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Lessons from Casualties

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The Proceedings of the Merchant Marine Council has been published since January 1944. Beginning with the first edition Lessons from Casualties have been printed each month. Prior to the introduction of the "Proceedings," Lessons also appeared in the monthly Bureau of Marine Inspection and Navigation Bulletin.

It has been our hope that the personnel of the ships to which copies are sent share the limited number of copies available for distribution in order that as many officers and men may profit from the unfortunate mishaps of others.

Capt. Schuyler F. Cumings, Senior Marine Superintendent of the United States Lines, suggested that a special Lessons from Casualties Edition be published. In accord with his very worthy suggestion past editions have been reviewed. From these, lessons from casualties have been selected as representative of some of the more common and more serious types of casualties.

A study of these casualties and of the lessons pointed out in the articles should be made by the men of the merchant marine with the object of avoiding the serious consequences experienced by those who failed to observe requirements of safe practices. We reiterate on the advisability of sharing this and future editions in order that all hands may benefit from the reading of these lessons.

LESSONS FROM CASUALTIES

GROUNDINGS

Scratch Three "*Liberties*"

Three Liberty ships became total losses as results of strandings which took place within a period of 17 days in widely separated parts of the world. In two of the groundings navigational lights were in sight and in the third the sighting of a light was not made at the expected time. These facts give cause for study as to how these strandings happened and how other strandings may be prevented.

The first grounding was on Sanda Island, Scotland, at 2252 on the night of 16 March 1946. The vessel was en route from Copenhagen to Gourock, Scotland. In making for the entrance to the Firth of Clyde the weather was overcast with a light drizzle. Visibility varied between 2 and 5 miles. At about 2225 the position was estimated to be about 8 miles south of Sanda Island and the course was changed to 90° true. Shortly thereafter, the Ship Light on Sanda Island was picked up, looming through the mist. A change of course at 2230 was made which headed the ship directly for the light on a course of 10° true. No change of course was made subsequently until the time when avoiding action was taken. Apparently it was intended to run on course 10° until crossing of the 50-fathom curve, which was about 5 miles south of the light. Checking the navigation back from the time and place of grounding indicates that instead of being 8 miles off shore, the vessel was actually only slightly more than 3 miles off at the time when it was headed for the light at a speed of about 8 knots. A chart of the locality shows that the depth gradient is very small and that many depths of more than 40 fathoms existed between the 50-fathom curve and the light. Within 1 mile of the light there is a 53-fathom spot.

The second grounding was on the coast of Peru on an overnight run between Callao and Cerro Azul. At 0600, sunrise, on 31 March 1946 the light at Cerro Azul was expected to be sighted. It was not picked up, however, and the vessel continued on a course of 140° along the coast at a speed of 7 knots. At 0640, a sounding of 7 fathoms was shown by the fathometer and course was changed to 95°, a course which headed the vessel for the shore. Speed was reduced to slow. The weather at this time was generally fair but there was a surface haze over the sea. Eighteen minutes after heading for the coast, breakers were sighted ahead. Although the engine was reversed the grounding could not be avoided. The time of grounding was about 1 hour after sunrise. Shortly before the casualty, hills beyond the shore line were visible although, as was mentioned previously, the surface haze obscured the beach.

The third grounding took place at about 0007, 2 April 1946, on Flat Ground Shoal, north of Cape Ann, Mass., while the vessel was en route to Boston from England. The visibility was clear as is evidenced by the position obtained at 2226 when the vessel was 18 miles abeam of Cape Cod Light on a course of 270° true. This course, if maintained, would have brought the vessel close to Boston Light Vessel at about midnight. However, about 15 minutes later, course was changed to 315° true to pass clear of some fishing vessels. While on this course a light was observed slightly on the port bow which the mate on watch reported as that of Boston Light Vessel. This, the master doubted, but after checking the flashes of the light he apparently became convinced that the mate was correct. One and a half hours later he realized that there must be some mistake for course was changed to 180° during which change the ship grounded.

In each of these groundings there was a fact common to all. In each case, at a time prior to grounding, there was a doubt as to the exact position of the vessel. This doubt existed at a time when the ship was in a completely safe position.

The weather conditions in two of the cases were not of the best, but they were not extremely bad. In the third, the conditions were ideal, the visibility was very good, and the vessel was in an area where a number of navigational lights, on which cross bearings could have been taken, were visible.

