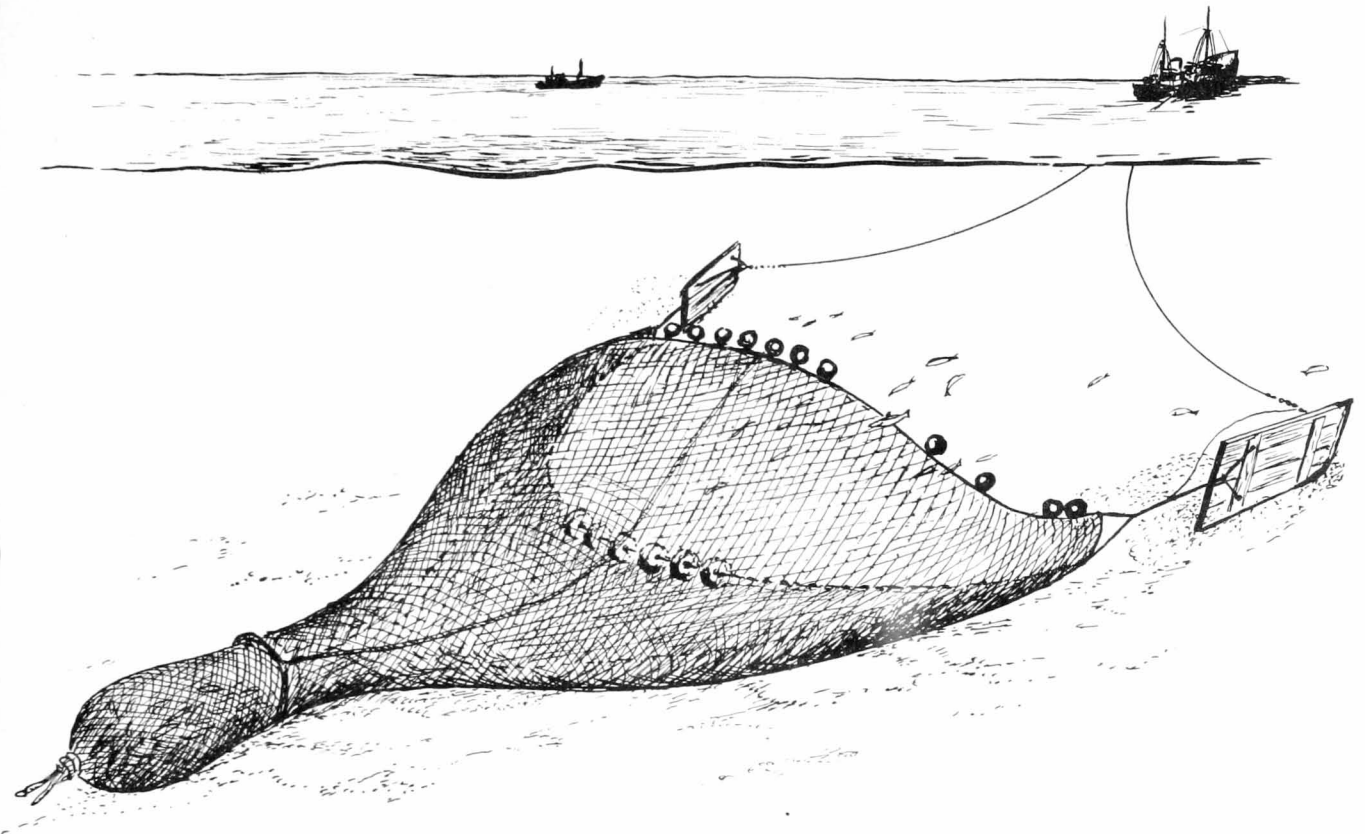


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**OPERATION OF NORTH ATLANTIC  
TYPE OTTER TRAWL GEAR**



**FISH AND WILDLIFE SERVICE**

**United States Department of the Interior**

**Washington, D.C.**

**Fishery Leaflet 445**



UNITED STATES DEPARTMENT OF THE INTERIOR, Fred A. Seaton, Secretary  
Fish and Wildlife Service, Arnie J. Suomela, Commissioner  
Bureau of Commercial Fisheries, Donald L. McKernan, Director

