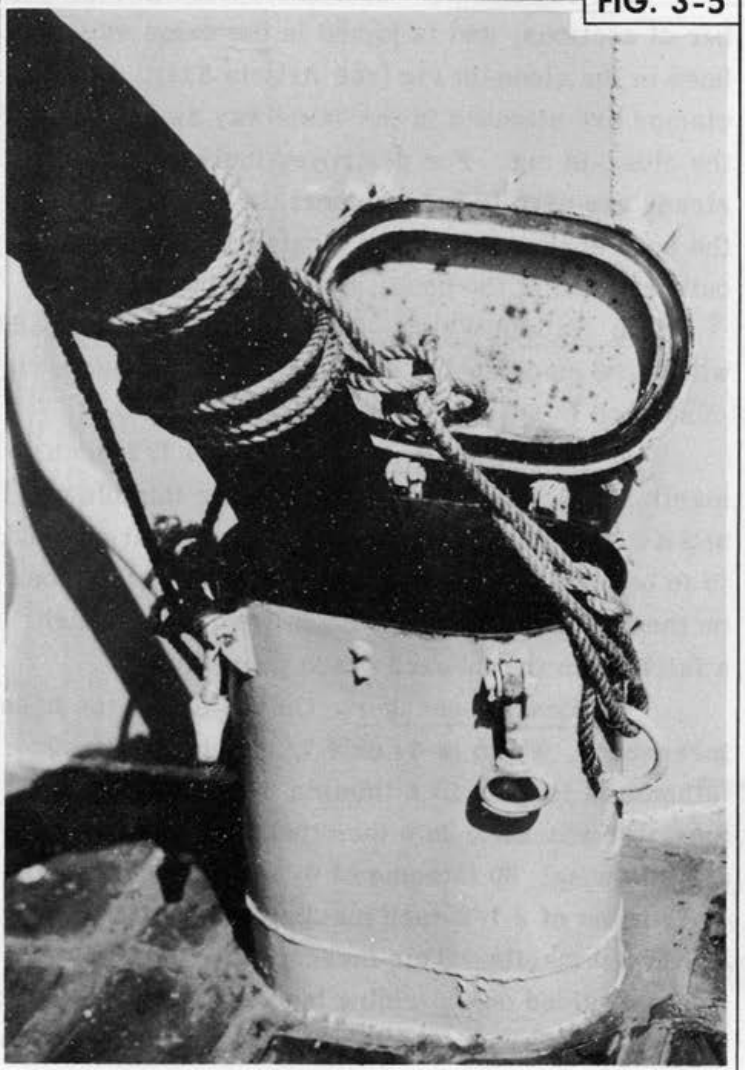
The oiler pays out on the retrieving line and saddle whips, allowing the hose to come across assisted by the outer bight line from the receiving ship (if such a line is being used). As the end of the hose comes on board, the receiving ship cuts the stops securing it to the messenger, one by one, until the riding-line hook is within easy reach. The bight of the riding line is slipped over the riding-line hook and the riding line is set taut. The hose end is then ready to be coupled to the receiving ship's hose, or to be lashed in the fueling trunk as shown in Figure 3-5. The messenger is then detached from the eye welded on the 9-foot riding hook, removed from the snatch block and, when requested, returned to the delivery ship by the 21-thread messenger return line.

When the receiving ship is ready, the delivering ship is requested to commence pumping. Care must be taken to open quick-closing valves where installed. These are never to be shut off while pumping is in progress.

e. Tending the Outer Bight Line and Saddle Whip. When an outer bight line is used, as it usually will be whenever the receiving ship is larger than a destroyer, the receiving ship will take it to the 14-inch snatch block provided for it at some convenient high-point and will tend it carefully. This line is important, for, as the ships roll, the hose bight may dip in and out of the water unless the outer bight line is used to raise and lower the outboard hose saddle. In the case of two ships rolling in opposite directions the hose will rise up suddenly, and the bight line (as well as the oiler's saddle whip, which is also helping to support

HOSE SECURED IN FUELING TRUNK

FIG. 3-5



the saddle) will stretch out horizontally. If these lines are not slackened immediately, they will break under the tension.

The outer bight line (tended by the receiving ship) and the outboard saddle whip (tended by the oiler) need constant handling by alert, intelligent men. Fast-moving winches will have to be used. The winchmen on both ships, working together with their eyes on the outboard saddle, should try to keep the two lines in the form of an upright V.

When the outer bight line is not used, the outer hose bight is controlled by the oiler's outboard saddle whip alone.

f. Retrieving the Hose and Outer Bight Line. When fueling is completed, the receiving ship gives the "Stop pumping" signal; disconnects the hose after it is blown through; and lashes the necessary valves closed or replaces the end flanges or hose caps. She eases out the hose on the bight of the riding line and then, as the outer bight line or hose messenger is being eased out, the oiler heaves in and two-blocks the inboard and outboard saddles. The oiler stops-off the inboard saddle whip, removes it from the winch gypsy head and belays it to a cleat. The retrieving line is then placed on the same gypsy head and with it the hose is hauled aboard. Finally, the receiving ship returns the outer bight line, the telephone and distance lines and the messengers.

g. Safety Precautions in Handling Winches and Wires. A 5/8-inch diameter shackle shall be used for securing the outboard saddle whip to a hose clamp. The 5/8-inch diameter shackle acts as a safety link which parts before the full breaking load of the 3/4-inch wire can be imposed on the boom and thereby minimizes the possibility of failure of the boom.

It is mandatory that the above precaution be promulgated to personnel handling these rigs prior to each replenishment operation and that they be explicitly followed.

312 SPAN-WIRE FUELING. In the span-wire rig the hose is extended by use of a single span wire stretching between the two ships. The hose hangs from trolley blocks which ride along the wire. This permits ships to open out to between 140 and 180 feet. This greater separation is safer, and better for station keeping and easier maneuvering. These factors not only allow commanders a wider latitude in choosing a fueling course, but they also facilitate the use of antiaircraft batteries should the need for them arise. The span-wire rig, with its higher suspension affords protection for the hose in rough weather. Figure 3-6 and 3-7 show span-wire fueling and Figure 3-9 the French adaptation.

a. Rigging the Replenishment Ship. The following is a guide to be used in making up the hoses and lines for fueling by the span-wire method. Details are shown in Figure 3-8.

(1) The Hose (6- or 7-inch) has the same number of sections, and is joined in the same way, as the hose in the close-in rig (see Article 311). Hose clamps are attached in the same way as described for the close-in rig. For destroyer fueling, manila straps are used to help support the outboard end of the hose at the riding hook located 13 feet from the outboard end of the hose, and at the bitter end.

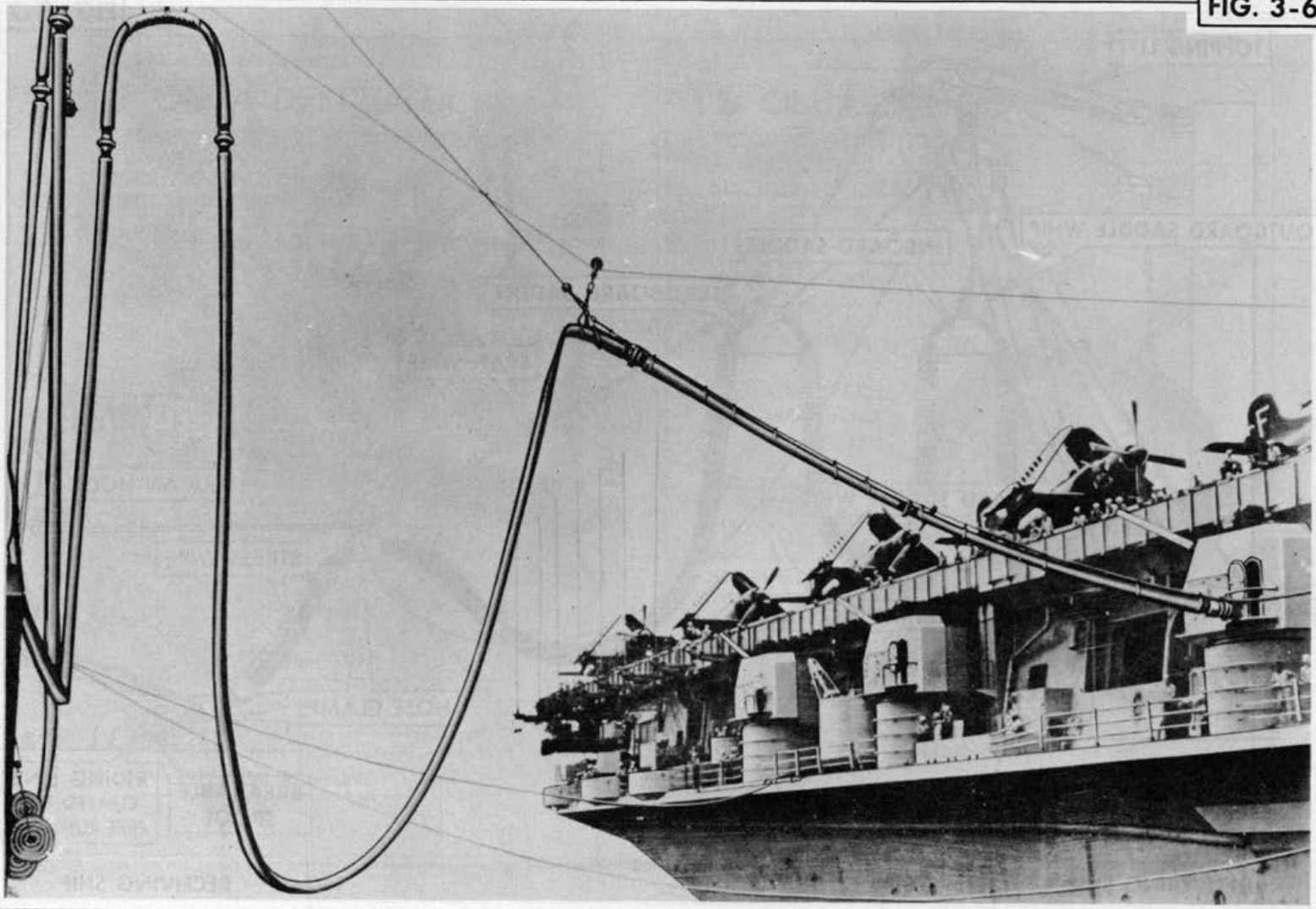
(2) Saddle Whips. Inboard and outboard saddle whips are made up and rigged as in the close-in rig described in subparagraphs 311a(2) and (3).

(3) A Retrieving Line of 4- or 4 1/2-inch manila, 60 fathoms long, fitted with a thimble eye and a 3/4- or 7/8-inch diameter shackle at one end, is to be rove through a 12- or 14-inch snatch block on the forward side of the boom head and through a fairlead to the inboard winch gypsy head.

(4) Hose Messenger. On one end of the hose messenger, which is 4- or 4 1/2-inch manila 60 fathoms in length, fit a thimble eye and a 7/8-inch diameter shackle. Into the other end, taper-splice the following: 30 fathoms of 6- or 9-thread manila, 15 fathoms of 2 1/2-inch manila, and 15 fathoms of 21-thread manila. This messenger is shackled to the eye welded on the riding hook of that hose clamp located 9 feet from the outboard end of the hose, and

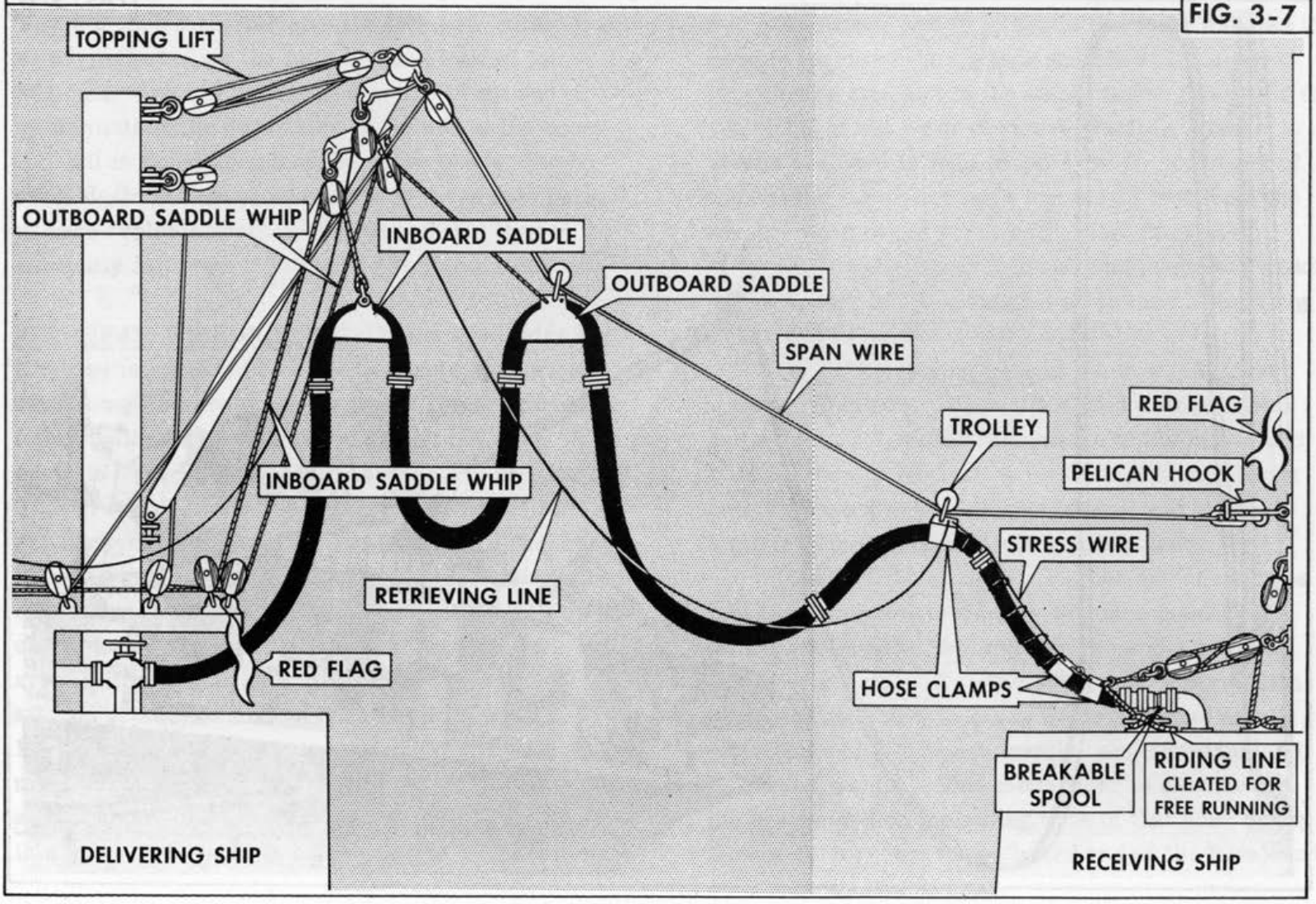
CONNECTING-UP SPAN-WIRE FUELING

FIG. 3-6



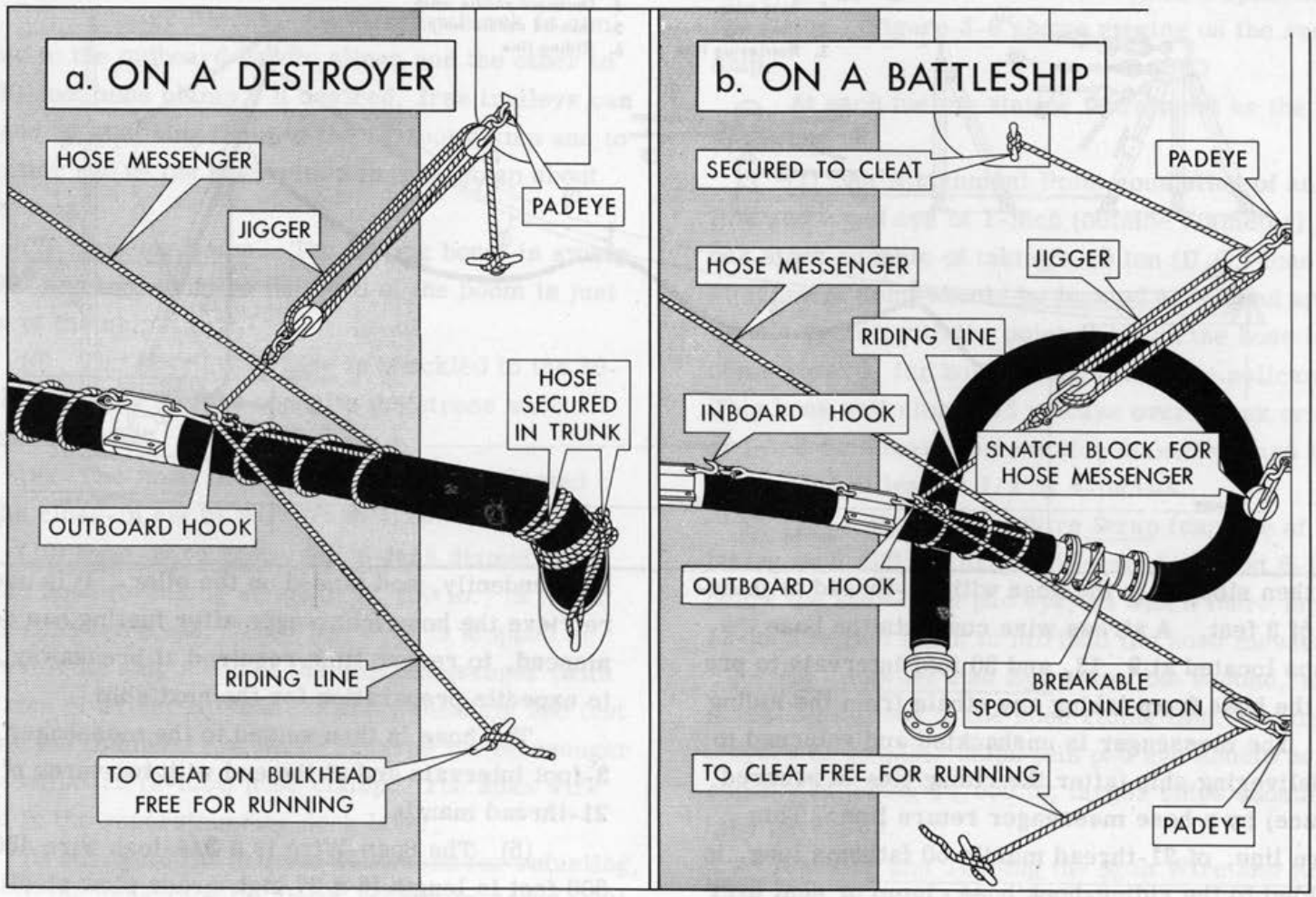
SPAN-WIRE RIG

FIG. 3-7



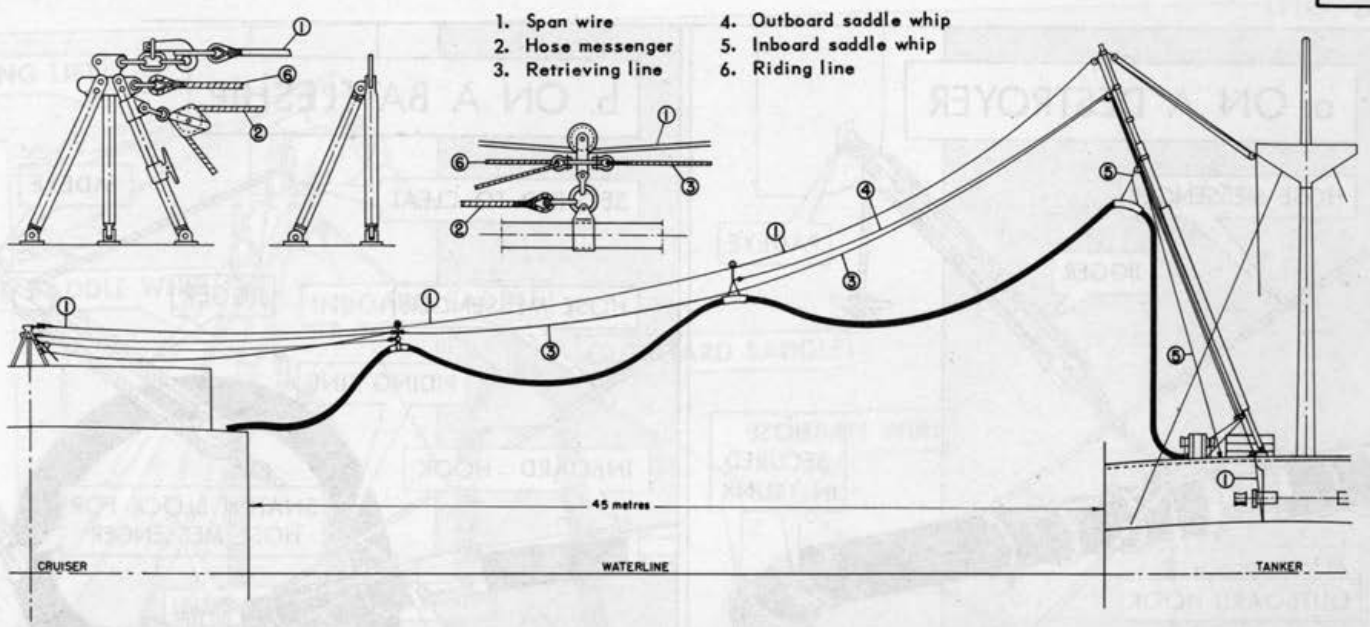
RECEIVING SHIP RIGGING

FIG. 3-8



FRENCH SPAN-WIRE RIG

FIG. 3-9



it is then stopped to the hose with 21-thread at intervals of 3 feet. A stress wire connects the hose clamps located at 9, 13, and 30 foot intervals to prevent the hose from taking any strain from the riding line. The messenger is unshackled and returned to the delivering ship (after the riding line is secured in place) by a hose messenger return line. This return line, of 21-thread manila 50 fathoms long, is shackled to the riding-hook hose clamp or sent over independently, and tended on the oiler. It is used to retrieve the hose messenger after fueling has commenced, to reduce time required at breakaway, and to expedite preparation for the next ship.

The hose is then seized to the messenger at 3-foot intervals and at the end with two turns of 21-thread manila.

(5) The Span-Wire is a 3/4-inch wire 450 to 600 feet in length (6 x 37 high-grade plow steel). It

is necessary to reeve the span wire through two trolley blocks and the free trolley, if one is used. A swivel and shackle are attached to the undercarriage of each trolley block.

(6) Trolley Blocks. One trolley block is connected to the outboard saddle slings and the other to the 30-foot hose clamp. If desired, free trolleys can be used by attaching them to the 13-foot clamp and to the bitter end of the hose with a manila strap about 2 feet long.

(7) Fueling Boom. The fueling boom is swung out 90° and topped up so the head of the boom is just clear of the ship's rail.

(8) The Retrieving Line is shackled to the 30-foot hose clamp so it is opposite the stress wire attachment point.

(9) The Hose is to be topped-up as directed for the close-in rig in paragraph 311a.

(10) Span-Wire Eye. A 7/8-inch diameter pelican hook (breaking strength 47,200 lb.) is fitted to the span-wire eye. The span wire is stopped to the receiving ship's end of the hose messenger (with 1-fathom of 21-thread manila) approximately 300 feet beyond the thimbled eye which secures the messenger to the outboard (9-foot) hose clamp. The span wire is led to the superstructure deck level.

To complete the general readiness for refueling, refer to the departmental check-off list in Article 321.

b. On the Receiving Ship. Beyond preparing for fueling in the usual manner (according to the check-off list in Article 322), little is needed in the way of special rigging to receive the hose in a span-wire operation. Figure 3-8 shows rigging on the receiving ship.

At each fueling station there must be the following:

(1) An Attachment Point consisting of an oblong link and a pad eye of 1-inch (outside diameter) round bar stock capable of taking a 16 ton (U.S.) load. The attachment point should be located above and approximately in line with the point at which the hose is to come aboard, for holding the span-wire pelican hook. This hook will close and release over a link or shackle of 1 3/8-inch maximum outside diameter, and it has an opening at least 1 1/2 by 4-inches.

(2) A Pad Eye or Wire Strap (capable of taking an 8,000 lb. load and located at least 6-inches below the span-wire pad eye) on which there is a 12-inch snatch block to fairlead the hose messenger.

(3) Another Pad Eye below the second, for shackling the end of the hose riding line. On destroyers or smaller ships this pad eye should be capable of taking 16,000 lb; larger ships should take 22,500 lb.

c. Passing and Tending the Span Wire and Hose. As the gun lines are fired and the connections begin

to be made, the receiving vessel draws in the hose messenger while the oiler pays it out by hand. When the 2 1/2-inch manila has cleared the side of the oiler, her crew cuts the stops holding the bights of the 4- or 4 1/2-inch manila as they are set up. The span wire is then payed out from the drum as the messenger is hauled across.

The receiving ship leads the hose messenger through the 12-inch snatch block (located slightly below the attachment point) and to a winch. When the span wire comes on board, the pelican hook on its end is made fast to the tie-in pad eye. The receiving ship then cuts the stops joining the span wire to the hose messenger, and the delivering ship begins to tend the wire.

The span wire should form a good catenary at all times. It is to be handled by a capable winchman who is to ensure that it is never too taut, yet never so slack as to allow the hose to touch the water.

Having freed the hose messenger, the receiving ship resumes heaving it in while the oiler pays out on the retrieving line and saddle whips. The saddles should be positioned so that the span wire will carry the weight of the hose, but the saddle whips can be used to help keep the hose high. When the hose end comes within easy reach of the receiving ship's deck, the stops marrying it to the messenger are cut, one by one, until the bight of a riding line can be slipped over the riding-line hook. Then the end of the hose is tended and controlled by the receiving ship, and the messenger is returned to the delivering ship where it is made up in preparation for the next ship.

When all is secure, the receiving ship opens the necessary filling valves and tells the oiler to begin pumping.

d. Retrieving the Hose and Span Wire. After uncoupling the hose and closing the necessary valves, the receiving ship uses the bight of the riding line to help return the hose as the oiler heaves in. The oiler two-blocks the inboard and outboard saddles, stops-off the inboard saddle whip, removes the whip from the winch gypsy head, and belays it to a cleat. The retrieving line is then placed on the winch gypsy head, and the hose is hauled aboard the oiler.

When the hose has been retrieved by the oiler, the receiving ship trips the span-wire pelican hook and either drops the wire clear or eases it out with the bight of a riding line. The oiler hauls in the span wire; telephone and distance lines are returned; and the operations are completed.

e. Safety Precautions in Handling Winches and Wires. The securing of the span wire to the winch drum shall be accomplished by using one wire clamp If ships should suffer a rudder casualty or loss of control from any cause while replenishing and

emergency breakaway cannot be effected, the wire shall be payed out from the winch drum to the securing clamp. As the ships veer apart and a strain is imposed, the wire will slip free of the clamp and drop over the side with minimum possibility of casualties to material or personnel.

A 5/8-inch diameter shackle shall be used for attaching the span wire to the pelican hook or for securing it to a hose clamp. The 5/8-inch diameter shackle acts as a safety link which parts before the full breaking load of the 3/4-inch wire can be imposed on the boom and the shackle thereby minimizes the possibility of failure of the boom.

It is mandatory that the above steps and precautions be promulgated to personnel handling these rigs prior to each replenishment operation and that they be explicitly followed.

313 CRANE AND SMALL DERRICK FUELING

Fueling by crane or derrick is used in carrying out replenishment between a warship (cruiser or larger type) and another warship. It is also used by an auxiliary which is only fitted with a small derrick. The best working distance is about 95 feet and the limits are between about 80 and 110 feet, the usefulness of the rig being limited by the short radius of the crane. Details of the rigging are shown in Figures 3-10 through 3-12.

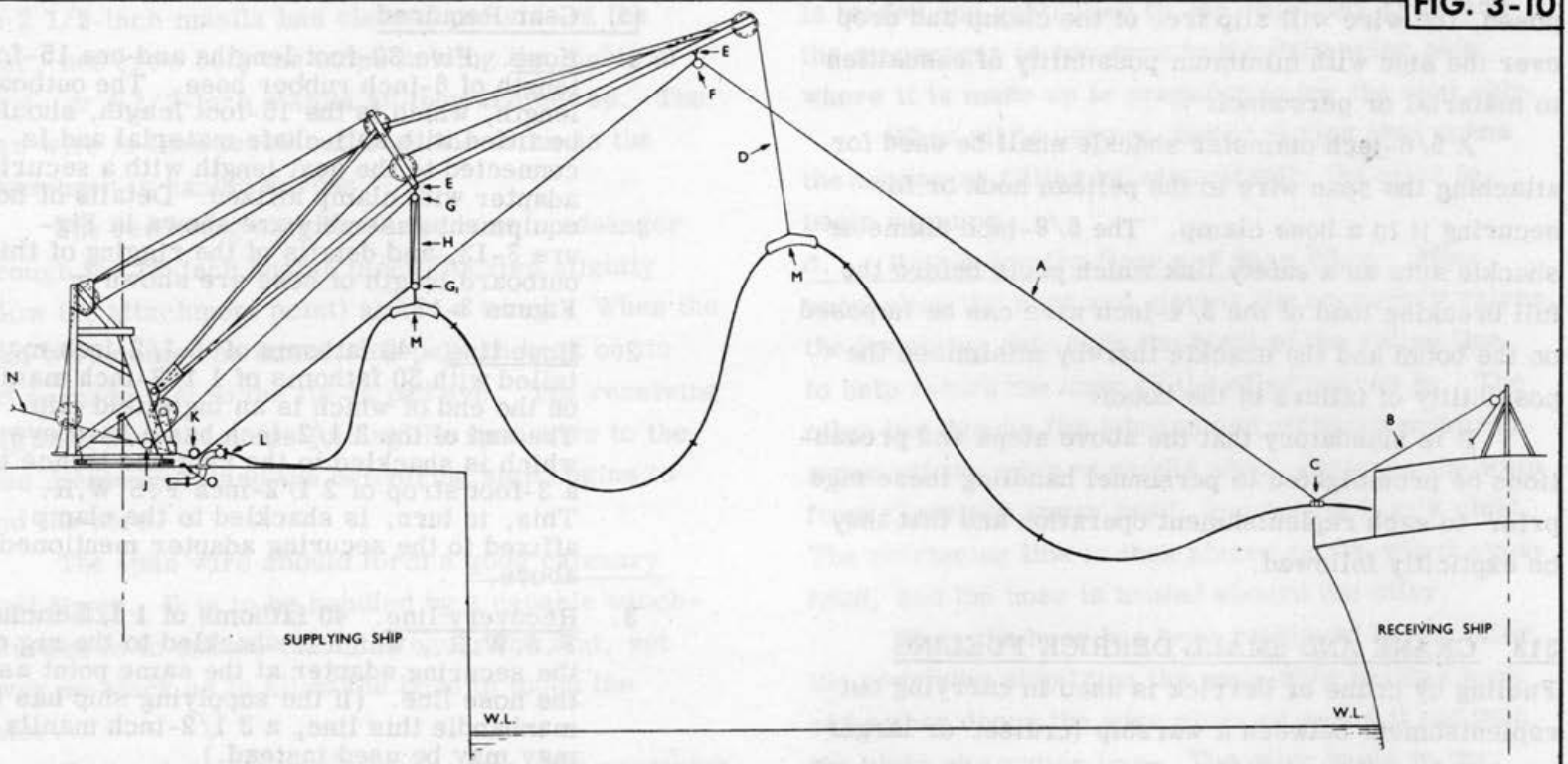
a. Rigging the Replenishment Ship. The following check-off list serves as a guide in making up the hose and fueling lines.

(1) Gear Required

1. Hose. Five 30-foot lengths and one 15-foot length of 6-inch rubber hose. The outboard length, which is the 15-foot length, should be fitted with anti-chafe material and is connected to the next length with a securing adapter with clamp affixed. Details of hose equipment assembly are shown in Figure 3-13, and details of the rigging of this outboard length of hose are shown in Figure 3-12.
2. Hose line. 40 fathoms of 3 1/2-inch manila tailed with 30 fathoms of 1 1/2-inch manila on the end of which is an Inglefield clip. The end of the 3 1/2-inch has a hard eye which is shackled to the ring and thence to a 3-foot strop of 2 1/2-inch F.S.W.R. This, in turn, is shackled to the clamp affixed to the securing adapter mentioned above.
3. Recovery line. 40 fathoms of 1 1/2-inches F.S.W.R., which is shackled to the rig on the securing adapter at the same point as the hose line. (If the supplying ship has to manhandle this line, a 3 1/2-inch manila may may be used instead.)
4. Working trough wire. 30 fathoms of 2 1/2 inches F.S.W.R., if using a derrick, or the crane purchase, as applicable.
5. Static trough line. 15 fathoms of 2 1/2- or 3-inch manila.
6. The trough. Working trough and static trough.

CRANE FUELING RIG

FIG. 3-10

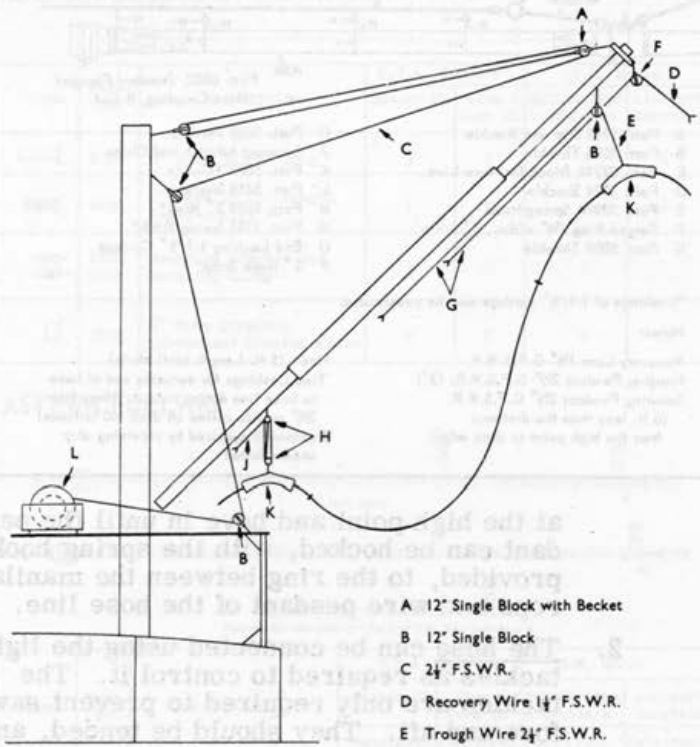


A Recovery Line. 40 fathoms 1½" F.S.W.R. 3½" Manilla, if being manhandled by the Supplying Ship
B Hose Line
C Securing Adaptor and Clamp
D Cranes Hoist Wire
E Eyeplate
F 8" Block
G Block Patt. 198 G_1 Patt. 199
H No. 1 Trough Line. 15 fathoms. 3" Manilla
J Snatch Block. Patt. 5220 A
K Snatch Block
L Hose Connection
M 6" Hose Trough
N To winch or manhandling position
O Air Connection for Blowing Hoses

Note:—
The hose is lashed in the troughs so that the distance from the securing piece to No. 2 trough is 70 feet, No. 2 trough to No. 1 trough is 50 feet, and No. 1 trough to the deck is 30 feet.

SMALL DERRICK

FIG. 3-11



7. Gun line and messenger.

(2) Passing the Gear. The hose is lashed in the troughs so that the distance from the securing piece to the working trough is 70 feet; from the working trough to the static trough is 50 feet; and from the static trough to the deck is 30 feet. Further hose is supplied if necessary to reach the deck connection. Details for hose connections are given in Figure 3-13. The hose is hoisted in the troughs and the hose end hoisted with the recovery line. A length of 2-inch hemp is used to bowse the inboard bight of hose into the guard rails so that it does not tangle. The hose line is passed over on the messenger, and the recovery line and trough wires are tended as the hose line is passed. The bowsing-in line is cast off as necessary.

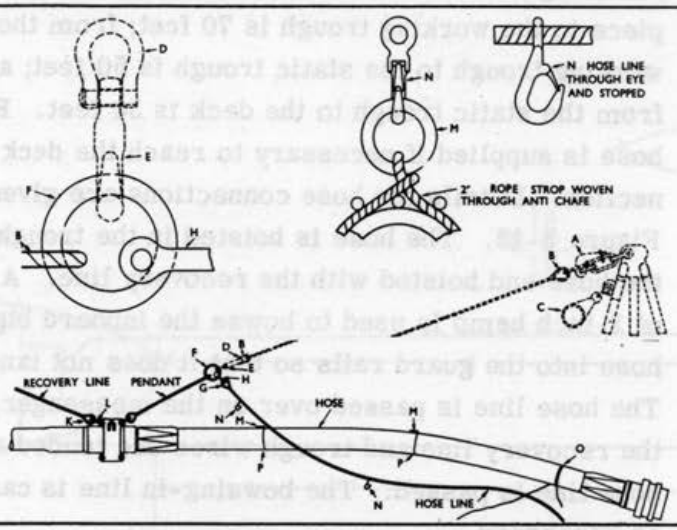
b. Rigging the Receiving Ship

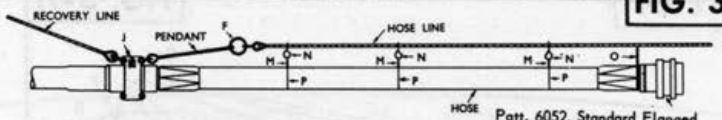
(1) Gear Required

1. Sufficient hoses to allow for play between the deck connections and the reception point where guard rails are lowered and shot mats are provided to prevent chafing.
2. Pendant. A 2 1/2-inch F.S.W.R. hanging pendant, whose length is generally 6 feet less than the distance from the high point to the deck edge, but which must be such that the distance from the securing clamp to the deck connection may be met by the inboard 15-foot length of hose. One end of the pendant is secured to a slip at the high point, and the other end is fitted with a spring hook as shown in Figure 3-12.

HOSE-END RIG -- ABEAM FUELING

FIG. 3-12





Patt. 6052, Standard Flanged Hose Coupling, B-End

A Patt. 1915 Slip and Shackle
B Patt. 5086 Thimble
C Patt. 5221A Block for Hose Line
D Patt. 2024 Shackle
E Patt. 2097A Spring Hook
F Forged Ring 7½" o/dia., 5" i/dia.
G Patt. 5088 Thimble
H Patt. 5463 Shackle
J Securing Adaptor and Clamp
K Patt. 5083 Thimble
L Patt. 5459 Shackle
M Patt. 5059 3" Ring*
N Patt. 2181 Spring Hook*
O End Lashing 1-1/8" Cordage
P 2" Rope Strop*

*Lashings of 1-1/8" cordage may be substituted.

Notes:

Recovery Line 1½" G.F.S.W.R.
Hanging Pendant 2½" G.F.S.W.R. (3')
Securing Pendant 2½" G.F.S.W.R. (6 ft. less than the distance from the high point to deck edge)

Hose 15 ft. Length (anti-chafe)
Tied Lashings for securing end of hose to hose line during transit. Hose line 3½" manila coiled on deck (40 fathoms)
Equipment supplied by receiving ship shown dotted

3. A leading block at the high point so placed that there is plenty of room for the hands to haul in the hose line, as when placed, for example, at the disengaged side of the forward gun mounting or turret where the line can be hauled along the forecastle.

4. Two light tackles for hooking to the securing piece of the hose if required to prevent it from working against the guard rails or other obstructions near the reception point.

(2) Receiving the Gear

1. The hose line is received on the messenger, which is passed as usual. The lashings securing the last length of hose to the hose line are cast off. The hose line is unclipped and passed through the leading block at the high point and hove in until the pendant can be hooked, with the spring hook provided, to the ring between the manila rope and wire pendant of the hose line.

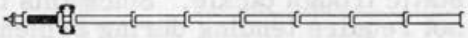
2. The hose can be connected using the light tackles as required to control it. The tackles are only required to prevent sawing fore and aft. They should be tended, and if ship motion causes the hose to rise, the tackles should be eased promptly or they may part.

c. Replenishment. The supplying ship tends the recovery line and the troughs as necessary for the variation in distance between ships. Any sideways strain on the head of a crane must be avoided. The

ASSEMBLY OF HOSES

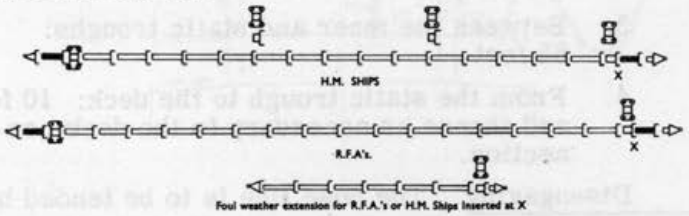
FIG. 3-13

ABEAM FUELING BY DERRICK METHODS



Item	Patt. No.	Description	R.F.A. Tankers		H.M. Ships	
			Ranger CL	Olna & Wave CL	Battleships & Cruisers	Aircraft Carriers
	6000	6" Hose 30 ft. Long	5	7	7	6
	6001	6" Hose 15 ft. Length (anti-chafe)	1	1	1	1
	6020 6021	Securing Adapter and Securing Clamp	1	1	1	1
	6052	6" Hose Coupling (B-end)and Closing Plate	2	5	2	2

ASTERN FUELING



Item	Patt. No.	Description	R.F.A. Tankers				H.M. Ships			
			Ranger CL.		Olna & Wave CL		Battleships & Cruisers		Aircraft Carriers	
			Fair	Foul	Fair	Foul	Fair	Foul	Fair	Foul
	6000	6" Hose, 30 ft. length	15	6	14 & 16	6 & 6	15	6	16	6
	6001	6" Hose, 15 ft. length (anti-chafe)	2		2		2		2	
	6020	Securing Adapter	3	1	2	1	4	1	4	1
	6010	Conical Cap for Female Hose Conn.	1	1	1	1	1	1	1	1
	6009	Conical Cap for Male Hose Conn.	1	1	1	1	1	1	1	1
	6021	Securing Clamp	3	1	2	1	4	1	4	1

crane driver must therefore be alert to keep the crane trained in line with the hose as well as to work the purchase used for the working trough.

d. Disengaging

(1) Returning the Hose Line. In the closing stages of fueling, the receiving ship passes back the tail of the hose line to the supplying ship by the messenger, ensuring that the bight of the hose line is clear. As convenient, the hose line must be secured to the last length of hose as originally passed. This must be done correctly or considerable delay will ensue before the next ship can be received.