The three situations were such that (1) in the Peruvian grounding there were no navigational aids visible; (2) in the grounding on the Scottish coast there was a single navigational light visible; and (3) in the third case there were a number of lights in sight.

Remembering that in each case there was doubt as to the exact position of the vessel, steps should have been taken to wipe out this doubt before proceeding on courses which could endanger the vessel. In the first situation where no aids were visible there was no urgency requiring the vessel to make port at a given time. In such cases the proper thing to do is to maintain the vessel in a safe position until such time as the position can be accurately fixed. Undoubtedly the surface haze which existed would have been burned off later in the morning and the aids shown on the chart and stated in the sailing

directions would have become visible. Then, and only then, would it have been completely safe to venture in toward the rocky coast.

In a situation where only one light is visible the position cannot be determined by a single bearing of the light. Other steps are required. Attempt was made to fix position by soundings in conjunction with the bearing. This is one method but where the slope of the bottom is gradual it is not too reliable. If conditions permit and a highly accurate position is required a vertical angle by sextant may be taken. Or instead of heading directly for the light, leave it on the safe side and determine the position by a series of bearings on a fixed course with a run between. In any event keep the vessel on a course which cannot lead the vessel into danger.

There is little to be said about the third situation. Where doubt exists stop the vessel, positively identify the lights in sight, and fix the position by cross bearings.

When doubt as to the position of the vessel exists it indicates that in your own mind the odds are not in your favor. Don't run up the odds: "Play it Safe."

Remember Your Responsibility

The Ship's Aground!! The Ship's Aground!! This is a call no navigator or person on board a ship wants to hear. Yet, a study of a recent grounding leads to no other conclusion than that the officers and seamen navigating the ship lacked a sense of responsibility for the ship, its crew, and the cargo, which caused the accident. Other groundings have been reported in these "Lessons from Casualties" and from them were drawn pointers for the guidance of those who might find themselves in similar situations. In the current case there is such a clear-cut exhibition of irresponsibility that the only lesson that stands out is that of arousing in the mind of every person in charge of a watch of the responsibility which he, as one in a responsible position owes to his ship, shipmates, and to the passengers and cargo, the carriage of which go to make up the wages he draws.

To present the lessons which may be drawn from the errors made by our less-fortunate fellows in the spirit of judicious candor is often not an easy task in view of the perhaps natural tendency toward invective harshness on the critic's part. However, in the case now considered, the circumstances leading to the recent grounding of a certain vessel leaves little doubt that something was radically amiss with the navigational procedure on board.

In the instance in question, the ship set forth apparently seaworthy in all respects, equipped with a fathometer, gyrocompass, and the proper charts for the voyage. The master and his three mates were duly licensed and the vessel was manned in accordance with the requirements of her class. The value of the ship and cargo was estimated at some $2,200,000.

From a position fixed by bearings of navigational aids at 2 a. m., the master laid his track to take him roughly midway between a shoal and a point of land on which was located a light with a visibility of 16 miles. The course should have left the light 6 miles on the starboard beam and the shoal 8½ miles on the port beam.

The master appears to have given verbal orders to the 2nd mate, upon leaving the deck at about 2:30 a. m., to "watch she does not set to the northward." His second, chief, and third mates thence were successively in charge of the navigation.

The weather was fine with light wind and slight sea as the vessel proceeded eastward approximately parallel with the clear coastline to starboard which is marked by outstanding elevations of 1,000 to 1,700 feet at 1 to 2 miles from the shore, at 6 to 7 miles off, and with the open sea to port.

Testimony revealed that good visibility conditions prevailed from the time of departure until that of the stranding. The situation called for nothing more than piloting of the simplest order in taking the ship along the land at 6 to 7 miles off, using any prominent objects from which to check the course by the time-honored "four-point bearing," while further check by fathometer sounding was at all times possible.

The third mate, as noted, was given no instructions by the chief on relieving the watch at 8 a. m., beyond the course required to be steered. The obviously great distance of the lighthouse on the beam, amounting to 8 miles farther off than the course line indicated, also appears to have met with little concern by this officer, due allowance being made for the fact that the young man was making his first voyage under the authority of his license. Incidentally it is noted that the chief mate's sea experience amounted to approximately 6 years, 3 of which were served as a licensed officer. The second mate had served 2 years under authority of his license out of a total experience at sea of 4 years.