## OPERATION OF NORTH ATLANTIC TYPE OTTER TRAWL GEAR

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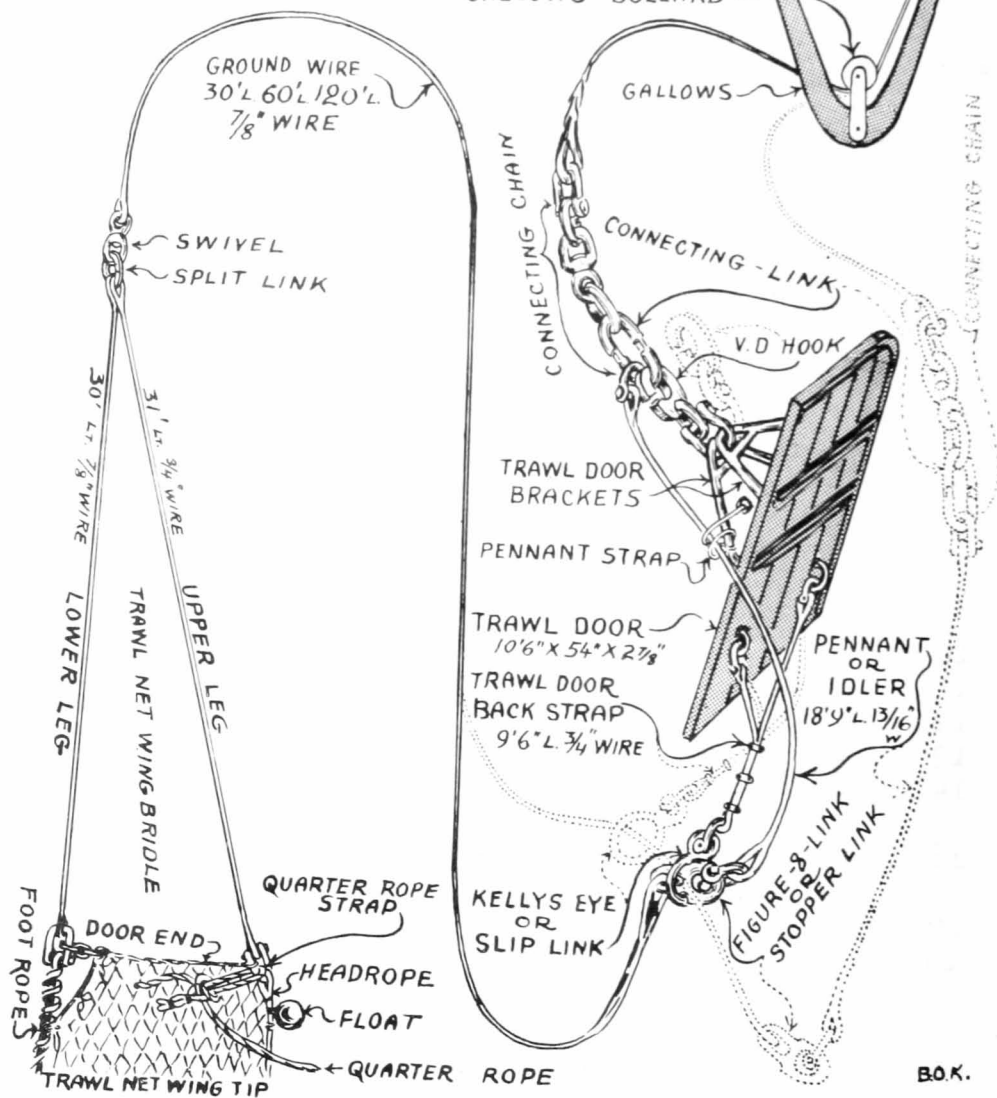
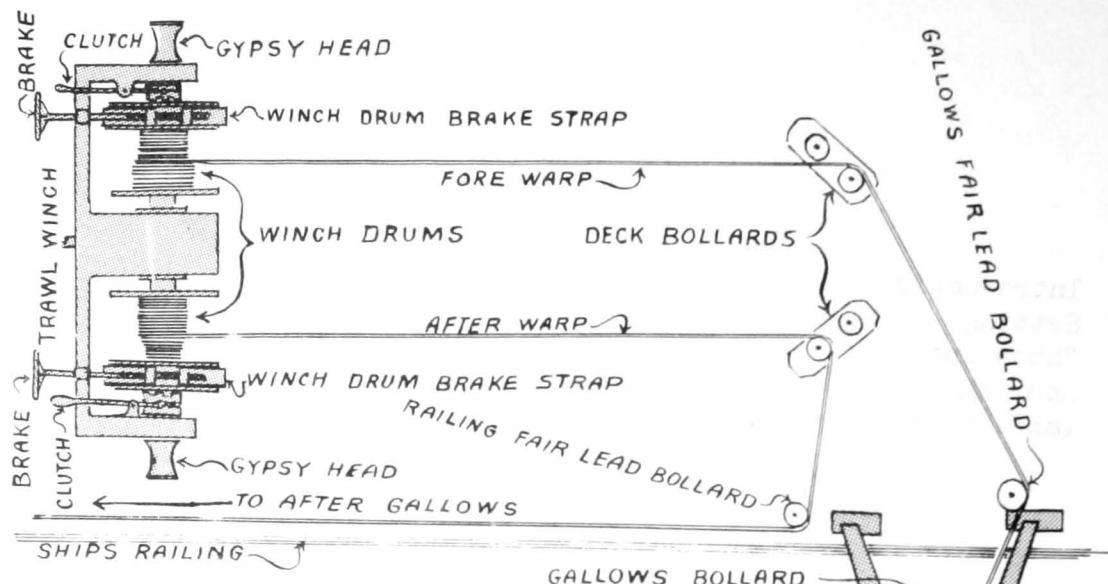
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View of the Trawl Net Rigging and Arrangement of Fore Door Connections and Leads.

## INTRODUCTION

Efficient and profitable operation of any fishing gear depends as much upon the experience and teamwork of the captain and fishermen as it does upon any other factor. This is particularly true in the case of the otter trawl, since its use and operation frequently varies in accordance with the weather and other changing conditions on the vessel while on the fishing grounds. If certain basic steps are followed, however, valuable fishing time can be saved, and the energies of the crew can be directed toward profitable fishing rather than time-consuming net mending and clearing of snarls.

This article is intended for those unfamiliar with the method of side-trawl fishing. The basic principles of operation apply to any size net or vessel since the weight of the otter doors has no effect on the basic procedure. On smaller vessels, with light rigging and remote-control apparatus, it is possible to operate successfully with as few as two men, while on the larger vessels, with correspondingly heavier rigging, extra men are required.

Otter trawlers fishing off the Atlantic coast use the side-trawl method primarily, and the vessels in that area are classed according to tonnages as listed below:

Size of trawler	Tonnage	Approximate capacity		Number in Crew
		for iced fish		
	Gross tons	lbs		
Small	To 50	10,000	- 50,000	2 to 5
Medium	51 to 150	50,000	- 100,000	6 to 8
Medium	51 to 150	100,000	- 180,000	11 to 15
Large	151 and up	180,000	- 500,000	15 to 18

The typical large modern otter trawler using this side-trawl type of gear is designed for operation by six keymen per shift; each keyman is stationed at one of the six predetermined key positions when setting or hauling in the net (fig. 1).