(2) Emptying the Hose. When pumping is completed, and where no shut-off valve is fitted to the hose coupling, the hose must be emptied before being uncoupled. The hose is allowed to drain by hoisting the troughs as high as possible; if the supplying ship is still not satisfied that the hose is clear of fuel, it must be blown through as described in Article 303.

(3) Returning the Hose. The weight of the uncoupled hose is taken on the hose line, and the light tackles and the hanging pendant are unhooked. The hose is eased away on the bight of the hose line until the recovery line carries the weight, at which time the hose line is unsnatched from the leading block and cast-off.

(4) Emergency Disengaging. The hose is disconnected and the hose line cut. The hose can then be slipped from the high point by the slip provided, The messenger, telephone cables, and distance lines are cast off or parted if necessary.

314 LARGE DERRICK FUELING. Large derricks are used to transfer fuel to a warship from a tanker fitted with a 70-foot derrick (see Figures 3-14 through 3-16). This is the standard British fueling rig, and it enables satisfactory fueling of all ships to be carried out under most conditions of sea and weather. The best working distance is about 120 feet and the limits are between about 100 and 160 feet. To extend fueling operations of large ships from fast oilers the jackstay rig is used (see Article 315).

Methods of using and disengaging large derricks are exactly the same as those used for crane or small derrick fueling described in Article 313. Because of the greater length of the derrick and hence the greater distance possible between ships, there are certain differences in the gear used.

a. Gear Required. The gear is fitted in the same manner as for crane and small derrick rigs with the following exceptions:

1. Hose. Seven 30-foot lengths and one 15-foot length.
2. Recovery line. 75 fathoms of 1 1/2-inch F.S.W.R.
3. Outer trough wire. 45 fathoms of 2 1/2-inch F.S.W.R.
4. Inner trough wire. 35 fathoms of 2 1/2-inch F.S.W.R.
5. Static trough tackle. Since this trough does not require tending during replenishment, a light tackle is used to hoist it about 10 feet, where it is secured.
6. Three troughs instead of two.

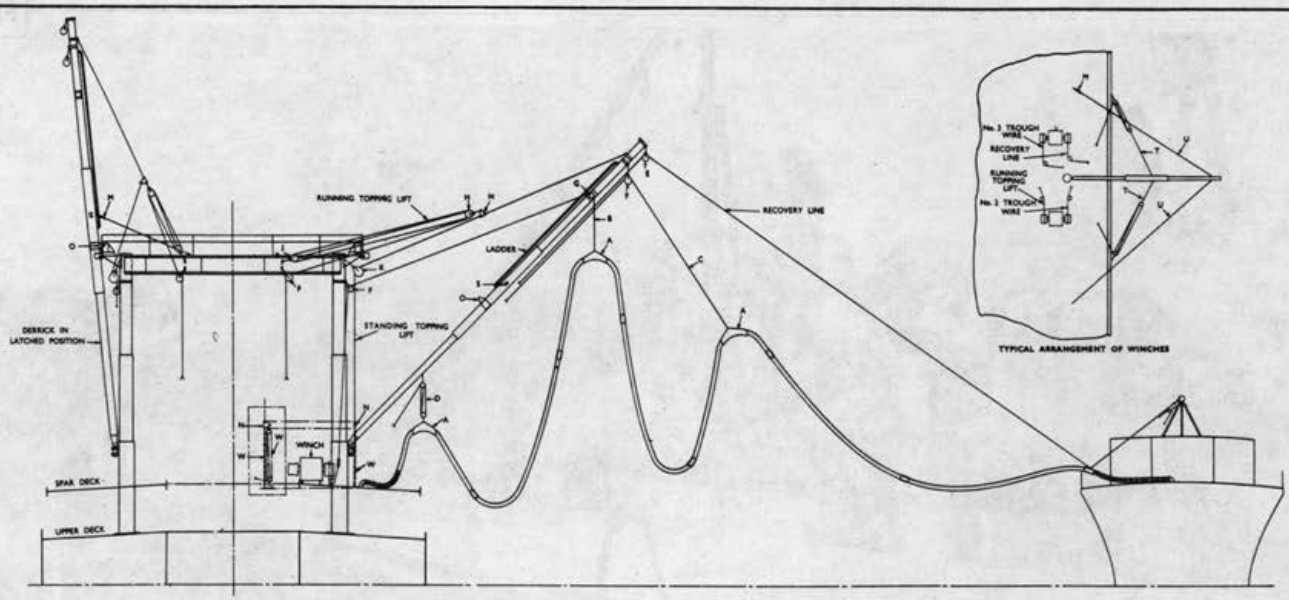
b. Passing the Gear. The only difference between this rig and crane and small derrick rigs are the lengths of hose between troughs, which are as follows:

1. Securing adapter to the outer trough: 75 feet.
2. Between the outer and inner troughs: 60 feet.
3. Between the inner and static troughs: 65 feet.
4. From the static trough to the deck: 10 feet and thence as necessary to the deck connection.

c. Disengaging. The hose line is to be tended by the receiving ship until the tanker has recovered the hoses and signaled that she has complete control of the equipment and that the hose line may be cast off. This method is practicable even in the worst weather; and the hose line is of ample length to allow for the retention of control by the receiving ship even in the case of an emergency cast off caused by the ships yawing apart.

LARGE DERRICK RIG

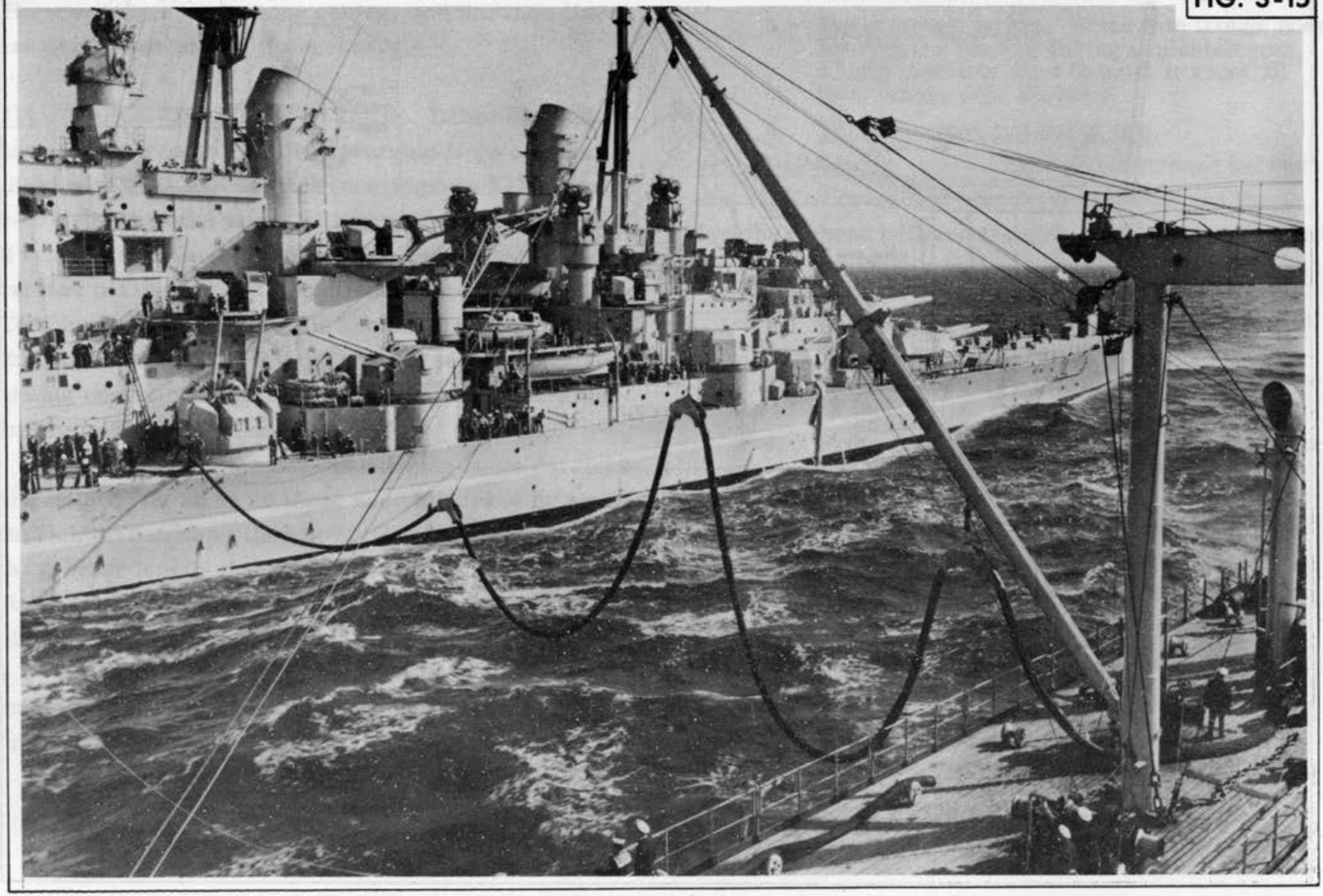
FIG. 3-14



A Trough
B Trough Wire—35 fathoms of 2 1/2" F.S.W.R.
C Trough Wire—45 fathoms of 2 1/2" F.S.W.R.
D Trough Blocks and Shackle
E 8" Swivel Block
F 12" Swivel Block
G 12" Fixed Sheave
H 12" Double Block
J 12" Block with becket
K 16" Swivel Block
L Patt. 1915 Slip and Shackle
M Slip and Rigging Screw
N Monkey Plate
O Latching
P Securing Adapter and Clamp
R Patt. 5221A Block
S Eyeplate for Running Guys
T Running Guys
U Standing Guys
V Securing Pendant
W Securing Chain
X Purchase for initial topping from horizontal stowage

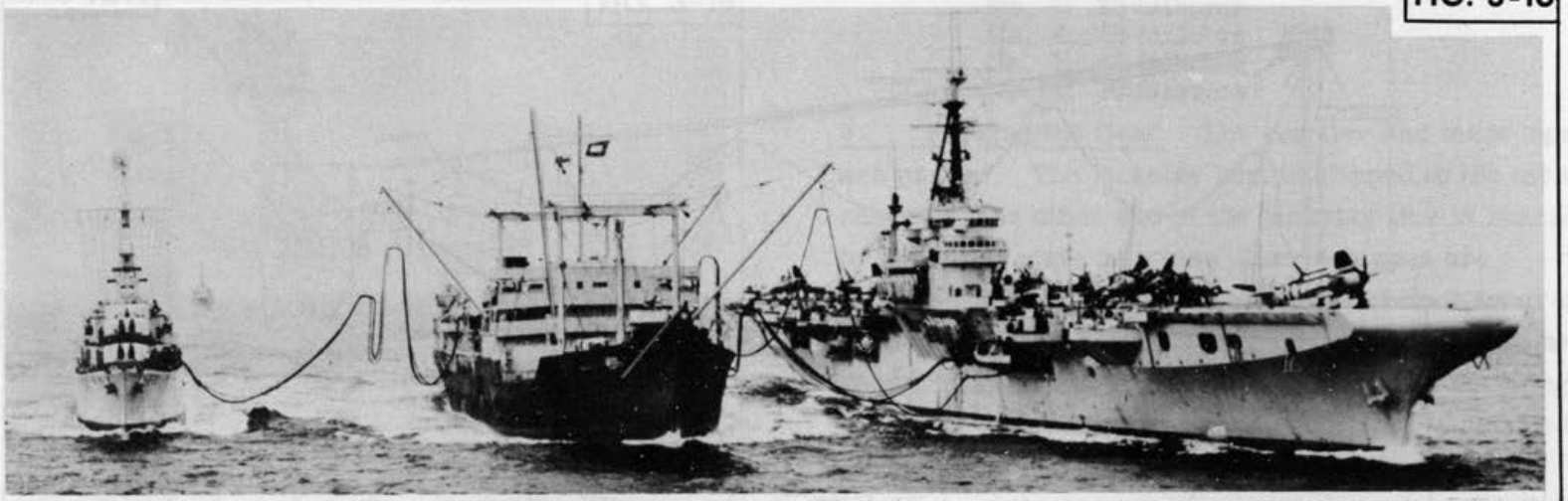
FUELING BY LARGE DERRICK

FIG. 3-15



TWO SHIPS FUELING

FIG. 3-16



315 JACKSTAY FUELING. Jackstays are used for transfer of fuel to a heavy ship when a greater distance between ships is desirable than that provided by the derrick method. The best working distance is about 200 feet, and the limits are between about 150 and 250 feet. Figures 3-17 through 3-21 show this rig and details of its operation.

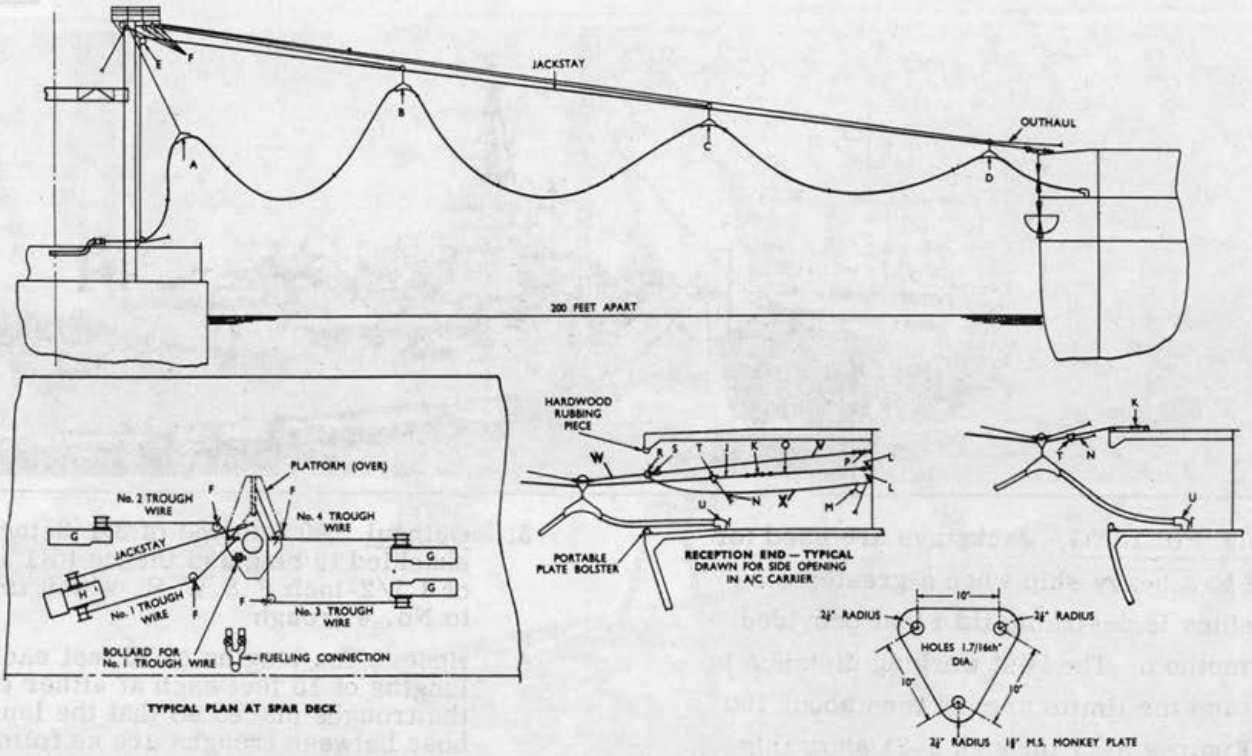
a. Gear Required

1. Jackstay. 120 fathoms of 3 1/2-inch E.S.F.S.W.R. with monkey plate and pendants on the outboard end
2. Jackstay line. 40 fathoms of 3 1/2-inch manila
3. Outhaul. 40 fathoms of 3 1/2-inch manila shackled to ring and thence to 1 1/2 fathoms of 1 1/2-inch F.S.W.R. which is secured to No. 4 trough
4. Hose. Ten lengths of 30 feet each and two lengths of 15 feet each at either end with the troughs placed so that the lengths of hose between troughs are as follows:

   Outboard end to No. 4 trough: 20 feet
   No. 4 trough to No. 3 trough: 75 feet
   No. 3 trough to No. 2 trough: 90 feet
   No. 2 trough to No. 1 trough: 75 feet
   No. 1 trough to the deck: 40 feet, thence as necessary to the deck connection
5. Four troughs on traveler blocks

JACKSTAY RIG

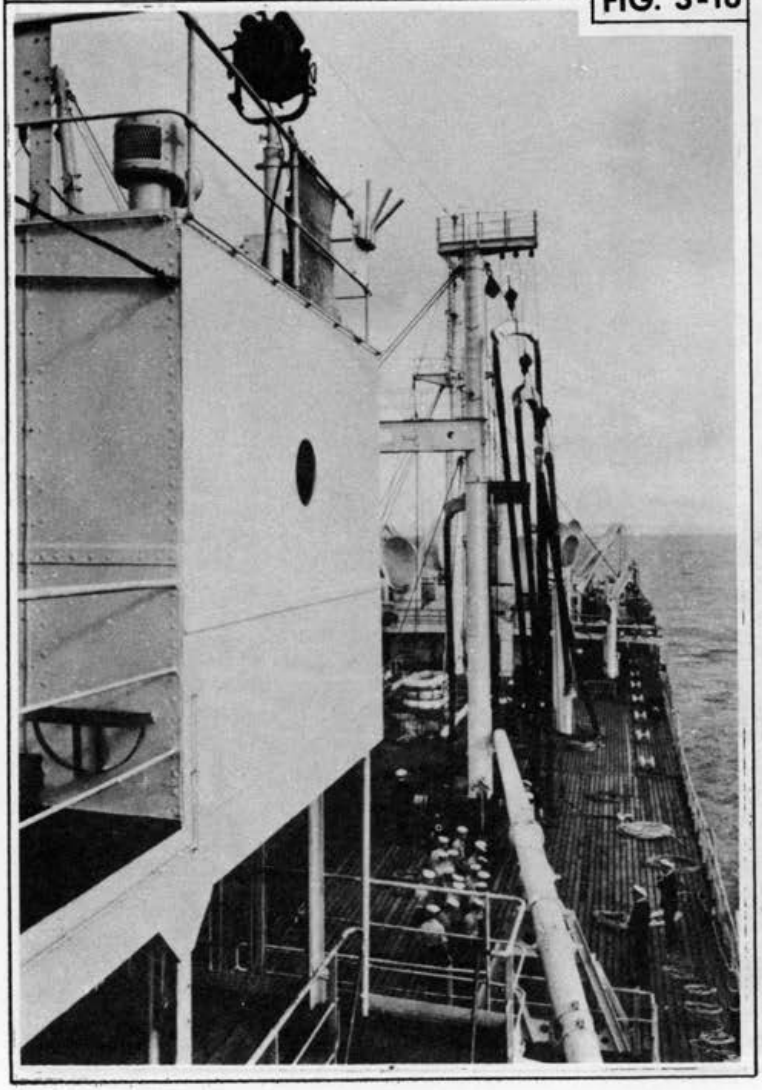
FIG. 3-17



A No. 1 Trough
B No. 2 Trough
C No. 3 Trough
D No. 4 Trough
E Eyeplate and 16" Lead Block
F Eyeplate and 8" Lead Block
G 1½ Ton Steam Winch
H 7 Ton Winch
J Securing Pendant 3½" E.S.F.S.W.R. 4'0" Long with Link (Patt. 5938)
K Patt. 1915 Slip and Shackle
L Eyeplate Patt. 4020 (Welded) or Patt. 4006 (Riveted) to be used also in Large Derrick Method
M Patt. 5221A Block
N 3½" Manila Jackstay Line led forward to suitable position, e.g. Fore and Aft Gangway
O Ship's Pendant for Securing Jackstay 3½" E.S.F.S.W.R.
P Patt. 1914 Slip and Shackle
R Forged Ring 7" o/dia.--5-1/4" i/dia.
S Spring Hook Patt. 2097A
T 1-3/8" Monkey Plate
U 6" Standard Hose-Coupling with cast-iron breakable spool, Patt. 6052 and 6051
V Hanging Pendant for Securing Trough 1½" F.S.W.R.
W Hose Pendant 1½" F.S.W.R. 9'0" long
X Hose Line 40 Fathoms of 3½" Manila

JACKSTAY RIG HOISTED

FIG. 3-18



6. Gun line, messenger, and distance line
7. Trough wires, each of 1 1/2-inch E.S.F.S.W.R.

   No. 1: 30 fathoms
   No. 2: 40 fathoms
   No. 3: 55 fathoms
   No. 4: 70 fathoms

b. Passing the Gear. The gun line and messenger are passed. The jackstay line is clipped to the messenger. The other end of the jackstay line is shackled to a monkey plate on whose other two eyes are shackled the end of the jackstay and a 4-foot securing pendant of 3 1/2-inch E.S.F.S.W.R. with a link, as shown in Figure 3-17. This simplifies the securing of the jackstay. The end of the hose line is secured to the monkey plate. The hose is secured in the troughs and the troughs are hoisted as shown in Figure 3-16. The end of the jackstay is adjusted for convenience so that it just reaches the deck.

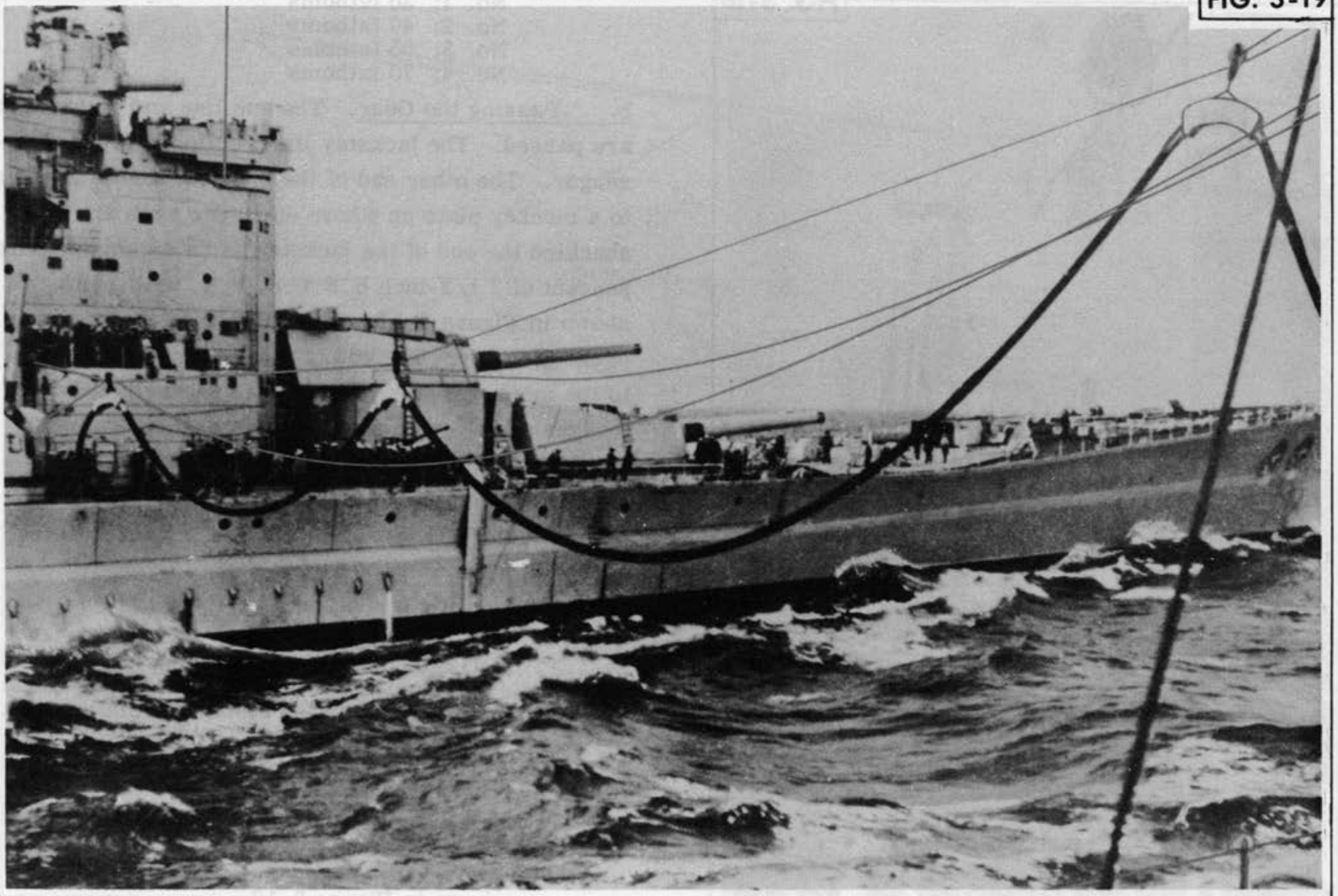
c. Rigging the Receiving Ship

(1) Gear Required

1. A slip for the jackstay
2. Slip and hanging pendant. A slip and 1 1/2-inch F.S.W.R. hanging pendant, (V in Figure 3-17) whose length is generally 6 feet less than the distance from the high point to the deck edge, with a spring hook for the ring of the hose pendant, as with crane or derrick fueling
3. A snatch block for the jackstay line used subsequently for the outhaul
4. Anti-chafe arrangements for the hose, as shown in Figure 3-12.

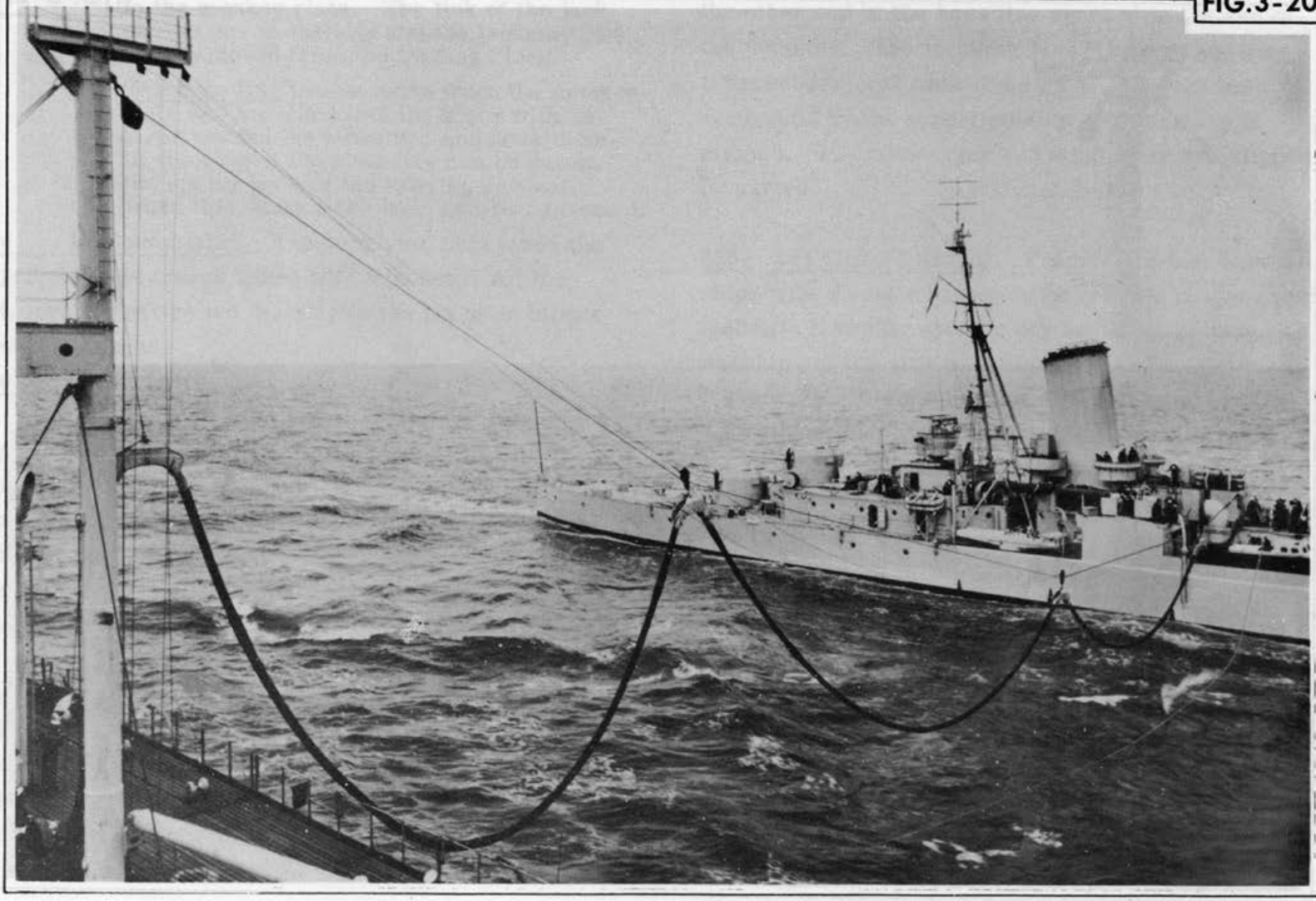
FUELING A BATTLESHIP BY JACKSTAY

FIG. 3-19



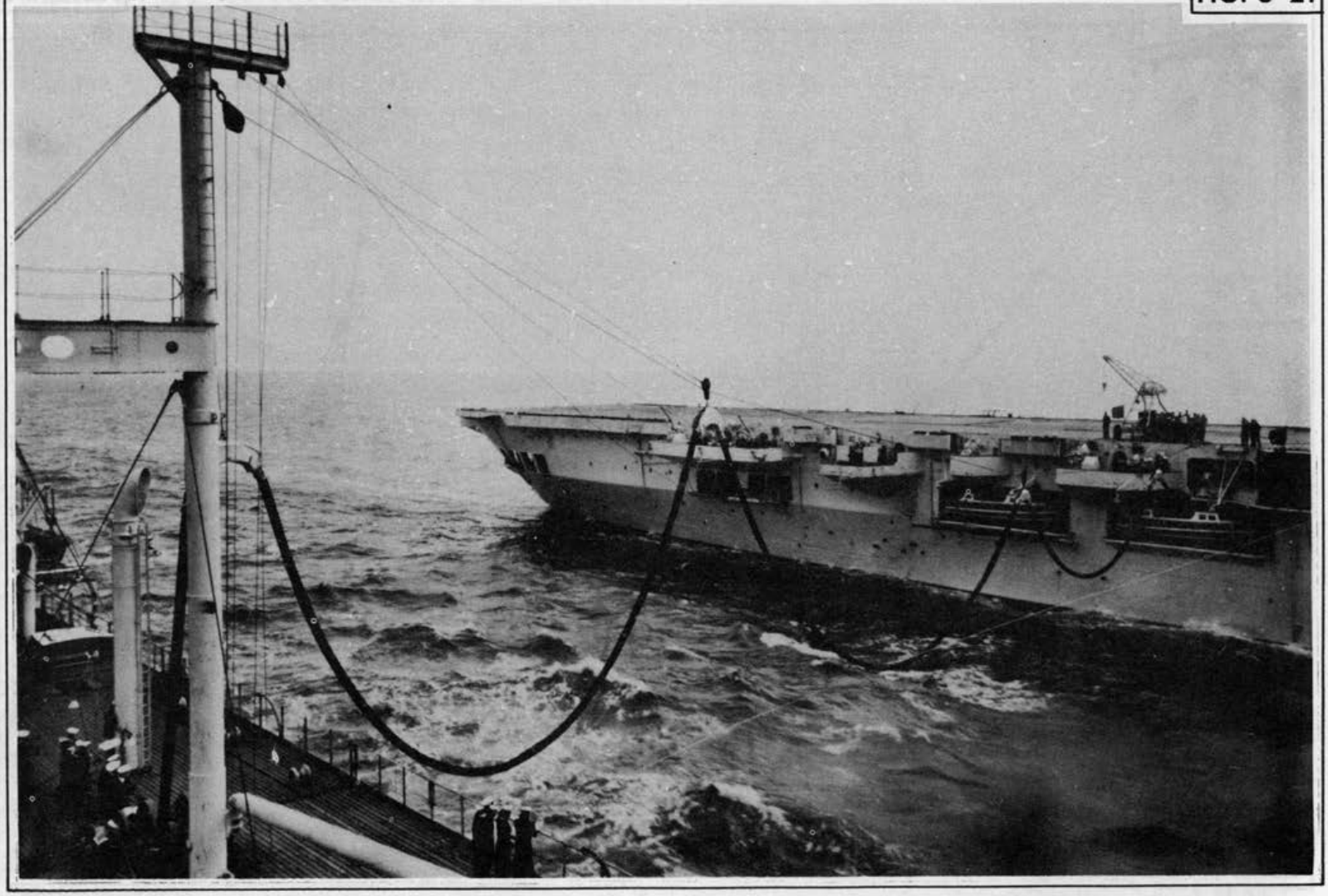
FUELING A CRUISER BY JACKSTAY

FIG.3-20



FUELING A CARRIER BY JACKSTAY

FIG. 3-21



(2) Receiving the Gear

1. The jackstay line is passed by messenger and is hauled in after snatching it in the block. The end of the hose line is stopped to the monkey plate. The link of the jackstay is put on the slip and the jackstay line then removed from the leading block.

2. The hose line is now taken from the monkey plate and snatched into the block with no turns around the jackstay, and hove in until the ring of the hose line can be put on the spring hook of the hanging pendant. When this is done the hose can be connected.

d. Replenishment. The supplying ship tends the jackstay and trough wires with winches. All the trough wires are led directly to the traveler blocks of the troughs.

e. Disengaging

(1) Returning the Hose. When fueling is completed, the hose is uncoupled and the end of the hose is secured again to the hose pendant so that it is ready for the next ship. The outhaul is slipped and the hose eased back to the supplying ship, the other end of the hose line being stopped to the monkey plate as convenient.

(2) Returning the Jackstay Line. When the supplying ship has recovered the hose, the jackstay is eased off so that the receiving ship can take the weight on the jackstay line and slip the jackstay. The jackstay itself is then passed back to the supplying ship, and the jackstay line is cast off with the messenger and remaining gear being passed back.

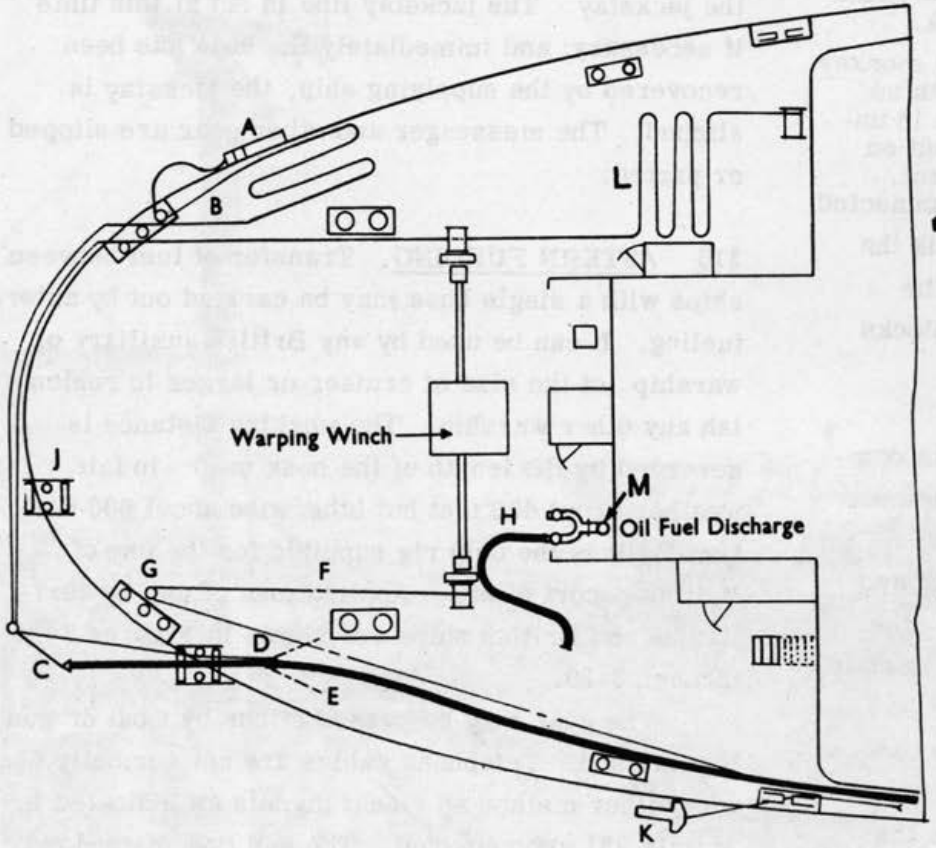
(3) Emergency Disengaging. As soon as the hose is uncoupled, the hose pendant is slipped and the other end of the hose line secured to the end of the jackstay. The jackstay line is cut at this time if necessary; and immediately the hose has been recovered by the supplying ship, the jackstay is slipped. The messenger and other gear are slipped or parted.

316 ASTERN FUELING. Transfer of fuel between ships with a single hose may be carried out by astern fueling. It can be used by any British auxiliary or warship of the size of cruiser or larger to replenish any other warship. The working distance is governed by the length of the hose used: in fair weather about 400 feet but otherwise about 600 feet. Usually it is the only rig supplied for the use of British escort oilers. Applications of use by auxiliaries and British ships are shown in Figures 3-22 through 3-29.

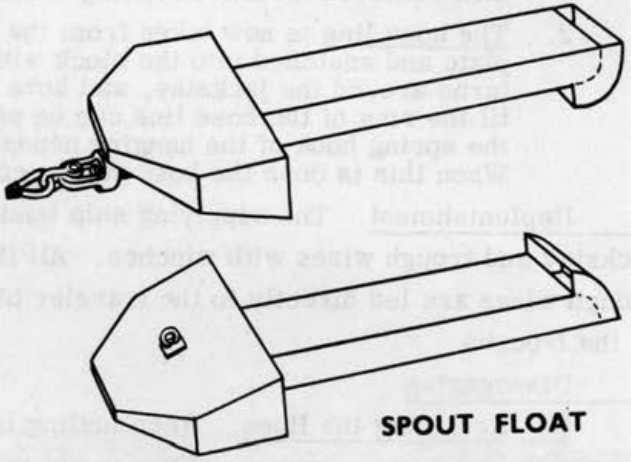
The gear may be passed either by float or gun line method. Telephone cables are not normally used with either method so visual signals as indicated in Article 231 are required. The gun line method may be preferable in rough weather, but the float method is quicker if a number of ships are to be fueled in succession.

ASTERN FUELING

FIG. 3-22



TANKER



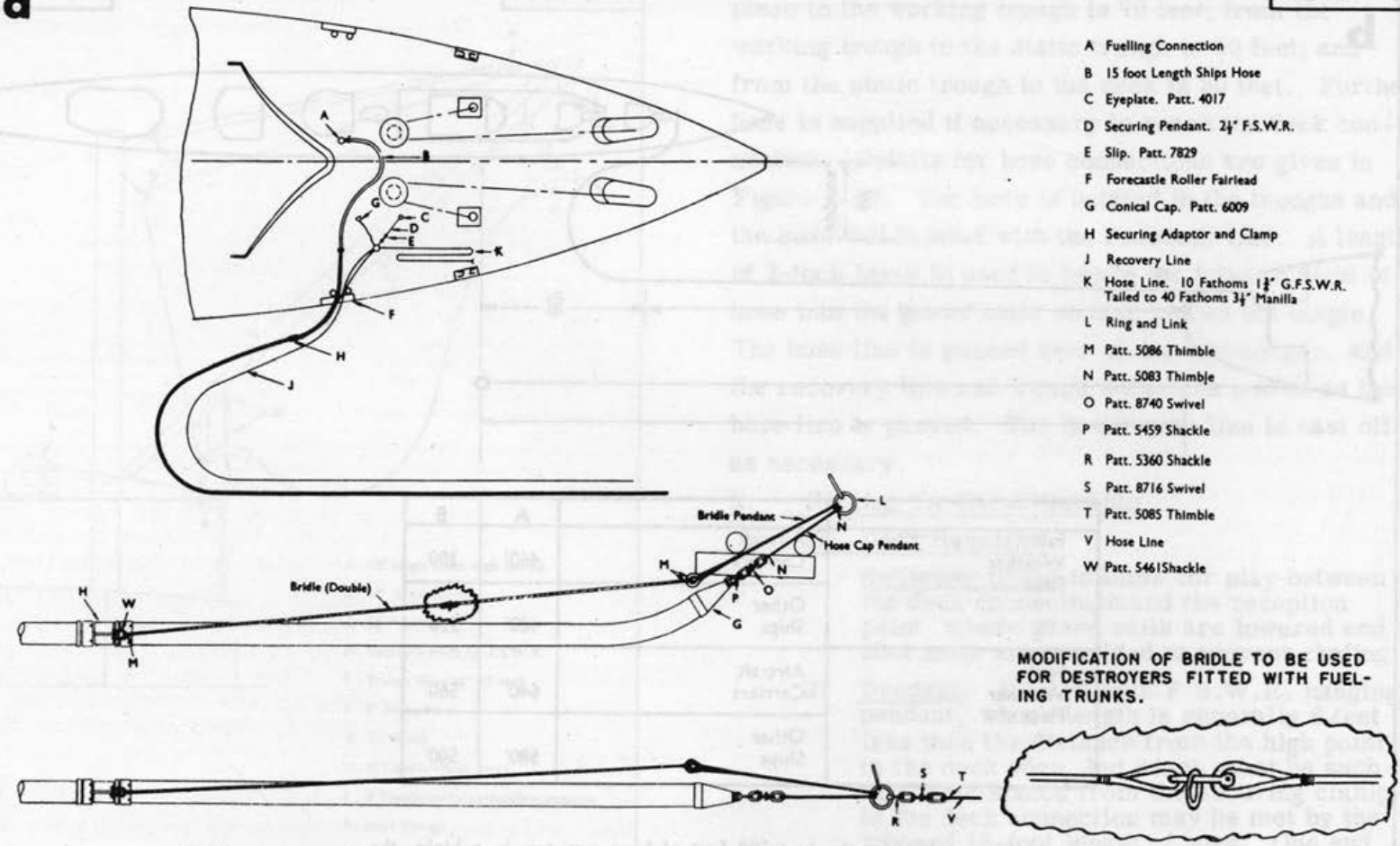
SPOUT FLOAT

A Float
B Hose line
C Outboard end of hose (15 ft. length)
D Securing Adaptor
E Hose hanging off pendant
F Starting out pendant
G Snatch Block
H 15 ft. length of hose
J Stern Roller Fairlead
K Marker Buoy and Line
L Hose Recovery Line
M Oil Fuel Deck Connection

ASTERN FUELING

a

FIG.3-23



A Fuelling Connection
B 15 foot Length Ships Hose
C Eyeplate. Patt. 4017
D Securing Pendant. 2½" F.S.W.R.
E Slip. Patt. 7829
F Forecastle Roller Fairlead
G Conical Cap. Patt. 6009
H Securing Adaptor and Clamp
J Recovery Line
K Hose Line. 10 Fathoms 1¾" G.F.S.W.R. Tailed to 40 Fathoms 3¼" Manilla
L Ring and Link
M Patt. 5086 Thimble
N Patt. 5083 Thimble
O Patt. 8740 Swivel
P Patt. 5459 Shackle
R Patt. 5360 Shackle
S Patt. 8716 Swivel
T Patt. 5085 Thimble
V Hose Line
W Patt. 5461Shackle

MODIFICATION OF BRIDLE TO BE USED FOR DESTROYERS FITTED WITH FUELING TRUNKS.