From the investigation officer's remarks it appears that the laxity displayed by their captain had set the pace for his mates' perfunctory watchkeeping. The master, on that account, must be considered the leading offender. Absence of specific orders in the matter of correcting the course made good, or acquainting the master with regard to the vessel's position, on the other hand, cannot be held as mitigating the fault of the officer on watch in allowing the ship to proceed blindly on a given compass course.

During the second mate's watch, as previously noted, the master retired to his quarters at about 2:30 a. m. Thereafter the check obtainable by a position line from the bearing of the last passed shore light apparently was not considered. Such a line of position, coupled with a sounding, would have determined with very little effort whether the course was being made good or otherwise. The second mate duly turned over the watch to the chief mate at 4 a. m., each of these officers apparently accepting without question the vessel's position at that hour as that by the "dead reckoning," while, if we may so express it, the light in question was "grinning at them" on the starboard quarter! At what time this light disappeared is not indicated, but it was shown that throughout the second mate's watch it was visible, and there is good reason present to believe until as late as 4:30 a. m. a bearing of that navigational aid was at all times available. Both chief and second mate offered the excuse in their respective testimonies that the ship's smokestack hindered observation of such bearing. For some reason the simple expedient of swinging the ship off her course a point or two to accomplish this purpose, did not occur to them.

That the light mentioned should have been sighted after steaming a distance of 40 miles, and that the chart provides ample warning of a prevailing northwesterly set of current as the passage described is approached, appear to have passed unnoticed by any of the officers. No soundings were taken, though the chart indicates the gradients provide sufficient warning of approach to any danger in the locality. Daylight having arrived at about 5:30 a. m., it must have been apparent to even a casual observer that the ship was much farther off the coast than the proposed course line required; yet it develops that no attempt was madeto check the position with relation to the well-defined termination of the land, as marked by the point referred to, up to the time this was abeam.

It was testified that the lighthouse was on the beam bearing at 8:30 a. m.

At 8:40 the ship grounded on the shoal. Thus was the target presented by a clear 14-mile expanse of navigable water, beyond which lay the open ocean, entirely missed by the ill-guided vessel.

To quote from the investigation record: "The whole affair indicates careless navigation. The master did not keep himself informed as to the condition of the vessel and did not require his officers properly to advise him. Each of the mates, in turn, did not carefully and properly navigate the vessel in that they failed to take soundings and failed to establish the vessel's position by fix on objects ashore. In relieving the watch neither the officer relieved nor the relieving officer established the vessel's position. At 8 a. m. the vessel was far to the north and the chief mate, who was responsible for the watch, though he might have done so by observation, failed to advise the third mate of the vessel's position. The third mate was sailing his first voyage on his license and stated in his testimony that he took no soundings in an effort to locate the vessel's position because he did not know how to operate the fathometer. The master's testimony indicates that he did not thoroughly check back as to courses steered and consequently even now has but a vague idea of how his ship reached the point where it grounded."

It is clear that the charge of "inattention to duty" is justified by the facts—one is tempted to rename it "heedlessness of duty," and whatever disciplinary action awarded wholly deserving. The careless attitude of the men concerned, however, would seem to have reached the point where beforehand knowledge of such possible action was no deterrent to their conduct in the circumstances. At all events, the fundamental truth of the matter is that these officers, like many others on record, whether from lack of experience, training, or moral stability, failed to realize their responsibilities for the safe conduct of the ship, lives, and cargo under their immediate charge.

Overconfidence

The S. S. ——— was a standard type Liberty vessel converted to carry troops in accordance with a standard plan for such conversions. She was bound for a port in the United States having on board in addition to her own crew and the Navy Armed Guard, a capacity load of Army Personnel. The ship was fully fitted with the necessary lifesaving equipment, and the crew and passengers had been drilled in its use.

Routing orders required it to pass within 2 miles of some rocky islets lying offshore and there to take a direct course to destination. A landfall on these islets, which contained a lighthouse and fog signal, was computed to be due about daylight.

At about 0200 of that morning a dense fog shut down—a common occurrence in that locality. The master was called and extra lookouts were posted. The ship's direction finder had not been accurately calibrated on her previous departure, due to press of time, and it was not considered reliable by the master. He therefore called up the shore stations and asked for a fix. In response he was given three bearings which intersected accurately and gave him a position 303° from the islets and distance 11 miles at about 0400.