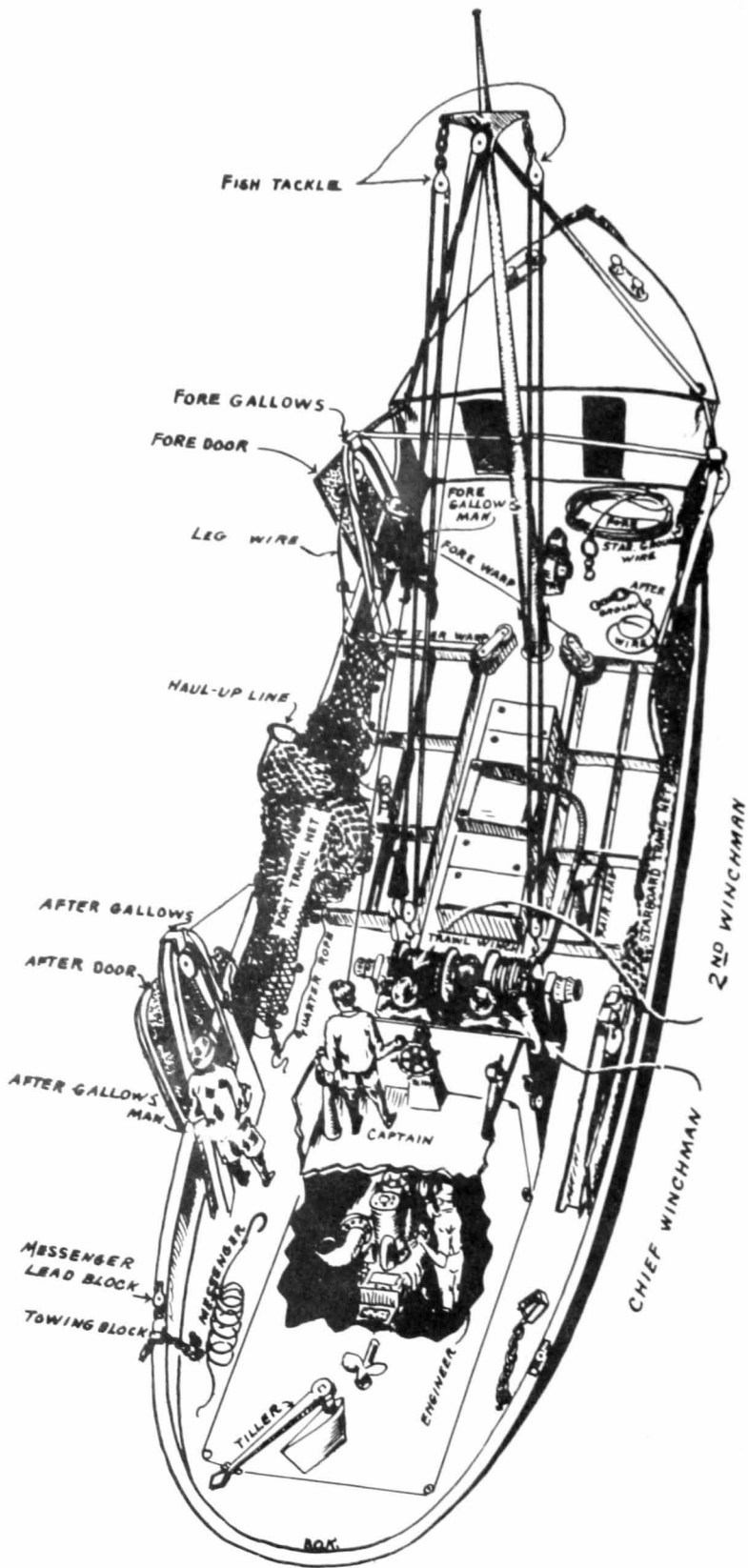


Fig. 1 - Topside View of Crew Stations on Board an Average Large Trawl Vessel.

These keymen and their stations are as follows:

1. Captain - stationed in the wheelhouse, commanding and operating the vessel's controls;
2. Engineer - stationed in the engine room at the engine controls;
3. Foregallows man (cod-end man) - stationed at the foregallows, in charge of the cod end, manipulating the foredoor operations, and repairing the cod end and the forewing of the net.
4. Aftergallows man (hook-up man) - stationed at the aftergallows manipulating the afterdoor operations and towing block, repairing the afterwing of the net, and may also be responsible for the icing of the fish in the hold, in which capacity he is referred to as "hold man";
5. Forewarp drum winchman (chief winchman) - stationed at the forewarp drum;
6. Afterwarp drum winchman (2nd winchman) - stationed at the afterwarp drum.

The men stationed at the winches must be especially alert at all times. It is largely through their ability to coordinate their actions with those of the captain and other crew members that accidents can be avoided, net damage and snarling kept to a minimum, and valuable fishing time saved.

#### SETTING

On the way to the fishing grounds, the trawl is carefully checked for condition and proper rigging, after which the cod end is tied and the quarter-ropes are secured (fig. 1). Upon arrival on the fishing grounds, the captain brings the vessel into position so that the side from which the net is to be set is to the windward; he then brings the ship to a complete stop and sets the tiller hard over to port if a port set is to be made, or to starboard if a starboard set is to be made (fig. 2).

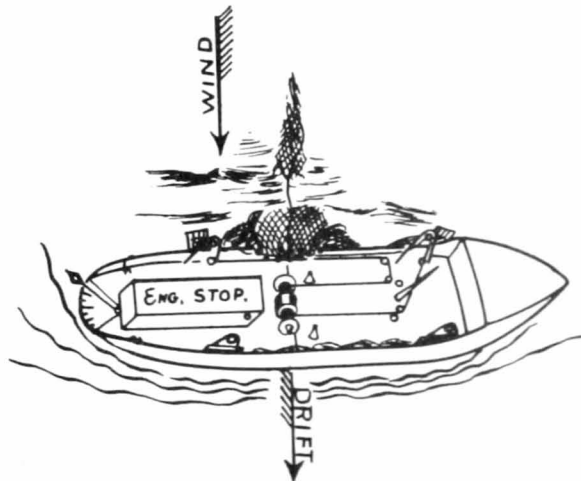


Fig. 2. Vessel Position with Relation to Wind for Port Set.

In setting the net the following procedure is used:

1. The cod end is hoisted overboard, followed by the net belly.
2. The footrope is cleared overboard.
3. The headrope is held at the quarter-rope becket on the railing, permitting the thorough overhauling of the quarter-rope.
4. When the net and lines are all clear, the headrope is released. The net will then spread outward as the vessel, broadside to the wind, drifts away from the net (fig. 3). At this stage, the footrope will be submerged and the net buoyed up by the floats on the headrope.