Notes:—

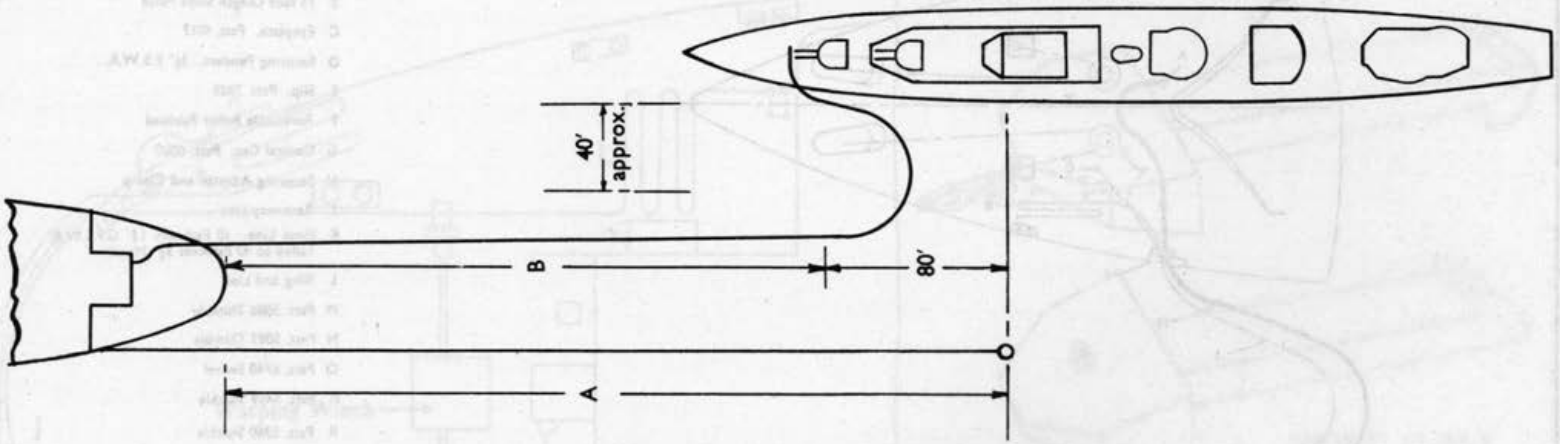
Length of Bridle Pendant with Bridle 19' 6"
Length of Hose Cap Pendant 2' 6" (approx.) to be such that 15 foot length of Hose is held straight but without strain.
The Weight of the Hose being taken on the Bridle Pendant

Bridle Pendant. 2½" G.F.S.W.R.
Bridle (Double) 2½" E.S.G.F.S.W.R. 15 ft (approx.)
Hose Cap Pendant 1¾" G.F.S.W.R.
Hose Line
Securing Pendant 2½" F.S.W.R. 2' to 3' long

ASTERN FUELING

FIG. 3-23

b



		A	B
Fair Weather Fleet	Aircraft Carriers	460'	380'
	Other Ships	400'	320'
Foul Weather Fleet	Aircraft Carriers	640'	560'
	Other Ships	580'	500'

In order that approximately the last 100 feet of hose may tow in a bight, the marker buoy should be streamed as at A: that is, B plus the distance between the receiving ship's fairleads and bridge. Allowance is made for 5 feet of hose on the receiving ship's forecastle.

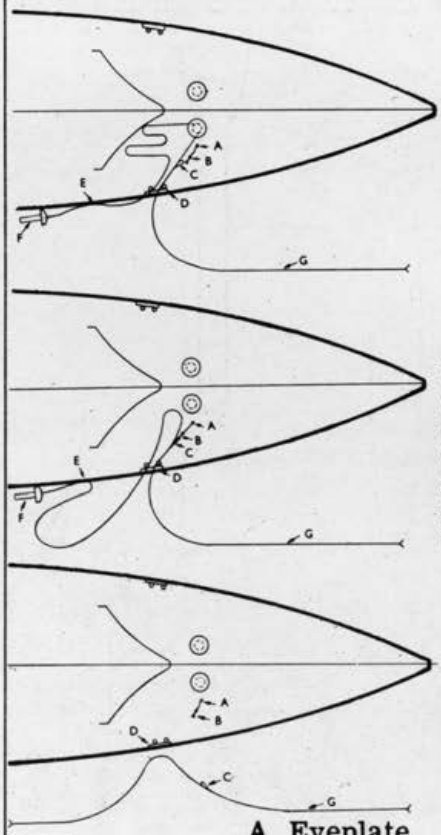
RECEIVING HOSE BY FLOAT

FIG. 3-24



DISENGAGING HOSE LINE AND FLOAT

FIG. 3-25



Becket has reached senhouse slip. Veering is stopped.

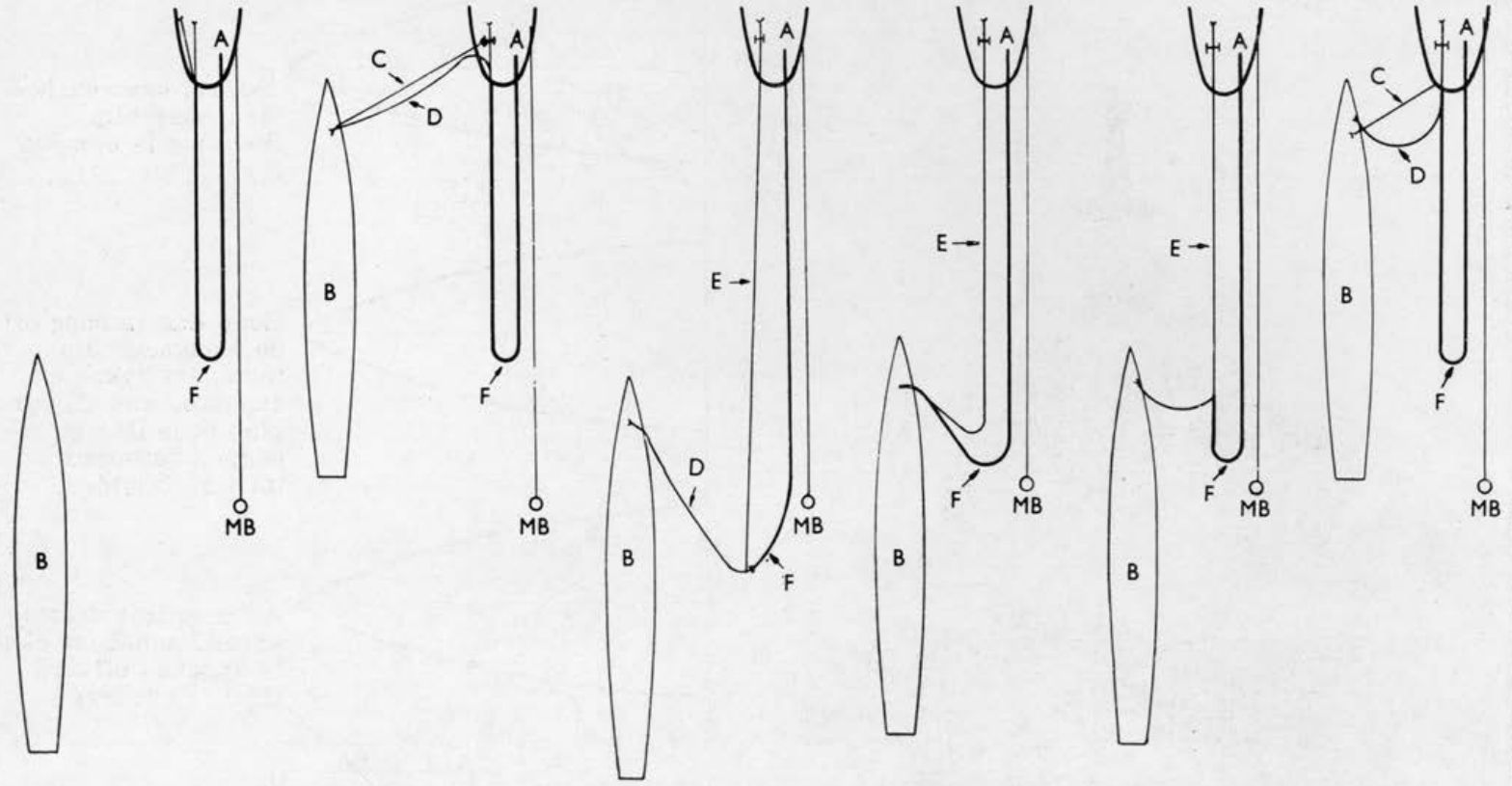
Hose line is hung off on senhouse slip, turns are taken off capstan, and all surplus hose line is passed outboard through fairlead.

As hose line draws ahead, senhouse slip is knocked off and float is cut free.

A Eyeplate
B Senhouse slip
C Becket
D Forecastle roller fairlead
E Float line lashed to guardrail
F Spout type float

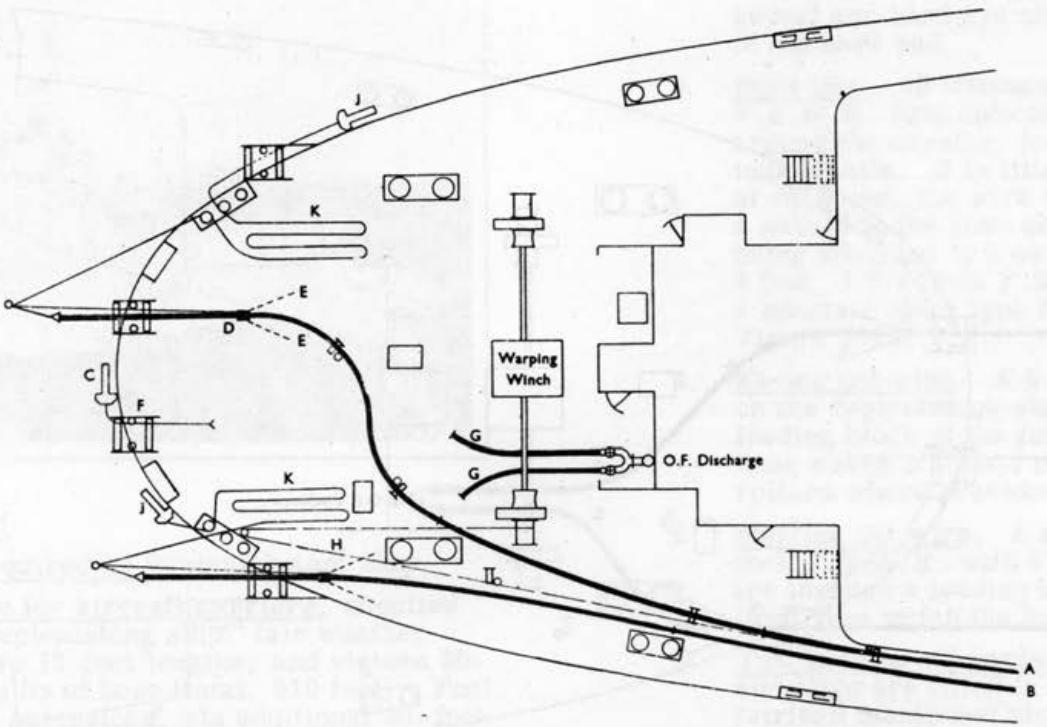
ASTERN FUELING – GUN LINE METHOD

FIG. 3-26



HOSE LAYOUT

FIG. 3-27



A Hose to Receiving Ship on Port quarter

B Hose to Receiving Ship on Starboard quarter

C Marker Buoy and line

D Securing Adaptor and Clamp

E Hose hanging off Pendant

F Stern Roller Fairlead

G 15 feet length of Hose

H Starting out Messenger

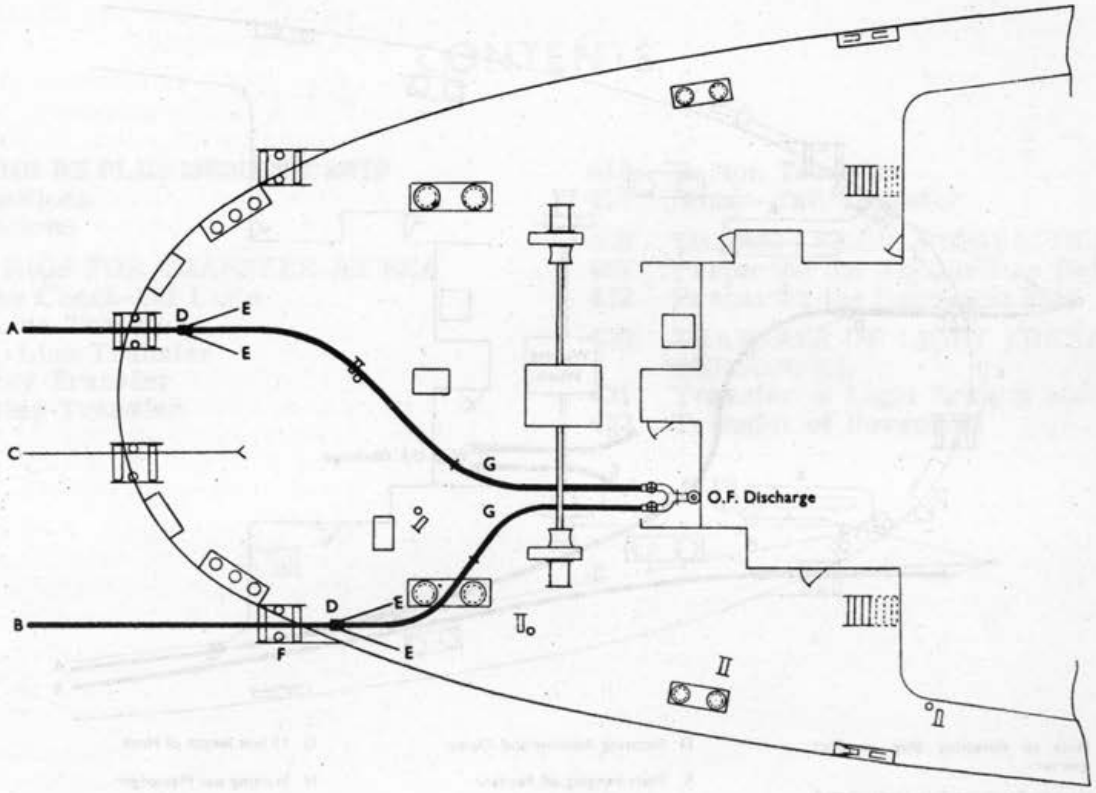
J Float (for details of Float see figure 12)

K Float line

Note:— Starboard Hose off rollers, placed on rollers and veered after Port Hose is streamed.

TWO SINGLE HOSES STREAMED

FIG. 3-28



A Hose to Receiving Ship on Port quarter

B Hose to Receiving Ship on Starboard quarter

C Marker Buoy line

D Securing Adaptor and Clamp

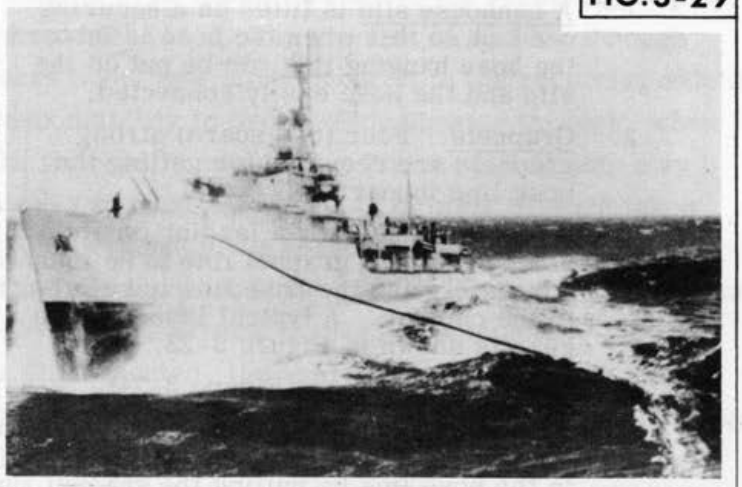
E Hose Hanging Pendant

F Stern Roller Fairlead

G 15 feet length of Hose

FUELING A DESTROYER ASTERN

FIG. 3-29



a. Float Method

(1) Gear Required by Replenishment Ship

1. For hose for aircraft carriers, supplied by the replenishing ship: fair weather fleet, two 15-foot lengths, and sixteen 30-foot lengths of hose (total, 510 feet). Foul weather extensions, six additional 30-foot lengths (total, 690 feet).
For other receiving ships. Two 30-foot lengths of hose may be omitted at the discretion of the replenishment ship (totals of 450 and 630 feet). This may save the replenishment ship the necessity of streaming the hose in more than one fleet. For details of hose equipment assembly, see Figure 3-13. Details of the fittings on the hose end are shown in Figure 3-23.

2. Hose recovery line. 120 fathoms of 2 1/2-inch F.S.W.R. (or 20 fathoms of 2 1/2-inch F.S.W.R. tailed with 100 fathoms of 3 1/2-inch manila if it has to be manhandled on a capstan), fitted with a reduced eye at the winch end and having at the other end, a swivel and hard eye shackled to the ring of the hose end.

3. Hose line. 10 fathoms of 1 3/4-inch F.S.W.R. long spliced, so that it will go around the capstan, to 40 fathoms of 3 1/2-inch manila. It is fitted with a hard eye at each end, the wire being shackled with a swivel to the hose end rig, the manila being shackled to a swivel and then by a 3 foot, 1 3/4-inch F.S.W.R. pendant to a spout or other type float as shown in Figure 3-22.

4. Easing out wire. A 2 1/2-inch F.S.W.R. on the replenishing ship, fitted from a leading block at the forward end of the hose where it is laid out on deck or on the rollers where provided.

5. Starting out wire. A short length of 1 1/2-inch F.S.W.R. with a hook at one end is led through a leading block near the fairlead from which the hose is streamed.

6. Two hanging off pendants. Short pendants and slips are fitted in the vicinity of the fairlead mentioned above.

7. Marker buoy. A minesweeping (T.S.D.S.) float, which is designed to be illuminated at night, or some similar float towed by the fog buoy wire.

(2) Passing the Gear

1. The marker buoy is streamed, when replenishing ships other than aircraft carriers, to a distance of 320 feet for the

fair weather fleet, or 500 feet with the foul weather extension, plus the distance from the fueling fairlead of the receiving ship to her bridge. This ensures that the hose will tow in a bight of about 100 feet, and this bight must be kept as narrow as possible, especially at high speeds, to avoid undue strain on the hose (see Figure 3-24). For aircraft carriers the length of the marker buoy wire must be increased by approximately 60 feet.

2. The hose is streamed to its full length. This process is begun by using the starting out wire until the hose takes itself out, at which time the easing out wire is used to control it. In some ships it is necessary to lay out the hose on deck in several fleets. The hose is hung on the hanging off pendants while each fleet is connected; then the easing out wire is shifted to the end of the new fleet, and the hose is connected to the discharge point after it has been fully streamed.

3. The hose recovery line is veered with the hose. Its chief use is for recovering the hose end, if the receiving ship should damage the hose line or float, rather than the lengthy operation of recovering the whole hose in the normal way. Since the recovery line is only a refinement for the float method and since some ships may not have a suitable capstan or winch for handling it, the recovery line may be dispensed with at the discretion of the replenishment ship.

4. Securing adapter and clamp. At any place in the hose where the hose has to be hung, there must be a securing adapter and clamp for the hanging off pendants. Two hanging off pendants are normally fitted, so that the connection may be simplified by keeping the hoses square to one another.

(3) Gear Required by the Receiving Ship

1. A senhouse slip is fitted on a securing pendant so that when the hose is inboard the hose hanging link can be put on the slip and the hose easily connected.

2. Grapnels. Four (two spare) strong grapnels are required for getting the hose line inboard.

3. A roller fairlead or a leading (snatch) block enables a grapnel line to be manned adequately and the hose line to be brought to the capstan. A typical layout of the gear is shown in Figure 3-23.

(4) Receiving the Gear (Figure 3-24)

1. Float. The receiving ship approaches the float from astern, grapples it and hauls in the hose line by putting the grapnel line in the leading (snatch) block and bringing the hose line to the capstan.

2. The hose line should be grappled some distance from the float and not at the float itself.

3. The hose end rig is designed so that, when it is hauled in, the hose points itself through the forecastle fairlead (roller) without jamming.

4. The hose is hung on the slip, the conical cap removed and the hose connected.

5. The hose line is kept on the capstan and racked as a preventer.

(5) Disengaging. When within about eight tons of the desired amount of fuel, the receiving ship should signal "Stop pumping." This is necessary in

case there is any delay in passing the order to the supplying ship's engine room, and to leave room for the two or three tons of fuel left in the hose which remains to be blown through to the receiving ship by compressed air. The process of blowing through takes about five minutes and it is the receiving ship's responsibility to order "Stop blowing through" when the process is complete. The supplying ship may appear to increase speed as blowing through takes place because of the reduced drag of the hose. (For detailed instructions for blowing through, see Article 303.) When blowing through is completed, the hose is disconnected, the conical cap is replaced, the weight is taken on the hose line, and the hose hanging link is slipped.

The receiving ship drops astern, veering the bight of hose line as she goes and finally slips it from the becket as shown in Figure 3-25.

b. Gun Line Method

(1) Gear Required by the Replenishment Ship. The chief differences between the float method and the gun line method are: (1) the spout or other type float is omitted from the hose line, and (2) the hose recovery line is essential and can never be omitted.

1. The hose line is passed with a gun line and normal messenger
2. The messenger is retained by the receiving ship until used to return the hose line when fueling is completed

(2) Passing the Gear

1. The hose is veered together with the marker buoy to the appropriate length before the receiving ship approaches
2. The recovery line is retained on board the supplying ship so that the hose is towing in a bight with the hose end at the supplying ship's stern and the hose line inboard
3. The hose line is passed by messenger and gun line as soon as the receiving ship is close enough on the quarter; and the recovery line is veered as soon as the hose line has been passed, so that the end of the hose drops astern at the same rate as the receiving ship.

(3) Gear Required by the Receiving Ship. A senhouse slip is fitted on a securing pendant so that when the hose is inboard the hose hanging link can be put on the slip and the hose easily connected.

(4) Receiving the Gear. The sequence of events is shown in Figure 3-26. It should be noted that the receiving ship does not haul in the hose line until in station on the marker buoy. This ensures that no excessive strain is placed on the hose or hose line. The strain on a large bight of hose amounts to several tons at speeds exceeding eight knots. When the hose end is inboard, it is connected up in the same way as in the float method.

(5) Disengaging. "Stop pumping" procedure is the same as for the float method, described in paragraph a(5) above.

The sequence of events is shown in Figure 3-26. Note that the hose line is veered before the receiving ship begins regaining station on the quarter to pass back the hose line by the messenger and gun line. The supplying ship must heave in the recovery line as soon as the receiving ship begins to veer the hose line. This will again avoid undue strain on the hose and hose line as well as enable the receiving ship to begin coming ahead at the earliest possible moment.

c. Emergency Disengaging. For either method the process is the same. The hose line is slipped or cut as soon as the hose is disconnected. The hose recovery line is desirable for either method, because it enables the hose end to be recovered by the supplying ship without recovering the complete hose.

320 SAMPLE CHECK-OFF LISTS

Details of the actual rigging for the various methods of fueling have been presented in Section 310. The following articles give check-off lists for oilers and receiving ships.

321 DEPARTMENTAL CHECK-OFF LIST: OILERS

a. Navigation Department

1. Purge and check telemoter system
2. Check hand electric steering system
3. Check gyro error
4. Have megaphone available
5. If an electric megaphone is available, have it on hand, tested, and ready for use
6. Have distance line ready.

b. Engineering Department

1. Light-off all boilers
2. Warm up and test extra ship's service generator
3. Heat cargo being transferred to pumping temperature as necessary
4. Test all pumps; line up on first tank to be used and circulate oil to ensure that pumps are not airbound
5. Check all sound-powered telephone communication systems both inter and intraship
6. Cut in steam on deck and warm up all deck machinery
7. Maintain fire-main pressure at 100 pounds
8. Prepare and inspect necessary fire-fighting equipment
9. Ensure that the following equipment is available at each transfer station: tools, rags, sand, sawdust, and drip pans
10. Check to see that sufficient air pressure for blowing through hoses is available, and that there are no leaks
11. Check to see that gasoline CO_2 system is properly lined up, and that a man is standing by the control box
12. Take ullages and temperatures of oil tanks.

c. Deck Department

(1) Avgas Station

1. Place hose rig in fueling position, fitted on outboard end with appropriate fitting for ship to be refueled

2. Ensure that only properly tested hose is used in rig
3. Stop-off messenger to hose; fake messenger down on forward well deck for running, rigged for the method being employed
4. Have telephone-distance line and hose messenger faked down on the forward well deck clear for running, and rigged as necessary for the method to be used
5. Have heaving lines ready for use
6. Rig station markers on rail
7. Test line-throwing guns; examine firing pins; have spare spindles, cartridges, and lines on hand
8. Test winches. Have span-wire drum engaged on appropriate winch
9. See that inboard saddle whip is belayed to cleat on deck and is faked down free for running
10. See that outboard saddle whip is clear for running and is led to a winch gypsy head
11. See that topping lift brake is set on topping lift and preventer stoppers are in place
12. Stop-off grounding wire to telephone line with sufficient slack coiled up and stopped-off on outboard end (at least 10 feet) to permit flexibility in hooking up.

(2) Furnace Fuel Oil Stations

1. Have hose rigged in fueling position with appropriate fitting on the end
2. Messenger stopped-off to hose and led to superstructure deck. Stop each bight to rail. Length of bight should not exceed 10 feet
3. Test winches and engage span-wire drums
4. Have topping lift brakes set and preventer stoppers in place on topping lifts
5. Place outboard saddle whips clear for running and through fairleads to appropriate gypsies. When a retrieving line is to be used, ensure that it is led to appropriate gypsy head and faked down clear for running
6. Rig station markers on rails
7. Have inboard saddle whips through fairleads to cleats and belayed, faked down clear for running
8. Have line-throwing guns at each station tested, firing pins examined. Have spare spindles and lines
9. Have at least two heaving lines at each station. Ensure that retrieving line is clear for running and is led to inboard gypsy head (span-wire method)
10. Rig side with fenders: there should be 3 cluster fenders and 3 ball fenders (to be used where needed) for each side.

(3) For High-Line or Jackstay Transfers:

1. Have high-line rigged and ready for use to port or starboard; see that all lines are faked down clear for running
2. Break out transfer bag and have it ready
3. Break out personnel transfer chair and have it ready
4. Rig green provision marker on port and starboard sides of the cargo deck
5. Have light line with sea bag ready for transfer of small articles, movies, or guard mail

6. Break out life jackets for use with the transfer chair.

(4) General Preparations:

1. Rig in lifeboats and remove sea painter
2. Ensure that all men on deck are wearing inherently buoyant life jackets
3. Have CO_2 extinguishers available and fire hoses run out and connected to foam hoppers at gasoline station, with a man standing by to discharge the main bank of CO_2 bottles if an emergency arises
4. Gunner's mates with line-throwing guns don red helmets and red jackets during daylight or luminous tape on their helmets at night
5. When fueling is done in freezing temperatures and the deck is ice covered, a considerable quantity of sand should be available for sanding iced areas to reduce slippage. Whenever practicable, all ice should be removed from fueling areas prior to commencement of replenishment operations.

322 CHECK-OFF LIST: RECEIVING SHIPS

a. All Methods. Regardless of the method of fueling to be used, receiving ships will make the following preparations:

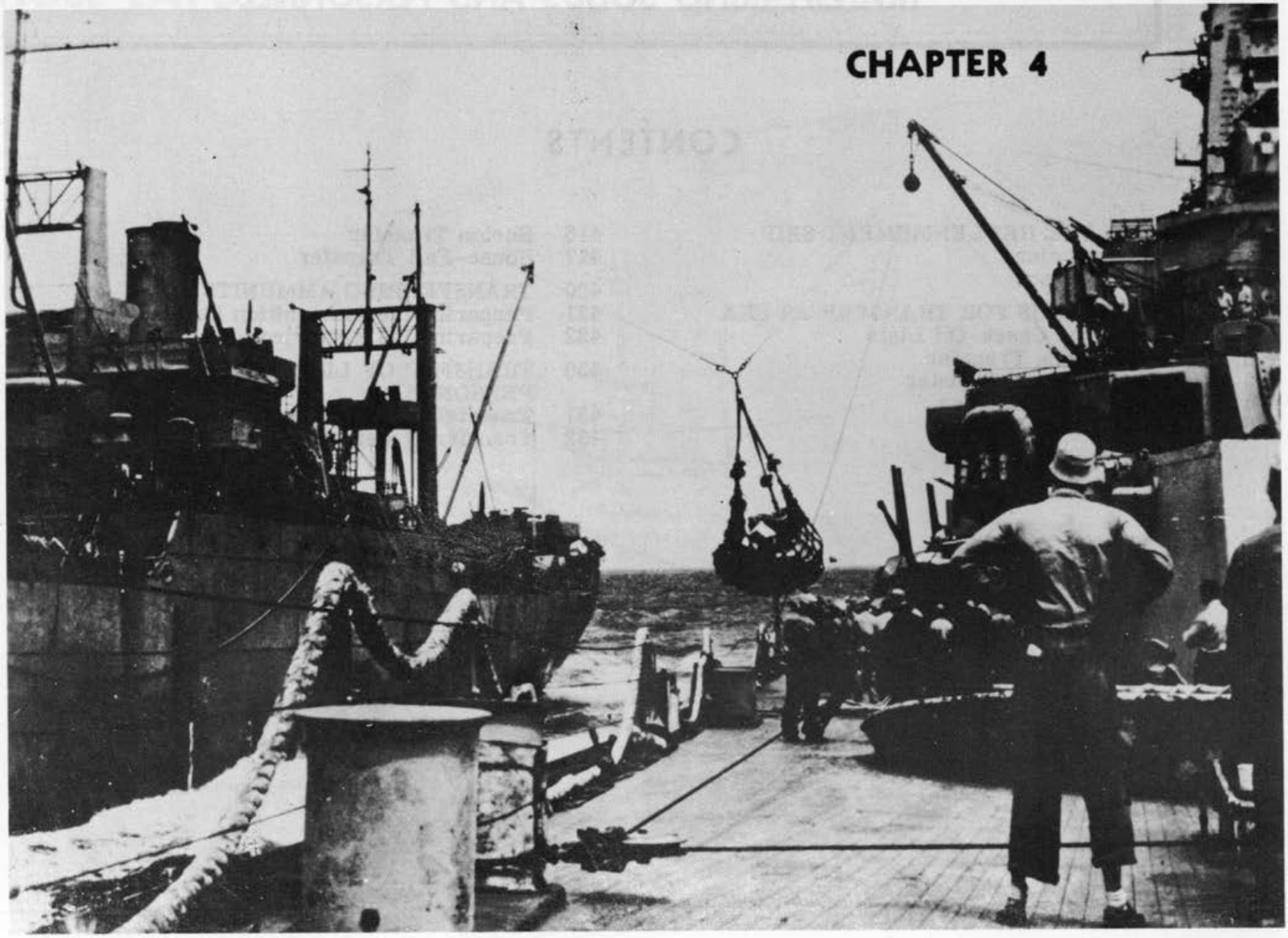
1. Deballast and redistribute fuel as necessary
2. Station experienced steersmen, throttlemen, and other special sea detail personnel that will be necessary.

b. As Appropriate. Make the following preparations as appropriate for the method of replenishment:

1. Detail men to receive and tend the distance line (combined with bridge and forward station telephone lines) at the forward fueling station, the hose-line messengers, fueling station telephone line aft, and outer bight line
2. Station the fueling detail, with qualified officers in charge at each station. All topside personnel exposed in the vicinity of replenishment stations or other hazardous locations shall be in life jackets
3. Clear all unengaged men from the fueling scenes
4. Provide chafing gear at the point where the hose comes aboard. (Old canvas, boat fenders, or cargo nets will suffice)
5. Lash shores over depth charge racks or other structures that might possibly interfere with the lines
6. Mark receiving stations with bunting or lights as shown in Figure 2-8
7. Provide at each station the necessary tools for making connection, opening valves, and for cutting the lines and breaking the rigs in case of emergency
8. When fueling is done in freezing temperatures and the deck is ice covered, plenty of sand should be available for sanding iced areas to reduce slippage. Whenever practicable, all ice should be removed from fueling areas prior to commencement of replenishment operations
9. Provide shores to place under the end of the hose in order to lift it off the deck if necessary

10. See that suitable equipment for controlling oil spillage (such as drip pans, rags, old canvas, and the like) is available at each station
11. Rig phones for conning station and each fueling station
12. Rig in lifeboats and other movable projections on the fueling side
13. Have line-throwing gun available and tested. Carriers normally will pass all line-throwing gun lines, whether replenishing or receiving
14. Open necessary fueling trunk tops on types so fitted
15. Connect sufficient hose (on large receiving ships) to fueling connections to provide a straight lead to the end of the delivery hose
16. Have an electric megaphone or loud hailer ready for use.

TRANSFERRING SOLIDS AND PERSONNEL



CHAPTER 4

CHAPTER 4

TRANSFERRING SOLIDS AND PERSONNEL

CONTENTS

400 LOADING THE REPLENISHMENT SHIP
401 Safety Precautions
402 Transfer Stations

410 STANDARD RIGS FOR TRANSFER AT SEA
411 Preparing the Check-Off Lists
412 Wire High-Line Transfer
413 Manila High-Line Transfer
414 Light Jackstay Transfer
415 Heavy Jackstay Transfer
416 Burton Transfer
417 House-Fall Transfer

420 TRANSFERRING AMMUNITION
421 Preparing the Ammunition Delivery Ship
422 Preparing the Receiving Ship

430 TRANSFER OF LIGHT FREIGHT AND PERSONNEL
431 Transfer of Light Freight and Mail
432 Transfer of Personnel

ORIGINAL (Err.)

CHAPTER 4

Transferring Solids and Personnel

400 LOADING THE REPLENISHMENT SHIP

Replenishing ships may be loaded with cargo intended for delivery to a base or to a replenishment group, in which case they are said to be base-loaded; or they may carry cargo intended for delivery to the fleet at sea, in which case they are fleet-issue loaded. Cargo on a base-loaded vessel can consist of one or many kinds of items stowed aboard with no particular attention given to their accessibility while the ship is underway. The fleet-issue loaded vessel, however, with which this chapter is exclusively concerned, has a varied cargo disposed for quick and easy handling at sea.

a. Standard Units. What a given delivering ship will carry is determined in one of several ways: by requisitions on hand prior to loading; by anticipated fleet requirements; or by the need for issuing provisions and stores in standard units. A standard unit is a package, or kit, containing a fixed variety of items in fixed quantities. During a national emergency or in wartime, delivering ships may be loaded, or partly loaded, with standard units of certain categories of materials, making it unnecessary to requisition by item the articles included in such units. In peacetime, when replenishment operations are more regularly scheduled, ships are loaded on the basis of requisitions or anticipated fleet requirements.

b. Loading for Mobility. The problems inherent in fleet-issue loading are numerous as well as peculiar to each operation. They involve the type of delivering ship being used, the kind and quantity of stores put aboard, the manner of procurement, and the requirements of the receiving ships. But although the problems vary in relation to these considerations, there is one problem that is always present in loading ships for issue to the fleet. Since each item must be constantly accessible, much cargo space has to be sacrificed to provide passageways throughout the stacks of cargo. Hence, fleet-issue loaded ships are not loaded to capacity, but are loaded for mobility. This and other matters are normally discussed and resolved in a preloading conference and in subsequent conferences held between the delivering

ship's officers and the supply and loading activity. The disposition of cargo and the location of each item is then entered on a preliminary cargo plan.

c. Loading on Ship or Item Basis. Cargo that has been assembled and consigned to specific receiving ships is loaded on a ship basis--that is, put in special places designated for particular ships. In loading on a ship basis, different levels of the cargo hold can be used for building up specific ship units. Provisions and other nonconsigned types of cargo (whether procured to fill item requisitions or unit requests) are normally loaded in fleet lots on an item basis. This can be carried out either by the supply and loading activity or by the delivering ship, using receiving ships' requisitions to segregate the stores.

d. Guiding Principles. Five general principles guide the loading of ships delivering supplies to the fleet at sea:

1. The over-all objective in fleet-issue loading is to ensure efficiency in unloading
2. Regardless of the number of transfer stations to be used during unloading, portions of the same kind of cargo will be stowed where practicable, in various holds so that it can be broken out simultaneously near as many stations as possible
3. Adequate passageways and working areas will be in and among the cargo to permit quick segregation, checking, and independent handling of different types of goods. Provisions will be loaded so that they can be readily reshored, to reduce the hazard to personnel from shifting cargo
4. Bulky and heavy items should be placed near loading areas and in the holds that can accommodate their disposal most easily. The hatch opening, the height of the hold, and the fact that certain types of receiving ships can take on bulky items only at certain stations must be considered
5. Replenishment must be made at the highest tonnage rate per hour and in the shortest time consistent with safety.

401 SAFETY PRECAUTIONS. Safety must never be sacrificed for speed. Wire rigs and manila high-lines tended with capstans or winches are suitable for transfer of supplies; but since winch failure is fairly common, only manila high-lines tended by hand should be used for personnel transfer.

The heavy traffic in cargo going and coming over the side makes it advisable to rig safety nets, as shown in Figure 4-1, at the transfer stations whenever it is necessary to lower the life line. The following precautions must be taken to safeguard personnel.

1. Personnel assigned to transfer stations shall be instructed in all phases of safety procedures and precautions
2. Because transfer stations on receiving and delivering ships are in exposed locations, personnel working close to a ship's side shall wear inherently buoyant life jackets at all times. If it is necessary to wear inflatable-type life jackets they shall be inflated

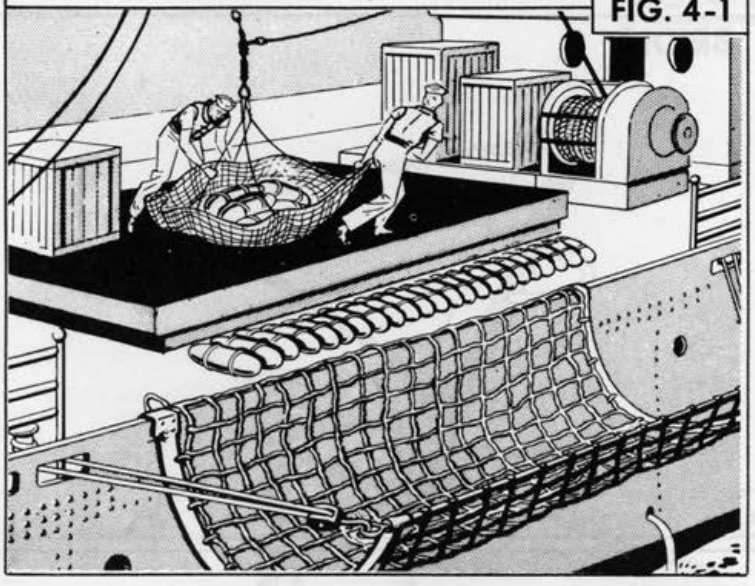
ORIGINAL

3. All exposed topside personnel shall wear inherently buoyant life jackets
4. Personnel shall be instructed to keep clear of suspended loads whenever possible
5. Ample provision must be made to prevent the shifting of cargo, with its risk to both personnel and material
6. Wire high-line may not be used to transfer personnel. When manila high-line is used to transfer personnel, a capstan shall not be used to tend the line
7. Securing of span-wires, whips, or wire high-lines to winch drums shall be accomplished by using one wire clamp. In the event ships replenishing should suffer a rudder casualty or loss of control from any cause, and emergency breakaway cannot be effected, the wire shall be payed out from the winch drum to the securing clamp. As the ships veer apart and a strain is imposed, the wire will slip free of the clamp and drop over the side with minimum possibility of casualties to personnel or material.

402 TRANSFER STATIONS. The number of stations to be rigged on the delivering ship is governed by such factors as ship construction, cargo stowage facilities, and available personnel. Normally, efficient manning of four or five replenishment stations should be attained, to permit replenishment of one large ship (usually on the port side) and one small ship (starboard) simultaneously. The commanding officer of the delivering ship will notify the OTC of any unusual capabilities or limitations

SAFETY NET

FIG. 4-1



in his ship. If the delivering ship requires special information concerning the receiving ship, she may question the latter by message. The delivery ship should endeavor to rig her transfer stations directly opposite those of the receiving ship.