The ship was making 11.5 knots through the water, and the troops, who had been called early to prepare for disembarkation, were all up on deck, noisily milling around in happy anticipation of landing shortly on United States soil. Several times the master asked over the loud speaker for quiet so that he might be able to pick up the fog signal ahead. His course was 55°, or almost directly for the islets.

At 0420 the signal was reported, apparently bearing slightly on the starboard bow, or about where he placed it, although if his fix and speed were correct such a report would mean that he was hearing it at a distance of 7 miles. At 0430 another report was made placing the signal on the starboard beam. These two conflicting reports, based upon hearing alone, clouded the situation for the master. (See "Ears Are Not Direction-Finders," in the August *Proceedings*.)

He stopped his engines but was unable to hear any further signals so proceeded on a slow bell until 0445. At this time by his reckoning he should have been 4 miles from the rocky islets which rise boldly from the ocean. The ship was hauled 20° to starboard with the intent of passing to the southward of the obstructions. In less than 10 minutes rocks loomed out of the fog right under the ship's bow, and before any effective action could be taken the ship struck, holing herself amidships and flooding the machinery spaces.

Because the vessel was on a pinnacle, with danger of either capsizing or breaking in two, the master correctly appraised the situation and decided to abandon ship. This was accomplished with a degree of precision and efficiency that speaks well for the training of the ship's crew and the discipline of the troops. Not a soul was lost or seriously injured in manning the boats and rafts, and everyone either reached land or was picked up by rescue vessels dispatched to the scene. The ship became a total loss.

In reviewing the casualty in the light of all knowledge it is apparent that undue dependence was placed upon two points: the original fix and the failure to hear the powerful fog signal. Although the three bearings which established the fix intersected accurately, their angles of intersection were acute, and any error thereby created would directly affect the assumed distance of the vessel from the obstructions. The possibility of current was not taken into account, and investigation disclosed a current of 1.8 knots setting exactly with the ship.

Even had the 0400 fix been absolutely accurate, the ship stood at full speed directly toward the danger, her only hope of hauling off in time being her estimate of distance run and her picking up the fog signal. If the latter was heard at all, the two reports of it should have been red flags to the master. That she continued on her course, despite the fact that she heard no further signals, was accounted for by the master on the ground that there was a "blind spot" in the signal area—if so, the strongest kind of reason for not proceeding!

It is impossible to emphasize the folly of trusting to ears alone, or to sound transmission in thick weather, if other precautions and navigational means can be employed. The use of the ship's fathometer to permit following the 200-fathom curve would have kept the vessel 5 miles off the rocks. Courses at 90° to bearings of the islets, successively taken, would have permitted the ship to circle them without approaching any closer. No routing order is intended to risk the lives of a thousand men.

The old precept: "When in doubt, assume the most unfavorable situation and navigate accordingly" is not sissy stuff; it is good, hard sense.

Loss of Ship Due to Poor Judgment

An American merchant ship loaded with an important war cargo recently arrived off a foreign port after sunset and in bad weather conditions. The wind was blowing a gale directly on shore with heavy rain squalls in which the wind reached force 8. The anchorage was congested due to the presence of a number of other vessels, many of which were experiencing difficulty in holding, even with two anchors down.

The master of the vessel in question came to anchor and almost immediately began to drag. He hove up and proceeded farther off shore and again

anchored with 90 fathoms of chain out. He again began to drag despite the use of his engines to ease the strain on his ground tackle. After about an hour he again hove up and steamed off shore at slow speed.

At about 0400, the night dark and the wind still of gale force and a heavy swell setting in, he ran back for the anchorage. His lookout was stationed on the bridge because of the seas that had been coming over the bow while heading into the wind. After about half an hour, when he concluded he was close enough to the beach to anchor—no soundings had been taken at any time—he discovered that he was well into the congested anchorage and was dangerously close to the beach. Full use of engines and rudder were insufficient to extricate the ship from this position due in part probably to the shallowness of the water in which she then was. Both anchors were let go but the vessel lay in the trough of the sea and drifted broadside onto the beach.

A tug was dispatched to her assistance but could not get close enough to pass a line in the shallow water and the heavy seas. The ship was pounding heavily and after about an hour and a half broke in two. Lifeboats and life rafts were launched and a part of the crew reached the beach although one man was swept off his life raft and drowned and the first lifeboat was capsized in the surf. The remainder of the crew stayed by the wreck and were taken off the following day.