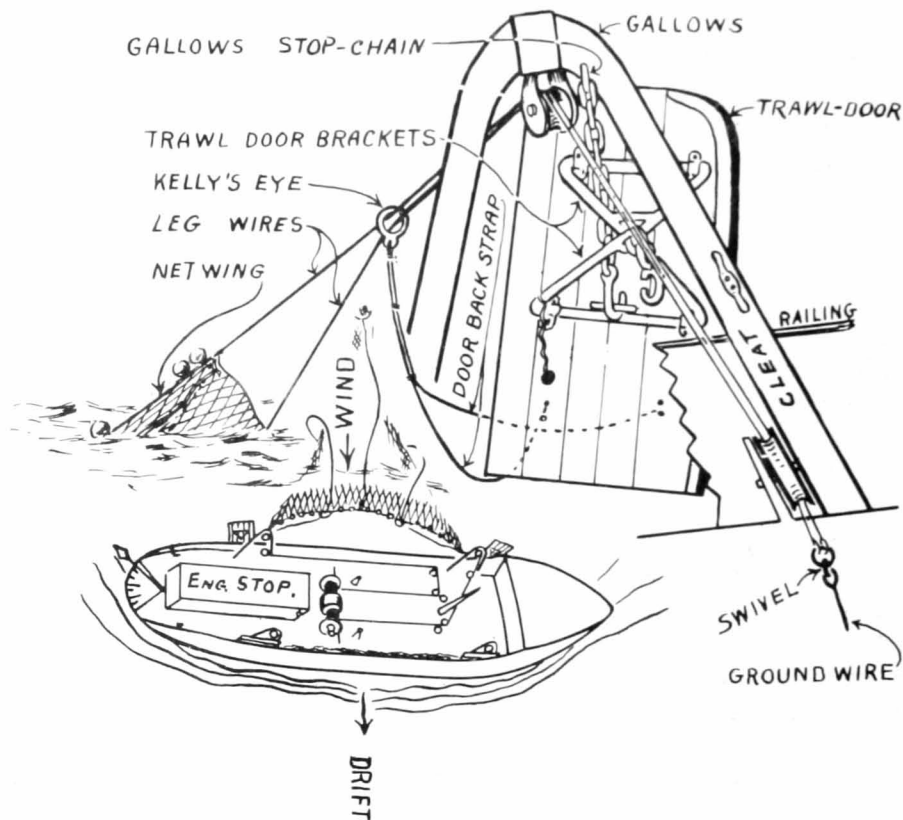


Fig. 3. Rigging of Port-Side After Door and Trawl Spread Broadside to Vessel.



5. The winchmen then release the brakes, letting the towing legs and ground wires pay out.
6. The fishermen stationed at the foregallows and aftergallows check the swivel on each ground wire to make sure it passes through the Kelly's eye.
7. The set is started with the wheel hard over but should be adjusted to a more gradual circle to ensure the wings not tangling with each other when using long (30 to 40 fathoms) ground wires. The Captain watches this closely and manipulates the wheel so that the net clears the propeller during the setting operation. In calm weather, the net will hang straight down and be close to the vessel's side. To proceed under these conditions would cause the net to foul the propeller; therefore, the engine propeller is briefly reversed to create a backwash which will drive the net clear of the vessel's side. The vessel can then proceed forward at a moderate speed as described above.
8. The ground wires are run out the desired length and the stopper or figure-eight link is arrested in the Kelly's eye (fig. 4).

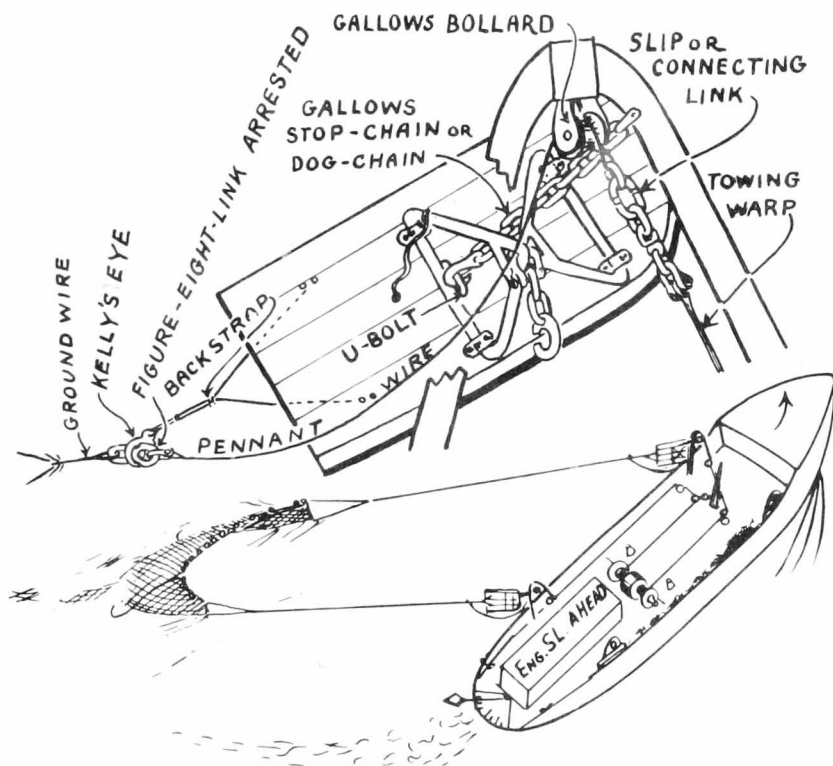


Fig. 4. Course of Vessel While Running Out Ground Wires. Inset Shows Ground Wire Connection Arrested in Kelly's Eye.

9. The men at the two gallows haul several feet of additional slack on the towing warp and pull on the pennant, or idler, in such a manner that the connecting links pass over the gallows bollard (fig. 5).

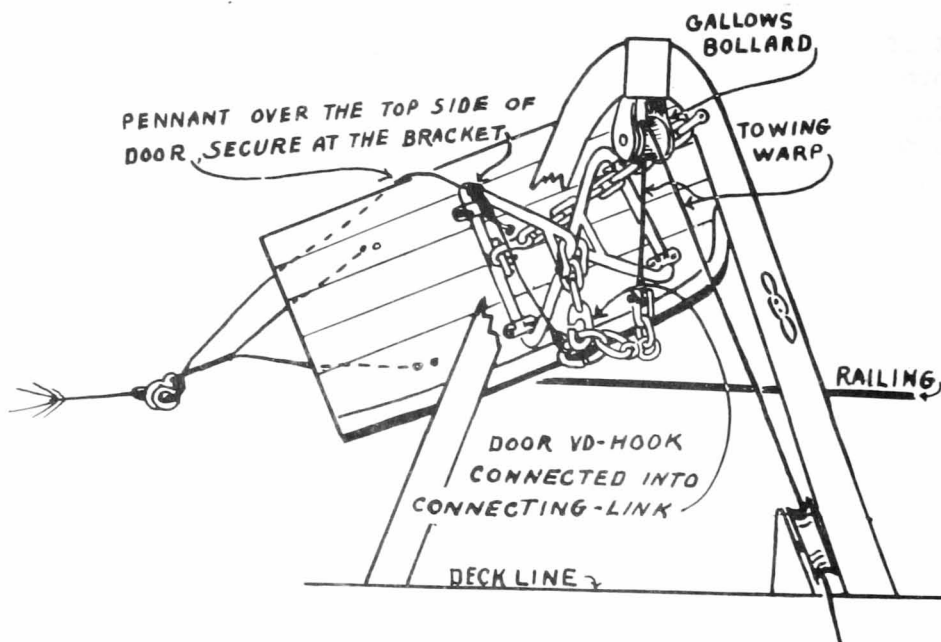


Fig. 5. Port Door Showing Secured Pennant and Connected V-D Hook.