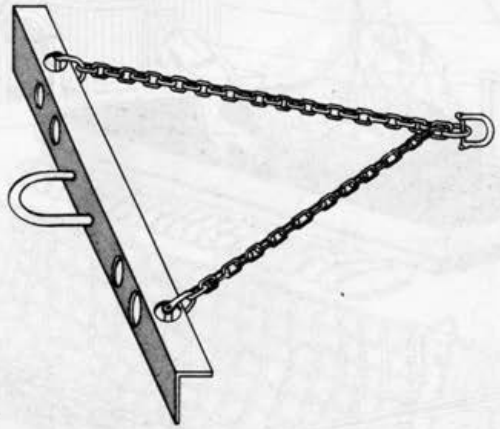
410 STANDARD RIGS FOR TRANSFER AT SEA

The standard rigs for transferring provisions and stores between ships are the manila or wire high-line and the light or heavy jackstay; additionally, the house-fall rig and burton rig may be used when they are compatible and mutually acceptable to the

TRANSFER-AT-SEA EQUIPMENT

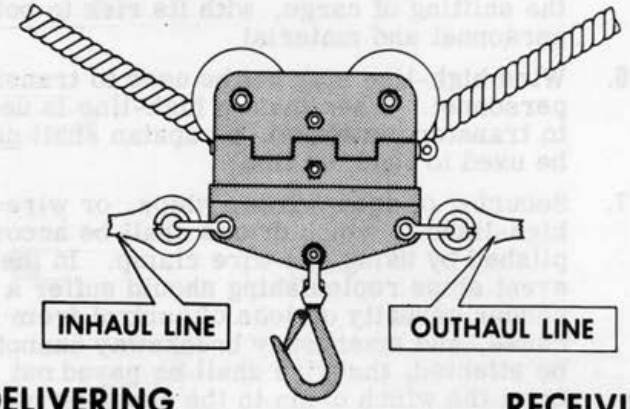
FIG. 4-2

BRIDLE



a

HIGH-LINE TROLLEY

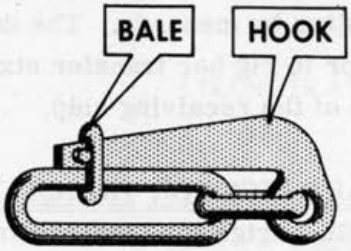


DELIVERING SHIP

RECEIVING SHIP

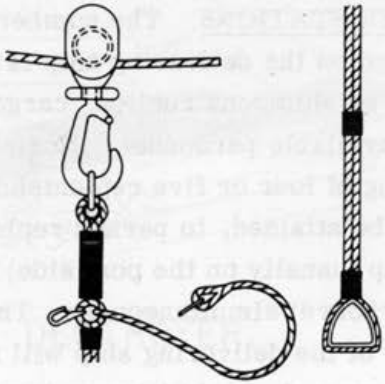
b

PELICAN HOOK



c

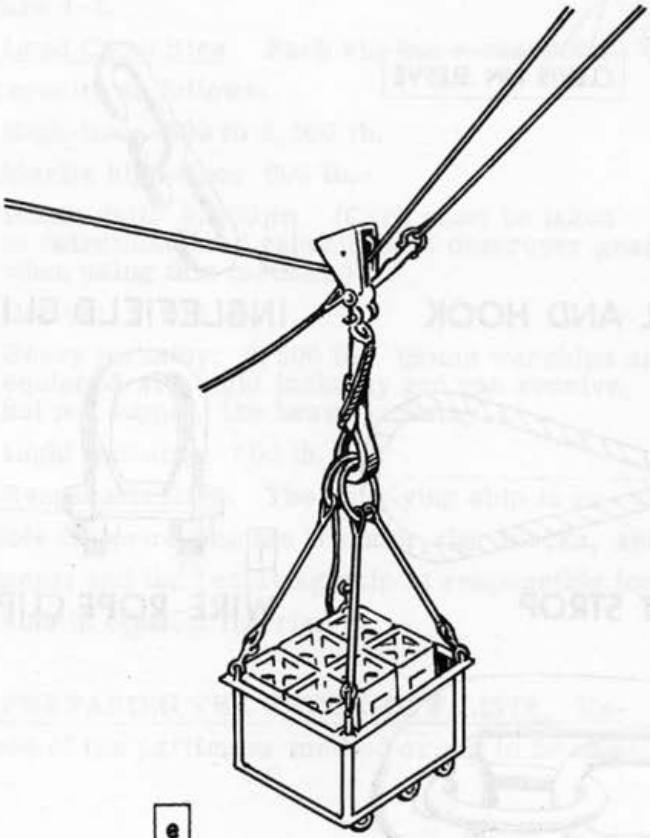
STIRRUP



d

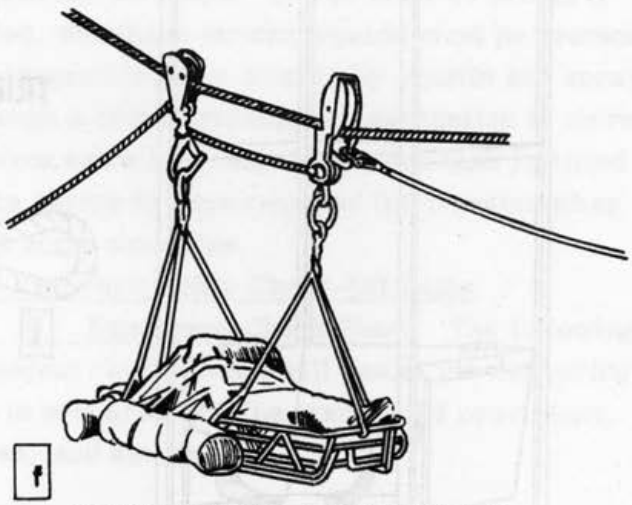
TRANSFER-AT-SEA EQUIPMENT

FIG. 4-2



e

SKIP BOX

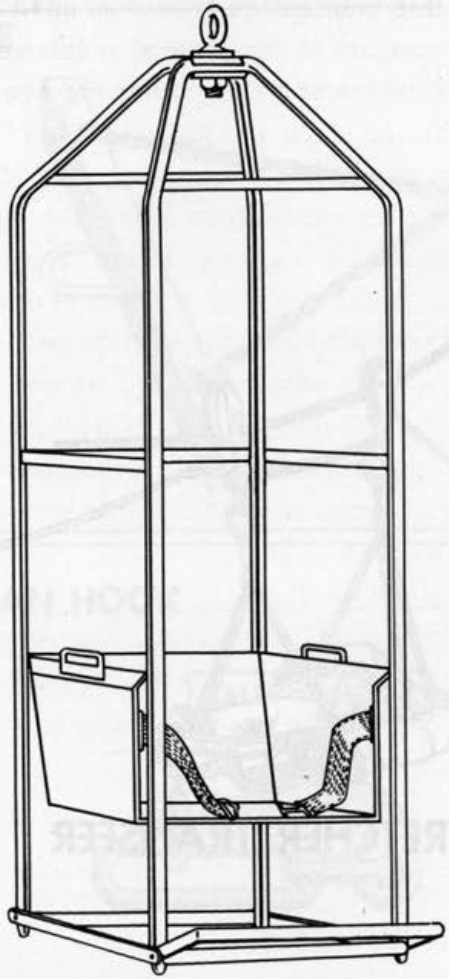


f

STRETCHER TRANSFER

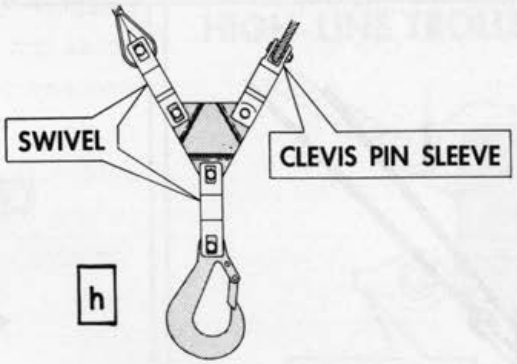
TRANSFER-AT-SEA-EQUIPMENT

FIG. 4-2



g

TRANSFER-AT-SEA CHAIR



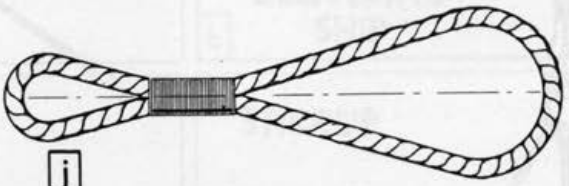
h

TRIPLE SWIVEL AND HOOK



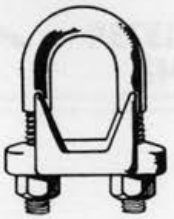
i

INGLEFIELD CLIP



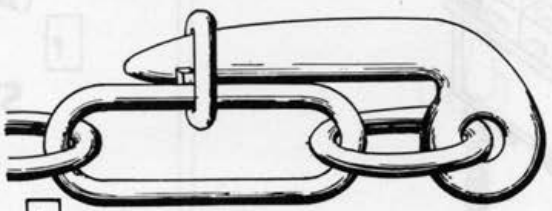
j

GROMMET STROP



l

WIRE-ROPE CLIP



k

SENHOUSE SLIP

supplying and receiving ships.

Appendix B to this book gives equivalent terms for uniform interpretation of underway replenishment rigging. Some items of equipment are shown in Figure 4-2.

a. Load Capacities. Each rig has a characteristic capacity as follows:

High-line: 800 to 3,500 lb.

Manila high-line: 600 lb.

House-fall: 2,500 lb. (Care must be taken to determine load capacities of destroyer gear when using this method.)

Burton: 3,500 lb.

Heavy jackstay: 4,500 lb. (Some warships are equipped with light jackstay and can receive, but not supply, the heavy jackstay.)

Light jackstay: 500 lb.

b. Responsibilities. The supplying ship is responsible for providing the transfer rig, blocks, and containers; and the receiving ship is responsible for being able to connect the rig.

411 PREPARING THE CHECK-OFF LISTS. Regardless of the particular method or rig to be used in transferring provisions and stores, the delivering ship has certain general preparations to complete. Chapter 2 of this publication should be used as a guide for the conduct of the general maneuvers and procedures of replenishment. When the requirements of receiving ships and the scheduled order of replenishment are known to the delivering ship before reaching the rendezvous point, the delivering ship can check her cargo and stow it in designated areas on board. Stores must be properly shored, and those stowed topside must be protected with tarpaulins from damage by squalls and spray. Although a prior breakout or segregation of stores involves extra handling, it is more than justified by the saving in time required for transfer when ships come alongside.

a. Delivering Ship Check-Off Lists

(1) Equipment Check Sheet. The following equipment check sheets will assist the delivering ship in preparing for the transfer of provisions, stores, and ammunition.

EQUIPMENT	QUANTITY				DATA
	House-Fall	Wire High-Line	Manila High-Line	Burton	
Bags, sand	*	*	*		800 pounds capacity
Block, house-fall transfer	1				12-in. single-sheave, for 3/4-in. wire
Block, 12- or 14-inch			*		To provide fair lead
Block, 8-inch		*	*		To provide fair lead for inhaul and outhauls
Block, trolley (wire high-line)		1			
Block, trolley (manila high-line)			1	*	Hook capacity of 800 pounds
Boxes, skip	*				See Figure 4-2
Boxes, skip high-line		*	*	1	
Bridle	1	1	1		See Figure 4-2
Chair, transfer			1		See Figure 4-2
Fender, ball	*	*	*	*	
Fender, cluster	3	3	3	3	Three large fenders lashed together
Hammer, ball peen, 2 1/2-pound	1	1	1	1	To open pelican hook
High-line, manila			1		
High-line, wire		1			
Hook, cargo	1	1	1	1	Type of hook used is determined by cargo
Hook, pelican	1	1	1		To convert load-supporting line
Hook, triple swivel	1			1	See Figure 4-2
				*	As required

EQUIPMENT	QUANTITY				DATA
	House-Fall	Wire High-Line	Manila High-Line	Burton	
Keys, cotter assorted	*	*	*	*	For use with pelican hook
Line, heaving	2	2	2	2	15 to 20 fathoms of sash cord or 9-thread manila
Line-throwing gun	2	2	2	2	
Line, inhaul		1			
Line, outhaul		1			
Line, steadying			1		
Mats, thrummed	*	*	*	*	To provide matting at transfer points
Messenger, bridle	1	1	1		
Messenger, house-fall block	1	1	1		
Nets, cargo, 10 feet square	*			*	
Nets, high-line 6 feet square		*	*		
Phone, combined bridge-to-bridge and distance line	1	1	1	1	Intership communications
Phone, station-station	*	*	*	*	Interstation communications
Pliers, gas	1	1	1	1	
Pliers, side cutter, 6-inch	1	1	1	1	
Preventers, boom	*	*	*	*	
Shackles, 1-inch, 3/4-inch, 7/8-inch, 2 each	1	1	1	1	
Spikes, marlin	1	1	1	1	For setting-up on shackles (anchor type)
				*	As required

EQUIPMENT	QUANTITY				DATA
	House-Fall	Wire High-Line	Manila High-Line	Burton	
Stretcher, flotation			1		Transfer of patients
Transfer-station marker	1	1	1	1	
Whip, house-fall transfer	1				
Whip, house-fall cargo	1				
Wire, seizing, 5-fathom 1/16-inch diameter	1	1	1	1	Seizing all anchor-type shackles in inaccessible locations
Wrench, crescent, 8-inch				1	For setting-up on bolt-type shackles

b. Departmental Check List: Delivering Ship

(1) Navigation Department

1. Check gyro error
2. Check telemotor steering system
3. Check hand and electric steering
4. Have megaphone available
5. Have electric megaphone or loud hailer tested and ready for use.

(2) Supply Department

1. Furnish checkers for transferred cargo at each station
2. Insure that the following preparations have been made prior to the replenishment operation: stores and/or ammunition sorted out ready for transfer; information on hand to ascertain that ships alongside get the correct amount and kind of stores and/or ammunition.

(3) Engineering Department

1. Put necessary additional boilers and generators in operation
2. Lubricate and test all deck winches
3. Check all replenishment at sea communications circuits.

(4) Deck Department

1. Rig station markers on rail
2. Check each station to see that it is properly rigged for the method of transfer. Insure proper placement and operation of

such mechanical material handling equipment as may be available

3. Prepare the combined distance and bridge-to-bridge telephone lines and the station-to-station telephone lines, faked-down clear for running
4. Rig fenders over the engaged side or sides
5. Rig in movable projections over the engaged side or sides
6. Have line-throwing guns on station, tested, with firing pins examined, and with spare spindles and lines
7. Check to see that line-throwing gunners are wearing red helmets and red jackets during daylight or luminous tape on their helmets at night
8. Check to see that all exposed personnel on the topside are wearing inherently buoyant life jackets
9. Check all preventer stoppers on topping lifts
10. See that messengers are ready, faked down, and clear for running
11. Have at least two heaving lines at each station, ready for use
12. See that appropriate carriers (cargo nets, skip boxes, transfer-at-sea chair, and transfer bags) are on station ready for use
13. Insure that ring life buoys are readily available
14. Rig safety nets over the side, or sides, when necessary
15. Make sure that all personnel concerned are familiar with the necessary safety precautions
16. If topping winches or double drum winches are installed, ensure that brake, ratchet, and pawl are secured or engaged.

c. Receiving Ship Check-Off List. The following sample check-off list is for use by receiving ships when preparing to carry out transfer operations.

EQUIPMENT	QUANTITY				DATA
	House-Fall	Wire High-Line	Manila High-Line	Burton	
Block, 12- or 14-inch			*		
Block, 8-inch		*	*		For fair leading inhaul
Fenders, ball	*	*	*	*	
Fenders, large cylindrical	*	*	*	*	Rig over vulnerable points
Hammer, ball peen, 2 1/2-pound	1	1	1		For tripping pelican hook
Keys, cotter, assorted	*	*	*		For use with pelican hook
Line, heaving	2	2	2	2	15 to 20 fathoms of sash cord or 9-thread manila
Line-throwing gun	1	1	1	1	Standby
Line, steadying			1	1	
Mats, thrummed	*	*	*	*	Place as necessary
Pliers, gas, 8-inch	1	1	1	1	
Pliers, side cutter, 6-inch	1	1	1	1	
Shackles, 1-inch, 3/4-inch, 7/8-inch, 2 each	1	1	1	1	
Spike, marlin	1	1	1	1	
Transfer-station marker	1	1	1	1	
Whip, Burton			1	1	
Wrench, crescent	1	1	1	1	For setting-up on bolt-type shackles

* As required

412 WIRE HIGH-LINE TRANSFER. The use of a wire high-line is standard procedure in transferring cargo to destroyers and other small ships; but at times it is also the most expedient means of making transfers to large ships. Loads are normally limited to 800 pounds—an amount considerably lower than that which is possible by either the burton or housefall methods. An automatic tension high-line winch, when available, may prove useful in conjunction with the high-line method since it will allow heavier loads to be transferred.

Essentially this method of transfer employs a wire high-line extending from a winch on the delivering ship through a block on a boom head and across to the receiving ship's pad eye as shown in Figure 4-3. A trolley is moved toward the receiving ship with a hand heaved outhaul line and is brought back to the delivering ship with a winch-operated inhaul line.

Personnel must never be transferred by wire high-line, because the wire is tended from a standard winch drum, and a sudden roll or pitch of the ships can snap it before the winchman has time to ease the tension.

In order to make use of a wire high-line, receiving ships must have the following:

1. A high attachment point at the receiving station, with sufficient strength to support the loaded line. (For destroyers and smaller: static test, 8,000 lb; working test, 4,000 lb. For larger types, static test 22,500 lb; working test 11,200 lb.) Normally, a pad eye with a weak link is welded or riveted to the ship's structure
2. An additional pad eye of 1-inch diameter stock located directly below and about 12 to 18 inches from the first pad eye, to support the block used to fair lead the outhaul line. (This pad eye should take a static breaking test of 3,000 lb, and working test of 1,500 lb.)
3. Sufficient deck space in the vicinity of these pad eyes to handle the supplies coming aboard.

a. Rigging the Delivering Ship. Normally, a boom is used to obtain a satisfactory lead for the wire high-line, but any other point of suspension on the ship's structure will serve as well if it is high enough and strong enough to withstand the combination of stresses described above. The description which follows deals with a boom-rigged high-line. Adaptations can be made on individual vessels accordingly.

(1) The High-Line consists of 350 feet of 5/8- or 3/4-inch wire (6 x 37 high-grade plow steel of 44,500 lbs. breaking strength) with a thimbled eye on its outboard end. The other end is rove through a trolley block, through the boom head and heel blocks of the boom, and is then spooled onto a winch drum. A pelican hook is secured to the thimbled eye with a 7/8-inch shackle and attached to a staple fitting on

the bridle messenger. (The pelican hook is 1/2-inch if the receiving ship has an 8,000 lb. weak link, but 7/8-inch for a heavier attachment point. If it is rigged to a 22,500 lb. attachment point, a 5/8-inch shackle of 22,100 lb. breaking strength secures the pelican hook to the wire high-line. As an alternate, a wire high-line may be attached to a 50,000 lb. test house-fall pad eye. In this case a 7/8-inch shackle with a breaking strength of 43,250 lb. secures the 7/8-inch pelican hook to the wire.)

(2) The Manila Inhaul Line (2 1/2-inch) is shackled to the inboard end of the trolley block, run through an 8-inch wooden block and swivel which is attached to a becket on the underside of the boom-head block (see Figure 4-3), and is then taken through a fairlead to a gypsy head. Where the cargo-handling equipment on the delivering ship permits it, a wire cargo whip 350 feet in length can be substituted for the manila inhaul line.

(3) Rigging the Boom. A preventer wire at least 1 inch in diameter (length to suit) is secured to the inboard side of the boom head. The boom is topped up so that the trolley block will plumb the desired loading point on deck. The preventer is led to the starboard side of the ship at as close to a 90° angle from the boom (or to the fixed position provided) as possible. After the working and lazy (standing) guys are set up, a strain is applied to the preventer and it is belayed.

(4) The Manila Outhaul Line. A 2 1/2-inch manila line having a snap hook attached to its outboard end. This end of the line is attached to the bridle. The middle part of the line is faked on deck, clear for running, and the standing end is shackled to the outboard side of the trolley block.

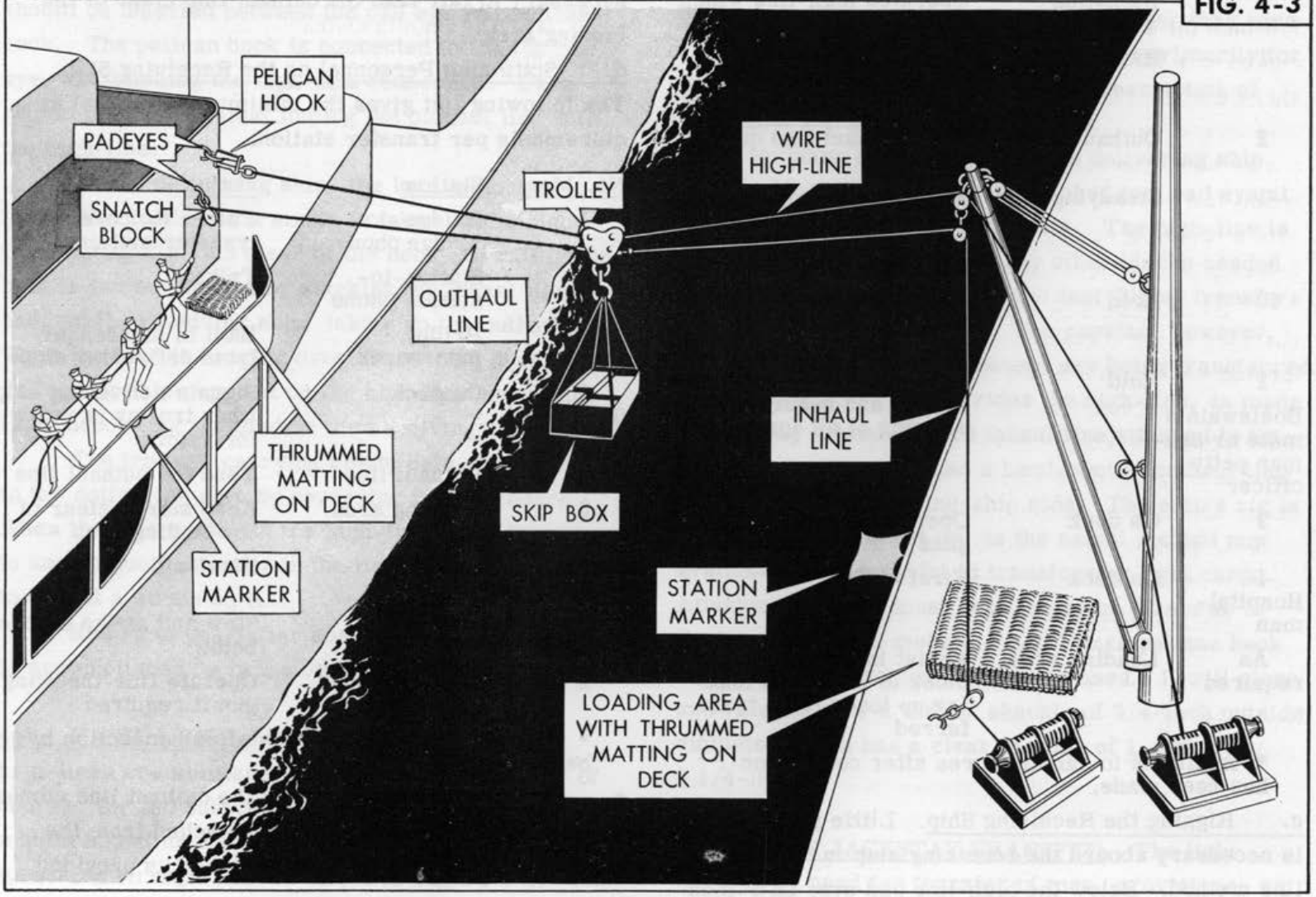
(5) If a Second Boom is to be used to remove cargo from the hold, it is rigged as in the other methods of transfer.

b. Stationing Personnel on the Delivering Ship. The following list gives the minimum personnel requirements for one transfer station.

No. Men	Station	Duties
1	Bridge-to-bridge phone	Talker (for each ship being supplied)
1	Station-to-station phone	Talker
1 *	Bridle messenger	Tends messenger when passing to receiving ship
2	Distance-telephone line	Tend line when passing to receiving ship
2 *	Inhaul line	Tend inhaul line when passing to receiving ship
1	High-line signal	Signals high-line and outhaul winch operators when trolley block is to be transferred

WIRE HIGH-LINE RIG

FIG. 4-3



No. Men	Station	Duties
1	Outhaul winch	Operates outhaul winch
1	High-line winch	Operates high-line winch
1	Hatch winch	Operates winch that hoists loads from the holds to the loading area
2	Outhaul line	Tend outhaul line during transfers
1	Steadying line	Tends the steadying line, secured to the cargo whip used to hoist loads out of the hold
10	Hold	Make up loads in the hold for transfer to the ship alongside
1 Boatswain's mate or seaman petty officer	Hold	Supervises working party in hold and ensures proper slinging of all loads
2	On deck	Operate line-throwing guns
1 Hospitalman	On deck	First aid
As required	Loading area	Assist in hooking trolley block to loads and making up loads to be transferred

* Available to handle stores after connection has been made.

c. Rigging the Receiving Ship. Little preparation is necessary aboard the receiving ship in the high-line method. Below the high-line pad eye, an 8-inch snatch block suitable for manila line is to be secured to take the outhaul line. Other blocks are rigged as necessary to fair lead the outhaul line clear of the landing area.

d. Stationing Personnel on the Receiving Ship. The following list gives the minimum personnel requirements per transfer station.

No. Men	Station	Duties
1	Bridge-to-bridge phone	Talker (to cover all transfer stations)
1	Station-to-station phone	Talker
10 *	Bridle messenger	Haul in messenger from delivering ship
1 Signalman	On deck	Signals delivering ship when trolley is ready for return
8	Outhaul line	Tend the outhaul line
6	Landing area	Keep stores clear of the landing area
1 Hospitalman	On deck	First aid
As required		Stow and strike stores below
2 *	Line-throwing gun	Operate line-throwing gun if required

* Available to handle stores after connection has been made.

e. Transfer Procedure. As the outhaul line comes aboard the receiving ship, it is detached from the bridle and inserted into the snatch blocks provided

for it. In ships where structural strength is not equal to the breaking strength of wire, a weak link should be inserted between the pad eye and pelican hook. The pelican hook is connected to the top pad eye, establishing the high-line connection. Care should be taken against fouling the outhaul line with the high-line.

On the delivering ship, the load is hooked to the trolley block and a strain is taken on the high-line, lifting the load clear of the deck and rail. The load is worked across by slacking the inhaul line and, on the receiving ship, taking up the outhaul line. When the load is hanging over the landing area, the delivering ship pays out on the high-line and inhaul line, depositing the load on the receiving ship's deck.

The trolley, carrying empty nets, is returned to the delivering ship by reversing the procedure. When there is a load on the high-line, it is important to keep a good catenary in the line to avoid imposing too great a strain on it.

Return of gear after completion of operations is accomplished as in the other transfer methods.

413 MANILA HIGH-LINE TRANSFER. Manila high-lines are similar to wire high-lines except, of course, for the substitution of manila for wire. The manila high-line consists of 350 feet of 5-inch manila (breaking strength 22,500 lb.) See Figure 4-4. The manila high-line can be used to transfer up to 600 pounds of provisions, ammunition, light freight, or personnel. Since manila high-line is safer than wire and is hand tended, this method is used primarily for personnel transfer. For a detailed description of personnel transfer, see Article 432.

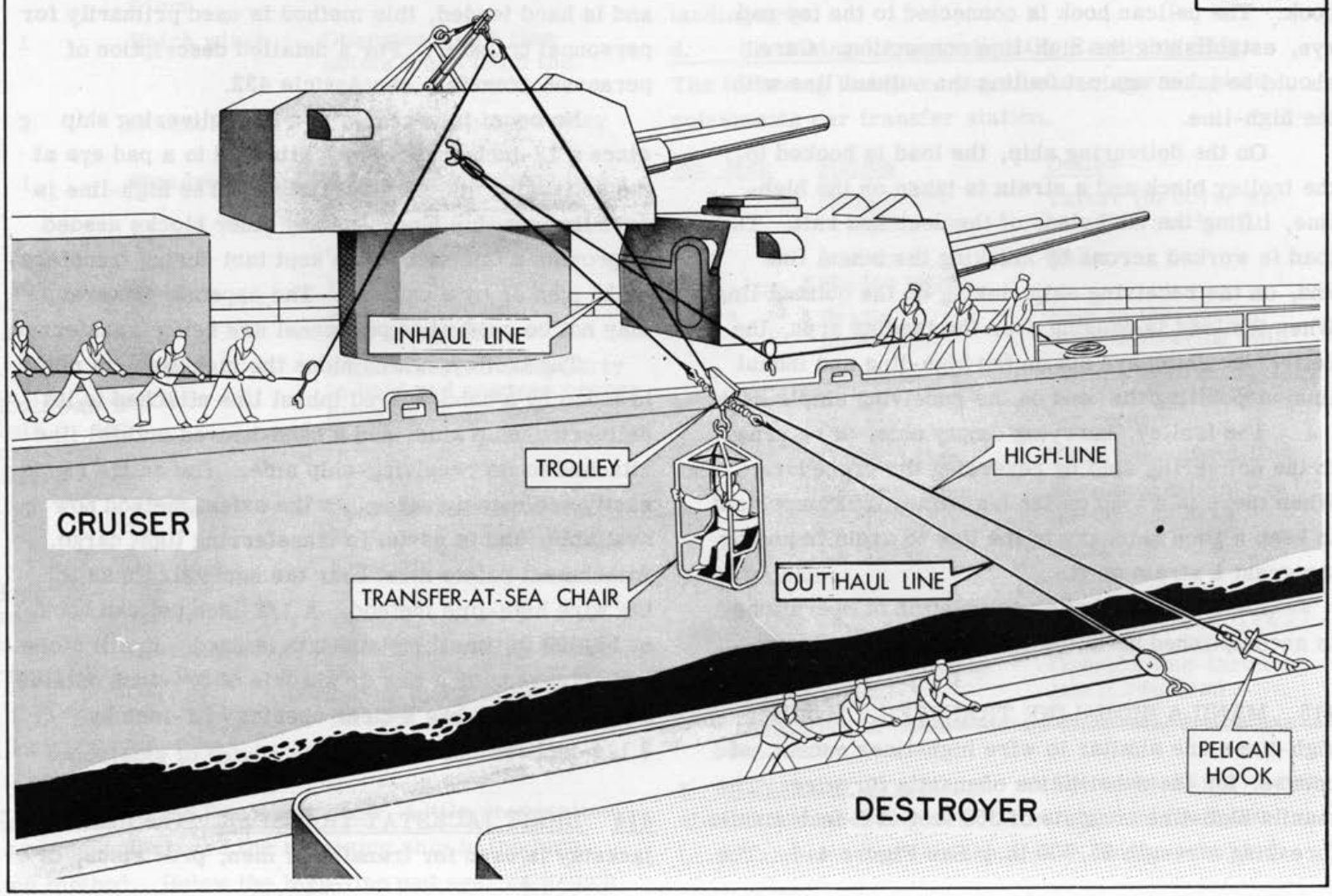
No boom is necessary on the delivering ship since a 12-inch snatch block attached to a pad eye at the delivering station is sufficient. The high-line is rove through this block and any other blocks needed to provide a fairlead. It is kept taut during transfers by 25 men or by a capstan. The capstan, however, may not be used when personnel are being transferred.

The trolley, which rides the high-line, is made to move by a hand-heaved inhaul line attached to its delivering-ship side, and a hand-heaved outhaul line attached to its receiving-ship side. The entire rig is easily and quickly set up, is the safest method now available, and is useful in transferring light cargo. Attachment points must bear the same strain as in the wire high-line method. A 1/2-inch pelican hook of 15,800 lb. breaking strength is used. It will close and release over a link or shackle of 3/4-inch outside diameter which has a clear opening of 1-inch by 3 1/4-inches.

414 LIGHT JACKSTAY TRANSFER. The light jackstay is used for transfer of men, provisions, or

MANILA HIGH-LINE RIG

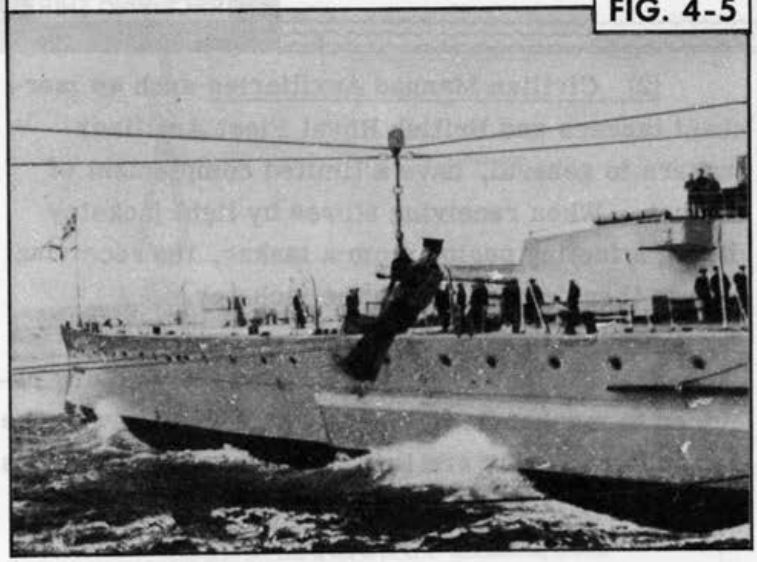
FIG. 4-4



light stores. It can be used between any ships in almost any weather, whatever the main rig being used. Best working distance for the light jackstay is about 110 feet and the limits are between about 80 and 200 feet. The distance between ships should be kept as small as possible to reduce the strain on the jackstay and expedite the transfer of each load. Figures 4-5 and 4-6 show this rig, and Figure 4-7 gives details.

LIGHT JACKSTAY IN USE

FIG. 4-5



a. Rigging the Supplying Ship

(1) Gear Required

1. Jackstay. 80 fathoms of 4-inch manila. One end is pointed and the other fitted with a wire grommet strop 18 inches long.
2. Inhaul and outhaul lines. Each of 60 fathoms of 2-inch manila fitted with a thimble eye at one end and pointed at the other. The outhaul has an Inglefield clip to go on the messenger.
3. Special traveler block, to which the thimble eyes of the inhaul and outhaul lines are shackled.
4. Necessary appliances for use on the traveler block, as shown in Figure 4-8.
5. Gunline and messenger.

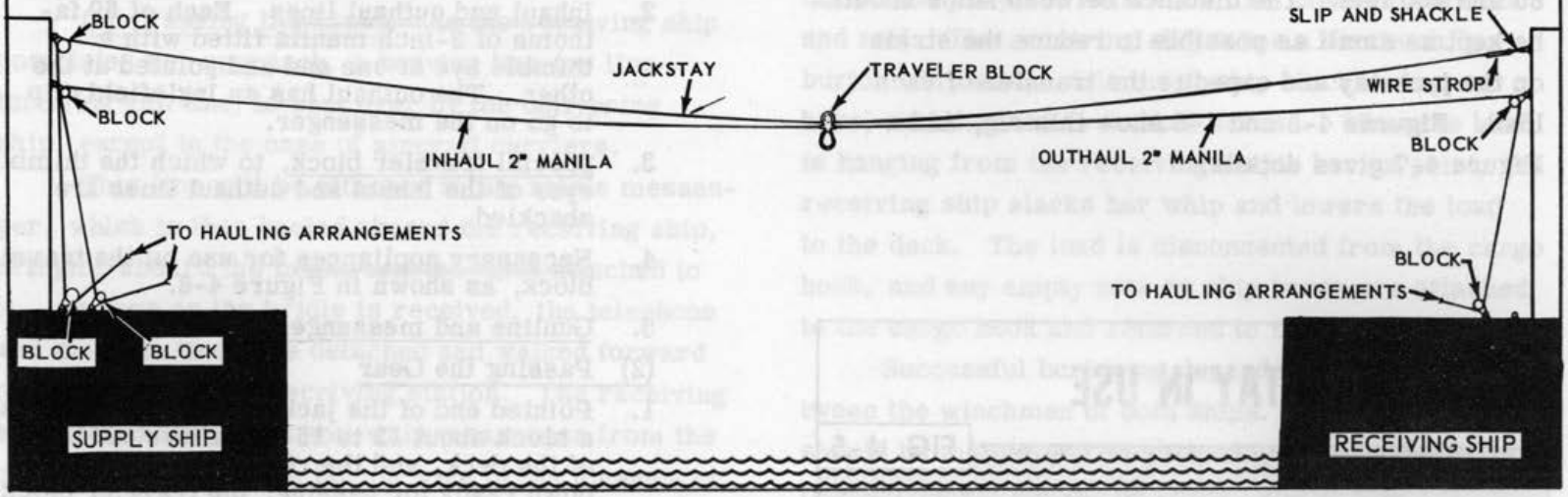
(2) Passing the Gear

1. Pointed end of the jackstay is passed through a block about 12 to 15 feet above the level of the deck, and the remainder is flaked down ready for passing, the traveler block being on the jackstay but near the end of it. Inhaul and outhaul lines are shackled to the traveler block and also flaked down in the vicinity.
2. The outhaul is clipped to the messenger, which is passed by gun line. The jackstay is bent onto the bight of the outhaul and is eased across so as to keep it clear of the water.
3. A winch is used by the supplying ship when working the jackstay for stores.

b. Rigging the Receiving Ship. A slip, set about 12 to 15 feet above the level of the deck, is required to take the wire strop of the jackstay; and a leading block, about 2 or 3 feet below the slip, is required for the outhaul line.

LIGHT JACKSTAY RIG

FIG. 4-6



(1) Receiving the Gear

1. The gunline and messenger are hauled over, and the outhaul is unclipped and let through the leading block. The outhaul is hove in until the end of the jackstay is received, unhitched from the outhaul, and secured to the slip as shown in Figure 4-9.
2. Guard rails in the vicinity of the dump should be lowered if necessary.
3. Shot mats should be provided at the dump, for which as large an area as possible should be kept clear to accommodate an accumulation of stores.

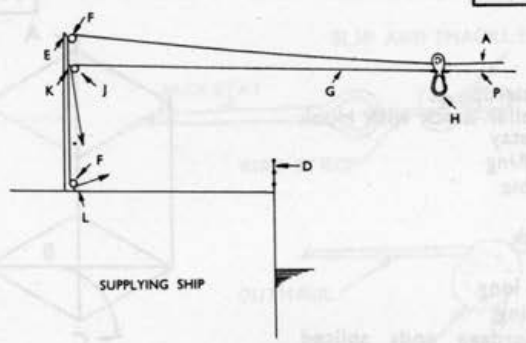
(2) Civilian Manned Auxiliaries such as merchant tankers and British Royal Fleet Auxiliary tankers in general, have a limited complement of seamen. When receiving stores by light jackstay during a fueling period from a tanker, the receiving ship is therefore to handle the jackstay.

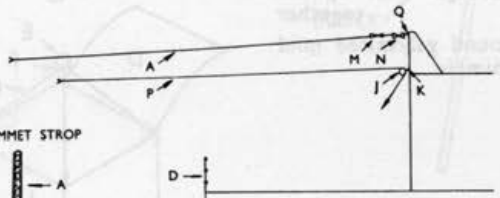
c. Replenishment

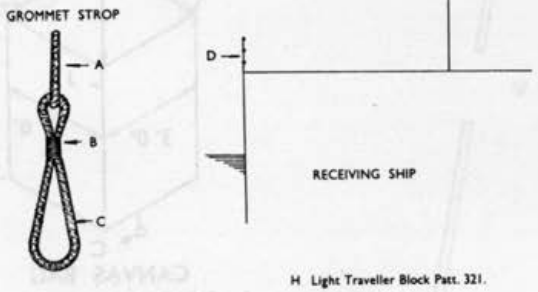
(1) Normal Procedure. About 20 men are required to manhandle the jackstay. It must always be manhandled if men are being transferred. All hands manning the jackstay must be trained to take an

LIGHT JACKSTAY DETAILS

FIG. 4-7







A 4" Manilla Jackstay

B Seizing

C 2" FSWR

D Portable Guardrails

E ¾" Eyeplate. 12' to 15' Above Deck and not less than 15' to 20' Inboard

F 12" Pulley Block. Patt. 256

G 2" Hemp. 60 Fathoms. Block end fitted with Patt. 5085 Thimble and Patt. 5443 Shackle and the other end pointed

H Light Traveller Block Patt. 321.

J 6" Pulley Block Patt. 244.

K ¾" Eyeplate from 2' to 3' below Eyeplate for Jackstay Block

L Blocks Patt. 244. for Inhaul lead as necessary

M Grommet Strop

N Patt. 1914 Slip

P 2" Hemp Outhaul

Q Patt. 4004 or 4018 Eyeplate 12' to 15' above the Deck and not less than 10' to 15' Inboard

Note:—
Winch power must never be used for JACKSTAY when transferring personnel

intelligent interest in expediting the transfer. When the supplying ship is handling the jackstay with a winch, the following points must be considered:

1. The winch must be capable of fast hauling
2. The driver must be able to see the whole rig and he must be well trained and alert
3. Winch drum. Only a few turns should be taken on the winch drum to allow for rapid rendering. It should be backed up by two alert and well-trained men, who must be able to see the whole rig.
4. Winch party. The entire winch party must be trained to act as a team, as well as on their own initiative.
5. The winch must be kept running continuously and the jackstay hauled or surged on the drum as necessary.

(2) Transferring Casualties. When transferring casualties by cot, the following points require attention:

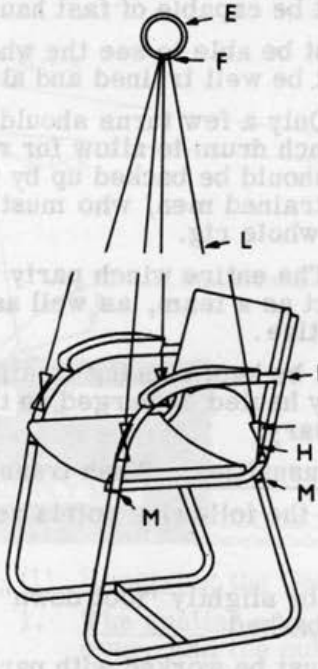
1. The cot should be slightly "foot down" when a patient is embarked
2. The jackstay must be worked with particular care when lifting, transferring, and lowering a patient
3. Steadying lines should be used and carefully tended.

d. Disengaging

(1) Normal. When the last load has been transferred, a sufficient length of the outhaul line is recovered by the receiving ship so that the jackstay can be hitched to the bight and payed back, keeping it clear of the water.

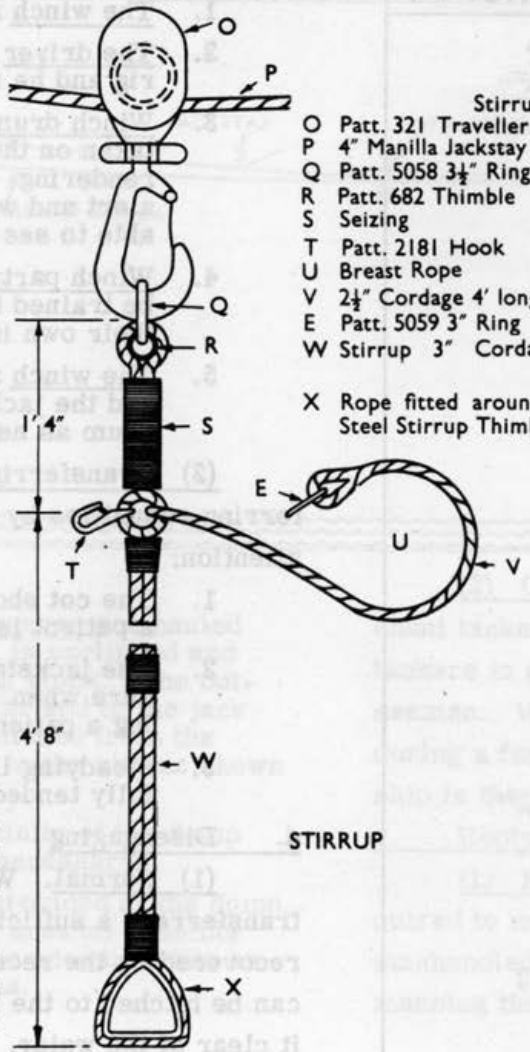
LIGHT JACKSTAY APPLIANCES

FIG. 4-8



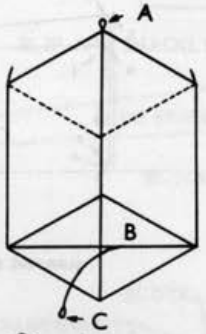
CHAIR AND SLING

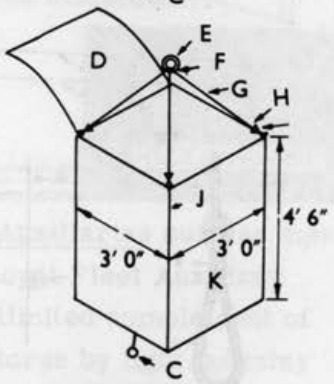
E Patt. 5059 3" Ring
F Patt. 5081 Thimble
L 1" FSWR Slings 4' 6" Length
N 1½" Soft Hemp is to be rigged across back of chair, seized to each chair arm by means of Cod Line and is to be long enough to be tied in a bow (which can be quickly undone) in front of the occupant of Chair
H Patt. 5419 Spring Hook
M Two 1" FSWR Strops, each rigged diagonally under chair seat, seized to each chair leg and seized to each other at point of intersection by means of Cod Line



STIRRUP

Stirrup
O Patt. 321 Traveller Block with Hook
P 4" Manilla Jackstay
Q Patt. 5058 3½" Ring
R Patt. 682 Thimble
S Seizing
T Patt. 2181 Hook
U Breast Rope
V 2½" Cordage 4' long
E Patt. 5059 3" Ring
W Stirrup 3" Cordage ends spliced together
X Rope fitted around galvanized mild Steel Stirrup Thimble



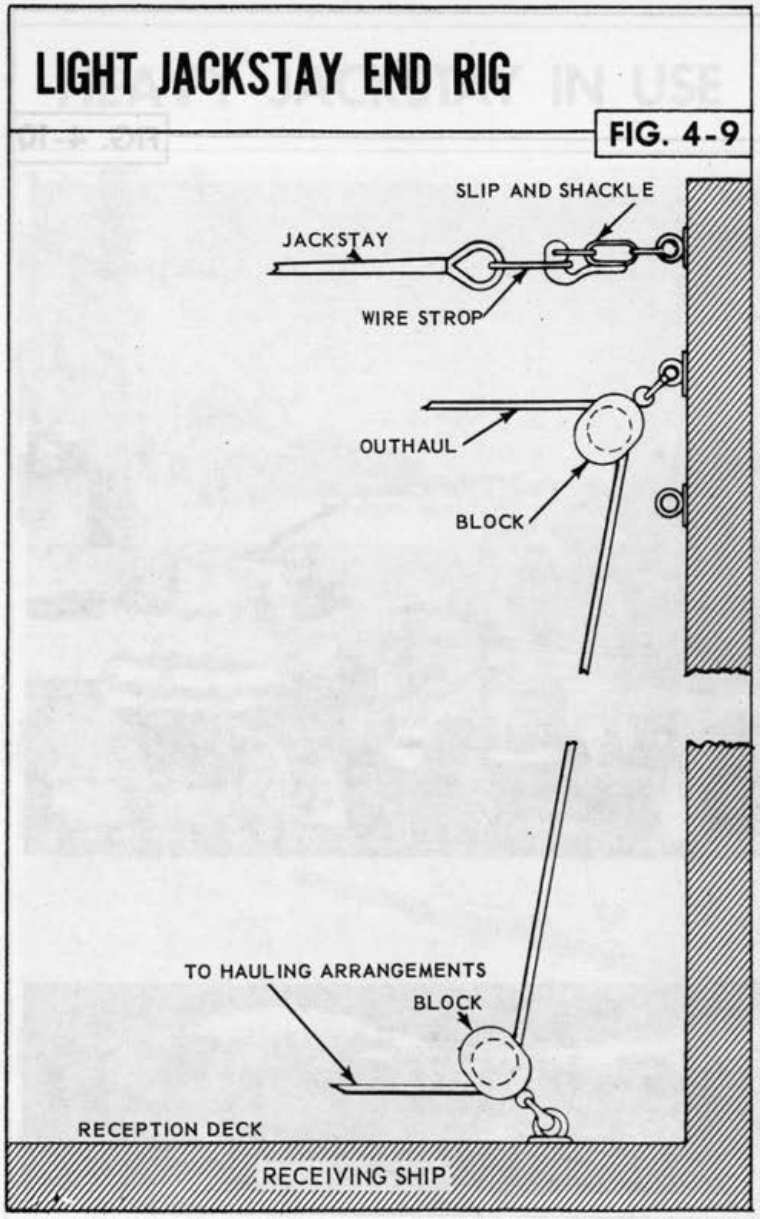


CANVAS BAG

A Soft Eye
B Cringle
C Lanyard
D Apron to fit over Top
E Patt. 5059 3" Ring
F Patt. 5081 Thimble
G 1" FSWR Slings 3' 6" Length
H Patt. 5419 Spring Hook
J 2" Cordage
K R.N. Canvas No. 1

LIGHT JACKSTAY END RIG

FIG. 4-9



(2) Emergency. Under most circumstances it will be possible to pass the gear as above. If necessary, however, the jackstay and outhaul lines can be cut. If the jackstay is being handled by the supplying ship, it can be slipped by the receiving ship. The distance line, messenger, and telephone cables can be slipped or even parted, depending on the circumstances.

415 HEAVY JACKSTAY TRANSFER. The heavy jackstay is used for transfer of heavy loads of stores, including ammunition, up to a maximum of one or two tons depending on the size of the gear being used. This rig can be used safely only under reasonably good weather conditions unless an automatic tensioning winch is fitted. The best working distance is about 110 feet and the limits are between about 80 and 200 feet. As with the light jackstay rig, the distance between ships should be kept as small as possible to reduce the strain on the jackstay and expedite the transfer of each load. Figures 4-10 through 4-13 show the heavy jackstay rig.

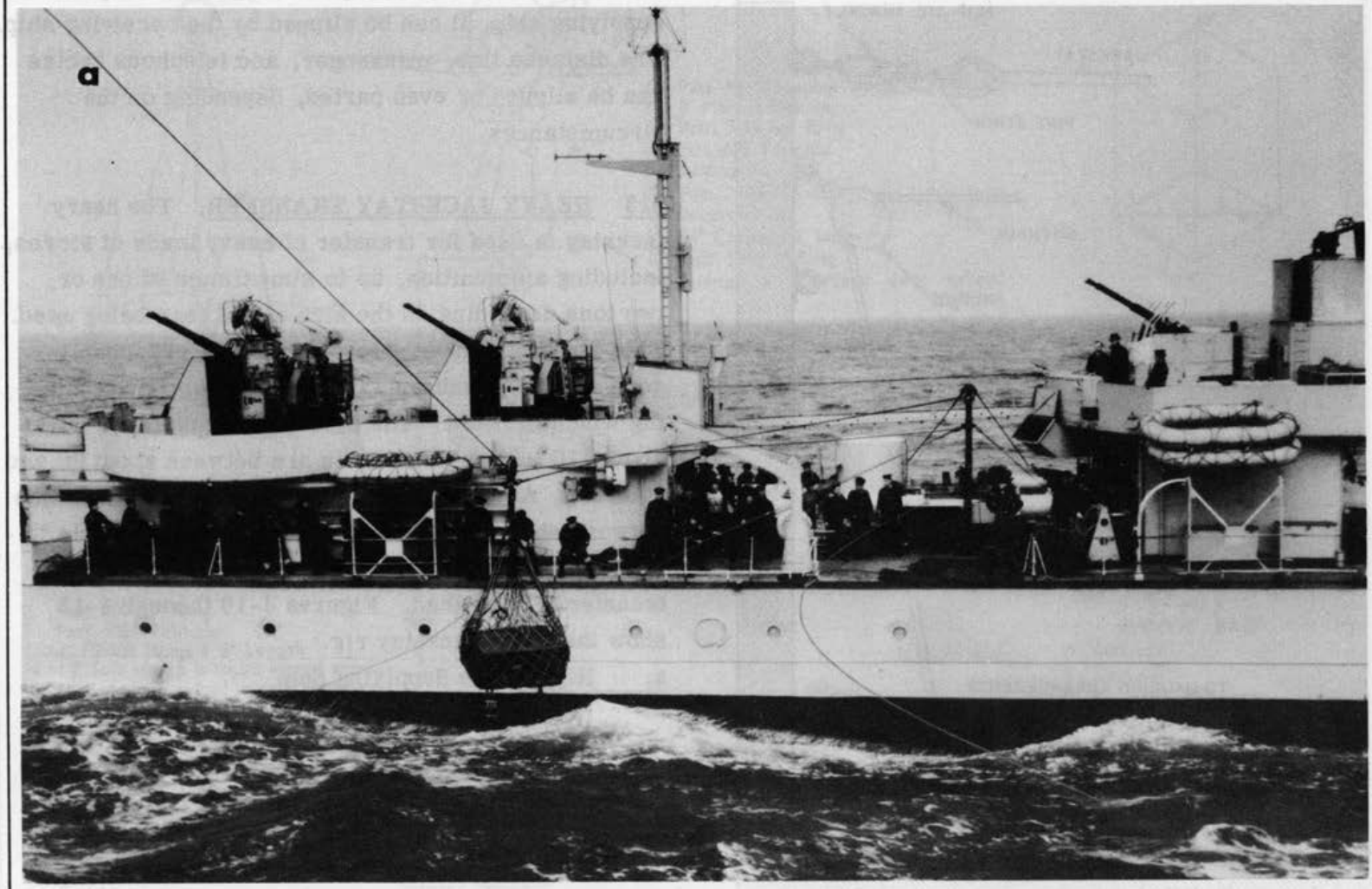
a. Rigging the Supplying Ship

(1) Gear Required for One Ton Rig

1. Jackstay. 70 fathoms of 2 1/2-inch E.S.F.S.W.R., fitted with an eye for the winch at the inboard end and a link for a slip at the outboard end.

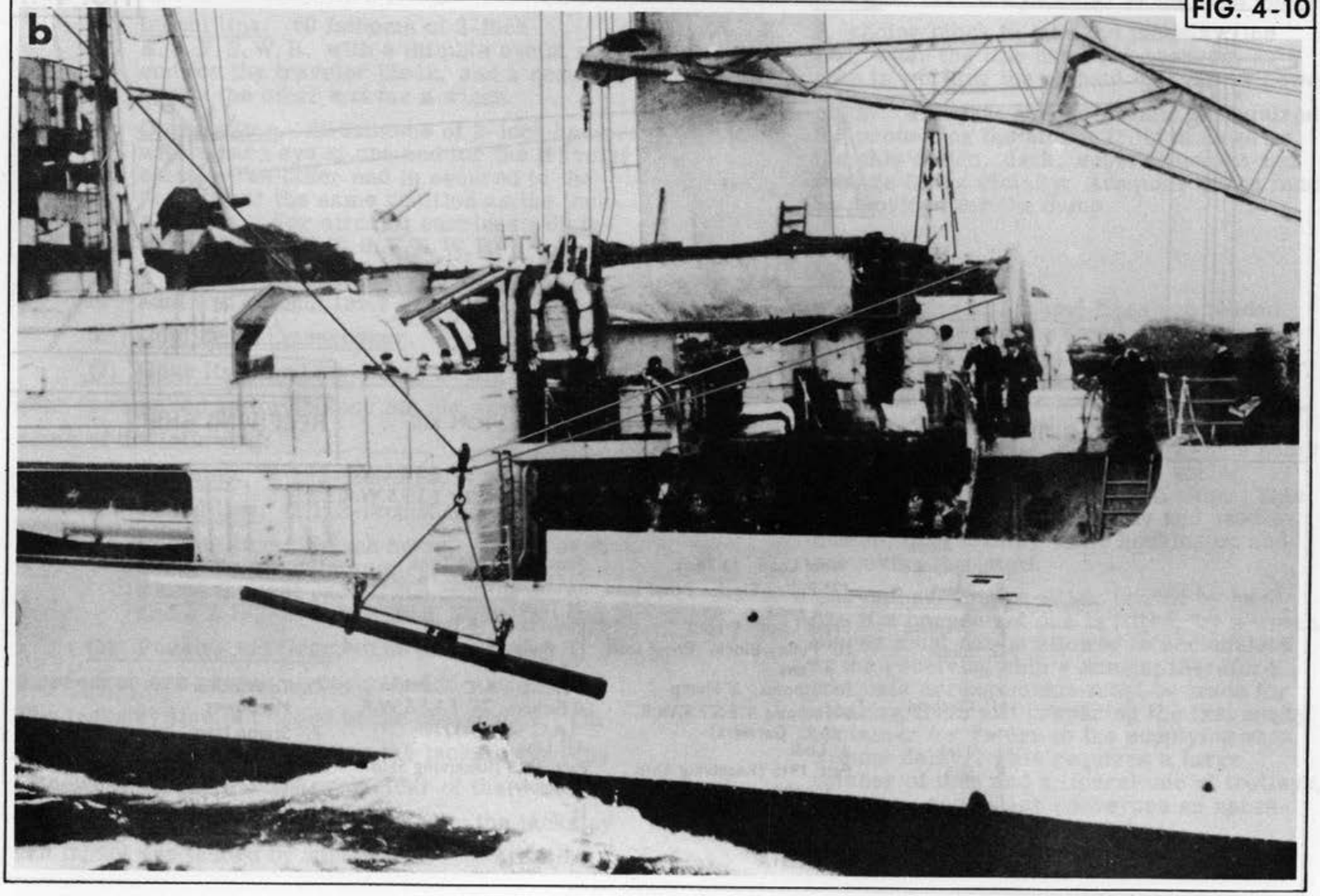
HEAVY JACKSTAY IN USE

FIG. 4-10



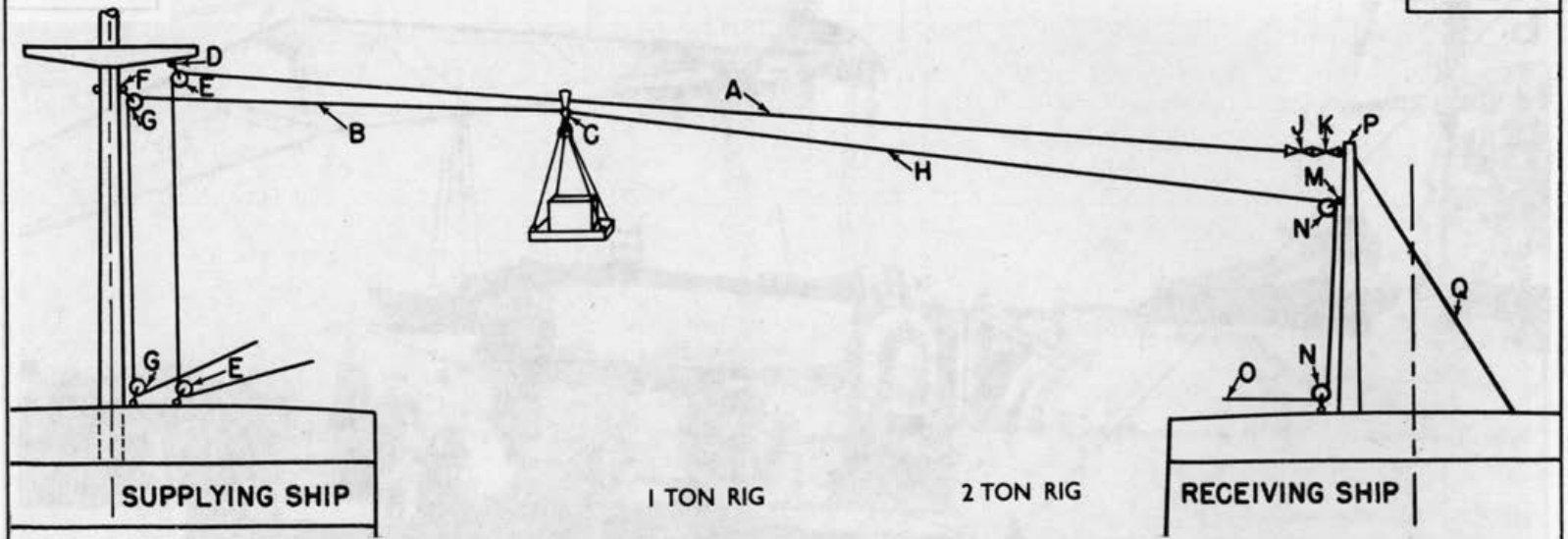
HEAVY JACKSTAY IN USE

FIG. 4-10



HEAVY JACKSTAY RIG

FIG. 4-11



		1 TON RIG	2 TON RIG
A.	Jackstay	70 Fathoms. 2½" E.S.F.S.W.R.	70 Fathoms. 3½" E.S.F.S.W.R.
B.	Inhaul	60 Fathoms. 2" E.S.F.S.W.R.	60 Fathoms. 2½" E.S.F.S.W.R.
C.	Traveller Block	Patt. 5296	
D.	Eyeplate	Proof Load. 12 Tons	Proof Load. 24 Tons
E.	Block	12" Pulley Block. Proof load 12 Tons	16" Pulley Block. Proof load 24 Tons
F.	Eyeplate	Proof Load. 4 Tons	Proof Load. 8 Tons
G.	Block	10" Pulley Block. Proof load 4 Tons	12" Pulley Block. Proof load 8 Tons
H.	Outhaul	50 Fathoms. 2" Hemp 60 Fathoms 2" E.S.F.S.W.R. (A C Carriers)	3" Hemp (A C Carriers) 60 Fathoms 2½" E.S.F.S.W.R. (A C Carriers)
J.	Link	1" Link	1¼" Link
K.	Slip	Patt. 1915 (Receiving Ship Supply)	Patt. 1915 (Receiving Ship Supply)
L.	Eyeplate	1½"	1½"
M.	Eyeplate	¾"	¾"
N.	Block	Patt. 5221A	Patt. 5221A

O. To Winch or Manpower
P. Stump Mast
Q. Guy Stump Mast

Note:—Jackstay line for messenger equipment to be 3½" Manilla.

2. Jackstay line. 40 fathoms of 3 1/2-inch manila, one end secured to the jackstay about 4 feet from the outboard end, and the other fitted with an Inglefield clip.

3. Inhaul line. 60 fathoms of 2-inch E. S. F. S. W. R. with a thimble eye at one end for the traveler block, and a reduced eye at the other end for a winch.

4. Outhaul line. 50 fathoms of 2-inch hemp with a hard eye at one end for the traveler block. The other end is secured to the jackstay at the same position as the jackstay line. For aircraft carriers: 60 fathoms of 2-inch E. S. F. S. W. R.

5. A special traveler block to which the inhaul and outhaul lines are shackled.

6. Gunline and messenger.

(2) Gear Required for Two Ton Rig. The same gear is required as for the one ton rig except for the sizes of the following:

1. Jackstay. 3 1/2-inch E. S. F. S. W. R.

2. Inhaul line. 2 1/2-inch E. S. F. S. W. R.

3. Outhaul line. 3-inch hemp, except when using the rig with an aircraft carrier where the last part of the haul is uphill and a 2 1/2-inch E. S. F. S. W. R. is used.

(3) Passing the Gear. The gun line and messenger are passed as described in Article 414. The jackstay line is clipped to the messenger. On the end of the jackstay line are the jackstay and the outhaul which are passed over clear of the water and free from tangles. When secured, the jackstay and inhaul are tended by winches.

b. Rigging the Receiving Ship (see Figure 4-12)

(1) Gear Required

1. A slip to take the jackstay at the high point.

2. A leading block to take the jackstay line and, when the line has been secured, to help in working the outhaul by hand or power.

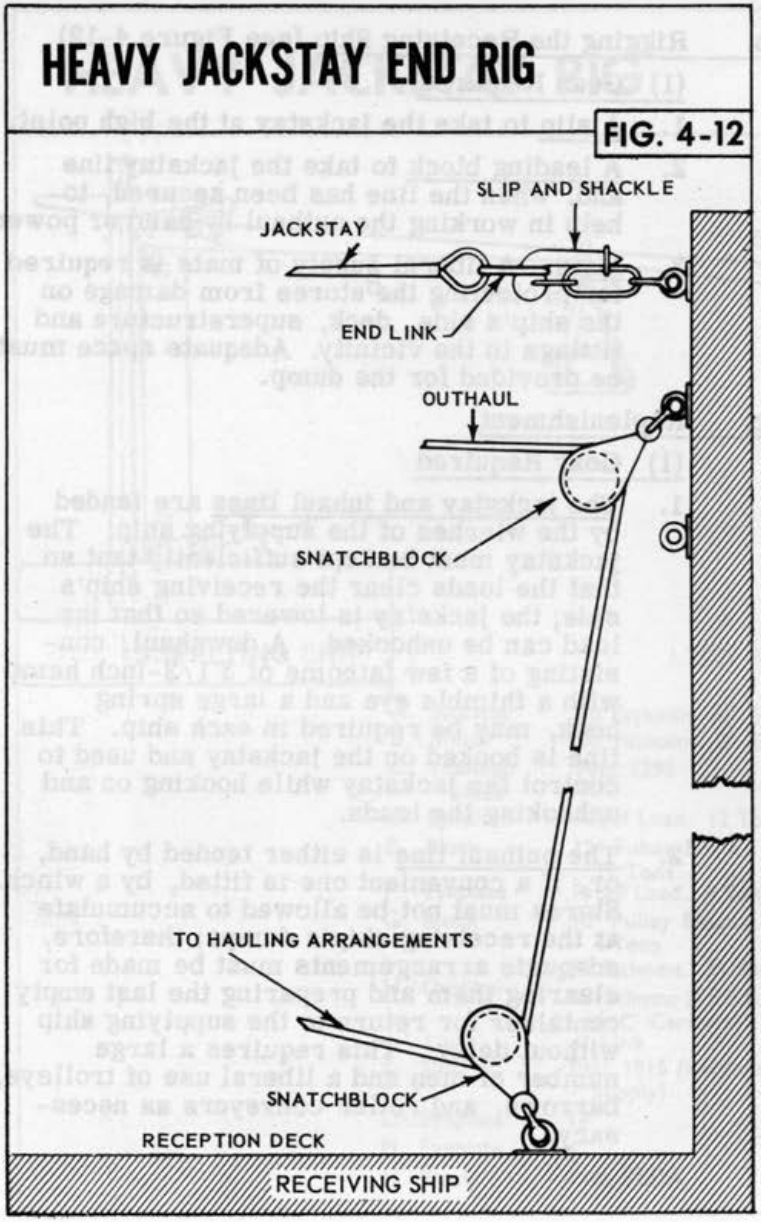
3. Mats. A liberal supply of mats is required for protecting the stores from damage on the ship's side, deck, superstructure and fittings in the vicinity. Adequate space must be provided for the dump.

c. Replenishment

(1) Gear Required

1. The jackstay and inhaul lines are tended by the winches of the supplying ship. The jackstay must be kept sufficiently taut so that the loads clear the receiving ship's side; the jackstay is lowered so that the load can be unhooked. A downhaul, consisting of a few fathoms of 3 1/2-inch hemp with a thimble eye and a large spring hook, may be required in each ship. This line is hooked on the jackstay and used to control the jackstay while hooking on and unhooking the loads.

2. The outhaul line is either tended by hand, or, if a convenient one is fitted, by a winch. Stores must not be allowed to accumulate at the receiving ship's dumps; therefore, adequate arrangements must be made for clearing them and preparing the last empty container for return to the supplying ship without delay. This requires a large number of men and a liberal use of trolleys, barrows, and roller conveyors as necessary.



3. Guard rails on both ships will necessarily be lowered, so all men working in the vicinity must wear life jackets.

d. Disengaging

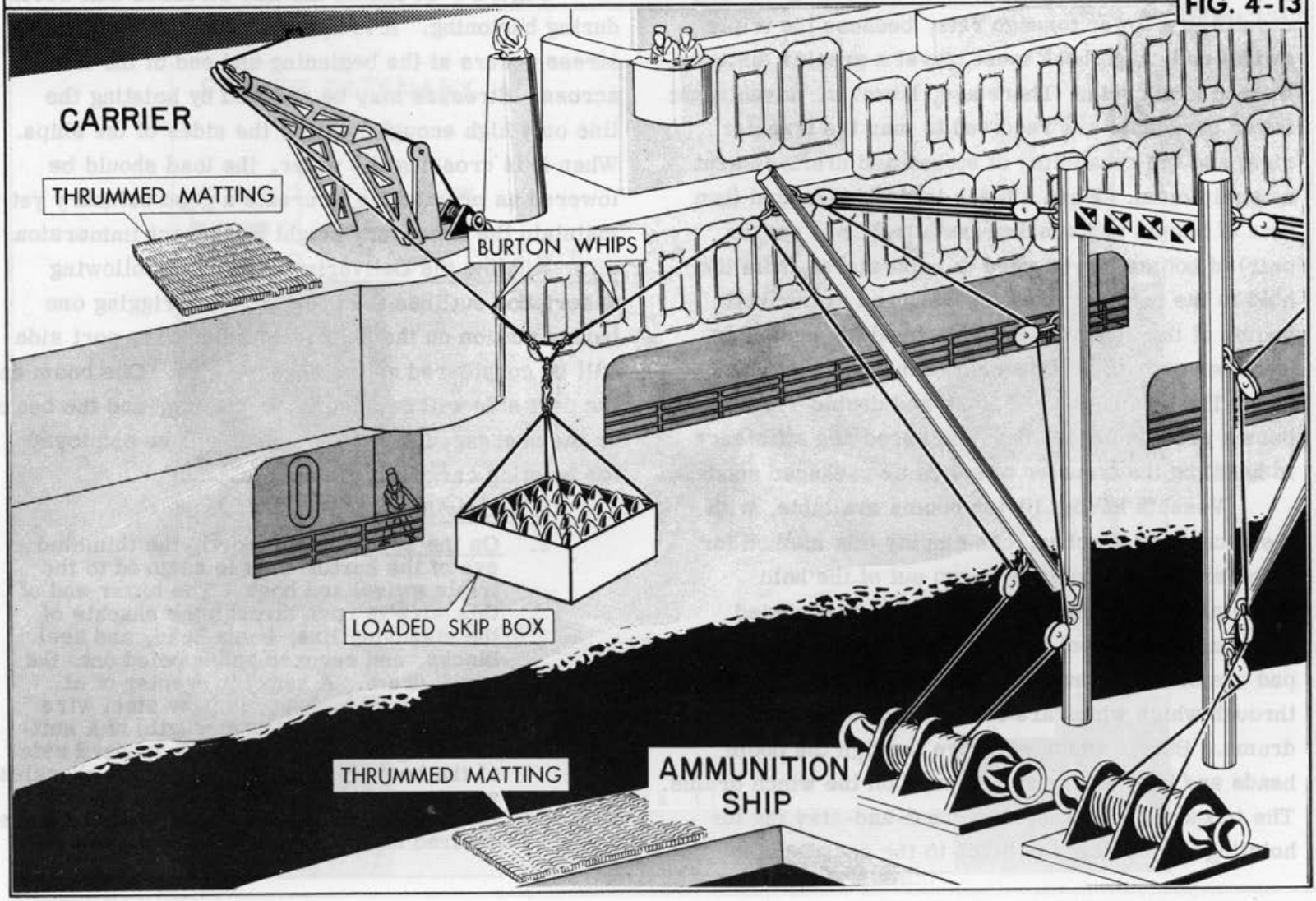
(1) Normal. When the last load has been passed, the end of the outhaul is secured to the jackstay as originally received, and the weight of the jackstay is taken on the jackstay line by leading it through the outhaul leading block. The slip is knocked off and the jackstay and outhaul are returned to the supplying ship. The messenger, distance line, and telephone cables are cast off as usual.

(2) Emergency. If the traveler block is in the supplying ship, the outhaul is cast off and the jackstay is slipped after cutting the jackstay line. If the traveler block is in the receving ship or in transit, the block is returned, with or without load, to the supplying ship and the procedure is the same as above.

416 BURTON TRANSFER (see Figure 4-13). The normal capacity of the burton rig is 3,500 lb. There are various ways of rigging the delivering ship for the transfer of cargo by this method. Normally, the boom on the engaged side is used for the actual transfer, and the boom on the opposite, or unengaged, side is employed to hoist loads from the hold. This is the most efficient means of transferring cargo by the burton method when only one set of booms and winches

BURTON RIG

FIG. 4-13



is available at the active hatch. However, one boom can be used to perform both functions by being plumbed over the center of the hold. Using this rig results in a lower tonnage rate, because the triple swivel and cargo hook must travel a greater distance in each load cycle. There are, however, advantages: fewer personnel are required to man the transfer rigs; and the rehandling of stores and drafts is kept at a minimum. When a hatch is double-ganged (two sets of booms and winches installed), one set (or pair) of booms can be used to hoist stores from the hold to the transfer area topside, and one or both booms of the other set are employed for burtoning to either or both sides simultaneously.

The double-ganged hatch and double-rigged booms provide for the greatest speed and efficiency in handling the transfer of solids or packaged goods.

Vessels having 10-ton booms available, with the necessary winches, can employ this method for transferring and hoisting cargo out of the hold simultaneously. An additional block is shackled approximately 4 feet from the head of the boom to a pad eye or fitting on the inboard side of each boom through which whips are rove and spooled on winch drums. Burton whips are rove through the boom heads and heel blocks and spooled on the winch drums. The inboard whips provide a yard-and-stay rig for hoisting cargo from the holds to the deck topside, while the burton whips are employed in transferring the loads between the vessels.

Figure 4-14 shows the line stresses that occur during burtoning. It is apparent that the heaviest stress occurs at the beginning and end of the trip across. Stresses may be reduced by hoisting the line only high enough to clear the sides of the ships. When it is crossing the water, the load should be lowered as practicable to create a good catenary yet maintain the necessary height to prevent immersion.

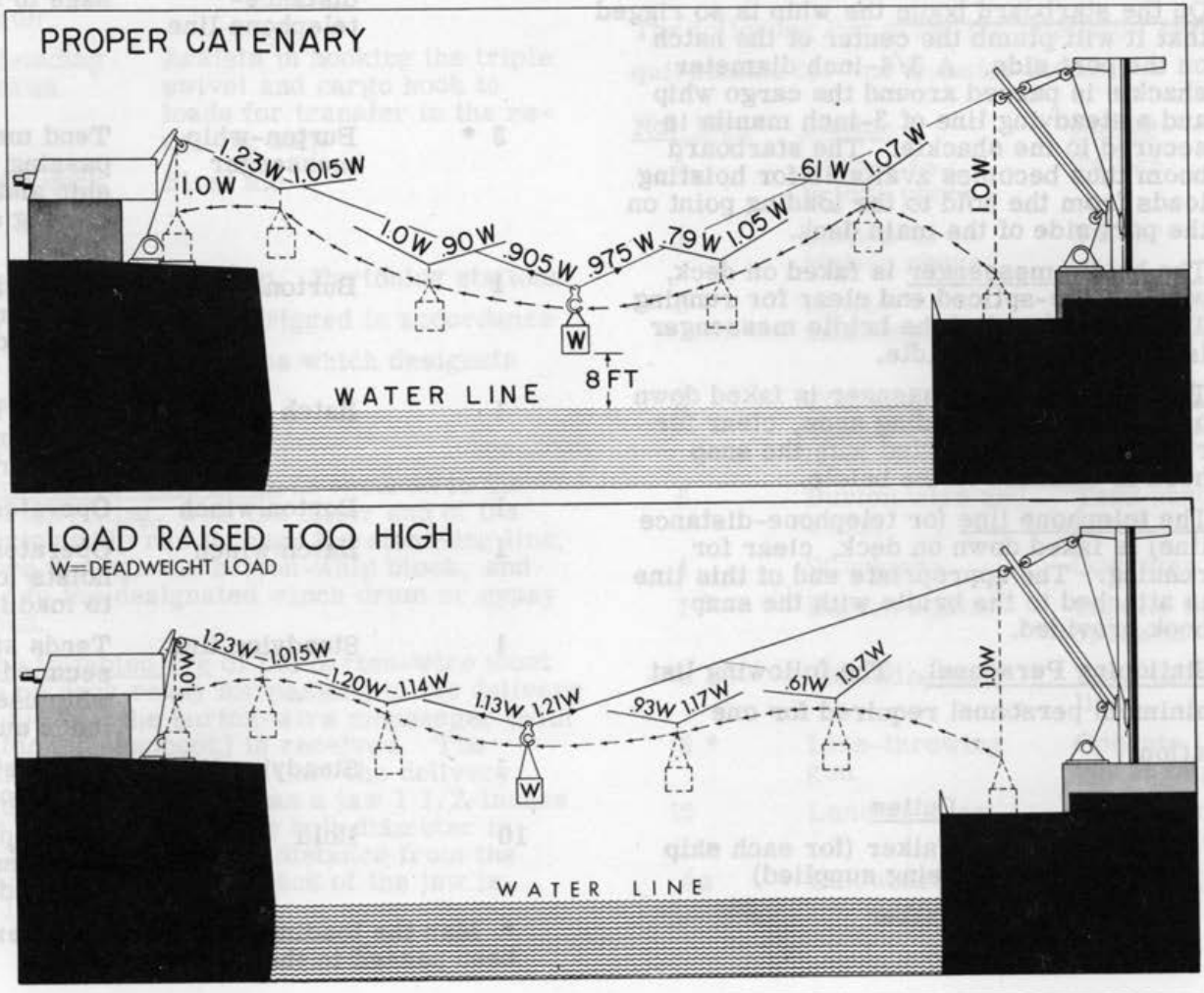
a. Rigging the Delivering Ship. The following description outlines the procedure for rigging one burton station on the delivering ship. The port side will be considered as the engaged side. One boom on the port side will be used for burtoning, and the boom on the unengaged side (starboard) will be employed for hoisting cargo out of the hold.

(1) Gear Required

1. On the burton boom (port), the thimbled eye of the burton wire is secured to the triple swivel and hook. The bitter end of this wire is rove through the shackle of the steadying line, boom head, and heel blocks, and secured and spooled onto the winch drum. A heavy preventer of at least 1-inch high-grade plow steel wire (77,000 lbs. breaking strength) of a suitable length is secured to the inboard side of the boom head. The pins of all shackles are secured with seizing wire. The boom is topped up so that the whip will plumb the desired loading point on the port side of

STRESSES ON BURTON WHIPS

FIG. 4-14



the main deck. Working and lazy guys are set up and belayed. The preventer is led to the starboard side of the ship at as close to a 90° angle from the boom as possible, or to the fixed position provided; a strain is applied; and it is belayed.

2. On the starboard boom the whip is so rigged that it will plumb the center of the hatch on the port side. A 3/4-inch diameter shackle is passed around the cargo whip and a steadying line of 3-inch manila is secured to the shackle. The starboard boom thus becomes available for hoisting loads from the hold to the loading point on the port side of the main deck.

3. The bridle messenger is faked on deck, with its eye-spliced end clear for running. The inboard end of the bridle messenger is secured to the bridle.

4. The burton whip messenger is faked down on deck near the loading area, clear for running. The end fitted with the snap hook is attached to the bridle.

5. The telephone line (or telephone-distance line) is faked down on deck, clear for running. The appropriate end of this line is attached to the bridle with the snap hook provided.

(2) Stationing Personnel. The following list gives the minimum personnel required for one transfer station:

No. Men	Station	Duties
1	Bridge-to-bridge phone	Talker (for each ship being supplied)
1	Station-to-station phone	Talker
1 *	Bridle messenger	Tends messenger when passing to receiving ship
2	Combined distance-telephone line	Tend line during passage to receiving ship
3 *	Burton-whip messenger	Tend messenger when passing to receiving ship and haul back receiving ship's burton whip
1	Burton signal	Signals burton winch operator when loads are ready to be transferred
1	Hatch signal	Signals hatch winch operator when loads are ready to be hoisted
1	Burton winch	Operates burton winch
1	Hatch winch	Operates winch that hoists loads from hold to loading area
1	Steadying line	Tends steadying line secured to the cargo whip used to hoist loads out of the hold
1	Steadying line	Tends steadying line on burton whip
10	Hold	Make up loads in hold for transfer to ship alongside

* Man the loading-area stations after lines have been passed to the receiving ship.

No. Men	Station	Duties
1	Hold	Supervises working party in hold and ensures proper slinging of all loads
2	Line-throwing gun	Operate line-throwing guns
1	Loading area	Assists in hooking the triple swivel and cargo hook to loads for transfer to the receiving ship
1 Hospitalman	On deck	First aid

b. Rigging the Receiving Ship. Burtoning stations on the receiving ship should be rigged in accordance with national type and class plans which designate the burton point.

(1) Gear Required

1. The burton-whip block is secured to the burton fitting, with the bitter end of the burton whip run through the steadying line, rove through the burton-whip block, and led to the designated winch drum or gypsy head.
2. The thimbled eye of the burton-wire must be on deck ready for passing to the delivery ship when the burton-wire messenger (with attached snaphook) is received. The thimbled eye must fit into the delivery ship's swivel which has a jaw 1 1/2-inches by 3 1/2-inches. The bolt diameter is 1.181-inches and the distance from the center of bolt to the back of the jaw is 2 1/8-inches.

(2) Stationing Personnel. Such factors as the quantity and type of stores received, structural differences on different ships, and the difficulties encountered in handling and striking stores below may call for greater numbers of personnel than normal. The following list gives the minimum personnel requirements for one transfer station.

No. Men	Station	Duties
1	Bridge-to-bridge phone	Talker
1	Station-to-station phone	Talker
3 *	Bridle messenger	Haul bridle messenger aboard from delivering ship
2	Combined distance-telephone line	Tend line when passing to receiving ship
5	Burton wire and winch	Tend burton wire and winch
1	Winchman	Operates winch
1	Burton signal	Signals the winch operator
2	Steadying line	Tend the steadying line
2 *	Line-throwing gun	Operate line-throwing gun if required
15	Landing area	Keep stores clear of landing area
As required	Below decks	Stow and strike stores below

No. Men	Station	Duties
1 hospitalman	On deck	First aid

*Available to handle stores after connections are made.

c. Transfer Procedure

(1) Passing the Lines. As the receiving ship completes her approach, a heaving line (or line-throwing gun line) is sent over by the delivering ship, except in the case of aircraft carriers.

This line will be attached to the bridle messenger, which is then hauled aboard the receiving ship, bringing aboard the bridle and the lines attached to it. As soon as the bridle is received, the telephone and distance lines are detached and walked forward or aft, clear of the receiving station. The receiving ship then takes the burton-whip messenger from the bridle and secures the burton wire to the messenger. Now the burton wire is hauled back to the delivering ship and secured to the triple swivel.

(2) Hoisting the Load Out of the Hold. The cargo whip and hook of the starboard boom is centered over the loaded net or skip box in the hold, using the steadying line which is tended from a cleat on the starboard side of the ship. As the load is hoisted clear of the hold, the steadying line is slackened, and the load is drifted over the loading point on the port side of the main deck. The beckets, or sling, of the load are removed from the cargo hook.

(3) Transferring the Load. The net beckets (or sling) of the load which was hoisted from the hold with the starboard boom are placed on the cargo hook of the burton whip. The delivering ship heaves in on the burton whip and hoists the load clear of the deck and rail. The receiving ship takes a strain on her burton whip as the delivering ship slacks away on hers, and the load is worked across. When the load is hanging from the receiving ship's burton point, the receiving ship slacks her whip and lowers the load to the deck. The load is disconnected from the cargo hook, and any empty nets or skip boxes are attached to the cargo hook and returned to the delivering ship.

Successful burtoning depends on teamwork between the winchmen of both ships. A constant tension should be maintained on each whip despite the relative movement caused by rolling and yawing.

d. Retrieving the Rig. On completion of the operation, when all nets and slings have been returned to the delivering ship, the delivery ship returns the receiving ship's burton whip by the burton-whip messenger. The messenger itself, along with the telephone line, is attached to the bridle and payed out with the bridle messenger. All messengers must be returned in the same manner as received, but in reverse order. The time required for rerigging on the delivering ship will thus be reduced, and

preparations for transferring supplies to the next ship to come alongside will be greatly expedited.

417 HOUSE-FALL TRANSFER. A thorough knowledge of rigging by the burton method is a prerequisite to understanding the procedures of house-falling. The normal capacity of the house-fall rig is 2,500 lb. As in the burton method, rigging for house-fall transfers can be accomplished using one or two booms; the boom and whip can be plumbed over the center of the hold to lift and transfer cargo, with a corresponding reduction of tonnage rate; and the load stresses are distributed in the same manner as in the burton rigs--though they are somewhat larger (see Figure 4-15).