10. The connecting link is then connected into the G-hook or VD hook (fig. 5).
11. The pennant is then swung over the door and secured at the rear doorbracket by several round turns of a pennant strap with a weight on the end.
12. The door is lifted several inches on the trawl winch, permitting enough slack on the gallows stop-chain so that it can be unhooked.
13. The stop-chain is then set aside and made fast so that it will not become fouled when shooting the trawl (fig. 6).

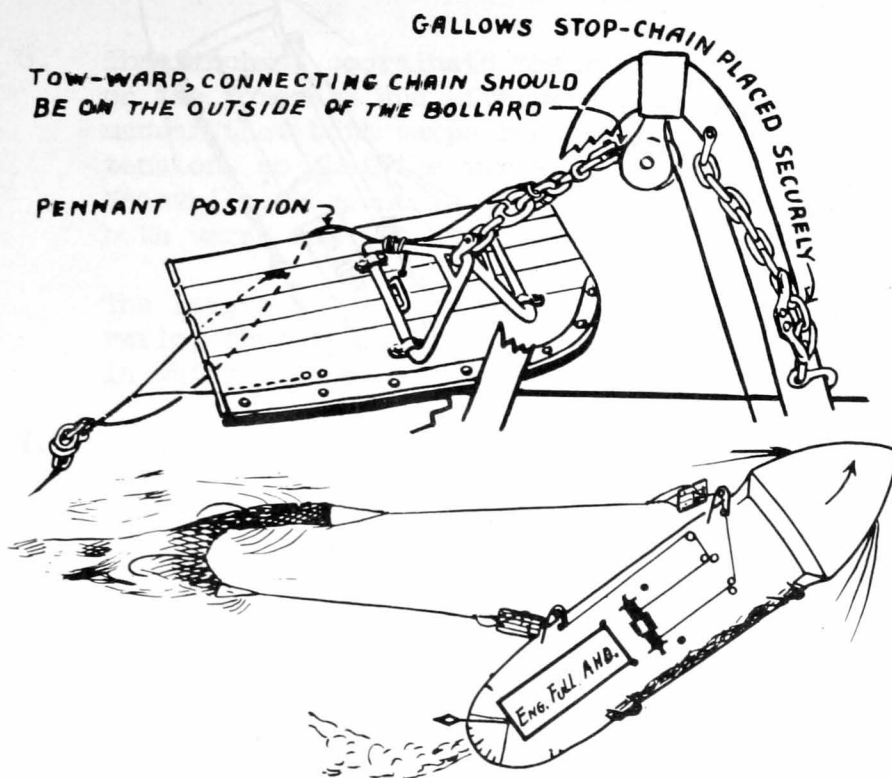


Fig. 6. Course of Vessel Ready to Drop Trawl Doors.

14. The trawl is ready to be set when both trawl doors have been connected to the towing warps and the towing chains slacked just enough so that they are not in the upper-bollard sheaves.
15. The messenger is now laid out and the winchmen stand by the trawl-winch brakes.

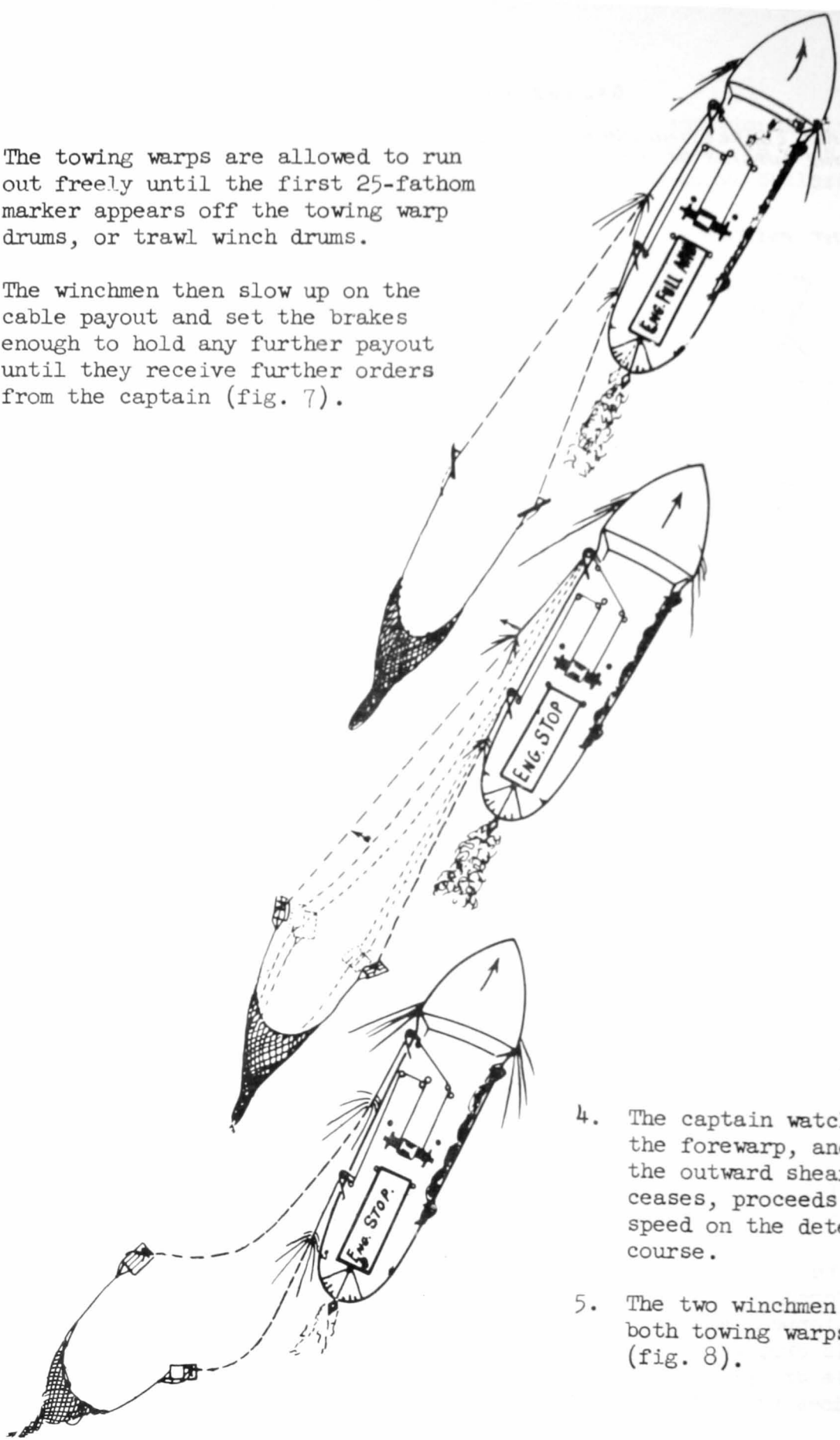
To obtain headway on the vessel, the captain proceeds full speed ahead, going in a wide circle. When the vessel heading reaches about "four points on the compass" to the desired course, the captain stops the engine, sets the wheel midships, and signals to shoot the trawl.