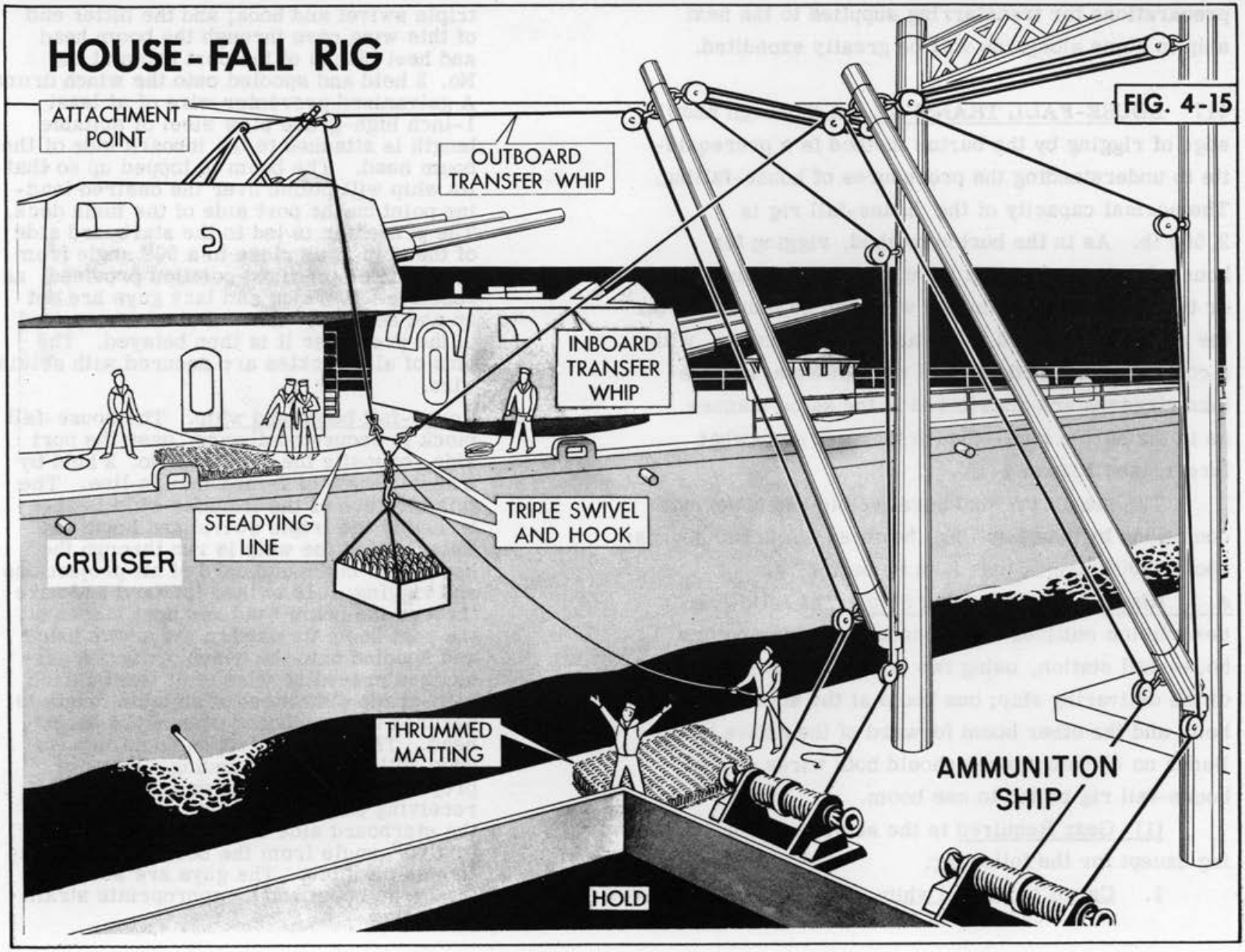
The maximum load permissible under normal conditions by house-falling, however, is 2,500 pounds: about 1,000 pounds less than by burtoning.

a. Rigging the Delivering Ship. The following description outlines the procedure for rigging one house-fall station, using two booms on the port side of the delivering ship; one boom at the active, No. 2, hold; and the other boom forward of the active hold. Under no circumstances should both wires of any house-fall rig be led to one boom.

(1) Gear Required is the same as for burtoning except for the following:

1. Cargo boom and whip. The thimbled eye of the cargo whip should be secured to the triple swivel and hook; and the bitter end of this wire rove through the boom head and heel blocks of the port boom at the No. 2 hold and spooled onto the winch drum. A galvanized preventer wire of at least 1-inch high-grade plow steel of suitable length is attached to the inboard side of the boom head. The boom is topped up so that its whip will plumb over the desired loading point on the port side of the main deck. The preventer is led to the starboard side of the ship at as close to a 90° angle from the boom or the fixed position provided, as possible. Working and lazy guys are set up and secured. After a strain is applied to the preventer it is then belayed. The pins of all shackles are secured with seizing wire.

2. House-fall boom and whip. The house-fall block is secured outboard, over the port side, opposite the center of No. 2 hold by a short length of 2-inch manila line. The thimbled eye of the transfer whip is attached to the triple swivel and hook; the bitter end of the whip is run through the house-fall block outboard of all projections and rigging; it is walked forward and rove through the boom head and heel blocks of the port boom forward of the active hold, and spooled onto the winch drum. A galvanized preventer wire of at least 1-inch high-grade plow steel of suitable length is secured to the inboard side of the boom head. The boom is topped up so that its whip will clear any standing rigging or projection when making deliveries to the receiving ship. The preventer is led to the starboard side of the ship at as close to a 90° angle from the boom or fixed station as possible. The guys are set up on the cargo boom and an appropriate strain is applied.


HOUSE-FALL RIG
FIG. 4-15
ATTACHMENT POINT
OUTBOARD TRANSFER WHIP
INBOARD TRANSFER WHIP
STEADYING LINE
TRIPLE SWIVEL AND HOOK
CRUISER
THRUMMED MATTING
AMMUNITION SHIP
HOLD

(2) Stationing Personnel. The following list gives the minimum personnel requirements for one transfer station.

No. Men	Station	Duties
1	Bridge-to-bridge phone	Talker (for each ship being supplied)
1	Station-to-station phone	Talker
1 *	Bridle messenger	Tends messenger when passing to receiving ship
2	Combined distance-telephone line	Tend line
3 *	House-fall block messenger	Tend messenger when passing to receiving ship
1	House-fall signal	Signals house-fall winch operator when load is ready to be lifted out of the hold
1	Hatch signal	Signals hatch winch operator when load is ready to be lifted out of the hold
1	House-fall winch	Operates house-fall winch
1	Hatch winch	Operates winch that hoists loads from hold to loading area
1	Steadying line	Tends steadying line secured to the cargo whip used to hoist loads out of the hold
10	Hold	Make up loads in hold for transfer to ship alongside
1 Boatswain's mate (or seaman petty officer)	Hold	Supervises working party in the hold and ensures proper slinging of all loads
2	Line-throwing gun	Operate line-throwing guns
1	Loading area	Assists in hooking the cargo hook to loads for transfer to the receiving vessel
1 hospitalman	On deck	First aid

* Man the loading stations after lines have been passed.

b. Rigging the Receiving Ship

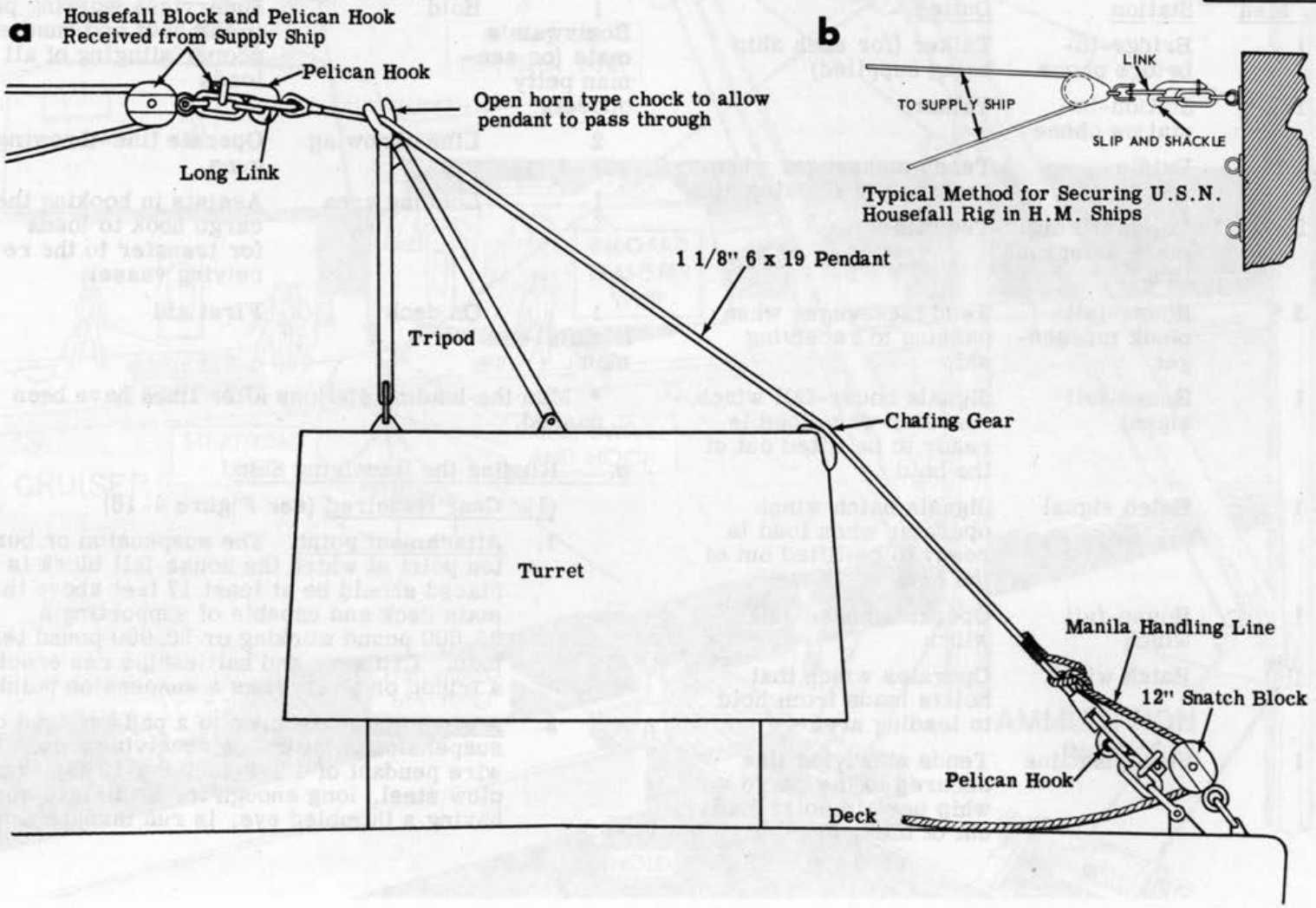
(1) Gear Required (see Figure 4-16)

1. Attachment point. The suspension or burton point at which the house-fall block is placed should be at least 17 feet above the main deck and capable of supporting a 25,000 pound working or 50,000 pound test load. Cruisers and battleships can erect a tripod on a turret as a suspension point.

2. A gin block is secured to a pad eye type of suspension point by the receiving ship. A wire pendant of 1 1/8-inch 6 x 19 high-grade plow steel, long enough for a fairlead and having a thimbled eye, is run through the

SECURING THE HOUSE-FALL RIG

FIG. 4-16



gin block. The thimbled eye remains on deck for attaching to the pelican hook on the house-fall block. When the house-fall block and pelican hook are received, the hook is secured to the thimbled eye. A strain is applied to the wire pendant, two-blocking the house-fall block, and the hauling part of this is then secured.

(2) Stationing Personnel. The following is a list of the minimum personnel requirements for one station.

No. Men	Station	Duties
1	Bridge-to-bridge phone	Talker (to cover all transfer stations)
1	Station-to-station phone	Talker
2	Combined distance-telephone line	Tend line when passing to receiving ship
3 *	Bridle messenger	Haul messenger aboard from delivering ship
1	Winch	Operates winch, if required
1	House-fall signal	Signals the winch operator on the delivering ship
2 *	Line-throwing gun	Operate line-throwing guns
15	Landing area	Keep stores clear of landing area
As required	Below decks	Stow and strike stores below
5 *	House-fall block messenger	Haul house-fall block from the delivering ship

* Available to handle stores after connection has been made.

c. Transfer Procedure

(1) Passing the Lines. A heaving or gun line is sent over by the delivering ship (except aircraft carriers) as the receiving ship completes her approach. The line is secured to the bridle messenger to which all other lines are attached by means of the bridle. After the receiving ship has taken care of the telephone and distance lines, the house-fall block messenger is detached from the bridle and used to haul the house-fall block over as the delivering ship pays out on the house-fall transfer whip. The block is secured to the wire pendant and made ready for cargo transfer, as on the receiving ship.

(2) Transferring the Load. On the delivering ship the load is hoisted out of the hold by the port cargo boom in the same way as by the burton method and transferred to the cargo hook. The load is raised clear of the rail with the house-fall cargo whip, the strain being taken on the whip, and the load being worked over to the receiving ship.

(3) Retrieving the Rig. When transferring is completed, lines are passed back to the delivering ship in the usual manner.

d. Optional Rigs. If a fitting of sufficient strength is installed on the crosstree or king post, the same manner of rigging can be used by employing this

fitting to serve as the lead for the transfer whip in lieu of the boom forward of the active hold. This is considered superior to using two booms of less than 8-ton capacity for transfer rigging. Using both the starboard and port booms at one hatch is not considered desirable because a small change in fore-and-aft position of the ship alongside creates strain on rigging and fitting.

When sufficient winches are available and two booms of at least 8-ton capacity are provided at a hatch, double rigging of the booms can be used for maintaining a simultaneous transfer and break out of cargo. The house-fall is rigged in the manner previously described. The rigging for simultaneously hoisting stores out of the hold is identical with the procedure for double rigging by the burton method.

420 TRANSFERRING AMMUNITION

The transfer of ammunition at sea is in the same order of military importance as refueling at sea and is the most hazardous and exacting of all transfer operations. Because of its nature, ammu nition must be handled with much greater care than provisions or general stores items.

a. Safety Precautions. All persons engaged in handling ammunition should be aware of one vital fact: with inert material an accident might be trivial, but with ammunition it could easily result in the destruction not only of the ammunition ship but also of the ships alongside. Carelessness and haste, in addition to causing accidents, often result in rendering ammunition unserviceable, even when it is in containers. Similarly, damage to the containers may make them unfit for reuse. All personnel engaged in transferring ammunition must be instructed in the special safety precautions pertinent to handling explosives.

b. Ammunition Ships. A typical ammunition ship is a naval auxiliary equipped to carry and transfer ammunition. Its holds are fitted with sheathing, ventilation, and sprinkling systems to provide increased safety for its cargo. Most ammunition ships contain five holds, three forward and two abaft the bridge island, with at least two booms and associated winches per hold. It is usual practice to deliver simultaneously to a heavy ship to port and a light ship to starboard. Depending on her complement, an ammunition ship can effectively man two to five replenishment stations if an advance break out has been made.

c. Planning. The operational commander of the receiving group should furnish the operational commander of the delivering group, before goods are to be issued, with a replenishment schedule containing the following:

1. The assignment of receiving ships to delivering ships, and the side from which each receiving ship will replenish
2. The order in which receiving ships will go alongside delivering ships.

Once the replenishment schedule is known, each receiving ship should inform her delivering ship(s) of her particular requirements if tactical and security considerations permit. At this time, the receiving ship also makes known the priority of her needs so that she will have taken aboard the most vital items in case replenishment operations cannot be completed. Priority must not be decided on the basis of convenience. A satisfactory break out of the ammunition on the delivering ships is practicable only when complete and timely information is exchanged.

d. Transfer Methods Used. Ammunition ships are equipped to transfer by standard high-line (Figure 4-17) and jackstay methods, and some may also use the burton or house-fall (Figure 4-18) methods. Burtoning is the preferred method for rearming large ships that meet the necessary deck-space requirements and that have high-speed winches for controlling their end of the whip. This method (because it allows the deckhands of the receiving ship to control the load as it arrives on board) is particularly desirable in bad weather, when ships have a tendency to roll heavily. Unfortunately, most combatant ships except carriers do not have winches of suitable speed to burton effectively. Such ships receive primarily by house-fall or high-line methods. In rough weather the high-line method is safer than the house-fall. Destroyer types are usually rearmed by high-line methods.

421 PREPARING THE AMMUNITION DELIVERY SHIP

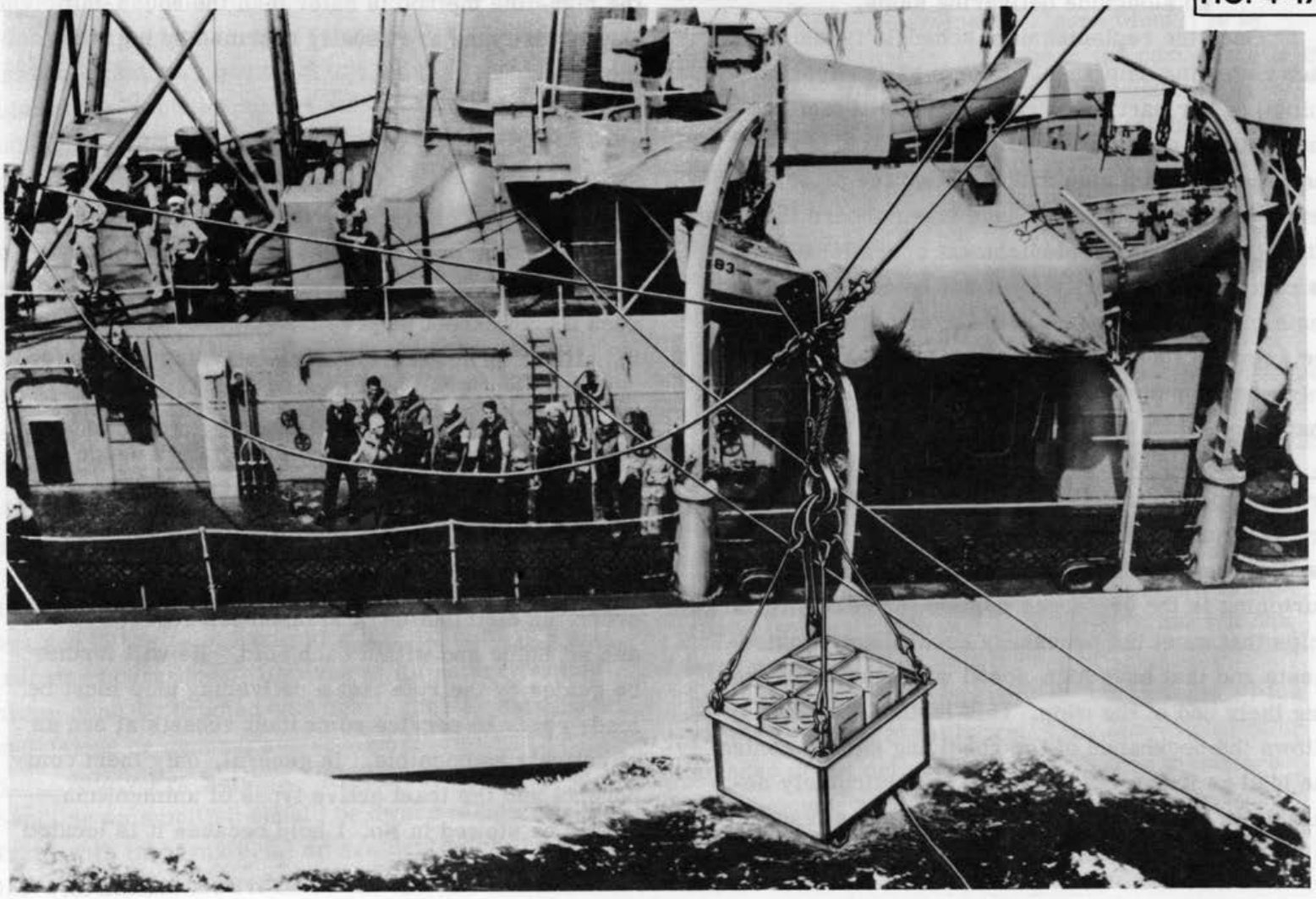
a. Loading. Before the loading of an ammunition ship is begun, it is essential that there be a cargo plan which shows where every item is to be placed. Such a plan cannot be prepared unless the commanding officer first ascertains the following vital information.

1. The designed deck-loading of this ship in pounds per square foot of deck space
2. The total deck-loading limit for his ship
3. The total deck load of break out from the standpoint of stability.

Thus informed, the commanding officer can order the distribution of ammunition between fore and aft holds and within each hold. He will further be guided by the rule that a delivering ship must be made ready to service combatant vessels at sea as effectively as possible. In general, only inert components and the least active types of ammunition should be stowed in No. 1 hold because it is located

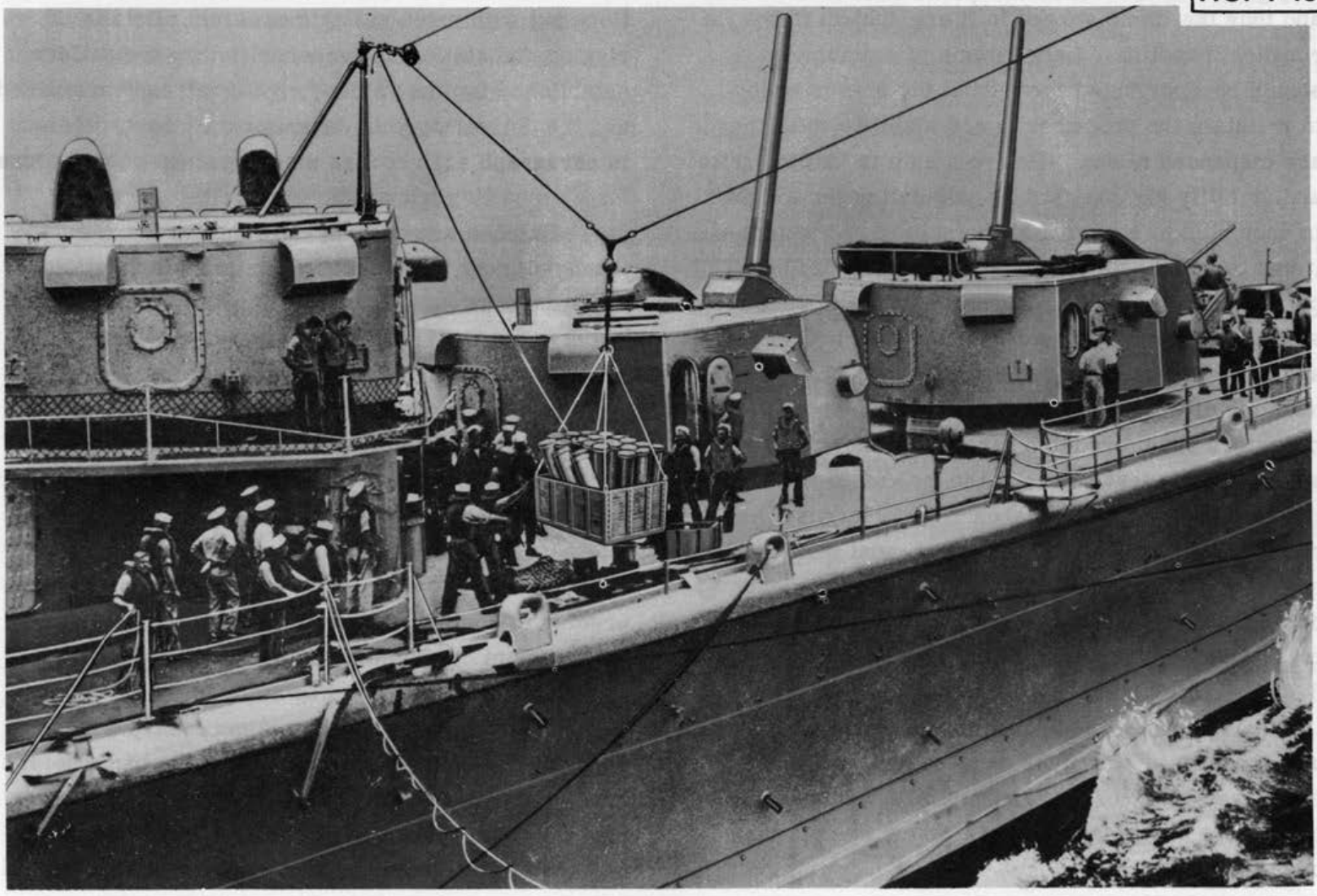
WIRE HIGH-LINE FOR AMMUNITION

FIG. 4-17



HOUSE-FALL FOR AMMUNITION

FIG. 4-18



in the section of the ship most vulnerable to mine and collision damage; and it is the most difficult hold from which to break out cargo in rough weather and thus the items stowed in it are subject to the roughest handling. Large items of ammunition should be distributed throughout the ship in order to maintain the proper trim and stability when they are dispensed at sea. Before a ship is loaded, trim and stability are checked by calculating the weight in each hold to ensure that the cubage and weight of items to be loaded is held within proper limits.

b. Winches. When the requirements of receiving ships are known, ammunition should be broken out and brought topside in the proper amounts. Since handling of winches on both ships is important, winch operators should receive careful training. Skill in applying sufficient power to the outhaul at the right moment to fleet the load aboard will increase the rate of transfer. Loads in transit must be kept clear of the sea, but care should be taken that the jackstay or high-line is not so taut as to strain the gear.

c. Stations. Stations are to be marked with 3-foot square pieces of green bunting by day and light boxes by night. All gangways, booms not in use, boat rigs, and other appendages must be secured well clear of the transfer rigs. Safety nets of the type shown in Figure 4-1 should be placed over the side.

422 PREPARING THE RECEIVING SHIP

a. Rigging. Essentially, transfer of ammunition is done in the same manner as other transfer operations but with extra safety measures. Details of rigging and stationing personnel follow the pattern established for the various rigs as already presented, and the delivering ship departmental check-off list in paragraph 411b covers many specific preparations for ammunition transfer.

Hatches are to be opened and the hatch covers removed from the vicinity of the transfer stations to allow passageways for cargo-handling trucks. Skip boxes, nets, and emergency-breakaway tools should be made ready at the loading areas.

Ample provision must be made for the use of shoring, wedges, chocks, straps, preventers, and dunnage to protect the various classes of ammunition. Wooden false deck is required to lessen the shock of loads landing on deck, and to provide a surface on which temporary bins, shoring, or retainers can be erected to control deck loads of advance break out ammunition. Thrummed matting and wooden pallets should be used at all landing stations.

b. Planning. A good plan is necessary in order for ammunition to be taken aboard and struck below efficiently. Ammunition will probably arrive faster than it can be stowed, so auxiliary dumps should be provided in the receiving ship to prevent chocking

of the main dumps. The rate of ammunition transfer should on no account be slowed down to the rate of its stowage. When a full container arrives, it should be placed on a mat and slid along to an unloading point, and the empty container for return should be hooked on and passed back. As an alternative, roller conveyors can be used to advantage when the layout of the ship permits.

Besides the normal preparations for replenishment, measures must be taken to prevent movement of ammunition caused by motion of the ship. This will require use of enough wedges, chocks, straps, preventers, and dunnage. Thrummed matting and wooden pallets must be placed at each deck station to protect against shock. As on the delivering ship, station markers of 3-foot squares of green bunting by day or light boxes by night are to be displayed over the side. Preparations must be made to return expended cartridge cases, boxes, and powder tanks.

430 TRANSFER OF LIGHT FREIGHT AND PERSONNEL

Although complete replenishment operations are likely to require a large amount of time, the transfer of personnel, mail, and light freight can be accomplished on short notice, at any time, and by all ships of the fleet. A regular replenishment operation provides an excellent opportunity to exchange mail and other light objects, and to shift personnel, including replacement aircrews. When such transfers are made during refueling or other transfer operations, they should ordinarily not be allowed to extend the time of the primary operations, so they must be adequately planned.

431 TRANSFER OF LIGHT FREIGHT AND MAIL. When odd consignments of light fleet freight or mail are to be transferred in considerable quantity, the manila high-line is used. Very light items such as a single bag of mail can, however, be transferred merely by being secured to the middle of a light messenger line and passed to the receiving ship.

432 TRANSFER OF PERSONNEL. All lines must be hand tended in personnel transfers: this cannot be stressed too highly. Tending lines by hand with an adequate number of men standing by for emergency is the only means by which proper caution can be taken against the high-line or jackstay parting from sudden strains between rolling ships. Manila is always prescribed because wire cannot be tended by hand.

a. Safety Precautions. All personnel who are being transfered at sea must wear inherently buoyant life jackets, as shown in Figure 4-19. In addition,

where water temperatures are low, immersion suits should be worn.

Transferring personnel demands close attention to details by all hands. ATP 1 contains data on replenishment formations that describes the staggering of ships in the service lines for the purpose of picking up personnel lost overboard during transfer operations. Whenever practicable, a rescue ship should be stationed astern of ships replenishing at sea, in order to rescue personnel lost overboard.

b. Casualties. Casualties may be transferred at sea by use of a stretcher on a manila high-line or jackstay. The stretcher used for personnel transfer must have enough flotation gear rigged to ensure that the patient's head is held above water in case of accidental submergence. The safest device is a kapok-filled canvas tube 10 inches in diameter and 10 feet long, as shown in Figure 4-20. The center of the tube is secured to the head of the stretcher and the tapered ends are attached, wrap-around fashion, to the sides. Stretcher buoyancy can also be obtained by lashing five kapok life jackets to it, one at the head and two on each side.

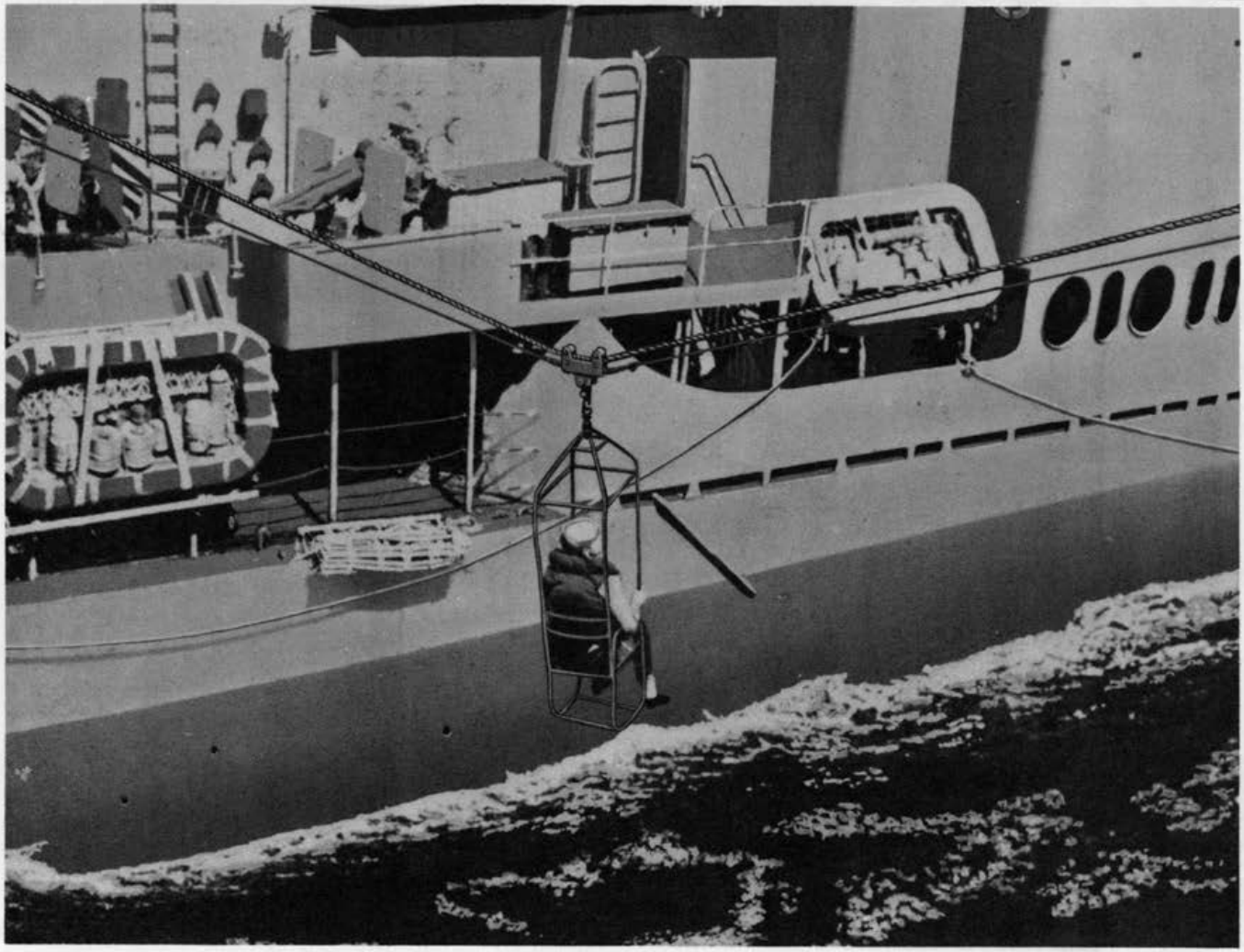
c. Manila High-Line or Light Jackstay. For transferring individuals singly, the only approved rigs are the manila high-line or light jackstay. Rigging details of these methods are given in Articles 413 and 414, with illustrations of their use in Figures 4-4 through 4-9. For weight up to 300 pounds, the rig may be modified by the use of a 3-inch manila line for the high-line and 1-inch for the inhaul and outhaul lines.

d. Burton. The burton method is an expeditious means of transferring four or five men simultaneously in a skip box, as shown in Figure 4-21. Consideration must be given, however, to the dangers involved in having winch operators on different ships controlling the transfer. The burton method shall be used only when the situation demands speedy transfer of a relatively large number of personnel and time does not permit individual transfer by the standard manila high-line or jackstay methods.

e. Transfer by Helicopter. The ability of the helicopter to take off and land in confined spaces has made it valuable in shuttling replacement aircrews between carriers and in increasing the speed of transfer of the wounded. Some hospital ships are being fitted with a helicopter landing platform above the main deck at the stern to effect swifter medical attention both for men at sea and on shore in battle areas.

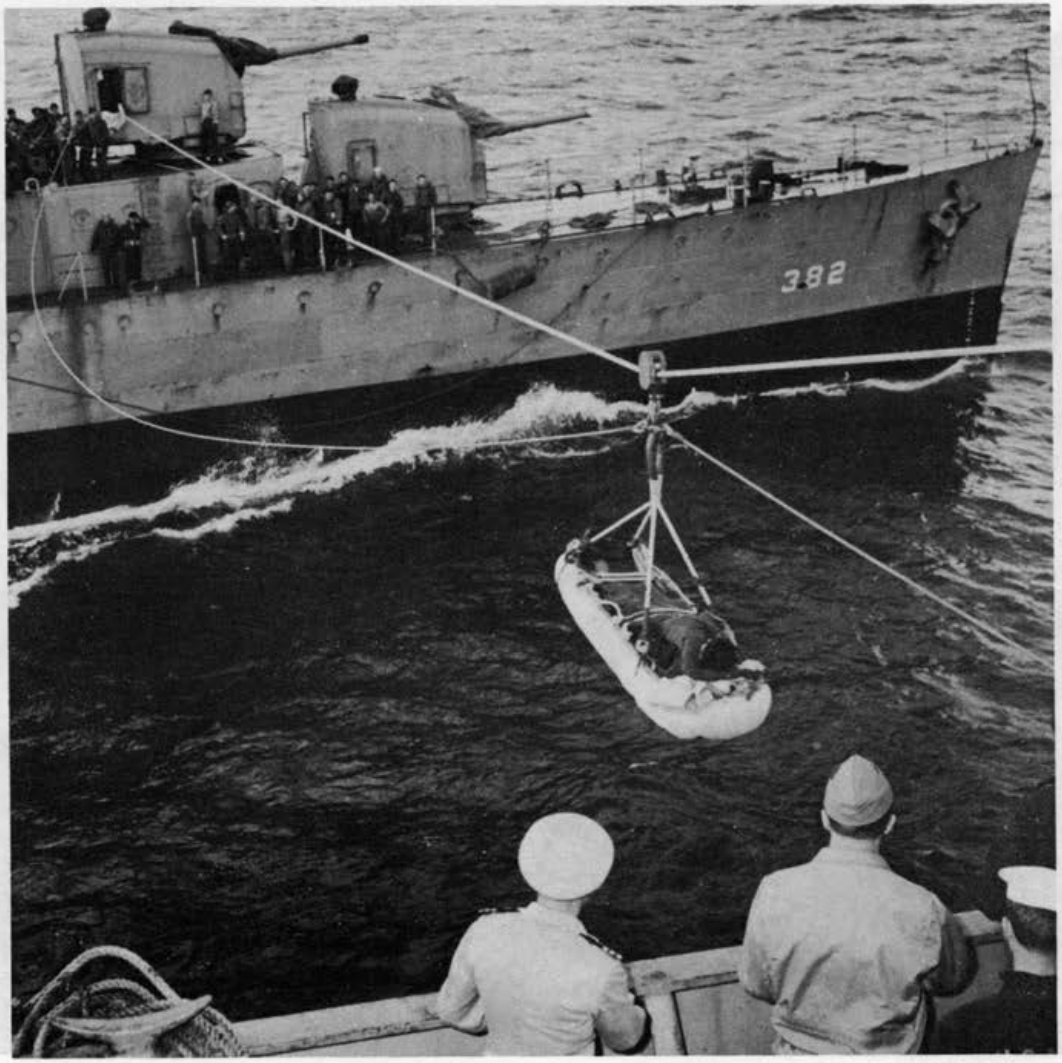
PERSONNEL TRANSFER

FIG. 4-19



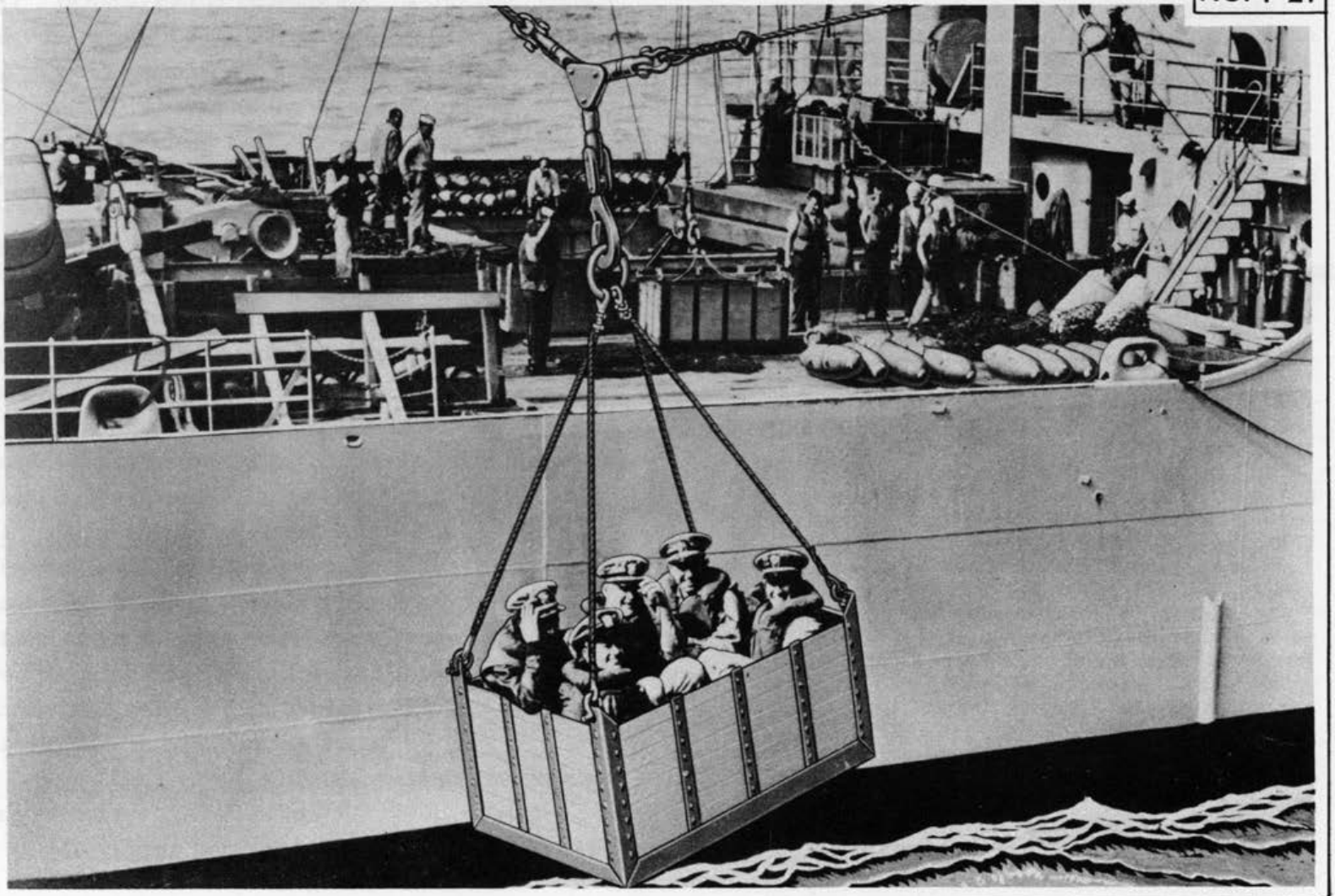
TRANSFERRING INJURED MAN

FIG. 4-20



BURTON TRANSFER

FIG. 4-21



ORIGINAL
(REVERSE BLANK)

APPENDIX A

REPLENISHMENT AT SEA FROM SPECIALLY EQUIPPED MERCHANT SHIPS

APPENDIX
A

REPLENISHMENT AT SEA FROM SPECIALLY EQUIPPED MERCHANT SHIPS

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APPENDIX A

Replenishment at Sea from Specially Equipped Merchant Ships

A-100 CONCEPT OF REPLENISHMENT

The rapid and efficient replenishment of escort vessels at sea is vital for the success of convoys. Convoy operations require the use of merchant ships to replenish escorts. Since the average merchant ship's crew consists of a mere handful of experienced deck hands, for whom replenishment at sea is mainly overtime work, gear must be set up so as to minimize their efforts. Underlying the whole layout is therefore the need for the gear to be operated with the minimum of effort and difficulty on the part of the crew; this means that the layout for a given ship must be decided on with the operating procedure clearly in mind, and with the determination that all possible adjustments shall be made by the fitting-out yard during equipment, for the sake of simplifying operation of the gear on service.

The procedure for oiling at sea (the most common type of replenishment) is simple, straightforward seamanship, and the equipment provided is also simple. Any experienced seaman with a knowledge of the requirements could produce an appropriate equipment and could operate it. To ensure success, however, he would need to inform the escort which he planned to refuel of the nature of his equipment, its arrangement, and his proposed method of carrying out the operation.

This appendix has been prepared to provide a ready reference of the material required for replenishment, and to outline procedures, so that there will be a common basis of understanding by escort commanders, merchant ships, escort vessels, convoy commodores, naval port control officers, and outfitting activities. Appendix B consists of a table of equivalent terms which will help with unfamiliar terminology.

A-101 NECESSITY FOR RAPID FUELING. Fueling, since it is done most often and requires the most time, will be the primary procedure presented in this appendix, but other procedures are similar. It must be done as rapidly as possible, because the safety of the escort as well as the entire convoy is reduced.

The optimum pumping rate per hour is to be 400 tons (2600 barrels), or 110,000 gallons.

Escort vessels and tankers are vulnerable to attack when coupled for fueling. The convoy is vulnerable because of the absence of the escort from the screen. Also, fast convoys often have to slow down during fueling operations so rapid fueling decreases the length of time the entire convoy is endangered by such slow speeds.

In order to expedite the fueling operation, oilers fitted with heating coils should always maintain oil, in those tanks to be used for fueling escorts, at that temperature required to achieve the optimum pumping rates for their particular pumping installations but not to exceed 100° F. (38° C.). Escorts may take any opportunity to refuel, even on short notice, so tankers should keep oil at transfer temperature at all times throughout passage.

A-102 MANEUVERING

a. Fueling Course and Speed. The fueling course and speed will be determined by the escort commander. If weather conditions permit, the tanker will adopt the course and speed of the convoy.

(1) Alongside Method. In general, a course will be chosen to put the wind one to two points on the disengaged bow of the tanker. During heavy weather it may be necessary to head downwind. Optimum fueling speeds range between 10-15 knots, with 12 knots considered the most practical. Below 8 knots it is very difficult for the escorts to maneuver and maintain station; above 12 knots some tankers lose maximum pumping capacity.

(2) Astern Method. Variations in speed assume more importance than steering a steady course when an escort is fueling astern of a tanker. Because judgment of relative speed and distance is more difficult than in abeam methods, great care must be taken in giving revolution orders. The maximum practical fueling speed by astern methods is 15 knots, and 8 knots is the practical minimum. Sea conditions, strength of the gear being used, and the necessary reserve speed of ships taking part, are the governing factors. The tanker's most suitable speed while recovering gear is 6-8 knots, and it should not exceed 10 knots.

b. Station Keeping. In all cases it is the responsibility of the tanker to maintain a steady course and speed as prescribed by the escort commander. The escort being refueled is responsible for adjusting her course and speed to maintain correct station on the tanker.

(1) Changing Course. Alterations of course during fueling operations are relatively dangerous; however, it may become tactically necessary to change course during such an operation. It is the

responsibility of the tanker to keep the escort informed of any alterations in course and speed. In such an event, the entire force should change course in 20^{o} steps, with each fueling unit (tanker and alongside replenishing ships) accomplishing each step in 5^{o} increments. The tanker is the controlling ship for this maneuver. When the OTC signals to alter course 20^{o}, the master of the tanker will do the following:

1. Indicate commencement of each 5^{o} increment by waving a flag (red for port turns, green for starboard turns) in a circular motion above his head
2. Hold the flag steady while ship is swinging to new course
3. Wave the flag up and down when steady on each new 5^{o} increment
4. Hold flag in horizontal position, arm outstretched, on completion of the last 5^{o} increment.

The officer of the deck of the escort will make similar signals to indicate the movements of his ship. During the course change, the escort will maintain her relative position alongside by careful use of engine and rudder. The escort commander should not order any subsequent alteration of 20^{o} until he is satisfied that all units have steadied on the previously signaled course.

(2) Changing Speed. Alterations in speed by the tanker should be made in increments of less than 1 knot.

A-103 COMMUNICATIONS. Communications during fueling will be by flashing light, flag hoist, and special hand signals. Telephone communication between ships will not be used. Communication by megaphone or loud hailer during approach or emergencies may be used, but should be held to a minimum to avoid noise and confusion.

a. Progress Signals. Visual flaghoist signals, as shown in Figure A-1, will be used to indicate stages of the approach during replenishment operations.

b. Control Signals. Hand or light signals shown in Figure A-2 will be used between fueling stations to control lines, hoses, and fuel. In alongside replenishment, stations shall be marked by the code shown in Figure A-3. The light box used at night at fueling stations is shown in Figure A-4. In astern replenishment the following signals shall be displayed at the fueling stations in both ships:

SIGNAL		MEANING	
Day	Night	Receiving Ship	Delivery Ship
White flag	White light	Hose connected. Start pumping.	Pumping started.
Red flag	Red light	Stop pumping or blowing hose.	Pumping or blowing through has stopped.
Yellow flag	Yellow light	Blow down the hose.	Blowing down started.

APPROACH, RIDING ALONGSIDE, AND DEPARTURE

FIG. A-1

a. DELIVERING SHIP STEADY ON COURSE AND SPEED. FLIES ROGER AT THE DIP (ON RIGGED SIDE).

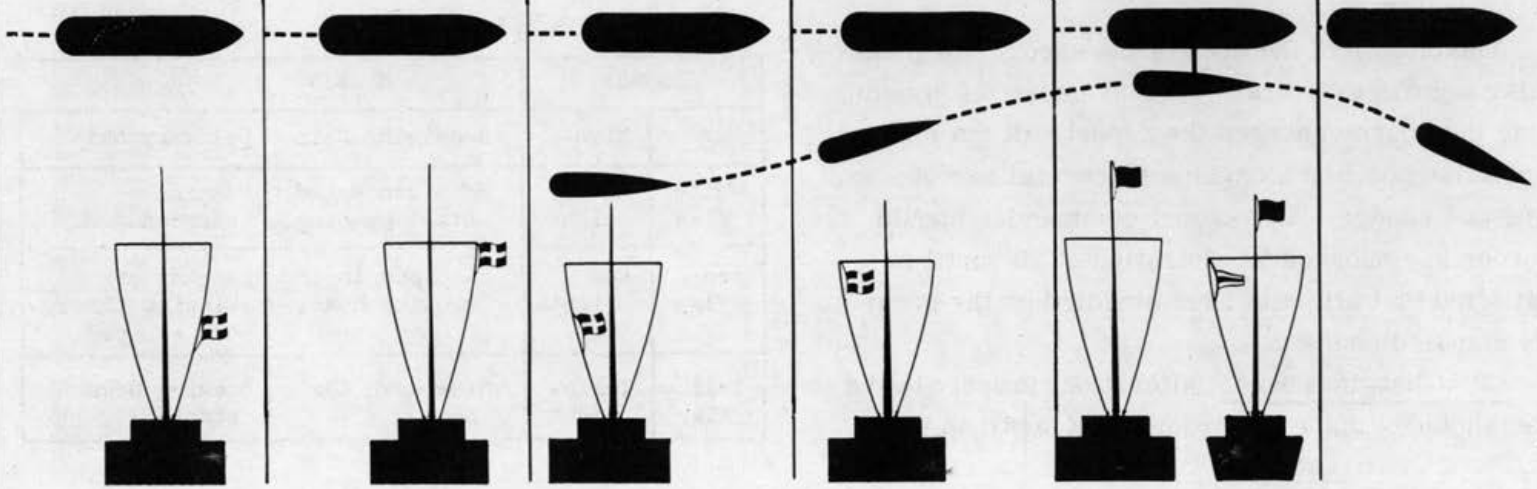
b. DELIVERING SHIP READY TO RECEIVE. FLIES ROGER CLOSE-UP.

c. RECEIVING SHIP READY TO MAKE HER APPROACH. FLIES ROGER AT THE DIP (ON RIGGED SIDE).

d. COMMENCING APPROACH. RECEIVING SHIP HOISTS ROGER CLOSE-UP.

e. AS FIRST LINE IS SECURED, BOTH HAUL DOWN ROGER. BOTH FLY BAKER AT THE FORE IF TRANSFERRING FUEL OR AMMUNITION. FIFTEEN MINUTES BEFORE DISENGAGING, RECEIVING SHIP HOISTS PREP AT DIP. ON DISENGAGING, RECEIVING SHIP HOISTS PREP CLOSE-UP.

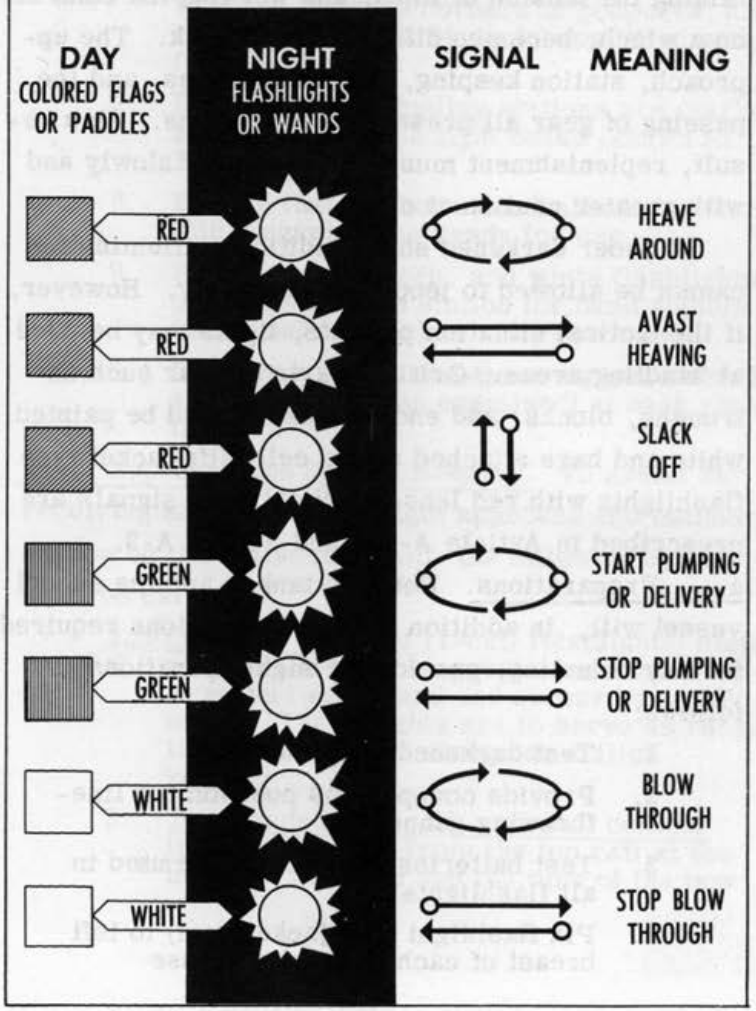
f. ON DEPARTURE, RECEIVING SHIP CLEARS AHEAD AND AWAY. WHEN CLEAR OF DELIVERING SHIP, RECEIVING SHIP HAULS DOWN PREP.



HAND OR LIGHT SIGNALS

FIG. A-2

FOR CONTROLLING LINES, HOSES, AND PUMPING



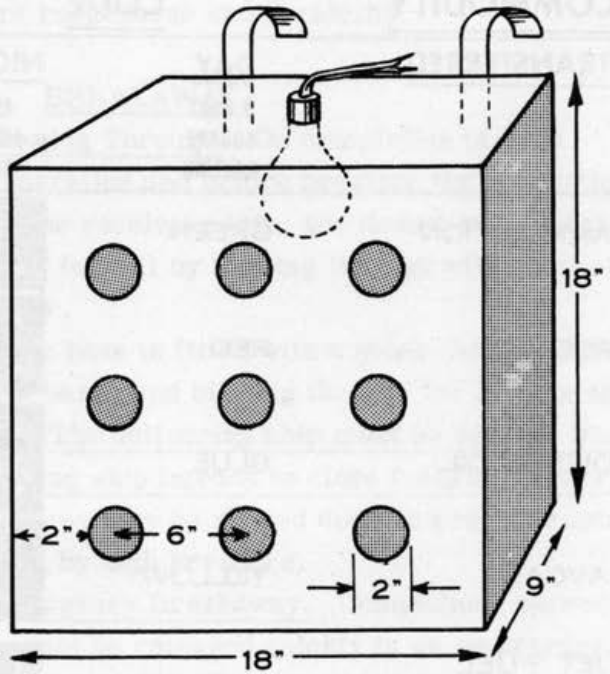
STATION MARKER CODE

FIG. A-3

COMMODITY TRANSFERRED	CODE DAY 3 FOOT SQUARE BUNTING	CODE NIGHT RED LIGHT BOX
AMMUNITION	GREEN	
FUEL OIL	RED	
DIESEL OIL	BLUE	
AVGAS	YELLOW	
JET FUEL (JP-5 OR AVCAT)	YELLOW-BLUE TRIANGLES	
WATER	WHITE	
STORES	GREEN	

LIGHT BOX

FIG. A-4



Box is of plywood or light weight sheet metal. Holes are equipped with individual hand-operated shutters and are covered on the inside with red Lucite. Interior of box to be painted with high gloss white enamel and illuminated by 25-watt light shielded to prevent direct emission of the light.

A-104 REPLENISHMENT AT NIGHT. At night it is often impossible to observe the progress of activity on the deck of the opposite ship. What is easy to perform in daylight, such as connecting hoses, maintaining the tension of lines, and working the controls on a winch, becomes difficult in the dark. The approach, station keeping, communications, and the passing of gear all present complications. As a result, replenishment must proceed more slowly and with greater caution at night.

Under darkened ship conditions, illumination cannot be allowed to jeopardize security. However, if the tactical situation permits, lights may be used at handling areas. Critical parts of gear such as troughs, blocks, and ends of hose should be painted white and have attached single cell, life-jacket type flashlights with red lenses. Night hand signals are prescribed in Article A-102 and Figure A-2.

a. Preparations. Both the tanker and the escort vessel will, in addition to the preparations required for day refueling, provide for night operations as follows:

1. Test darkened-ship switches
2. Provide conspicuous position for line-throwing gunners
3. Test batteries and bulbs to be used in all flashlights
4. Pin flashlight (life-jacket type) to left breast of each life jacket in use

5. Issue plastic police whistle to each man requiring life jacket. This is worn on a lanyard around the neck, with the whistle tucked inside life jacket to prevent fouling in line or gear.

6. Aboard replenishment ships, set life buoy watch at forward corners of poopdeck, and equip each with a 24-inch buoy fitted with float lights.

7. Ensure that all fueling stations are marked at the railing with light boxes (shown in Figure A-4).

8. Ensure that bullhorn (loudhailer), or electric megaphone is ready for use.

9. Provide red, green, and white flashlights or wands at each station for hand signals for signaling as shown in Figure A-2.

10. Provide a spare line-throwing gun (tested and with firing pin examined) at each station.

b. Approach and Station Keeping. To assist the receiving ship to make a night approach and maintain station on the delivering ship, the following lights shall be carried:

1. One dim red light (1-cell flashlights) atop each of the after kingposts, so hooded as to reflect downward and outward at a 45^{O} angle. These lights are to serve as range lights to assist in alongside station keeping

2. Two shaded, red, 50-watt hull contour lights suspended from the top rail at the break of the poop and the turn of the bow

3. Dimmed red truck and screened wake lights to be shown by the replenishment ship only during the approach of the receiving ship. They will be turned off after the latter has settled down in position alongside.

c. Aids to Personnel. To assist personnel in handling cargo and working the rigs, the following measures should be taken:

1. Red cargo lights (with those above-deck provided with shields) should illuminate working areas on deck and in the holds.

2. Clusters of three, red, 1-cell flashlights, clipped on or taped on, should illuminate all cargo hooks, nets, transfer chairs, trolley blocks, and hose saddle (trough) blocks.

3. Clusters of three, red, 1-cell flashlights, located at each marker flag, should illuminate the distance line.

4. White lights should not be used on dark or foggy nights because of danger caused by their blinding effect.

d. Light Specifications. The red lights described above shall have red colored lenses or filters which, when illuminated by International Commission on Illumination (I.C.I.) Illuminant A, shall pass less than one percent of light of wavelength shorter than 5800 A^{O} and shall pass at least 90 percent of light of wavelength longer than 6800 A^{O}. Cargo light shields shall be cylindrical with a length equal to 1 1/4

diameters of the lens and shall fit tightly to the lens without leakage; the interior will be painted dead black to assist in eliminating upward reflected light. The one-cell flashlights should be specially designed to assure ruggedness and durability.

A-105 BREAKAWAY

a. Blowing Through. On completion of each fueling operation and before breaking the connection on board the receiving ship, the tanker must clear the hose of fuel oil by blowing through with compressed air.

If the hose is fitted with a quick closing valve at the discharge end blowing through the hose is not required. The delivering ship must be notified when the receiving ship intends to close fuel line valves, so that pumps may be slowed down to prevent rupture of the hose by high pressure.

b. Emergency Breakaway. Connections between vessels must be released quickly in an emergency. In all replenishing an enemy attack should be considered to be imminent, so preparations for quick release of the gear must be made accordingly. It is the responsibility of the escort to release or cut all connections rapidly in an emergency. For this reason enough men on the escort should be stationed with knives, axes, and sledgehammers instantly available to effect a quick separation of the escort and replenishment ship. The tanker must be able to stop pumping instantly when there is an emergency or the "breakaway" order is given.

A-110 EQUIPMENT AND METHODS OF FUELING AT SEA

There are two principal methods of fueling at sea which have been standardized for NATO navies: the "alongside (close-in) method" and the "astern method". U. S. merchant tankers will ~~always~~ normally use the alongside method, whereas British tankers will always use the astern method. Tankers of other nations will be equipped to use either of these methods that they deem the more desirable. Escorts must be able to receive fuel by both methods, because heavy weather may preclude use of the alongside method and require astern fueling. Figure A-5 is a liquid conversion table. (Err. #2)

A-111 STANDARD FUELING EQUIPMENT

a. Tankers. Those merchant tankers designated by each of the NATO nations as convoy escort replenishment tankers will be equipped with the following gear:

1. Hose. For astern fueling, 600 feet (plus 4 spare lengths) of 6-inch internal diameter

LIQUID CONVERSION TABLE

FIG. A-5

Item	Tons			Liters	Cu. Meters	Gallons		U.S. Barrels	Cu. Ft.
	Metric 1000 kg	Long 2240 lbs	Short 2000 lb			U.S.	Imperial		
Fuel Oil	1	0.984	1.102	1050	1.050	277	230.65	6.59	37
Avgas	"	"	"	1390	1.390	366	304.85	8.71	49
JP-5	"	"	"	1250	1.250	329	274.40	7.84	44
Diesel Oil	"	"	"	1190	1.190	314	261.80	7.48	42
Water	"	"	"	1000	1.000	269	220.15	6.29	35.3

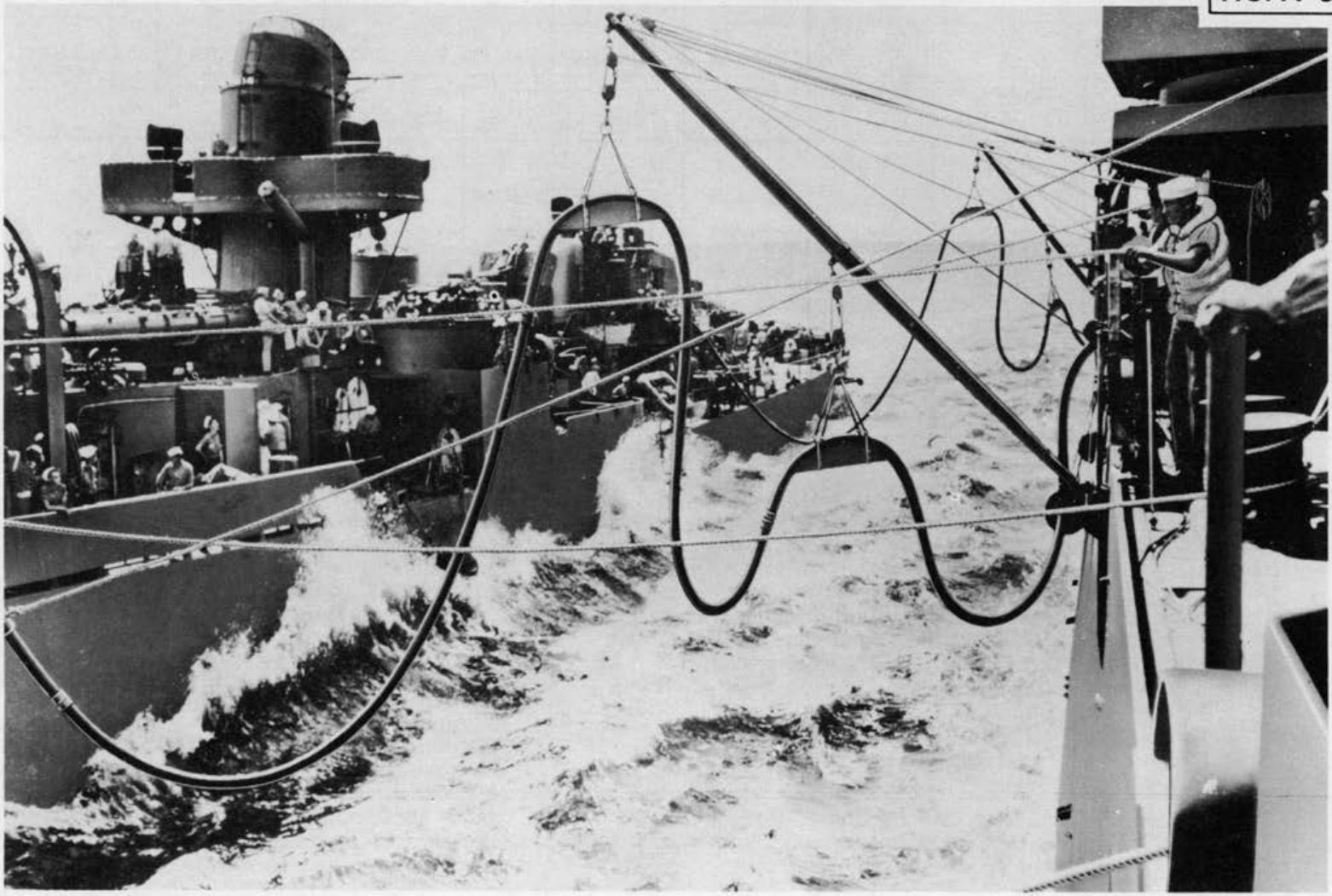
buoyant hose similar to Admiralty Pattern No. 6000 except that the length of the individual hose sections may be in accordance with national preferences. Enough connecting hose (6-inch internal diameter hose of any type) will be provided to reach from the tanker's fueling connection to the fantail, and will terminate in a suitable adapter to connect it to the buoyant hose. For abeam methods, the tanker will also be equipped with six 15- or 20-foot lengths of 6-inch internal diameter wire-stiffened hose for use over the saddles.

2. Coupling. The hose end for the receiving ship will have a coupling with a Unified Thread (British Standards 1580:53) of 4 threads per inch similar to Admiralty Patterns, Nos. 6016 and 6017 (male and female). If the escort's fueling connections are not compatible, the escort will provide an adapter incorporating a free turning, female threaded nut for connecting to the male end of the hose.

3. Additional Fittings. Tankers will further be supplied with conical caps and plugs of galvanized steel (similar to Admiralty Patterns, Nos. 6009 and 6010) for handling the hose; protecting caps of galvanized steel (similar to Admiralty Patterns, Nos. 6007 and 6008) for protecting the hose threads when not in use; and securing clamps and adapters (similar to Admiralty Patterns,

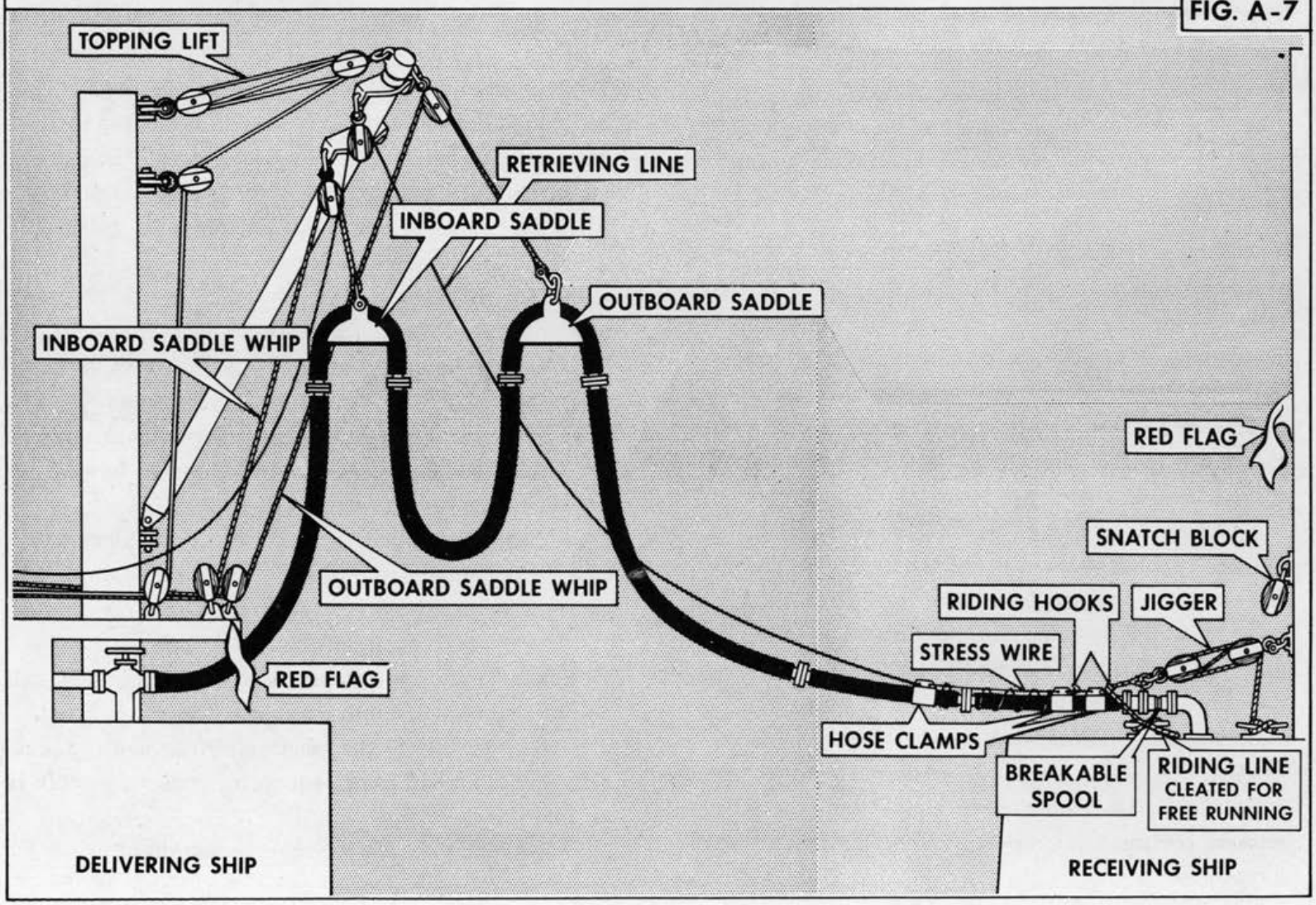
CLOSE-IN FUELING

FIG. A-6



CLOSE-IN RIG

FIG. A-7



Nos. 6020 and 6021) for connecting the bridle.

b. Escorts. Escorts may connect the hose in one of the following ways:

1. By coupling it directly to own deck fueling connection,
2. By coupling it to a hose previously connected to the deck fueling connection, or
3. By fitting the hose into an open fueling trunk.

A-112 ALONGSIDE (CLOSE-IN) FUELING. The escort commander should advise the tanker of the side on which fueling is to be done in ample time for the gear to be rigged; only one hose will be passed. Both tanker and escort will be advised by the escort commander of the course and speed to be maintained during the fueling operation. Figure A-6 shows use of the close-in rig by two naval ships.

The course should be the convoy course if wind and sea conditions permit; otherwise, a course to place the wind or sea (whichever is controlling) 1 or 2 points on the bow opposite the fueling side is desirable to form a lee for the escort.

The usual fueling station on the tanker is just abaft the amidship deckhouse; if it is at any other location the tanker should so advise all escort vessels in advance. The escort vessel must take fuel at her forward fueling station only, unless special arrangements can be made on the tanker for fueling the after tanks. Escorts should shift fuel to after tanks, as necessary, prior to fueling.

a. Gear Required (Figure A-7)

(1) Distance Line. This line, a 21-thread, 1 1/2" circumference manila, is among the first to be passed across and serves as an indicator for the distance between ships. By watching it, the commanding officer of the receiving ship will know immediately when his vessel is coming in too close or going out too far. (See Figure A-8.)

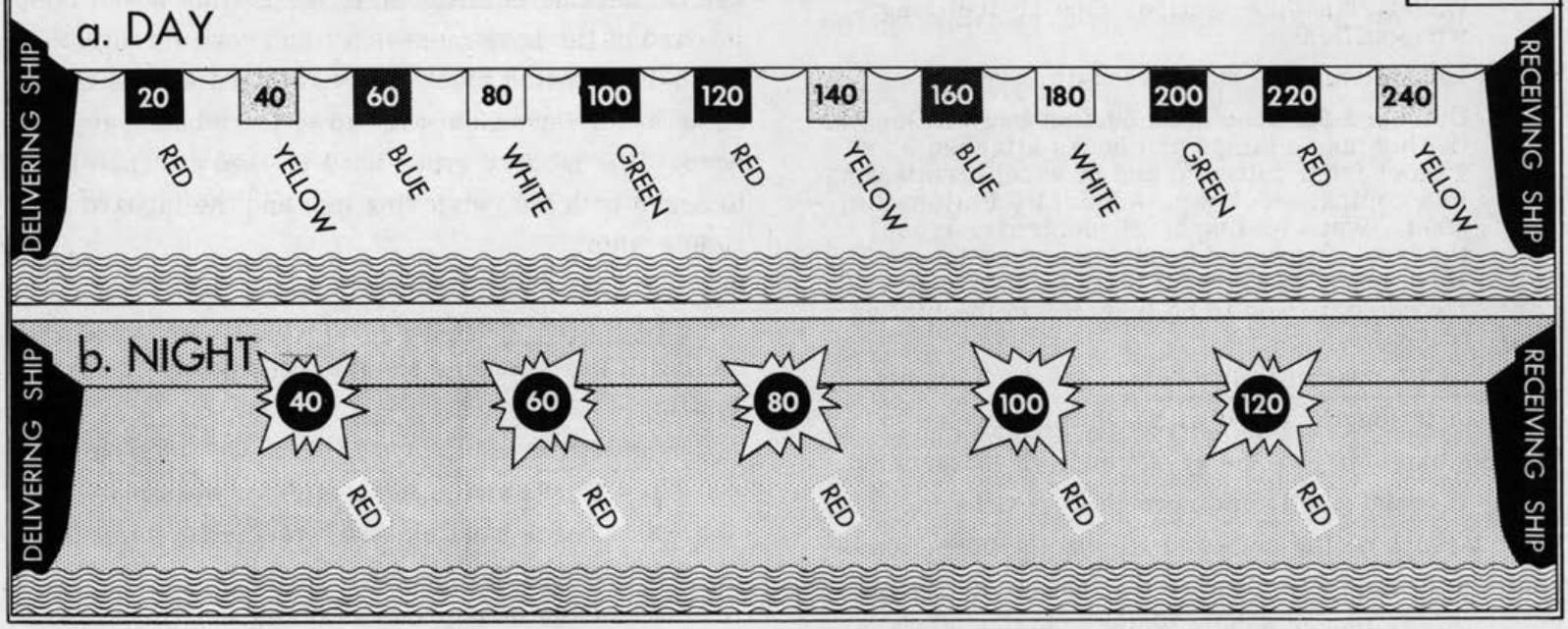
The distance line is passed by the delivering ship to the receiving ship and the receiving ship tends it, always keeping it taut. The zero end is secured to the rail of the delivering ship. The running end is held over the rail of the receiving ship at right angles to the ship's fore-and-aft line and in view of the receiving ship's conning officer.

Actual distances are marked at 20 foot intervals on the line during daylight by colored cloth or painted, 8" x 10" canvas markers with numerals clearly shown. At night clusters of three, single-cell, life-jacket type flashlights with red lenses will be used instead of cloth markers. Markers must always be visible to the conning officer and if necessary lights should have protruding lenses, visible in all directions.

(2) The Hose Messenger consists of a

DISTANCE-LINE MARKINGS

FIG. A-8



3 1/2-inch manila line, 40 fathoms in length, and fitted with a thimble eye and a 3/4-inch diameter shackle at one end; and is taper-spliced at the other end with 15 fathoms of 21-thread manila, to which is spliced 30 fathoms of 6- or 9-thread manila. The thimble eye of the messenger is shackled to the hose clamp, 9 feet from the outboard end of the hose, and the messenger is married to the hose at 3-foot intervals and seized with two turns of 21 thread at the end of the hose.

(3) The Hose - 210 feet long, consisting of 6-inch internal diameter buoyant hose similar to Admiralty Pattern No. 6000 and wire-stiffened hose. This will be made up as follows:

Oiler Inboard end: One 30-foot length, buoyant

Inboard saddle section: One 15-foot length, wire-stiffened

Section between saddles: Two 30-foot lengths, wire-stiffened

Outboard saddle section: One 15-foot length, wire-stiffened

Extension: One 30-foot length, buoyant

Outboard Section: Two 30-foot buoyant lengths (with 2 hose clamps and hooks attached 9 and 13 feet from outboard end of hose) terminating in a conical steel cap, Admiralty Pattern No. 6009. When fueling U. S. destroyer types, the hose clamp and hook are moved inboard sufficiently to allow 10 feet of clear hose at the outboard end to be inserted in the fueling trunk.

(4) Inboard Saddle Whip. A 5-inch manila, 240 feet in length, fitted with a thimble eye and a 1-inch diameter shackle at one end. It is shackled to the inboard saddle and rove through a 14-inch snatch block on the outboard side of the boom heads and led through a fairlead to the inboard gypsy head.

(5) Outboard Saddle Whip. This consists of 300 feet of 5-inch manila. The line if fitted with a thimbled eye and 5/8-inch diameter shackle at one end. The whip is shackled to the outboard saddle, and rove, as a single whip, through a block on the underside of the boom head using the pad eye below the head block and placing the shackle pin forward-to-aft. The line is led through a fairlead forward of the king post to the gypsy head of a winch.

(6) Retrieving Line. A 3 1/2-inch manila, 50 fathoms long, fitted with a thimble eye and a 3/4-inch diameter shackle at one end. The thimble eye of this line is shackled to the 13-foot hose clamp inboard of the hose messenger and rove through a 12- or 14-inch snatch block on the forward side of the boom head, through a fairlead to the inboard gypsy head. The inboard gypsy head is used alternately to serve both the retrieving line and the inboard saddle whip.

b. Preparation: Check-Off Lists

(1) Tanker. When preparing to carry out refueling at sea, tankers should check on the following details:

(a) Deck

1. Purge and check telemotor system
2. Check hand electric steering system
3. Check gyro error
4. Have megaphone available
5. Have electric megaphone on hand, tested, and ready for use
6. Check distance line
7. Ensure that only properly tested hose is used
8. Have distance line and messenger faked down on forward well deck, clear for running
9. Have two heaving lines ready for use

10. Mark fueling station with 3-foot square of red bunting or light box
11. Test winches
12. See that inboard saddle whip is belayed to cleat on deck and faked down free for running
13. See that outboard saddle whip is clear for running and is led to a winch gypsy head
14. See that topping lift brake is set and that preventer stoppers are in place
15. Check side for fenders. Both 3-cluster, and 3-ball fenders should be used on each side where needed
16. Rig in lifeboat and remove sea painter
17. Ensure that all men on deck are wearing inherently buoyant life jackets
18. In freezing temperatures, ice should be removed from fueling areas prior to commencement of replenishment operations. Large quantities of sand should be available for sanding areas that become icy.
19. Ensure that fueling boom is swung out 90° and topped up so that the head of the boom is just clear of the ship's rail.
20. Be sure that hose is topped up inboard to outboard as follows: Two-block the inboard saddle; top-up the outboard saddle to a point just below the inboard saddle; top-up the end of the hose with the retrieving line to a point just below the outboard saddle; lead the hose messenger to the superstructure and fake over the side in bights not over 10 feet in length. Stop each bight to the life rail securely.

(b) Engineering

1. Have maximum power available
2. Be sure that oil cargo being transferred is heated to temperature required to achieve optimum pumping rate for installed pump installation. Do not heat above 100° F (38° C).
3. Test all pumps; line up on first tank to be used and circulate oil to ensure that pumps are not airbound
4. Check all interior telephone communications
5. Cut in steam on deck and warm up all deck machinery
6. Maintain fire-main pressure at 100 pounds
7. Lead out and inspect necessary fire-fighting equipment
8. Ensure that the following equipment is available at each transfer station: tools, rags, sand, sawdust, and drip pans
9. Check to see that there is sufficient air pressure for blowing through hoses and that there are no leaks
10. Take ullages and temperatures of oil tanks.

(2) Escort. When preparing to carry out refueling at sea, escorts should check on the following details:

1. Deballast and redistribute fuel to after tanks, as necessary
2. Station experienced steersmen, throttlemen, and other special sea detail personnel

3. Detail men at the forward fueling station to receive and tend the distance line and the hose-line messengers
4. Station the fueling detail with a qualified person in charge. All topside personnel shall wear inherently buoyant life jackets.
5. Clear all unengaged men from the fueling scene
6. Provide chafing gear at the point where the hose comes aboard. Old canvas, boat fenders, or cargo nets will suffice
7. Mark fueling station with 3-foot square of red bunting or light box
8. Provide the fueling station with necessary tools for making connections, opening valves and cutting lines and breaking the rigs in case of emergency
9. In freezing temperatures, ice should be removed from fueling areas prior to commencement of replenishment operations. Large quantities of sand should be available for sanding areas that become icy.
10. Provide shores to place under the end of the hose in order to lift it off the deck if necessary
11. See that drip pans, rags, old canvas, and the like are available for controlling oil spillage
12. Rig in lifeboats and other movable projections on the fueling side
13. Have line-throwing guns available and tested
14. Open necessary fueling trunk tops
15. Provide a 12-inch snatch block at the fueling station to fair lead the hose line messenger. Locate this block inboard of the ship's side, about 6 feet above the deck. Provide knives to cut messenger stops. Provide a riding line for the hose at the fueling station. This line should be of 4- or 5-inch manila about 3 1/2 fathoms long with one end free for securing to a nearby cleat and the other end eye-spliced for the insertion in the hook or shackle of the jigger tackle.

c. Coordinated Procedures. The following procedures are to be coordinated by the escort and the tanker. The left column lists successive steps for the tanker, and the right column successive steps for the escort. When two items appear side by side on a page, they are to be carried out simultaneously.

THE APPROACH

Tanker	Escort
1. Take fueling course and speed	1. When ordered, take station about 500 yards on the quarter of the tanker
2. When steady on course and speed, hoist the signal flag ROGER at the dip on the side rigged.	2. Hoist ROGER at the dip when rigged and ready to come alongside.

Tanker	Escort
3. Hoist ROGER close up when ready to make delivery.	3. Hoist ROGER close up when commencing approach.
	4. Using a speed of 3-5 knots greater than that of the tanker, end up on a parallel course with a distance of 60-80 feet between ships--do not overrun. The conning officer must be alert to the possible ill effects of the propeller current from the tanker.
4. At earliest possible moment, send over gun line with distance line and hose messenger attached.	5. Be prepared when requested to use own gun line or heaving lines if the tanker's line breaks or fouls.
	6. Haul in gun lines and distance line and tend, always keeping it taut.
5. As soon as both ships have settled in proper relative position, commence paying out messenger line by hand.	7. Haul in hose messenger as it is passed by the tanker. Lead it to the 12-inch snatch block located about 6 feet above deck; to a winch; or to a cleared space on deck, if it is hauled in by hand.
6. Pay out retrieving line and saddle whips, allowing the hose to come across to the escort.	8. As the hose comes on board, cut the stops securing it to the messenger one by one till the riding hook is within easy reach.
	9. Slip the bight of the riding line over the riding line hook and set taut.
7. Haul down ROGER when first line is secured.	10. Haul down ROGER when first line is secured.
	11. Remove cap or plug from hose and couple it to fueling connection or place in fueling trunk.
8. Upon receipt of bitter end of messenger from escort, tend messenger as ships open or close on each other.	12. Restop messenger to the hose, remove it from the snatch block, and return the bitter end to the tanker.
	13. Make up and return tanker's gun line.

PUMPING AND TENDING HOSE

Tanker	Escort
1. Commence pumping when requested by escort. Maintain 100 p.s.i. discharge pressure at the pump.	1. When all ready to receive oil, make hand signal to tanker "Start pumping". If quick-closing valves are used, they must remain wide open while pumping is in progress. They must never be used to control the rate of flow of the oil.
2. Hoist BAKER at fore truck when pumping commences.	2. As soon as oil commences to flow, hoist BAKER at the fore.
3. During the fueling operation, the inboard and outboard saddle whips must be continually tended to keep the bights of the hose out of the water, or to ease the strain on the hose as the ships roll. It is especially necessary that alert, intelligent men and fast moving winches be used to control the outboard saddle.	3. Maintain station on the tanker, being alert at all times for unexpected changes in her course or speed due to wind or sea conditions.

DISENGAGING

	1. When within 15 minutes of completion of fueling, hoise PREP at the dip on the outboard yardarm.
1. When "Stop pumping" is signaled by the escort, stop pumping and blow through the hose for about 3 minutes to ensure that it is clear of oil unless quick-closing valves are used.	2. Three minutes before tanks are full, give tanker hand signal, "Stop pumping".
	3. When pumping has been stopped and hose blown clear of oil, remove it from the trunk and replace cap or plug.
2. When hose is blown through, haul down BAKER.	4. Haul down BAKER.
	5. Hoist PREP close up.
3. As the escort vessel eases out the riding line, heave in and two-block the inboard and outboard saddles.	6. Ease out the hose on the bight of the riding line.
4. Stop off the inboard saddle whip, remove it from the winch gypsy head, and belay it to a cleat. Lead the retrieving line to the gypsy head hauling the remainder of the hose back.	

Tanker	Escort
5. Haul in the distance line as it is payed out from the escort.	7. As hose is hauled in by the tanker, return the distance line.
DEPARTURE	
1. Inform the escort vessel by flashing light of the amount of oil transferred (in gallons, barrels, and/or tons) and the temperature of the oil.	
2. Make up all lines and prepare to repeat procedure in fueling next escort.	
	1. After all lines are clear increase speed moderately and clear ahead.
	2. As ship pulls ahead, change course in moderate steps away from the tanker.
	3. Haul down PREP when clear of tanker.
	4. Large changes in course and speed should be made only when well clear of the tanker to avoid causing the stern of the departing ship to swing in too close to the tanker.

A-113 ASTERN FUELING. The astern method will always be used by British tankers, and by all merchant tankers during heavy weather. Distance is governed by the length of hose used: 400 feet in fair weather or 600 feet in heavy weather.

The tanker streams a fleet of 6-inch buoyant hose astern and the end of the hose is picked up and connected by the escort. The receiving ship keeps very accurate station on the quarter of the tanker by keeping her bridge abreast a marker buoy towed by the tanker, and by staying about 40 feet clear of the tanker's wake. While picking up the hose, speed should be not more than 10 knots. Convoy speed may be resumed, by increases of 1 knot at a time, when the hose is secured by the escort.

a. Night Replenishment. The marker buoy is illuminated with a small light, but the spout type float is not normally illuminated because it can be seen by the phosphorescence of the spray thrown up from it. Signals for use at night are prescribed in

Article A-103 and Figures A-2 through A-4.

b. Precautions Against Loss of Fuel. When fueling at sea, particularly at night by the astern method, there is danger that fuel oil may be lost overboard in appreciable quantities because of damage to hoses. In order to detect losses as soon as possible, it is essential that frequent checks be made of the amounts of fuel supplied and received. The following checks should be carried out:

1. The receiving ship, when hoses are connected, signals the number of tons of fuel required.
2. The supplying ship signals the "Time pumping commenced", and subsequently at half hourly intervals determines the aggregate amount supplied.
3. The receiving ship signals at half hour intervals the aggregate amount received, giving the first signal based on dips taken a half hour after "Time pumping commenced".
4. During night fueling, the supplying ship is to report immediately if a sudden drop in back pressure is noted, because this might indicate a burst hose.
5. When fueling is completed, escorts report to the tanker the quantity of fuel received.
6. When fueling astern, signals are made by day with flags which are hauled down as soon as answered, and at night by shaded lamp.