#### "SHOOTING" THE TRAWL

It is in this operation that skilled, coordinated actions by the captain and the winchmen are essential.

1. The winchmen release the trawl winch brakes, dropping first the foredoor and then the afterdoor. In small boats the engine is not stopped, and the vessel continues the gradual turn. The afterdoor is dropped first; when it clears the propeller, the foredoor is dropped and the boat straightened on course so that the foredoor does not overturn.

2. The towing warps are allowed to run out freely until the first 25-fathom marker appears off the towing warp drums, or trawl winch drums.
3. The winchmen then slow up on the cable payout and set the brakes enough to hold any further payout until they receive further orders from the captain (fig. 7).



4. The captain watches the forewarp, and when the outward shearing ceases, proceeds at full speed on the determined course.
5. The two winchmen payout both towing warps (fig. 8).

Figs. 7,8,9. Course of Vessel While Setting Trawl,

6. The winchmen coordinate their actions in releasing the brakes on the forewarp and afterwarp trawl winch drums in such a manner that both warps run out smoothly but under a slight tension, so that the warps do not bulge or drag along the deck. Meanwhile, a count is kept on the outgoing markers to see that both warps run out at equal speeds and length (fig. 9).

The length of the towing warps is usually figured at a 3 to 1 ratio, thus the warp length is three times the depth of water in which the net is fished.

7. As the last 25-fathom marker of the predetermined length on the towing warps is sighted, the chief winchman sings out "LAST QUARTER!"
8. The captain then reduces the speed of the vessel to one-half.
9. The winchmen gradually apply the brakes so as to avoid any sudden strain or shock on the warps and firmly set the brakes when the length has been reached.
10. The cod-end man hooks the messenger on the forewarp (fig. 10).

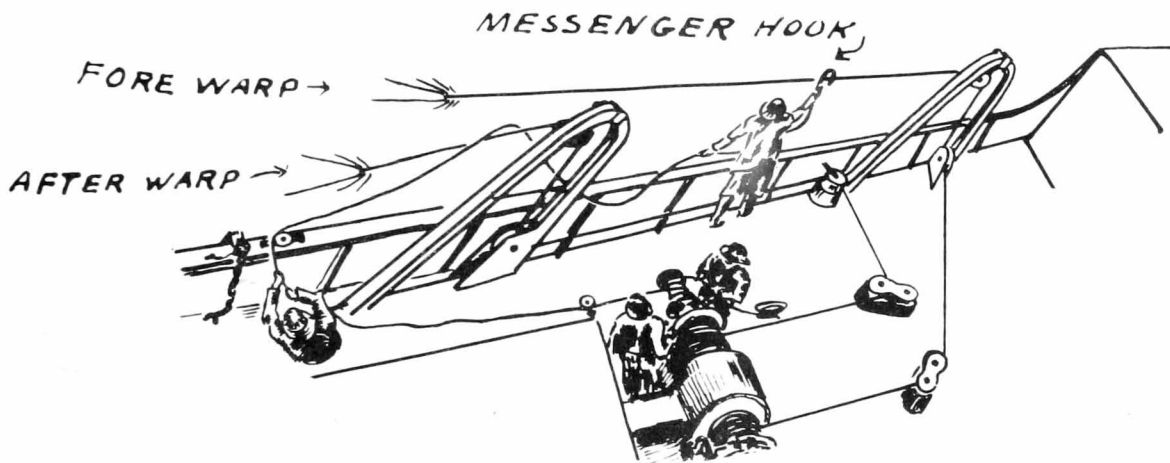


Fig. 10. Use of Messenger Hook to Secure Trawl Warps.

11. As the messenger hook slides down the forewarp, the hook-up man takes in the slack wire by hand and places the messenger wire in the quarterblock situated on the railcap aft of the aftergallows (fig. 10).

12. The afterdrum winchman then takes the messenger rope over a fairlead to the winch and heaves in on the messenger in such a way that it picks up the afterwarp on its way toward the railing.
13. By skillfully maneuvering the vessel slightly to the starboard or port, the captain can materially assist hooking-up operations.
14. When both warps reach the railing, the hook-up man encloses both warps with the hook-up or towing block and secures the hasplike closing device with a cotter pin (fig. 11).

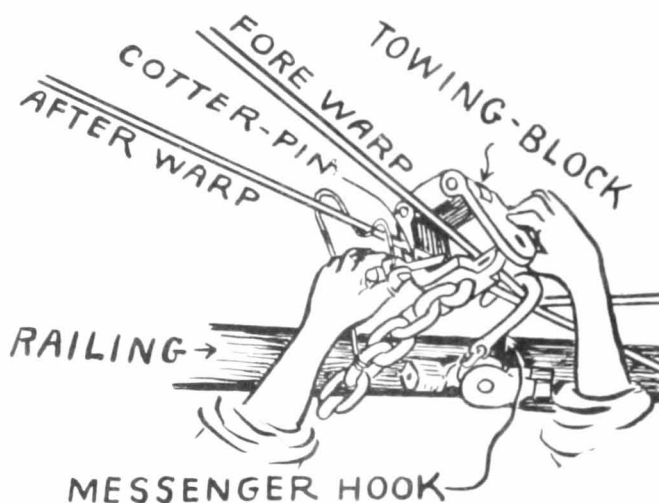


Fig. 11. Securing Towing Warps in Towing Block.

15. The messenger is then released by the hook-up man and set aside.
16. When notified that the warps show proper spread and are in their towing positions, the captain proceeds at the desired course and speed.
17. The winchmen should check the warp markers on each of the two warps and even them if not in balance. The brakes on the trawl winches should be adjusted by carefully easing the brakes until the warps start to "surge" and then tightening them enough to hold the tension.
18. In the event that the net should foul on some underwater obstruction, the warps will "surge" violently. Should this happen, the speed of the vessel should be reduced immediately and the entire gear hauled on board for damage inspection.

## HAULING

When the fishing period has elapsed, usually after 30 to 90 minutes, the captain notifies the engineer to start the trawl-winch motor, calls the crew to their stations, and directs the vessel so that it is in line with the towing warps. In hauling in the net:

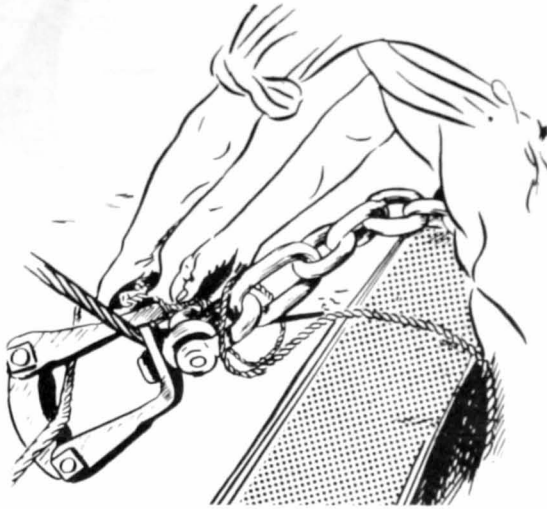


Fig. 12. Removing Cotter Pin from Towing Block Hasp .

1. The captain reduces the vessel to halfspeed and signals for the warps to be released.

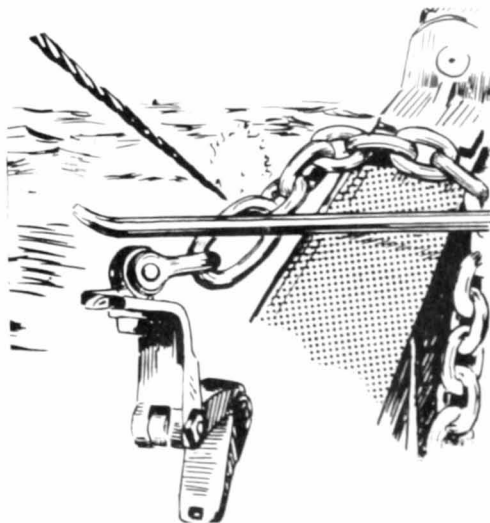
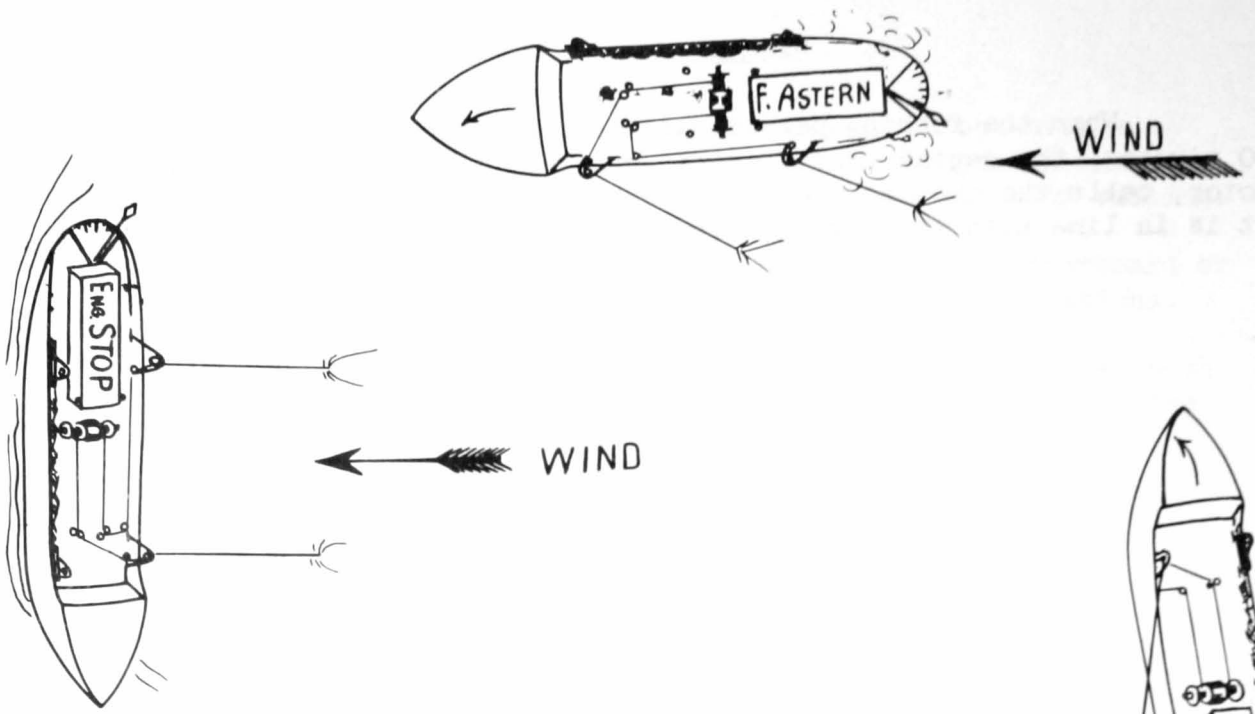


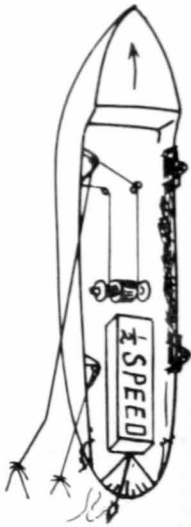
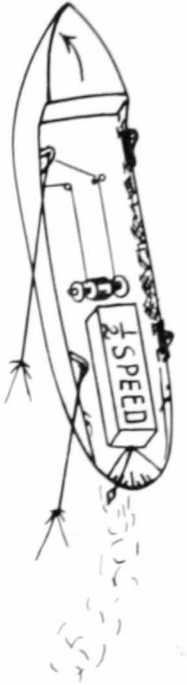
Fig. 13. Releasing Towing Warps .

The hook-up man removes the cotter pin from the closing hasp on the hook-up or towing block (fig. 12) and releases the hasp by forcing it apart with a crow bar (fig. 13). The warps will snap outward with terrific force, causing a dangerous snap-back of the towing block; therefore, the man releasing it must exercise extreme caution in this operation.



Figs. 14,15,16,17. Maneuvering Vessel Into Downwind Position for Hauling in Net.

3. The chief winchman first heaves in 5 fathoms on the forewarp.
4. Both winchmen then haul in both warps.
5. In the meantime, the captain is gradually maneuvering the vessel under moderate speed to a position where the net is to the windward (figs. 14,15, 16 and 17).