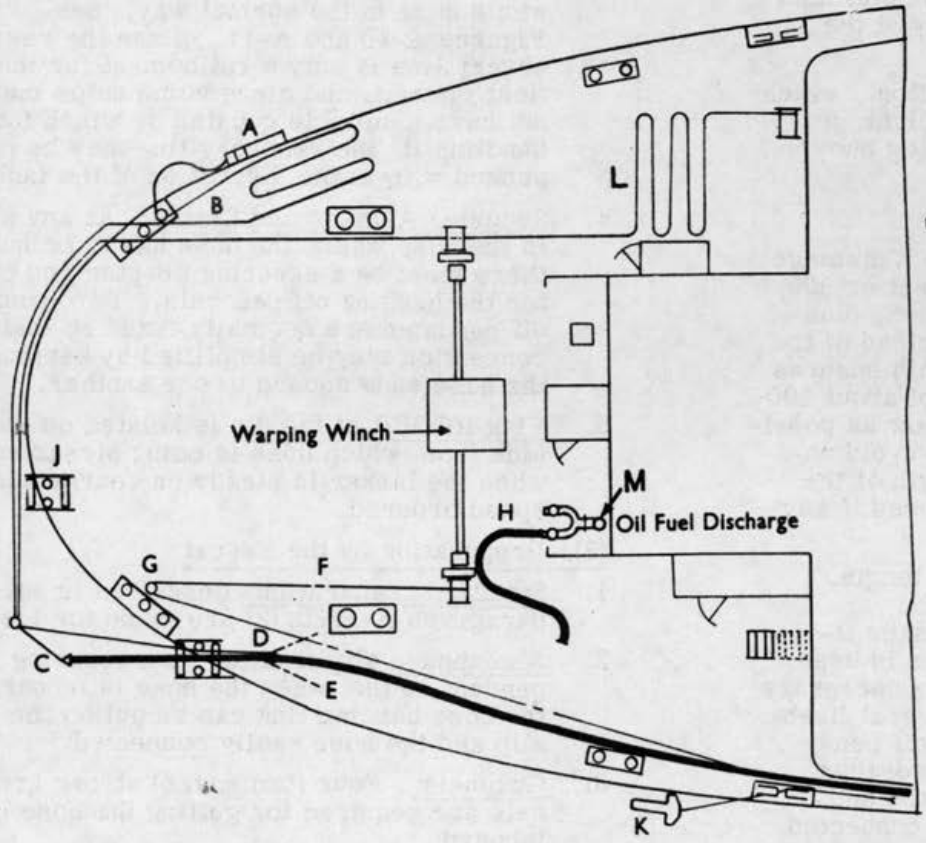
c. Float Method. The float method of passing the lines is quicker if a number of ships are to be fueled in succession, but the gun line method is preferable in rough weather. Telephone cables are not normally used with either method, so visual signals are required.

(1) Gear Required

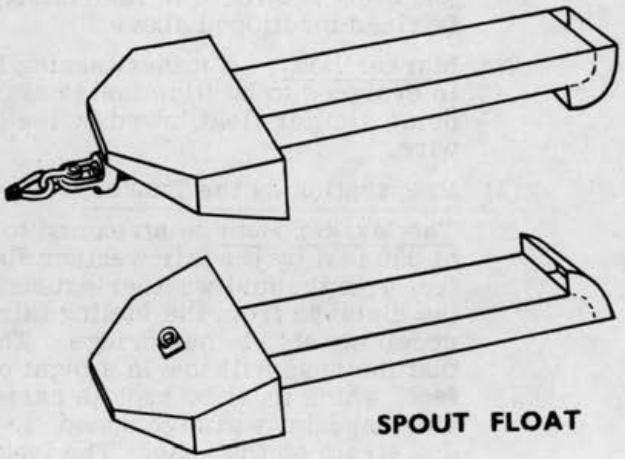
1. Hose. Fair weather fleet, two 15-foot lengths and fourteen 30-foot lengths (total, 450 feet). Foul weather extensions, six additional 30-foot lengths (total, 630 feet). Two 30-foot lengths of hose may be omitted at the discretion of the supplying ship (i.e., 390 or 570 feet). This may save the tanker the necessity of streaming the hose in more than one fleet.
2. Hose Recovery Line. 120 fathoms of 2 1/2-inch F.S.W.R., or 20 fathoms of 2 1/2-inch F.S.W.R. tailed with 100 fathoms of 3 1/2-inch manila if it has to be manhandled on a capstan, fitted with a reduced eye at the winch end and having at the other end, a swivel and hard eye shackled to the ring of the hose end.
3. Hose Line. 10 fathoms of 1 3/4-inch F.S.W.R. long spliced, so that it will go around the capstan, to 40 fathoms of 3 1/2-inch manila. It is fittedwith a hard eye at each end, the wire being shackled with a swivel to the hose end rig and the manila being shackled to a swivel and then by a 3 foot 1 3/4-inch F.S.W.R. wire pendant to a spout or other type float as shown in Figure A-9.
4. Easing Out Wire. A 2 1/2-inch F.S.W.R on the tanker, fitted from a leading block at the forward end of the hose where it is laid out on deck or on the rollers where provided.

SPOUT FLOAT

FIG. A-9



TANKER



SPOUT FLOAT

A Float
B Hose line
C Outboard end of hose (15 ft. length)
D Securing Adaptor
E Hose hanging off pendant
F Starting out pendant
G Snatch Block
H 15 ft. length of hose
J Stern Roller Fairlead
K Marker Buoy and Line
L Hose Recovery Line
M Oil Fuel Deck Connection

5. Starting Out Wire. A short length of 1 1/2-inch F. S. W. R. with a hook at one end is led through a leading block near the fairlead from which the hose is streamed.

6. Two Hanging Off Pendants. Short pendants and slips are fitted in the vicinity of the fairlead mentioned above.

7. Marker Buoy. A minesweeping float, which is designed to be illuminated at night, or some similar float towed by the fog buoy wire.

(2) Preparation by the Tanker

1. The Marker Buoy is streamed to a distance of 320 feet by the fair weather fleet or 500 feet with the foul weather extension, plus the distance from the fueling fairlead of the receiving ship to her bridge. This ensures that the hose will tow in a bight of about 100 feet, which must be kept as narrow as possible, especially at high speed, to avoid undue strain on the hose. The length of the marker buoy wire should be reduced if any lengths of hose are omitted.

2. The Hose is streamed to its full length. This process is begun by using the starting out wire until the hose takes itself out, when the easing out wire is used to control it. In some ships it is necessary to lay out the hose on deck in several fleets. The hose is hung on the hanging off pendants while each fleet is connected; then the easing out wire is shifted to the end of the new fleet, and the hose is connected to the discharge point after it has been fully streamed. The hose is inflated as necessary with low pressure air to give it added buoyancy.

3. The Hose Recovery Line is veered with the hose. Its chief use is for recovering the hose end if the receiving ship should damage the hose line or float, rather than the lengthy operation of recovering the whole hose in the normal way. See Figures A-10 and A-11. Since the recovery line is only a refinement for the float method, and since some ships may not have a suitable capstan or winch for handling it, the recovery line may be dispensed with at the discretion of the tanker.

4. Securing Adapter and Clamp. At any place in the hose where the hose has to be hung, there must be a securing adapter and clamp for the hanging off pendants. Two hanging off pendants are normally fitted so that the connection may be simplified by keeping the hose ends square to one another.

5. Flag ROGER at the dip is hoisted on the side from which hose is being streamed, when the tanker is steady on course and speed ordered.

(3) Preparation by the Escort

1. Standard preparations described in subparagraph A-112b. (2) are made for fueling.

2. A senhouse slip is fitted on a securing pendant so that when the hose is inboard, the hose hanging link can be put on the slip and the hose easily connected.

3. Grapnels. Four (two spare) strong grapnels are required for getting the hose line inboard

4. A roller fairlead or a leading (snatch) block to enable a grapnel line to be manned adequately and the hose line to be brought to the capstan.

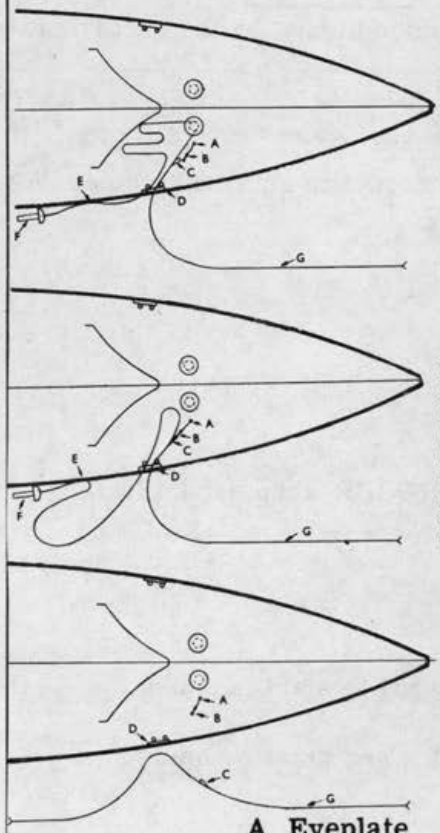
RECEIVING HOSE BY FLOAT

FIG. A-10



DISENGAGING-ASTERN METHOD

FIG. A-11



Becket has reached senhouse slip. Veering is stopped.

Hose line is hung off on senhouse slip, turns are taken off capstan, and all surplus hose line is passed outboard through fairlead.

As hose line draws ahead, senhouse slip is knocked off and float is cut free.

A Eyeplate
B Senhouse slip
C Becket
D Forecastle roller fairlead
E Float line lashed to guardrail
F Spout type float

5. Flag ROGER at the dip is hoisted on the side where the hose will be received, when the escort is ready to close and take the hose.

(4) Coordinated Procedures. The following procedures are to be coordinated by the escort and the tanker. The left column lists successive steps for the tanker, and the right column successive steps for the escort. When two items appear side by side on a page, they are to be carried out simultaneously.

PASSING THE GEAR

Tanker	Escort
1. When ready for escort to approach, hoist flag ROGER close up.	1. Hoist flag ROGER close up when commencing approach.
	2. Approach the spout float from astern.
	3. Grapple the hose line. This should be done at a distance from the float, not at the float itself.
	4. Haul in the hose line by putting the grapnel line in the snatch block and bringing the hose line, when inboard, to the capstan.
2. Haul down flag ROGER when escort hauls ROGER down.	5. Haul down flag ROGER when hose is on deck.
	6. Hang hose by hose hanging link on the slip, and rack hose line on the capstan as a preventer.
	7. Remove conical cap and connect up the hose.
3. Acknowledge signal to start pumping.	8. When ready to receive oil, make hand signal to tanker, "Start pumping."
4. Hoist flag BAKER and start pumping.	9. As soon as oil starts to flow, hoist flag BAKER.

DISENGAGING

Tanker	Escort
	1. Hoist flag PREP at the dip 15 minutes before time of expected completion of fueling.
1. Stop pumping, on receipt of signal from escort.	2. When within about 8 tons of the desired amount of fuel, signal "Stop pumping", to leave room for the two or three tons of fuel left in the hose to be blown through to the receiving ship by compressed air.
2. Blow through hose with compressed air.	
3. On receipt of signal, stop blowing through.	3. When hose is clear of oil, signal "Stop blowing through".
4. Haul down flag BAKER.	4. Haul down flag BAKER.
	5. Hoist PREP close up.
5. When conical cap has been replaced, inflate hose.	6. Disconnect hose and replace conical cap. Signal tanker when cap is replaced.
	7. Take weight on the hose line by capstan.
	8. Slip the hose hanging link.
	9. Veer the hose while dropping astern, until the becket (cut splice) is put on the senhouse slip.
	10. Remove turns from capstan and slip hose line.
	11. Haul down flag PREP and proceed clear of tanker.

d. Gun Line Method (See Figure A-12)

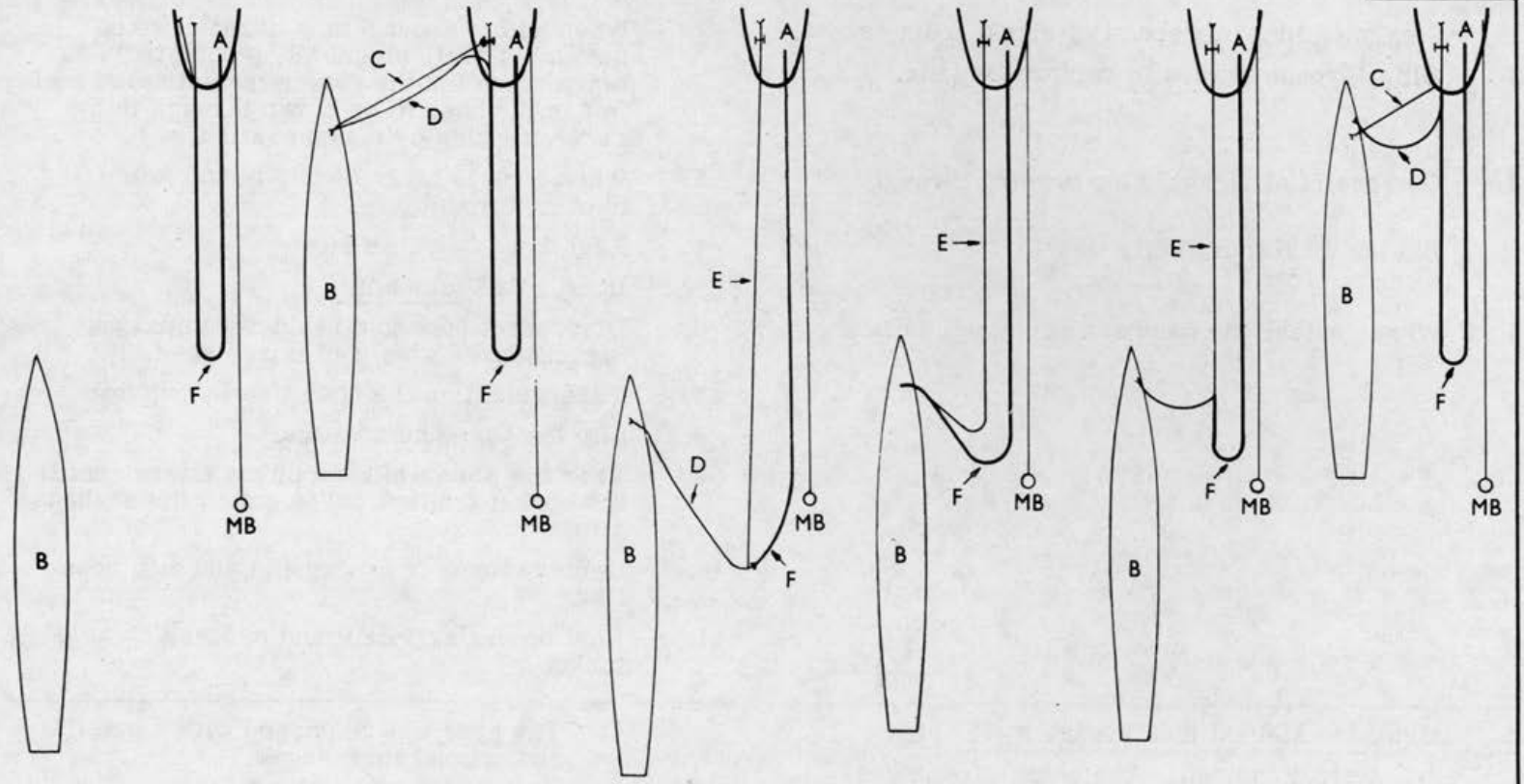
(1) Gear Required. The chief differences between the float method and the gun line method are: (1) the spout or other type float is omitted from the hose line, and (2) the hose recovery line is essential and can never be omitted.

1. The hose line is passed with a gun line and normal messenger.
2. The messenger is retained by the escort until used to return the hose line when fueling is completed.

(2) Preparation. The tanker makes the same preparations as in the float method except that the

GUN-LINE METHOD

FIG. A-12



Receiving Ship Approaching | Passing the Hose Line | Ready to heave in Line | Fueling in Progress | Hose Line Veered | Returning the Line

A Supplying Ship
B Receiving Ship
C Messenger
D Hose Line
E Recovery Line
F Hose
MB Marker Buoy

hose recovery line is not veered with the hose but is retained on board the tanker so that the hose tows in a bight with the hose end at the tanker's stern and the hose line inboard.

The escort makes the same preparations as in the float method except that the grapnels are not required.

(3) Coordinated Procedures. The following procedures are to be coordinated by the escort and the tanker. The left column lists successive steps for the tanker, and the right column successive steps for the escort. When two items appear side by side on a page they are to be carried out simultaneously.

PASSING THE GEAR

Tanker	Escort
1. Hoist flag ROGER close up when ready for escort to approach.	1. Hoist flag ROGER close up when commencing approach.
	2. Close the quarter on the side from which hose will be passed.
2. Pass hose line by a messenger and gun line to the escort.	3. Bring the hose line to the capstan but do not heave in.
	4. Drop back until in station on the marker buoy.
3. Veer hose recovery line as soon as escort has the hose line on board.	5. Heave in the hose line. This should not be done till in station on the marker buoy in order to prevent excessive strain on the hose or hose line.
4. Haul down flag ROGER when escort's is hauled down.	6. Haul down flag ROGER when hose is on deck.
	7. Hang hose by the hose hanging link on the ship, and rack hose line on the capstan as a preventer.
	8. Remove conical cap and connect up the hose.
5. Acknowledge escort's signal to start pumping.	9. Signal tanker to start pumping.
6. Start pumping and hoist flag BAKER.	10. Hoist flag BAKER when oil starts to flow.

DISENGAGING

Tanker	Escort
	1. Hoist flag PREP at the dip 15 minutes before time of expected completion of fueling.
1. Stop pumping, on receipt of signal from escort.	2. When within about 8 tons of the desired amount of fuel, signal "Stop pumping," to leave room for the two or three tons of fuel left in the hose to be blown to the receiving ship by compressed air.
2. Blow through hose with compressed air.	
3. On receipt of signal, stop blowing through.	3. When hose is clear of oil, signal "Stop blowing through".
4. Haul down flag BAKER.	4. Haul down flag BAKER.
	5. Hoist PREP close up.
5. When conical cap has been replaced, inflate hose.	6. Disconnect hose and replace conical cap. Signal tanker when cap is replaced.
	7. Take weight on the hose line by capstan.
	8. Slip the hose hanging link.
6. Heave in the hose recovery line as soon as the escort begins to veer the hose line. This will avoid undue strain on the hose line and enable the escort to begin coming ahead at the earliest possible moment.	9. Veer the hose line.
	10. Close the quarter of the supplying ship.
7. Pass gun line to escort and recover hose line. Or, if another escort is waiting to fuel, tanker may request that the gun line and messenger be passed direct to it by the escort disengaging. In this case the tanker does not heave in the hose recovery line, but after inflating the hose awaits new escort to signal "Start pumping".	11. Pass hose line and messenger back to supplying ship by the gun line. Or, if ordered, the hose line may be passed by gun line and messenger to the next escort to be refueled.
	12. Haul down PREP and proceed clear of tanker.

A-120 TRANSFERRING PERSONNEL AND SOLIDS AT SEA

Personnel, ammunition, or stores may be transferred at sea by the manila high-line or light jackstay methods. These rigs are safe and easily put up and operated. The rig will in all cases be provided by the escort. Preparations, including making ready by departments, the approach and special instructions for night replenishment are the same as for fueling at sea, as presented in Section A-110.

A-121 MANILA HIGH-LINE TRANSFER. The manila high-line can be used to transfer up to 600 pounds of provisions, ammunition, light freight, or personnel. Since manila high-line is safer than wire and is hand tended, this method is the only one used for personnel transfer. See Figure A-13.

The manila high-line consists of a trolley line on which a trolley, equipped with a suitable cargo hook, travels back and forth between the two ships by means of hand-hauled inhaul and outhaul lines.

In order to use a manila high-line, replenishment ships must have the following:

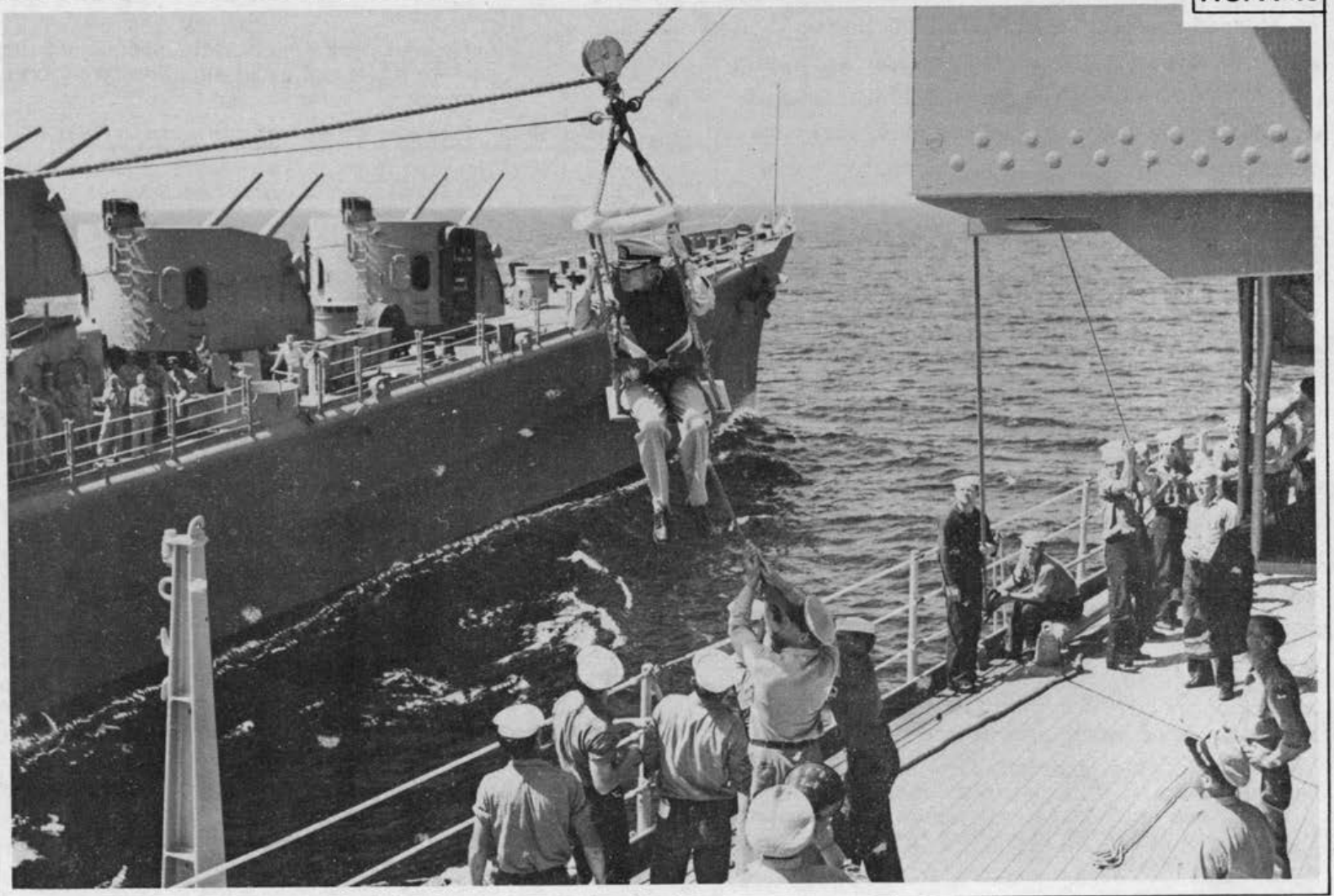
1. A high attachment point at the receiving station, with sufficient strength to support the loaded line: normally a pad eye which is welded or riveted to the ship's superstructure.
2. An additional pad eye of 1-inch diameter stock, located directly below and about 12 to 18 inches from the first pad eye, to support the block used to fairlead the outhaul line.
3. Sufficient deck space in the vicinity of these pad eyes to handle the supplies being transferred.

a. Gear Required by Escorts (Figure A-14)

1. Heaving lines. Two heaving lines, each 120 feet long, to carry the messenger line to the escort.
2. Messenger line. Forty fathoms of 2 1/2-inch manila taper spliced to 15 fathoms of 21 thread.
3. Distance line. A light line with distances marked on it, used in station keeping.
4. Trolley block. One trolley block for manila high-line, similar to U. S. BuShips No. S1801-921816 with hook capacity of 800 pounds.
5. High-line. A 5-inch manila line (3-inch for transferring personnel) 350 feet long with a thimbled eye on its outboard end. This end is connected by a pelican hook to the upper pad eye located on the tanker's superstructure. The other end is rove through the trolley block and a 12- or 14-inch snatch block attached to the lower pad eye on the tanker's superstructure. It is kept taut during transfers by 25 men or by a winch. When personnel are being transferred, the line must be manhandled.
6. Manila outhaul line. A 2 1/2-inch manila is shackled to the escort side of the trolley, run through an 8-inch block located about 12 to 18 inches below the high-line block

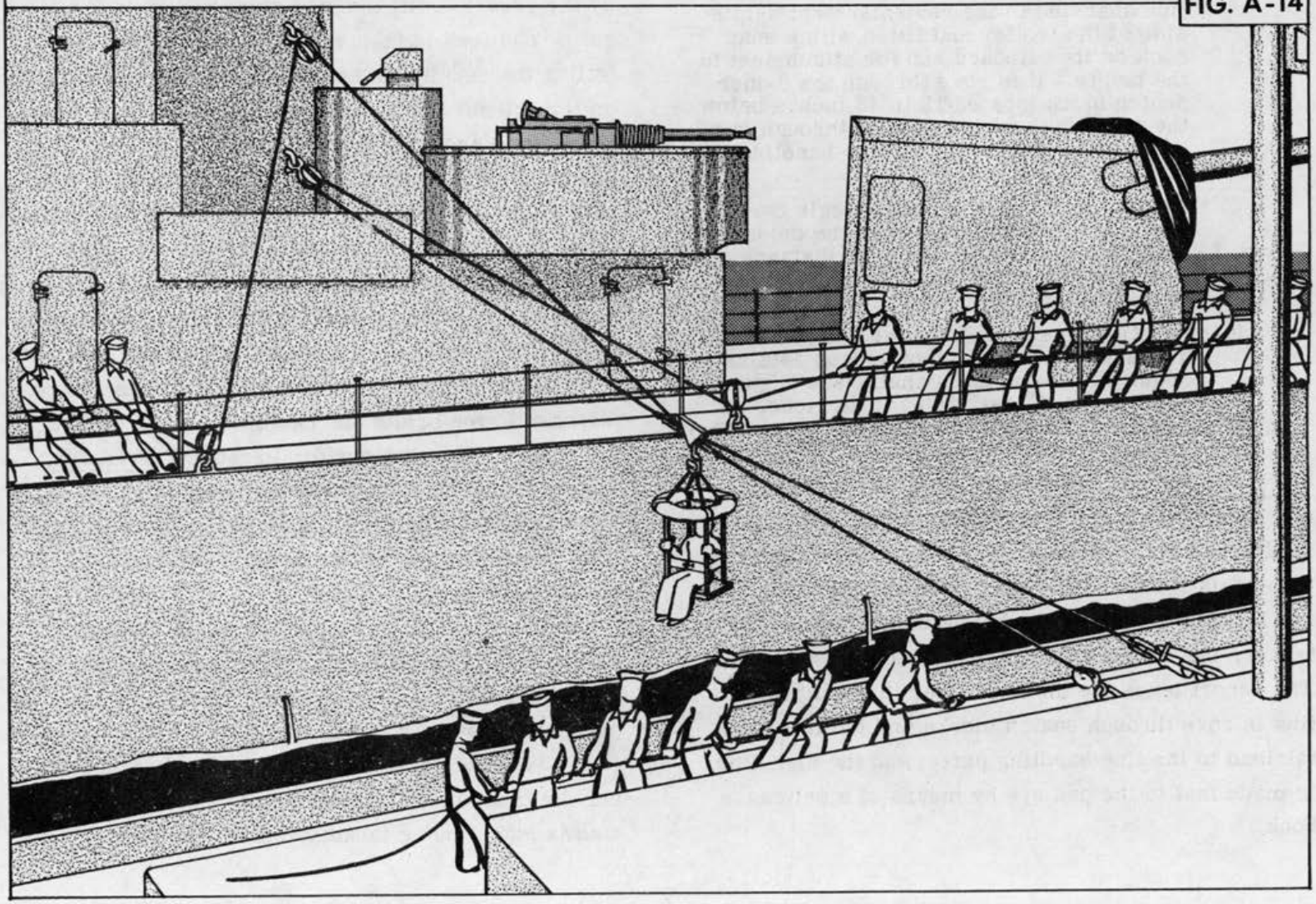
PERSONNEL TRANSFER

FIG. A-13



MANILA HIGH-LINE RIG

FIG. A-14



and led through a fairlead to winch (except when transferring personnel).

7. Manila inhaul line. A 2 1/2-inch manila line shackled to the replenishment ship's side of the trolley and fitted with a snap hook on its outboard end for attachment to the bridle. It is rove through the 8-inch snatch block located 12 to 18 inches below the high-line pad eye and led through fairleads as necessary to the line handling party.

8. Bridle. A 24-inch (1" x 1") angle bar to one side of which is attached the messenger line, and to the other side the distance line, the high-line, and the outhaul line. (Figure A-15.)

9. Additional gear. Thrummed mats for use at transfer points; 6-foot square nets as required; Boatswain's chair, see Figures A-16 and A-17, stirrup, or stretcher as required; 3 large fenders lashed together for use at appropriate points.

b. Procedure. As the escort comes alongside, she sends over a gun line or heaving lines to which is attached the messenger line. The replenishment ship hauls it aboard and the bridle and the other lines are brought over. As the bridle comes aboard the tanker, the distance line is unclipped and secured. The escort tends the distance line. The outhaul line is rove through snatch blocks and led through a fairlead to the line handling party; and the high-line is made fast to the pad eye by means of a pelican hook.

On the delivering ship, the load is hooked to the trolley block and a strain is taken on the high-line by the escort to lift the load clear of the deck and rail. The load is then worked across by the tanker letting the inhaul line slack, and the escort taking up on the outhaul line. When the load is hanging over the landing area, the escort pays out the high-line and inhaul line depositing the load on the receiving ship's deck. The trolley, carrying empty boxes or other material, is returned to the delivering ship by reversing this procedure. When there is a load on the high-line, it is important to keep a good catenary to avoid imposing too great a strain on the line.

When transfer is completed, all lines are reattached to the bridle and hauled in by the escort.

c. Safety Precautions for Personnel Transfer. All personnel who are being transferred at sea must wear inherently buoyant life jackets. In addition, where water temperatures are low, immersion suits should be worn.

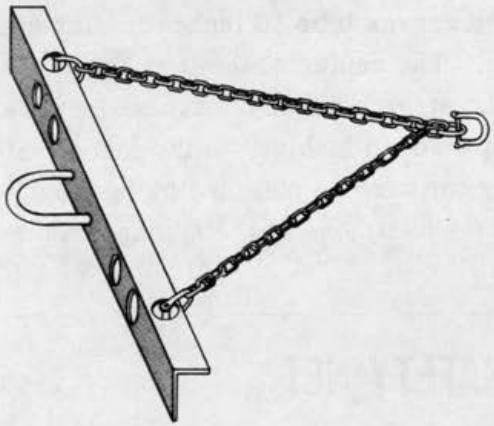
Transferring personnel demands close attention to details by all hands. When practicable, an escort should be stationed astern to pick up any personnel lost overboard.

Wounded personnel or other medical patients may be transferred at sea by use of a stretcher on a manila high-line or jackstay employing two trolleys.

MANILA HIGH-LINE EQUIPMENT

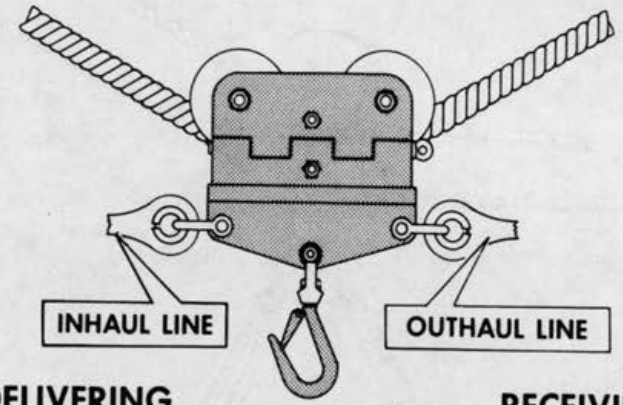
FIG. A-15

BRIDLE



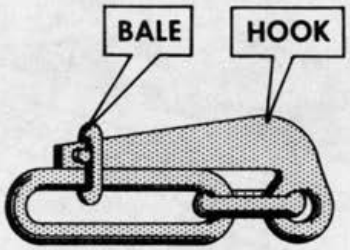
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HIGH-LINE TROLLEY



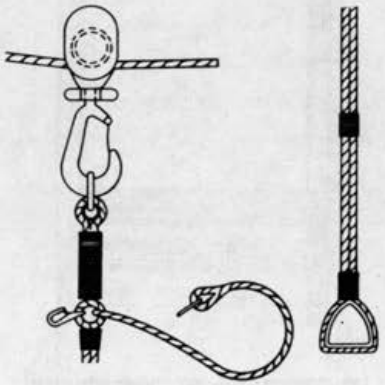
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PELICAN HOOK



c

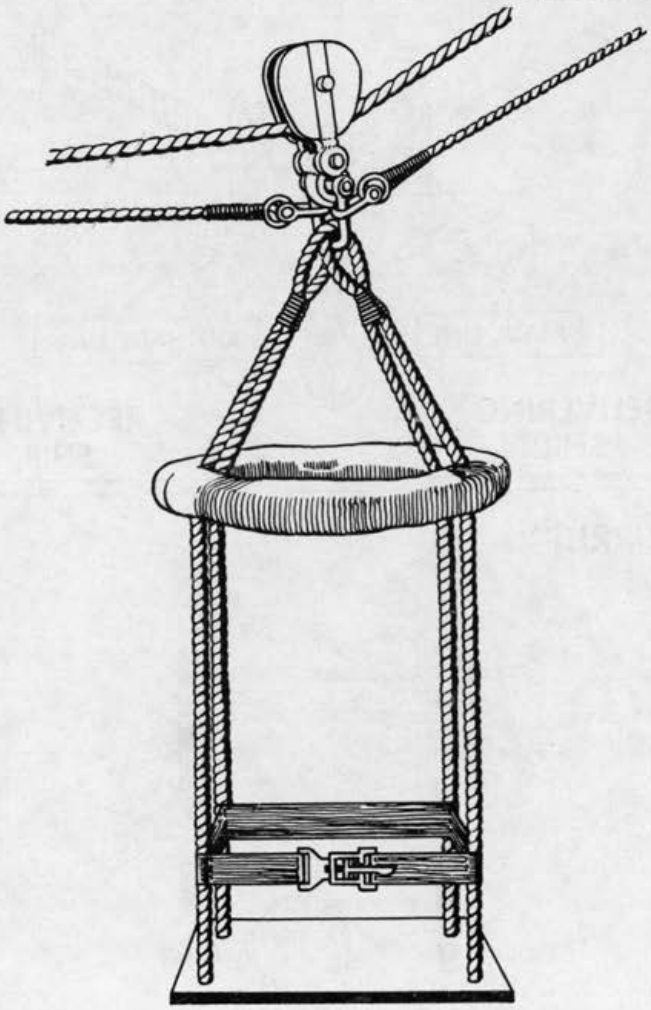
STIRRUP



d

BOATSWAIN'S CHAIR

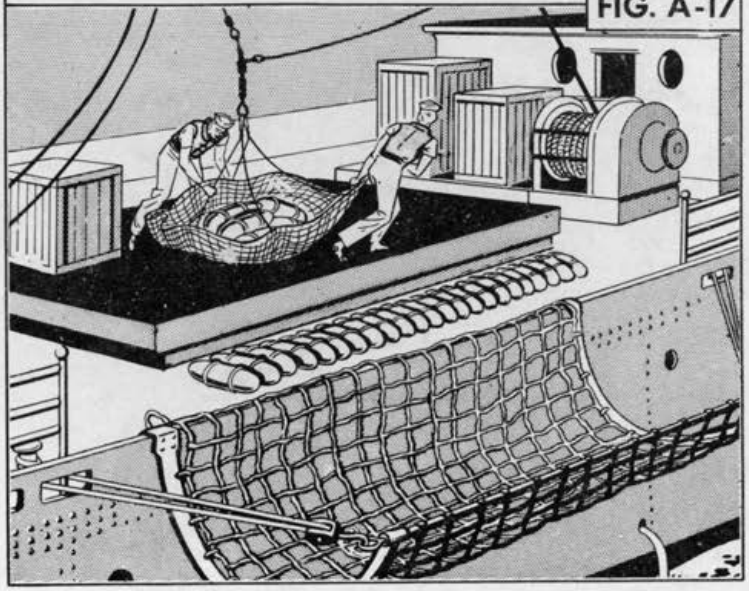
FIG. A-16



The stretcher used for personnel transfer must have enough flotation gear rigged to ensure that the patient's head is held above water in case of accidental submergence. The safest device is a kapok-filled canvas tube 10 inches in diameter and 10 feet long. The center of the tube is secured to the head of the stretcher and the tapered ends are attached, wrap-around fashion, to the sides. Stretcher buoyancy can also be obtained by lashing five kapok life jackets to it, one at the end and two on each side.

SAFETY NET

FIG. A-17



d. Safety Precautions for Transferring Ammunition. Certain merchantmen in the convoy may be required to carry replenishment ammunition for the escorts. Essentially, transfer of ammunition is done in the same manner as transfer of other solids by manila high-line or light jackstay but with special safety measures. The manila high-line or jackstay will be provided and tended by the escort. The transfer of ammunition at sea is the most hazardous and exacting of all transfer operations, requiring greater care than transfer of provisions or general stores items.

Ample provision must be made for the use of wedges, shoring, chocks, straps, and dunnage to protect the ammunition. Thrummed matting and wooden pallets should be used at the loading station, and the loading station should be marked with a three-foot square of green bunting. Safety nets should be placed over the side in the loading station vicinity (Figure A-17).

All persons handling ammunition should be made aware of this vital fact: with inert material an accident might be trivial, but with ammunition it could easily result in the destruction not only of the ammunition ship but also of the ships alongside.

INDEX

The indexes to the Naval Warfare Publications series are designed to provide the user with ready access to both general discussion and detailed information. This is accomplished by the following devices:

The subject of an entire chapter is referenced by the number of the sections within the chapters (for example, 300–350).

The subject of a section, which is the major component of a chapter, is referenced by the number of the section, which always ends in zero. It should be borne in mind that a section usually contains several articles.

The article is the basic textual component and the most frequent point of reference in the index. More detailed instructions, which may be within paragraphs or subparagraphs, are referred to through the article number plus the paragraph designation (for example, 552a, 552a(1)).

Illustrations, too, are listed in the index. They are referenced by "figure number." This number shows the chapter in which the illustration appears (for example, Figure 4–2 is in Chapter 4). References to sections or articles as well as to illustrations, within the same index item, will help the reader to find the exact location of the illustration.

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ORIGINAL
(REVERSE BLANK)

APPENDIX B

TABLE OF EQUIVALENT TERMS

APPENDIX
B

TABLE OF EQUIVALENT TERMS

CONTENTS

APPENDIX

B Table of Equivalent Terms

APPENDIX B

Table of Equivalent Terms

Bowsing in line	Frapping lines (used to hold bight of hose in to side of ship)
Clipped	Use of Inglefield clips or safety hooks and rings
Cot	Litter or stretcher
Derrick	Cargo boom
Dips	Taking soundings of oil tanks, etc.
Dumps	Stores landing areas or assembly points
Easedown	Slow down or lower pressure, as in fueling
Exchange	Marking for telephone jackbox sent to fueling station for tieing in the fueling circuit
Eyeplate	Pad eye (a metal eye permanently secured to deck or bulkhead)
Faked, flaked	Line layed out in long flat bights, the whole being much longer than wide
Grommet strop	Grommet strap with seizing
Gypsy head	A barrel-like fitting attached to a winch for tending a manila line
Hardeye	Thimbled eye
Hauling-over line	Inhaul
Heavy jackstay	Wire high-line
High flashpoint kerosene (JP-5) (AVCAT)	Jet aircraft fuel
High point	Attachment point for high-line
Hoseline	Hose messenger
Hose stirrup	A shackle support for hose on span wire (similar to use of span-wire trolleys)
Inglefield clips	Similar to two chain links, open on one side (must be placed at right angles to assemble or disengage)
Jackstay	In fueling, a span wire; in rearming, a high-line
Jackstay line	High-line messenger
Jet mix	A mixture of JP-5 and Avgas
Leading block	Fairlead block
Light jackstay	Manila high-line
Messengers	Light line used to carry a larger line across
Monkey plate	Triangular flounder plate with 3 holes
Pad eye	A metal eye permanently secured to a deck or bulkhead

Patt.	R. N. pattern number
Plug boxes	Telephone jackboxes
Recovery line	Retrieving line
Rope, manila	Size designated by circumference in inches (USN: when 1 1/2-inches or less, by thread number)
Rope, wire	Size designated in USN by nominal diameter in inches; in RN by circumference in inches
Securing adapter	Hose clamp with links for securing purposes
Senhouse slip	Pelican hook (of the type used on a clear hawse pendant). Size is indicated in USN by the diameter of the wire rope normally used in standing rigging, not by any dimension of the pelican hook.
Shot mats	Cargo mats, shell mats, or thrummed mats
Slip	Pelican hook
Spout float	Small position buoy or towing spar
Traveler block	Trolley block
Trough	Saddle
Troughwire	Saddle whip
Wire clip	A U-shaped, drop-forged steel bolt used to make an eye in wire rope or to connect two pieces rapidly without splicing.
Wire rope	
(F.S.W.R.)	Flexible steel wire rope
(E.S.F.S.W.R.)	Extra Special Flexible steel wire rope
(G.F.S.W.R.)	Galvanized flexible steel wire rope
(H.G.P.S.)	High-grade plow steel wire rope used by USN for running and standing rigging.