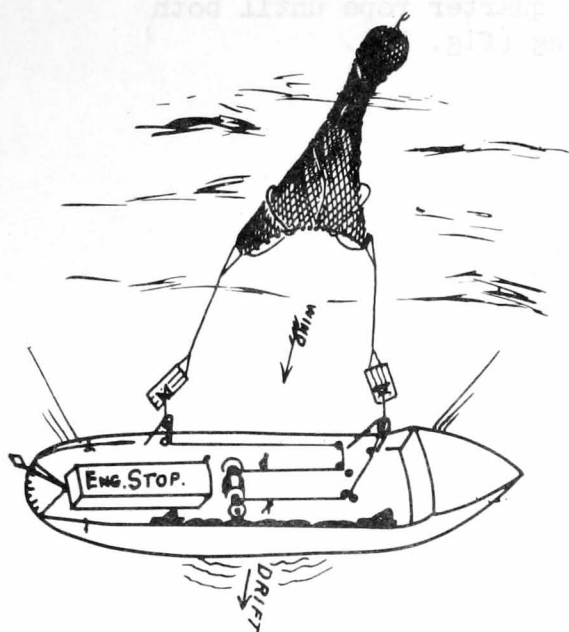
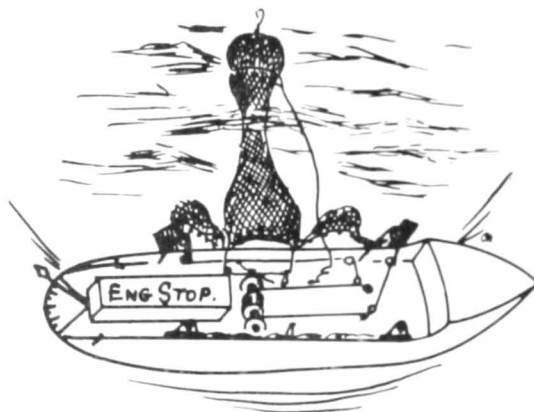


Fig. 18. Hauling Net. Note Vessel and Net Position with Respect to Wind Direction.

7. At the captain's direction the engineer reverses the engine until all forward progress ceases.
8. The winchmen resume heaving both warps.
9. Simultaneously, the captain orders the engines to be stopped. The vessel will then remain broadside to the wind and the net.
10. As the otter-doors are sighted, the men at the gallows signal to the winchmen, who in turn gently ease the pull on the winches until the two doors finally reach the fore and after gallows, respectively (fig. 18).

11. The gallowsmen throw their respective gallows stopchains between the otter-door brackets and hook each chain on the U-bolt at the center of the door.
12. Each winchman then reverses his winch slightly to allow the two otter doors to drop to a point where they are suspended on the gallows stopchain.
13. The gallows men then disconnect the G hooks or V-D hooks from the connecting links.
14. Both gallowsmen unwind the pennant strap on their respective doors.
15. When both doors are disconnected, each winchman resumes heaving until the net wing-tips are within reach of the men at the gallows.

16. The men at the gallows then release the quarter ropes, taking each over the respective fore and aft fair-leads to the trawl-winch gypsy-heads, and heave on each quarter rope until both bosoms of the net are over the railing (fig. 19).



19. Quarter Ropes Used to Heave in Net Bosoms.

#### LANDING THE CATCH

Methods of taking in the net differ somewhat on vessels of different size and design. The general idea is to sift the fish remaining in the net belly into the codend.

1. A strap is fastened by two round turns on the codend and it is then hoisted on deck by a fish tackle running from the boom off the mast (fig. 20).

If the catch is too large for a single lift (maximum about 6,000 pounds), the fish are hoisted aboard in two or more lifts by means of a special strap, called the splitting strap, which is rigged on the codend.

2. When all the fish have been hoisted on deck, at the captain's discretion, the net is again set for fishing.
3. The fishermen all pitch to and dress the fish, stow them in ice in the hold, wash the decks, and await the next hauling-in of the net.

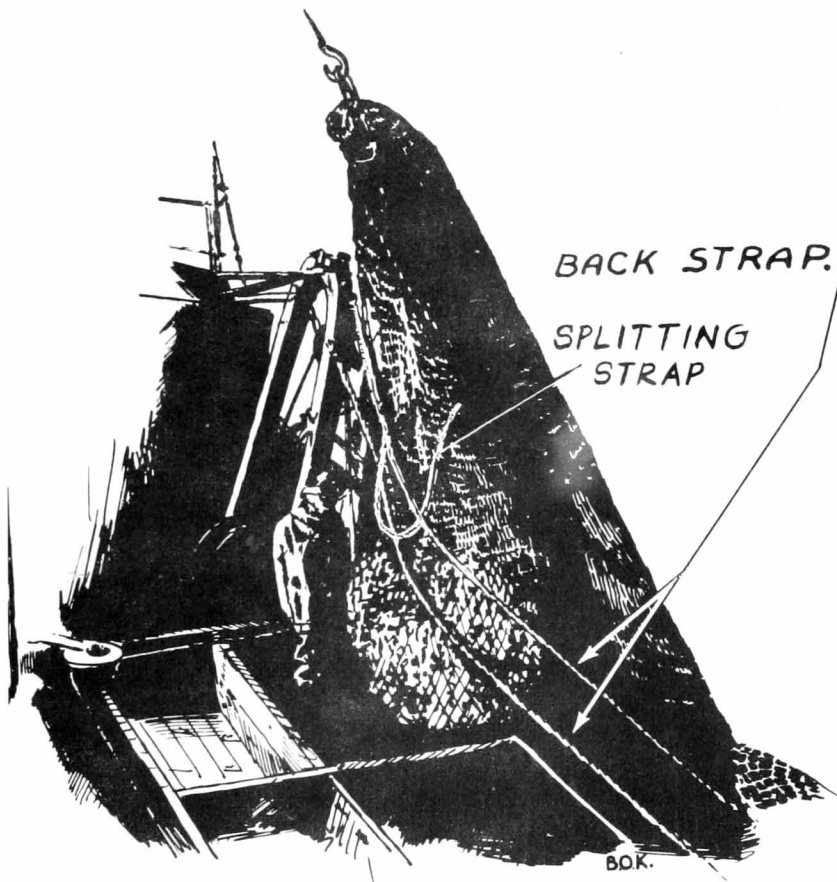


Fig. 20. Cod-End Held in Position over Fish Pens by Back Strap. Splitting Strap Is Used to Split Catches too Large for a Single Hoist.

AVAILABLE PUBLICATIONS ON FISHING GEAR

- Cir-48 Commercial Fishing Vessels and Gear
- FL-64 Construction and Operation of Lobster Gear (New England Type)
- FL-125 How to Make and Mend Fish Nets
- FL-343 Floating Trawls
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