The master was charged with inattention to duty and unskillfulness and after a full hearing was found guilty and his license suspended for a period of 6 months. The conclusion was inescapable that after anchoring in a dangerously congested area under conditions which showed that the vessel's ground tackle would not hold, the master had properly gotten under way and had gained sea room where he could lie to or hold his position with the use of his engines. A short time thereafter he re-entered this congested anchorage under conditions which placed him in greater peril than at the time when he first anchored. Inadequate precautions as to lookouts and soundings were taken with the result that he overran his estimated position and caused the total loss of a valuable cargo vessel and the death of one of his seamen.

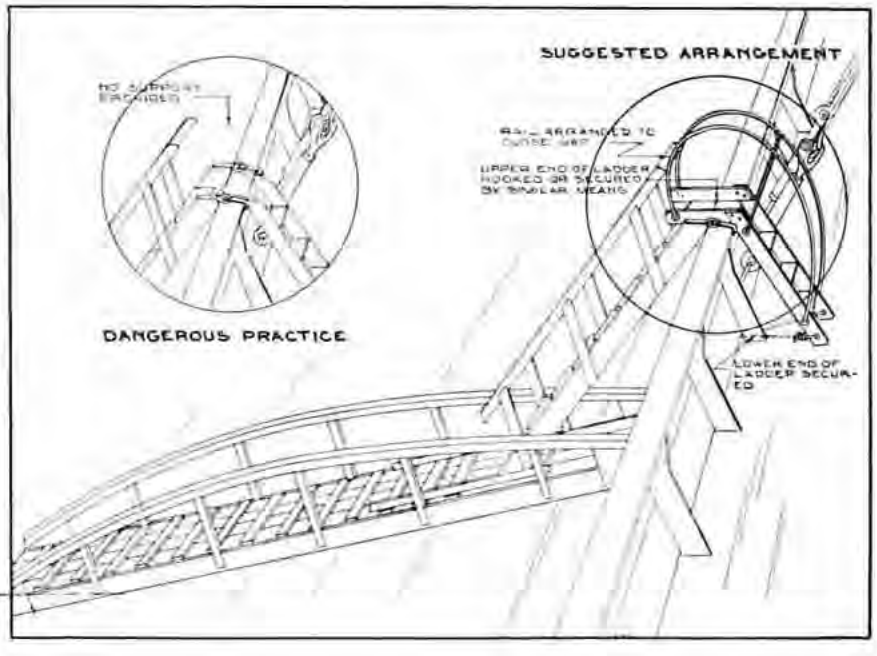
PERSONAL INJURIES

Gangplank Accidents

On three different occasions during the last few months, in a single port, men have lost their lives by falling from the gangplank of ships berthed alongside a pier. In each of the three cases the gangway was of the same type: A gangplank slung from the bulwark with a ladder resting upon it leading up to the rail, leaving an unprotected space between the ship's rail and the end of the handrail on the ladder. Probably all three lives might have been saved had an adequate guard rail been installed at this danger point.

In one case an oiler was boarding a ship carrying a parcel in one arm. Just as he reached the bulwark (beyond the point where there were handrails on the ladder) he slipped and fell in a sitting position; in attempting to rise, still clutching his bundle, he lost his balance and went overboard between the ship and the pier and was drowned.

In another case the gangway ladder was at the extreme angle of 75° with the ship's side, and was also slippery from a recent shower. The seaman boarding the ship slipped at the top of the ladder and, there being nothing for him to catch hold of, fell overboard to his death.



In the third case, a crew member was boarding a vessel with a package under each arm. On this ship the gangway was fitted only with a manila handrope over 3-foot stanchions instead of the customary fixed handrail. This type of rope rail is poor at best, not only because of its sag, but also because it cannot be carried out to a stanchion at the end of the ladder and is usually secured at each end to an eyebolt on the ladder itself. Here the hazard was still further increased by the fact that the seaman did not have his hands free to help himself. He asked to be given a hand as he stepped from the ladder to the rail, but no one could reach him before he toppled over. He fell from the bulwark, striking his head against the pier as he fell, and never regained consciousness.

In none of these cases was there any indication that the victim was under the influence of alcohol. Also, they all occurred either in daylight or under adequate lighting conditions. In all probability they would not have happened, even in the case of those men encumbered with packages, had some better protection been afforded at the point where a man steps from the gangway ladder to the bulwark. The accompanying sketch indicates the "danger zone," and shows a suggested installation for increased safety at the crucial spot. However, a seaman is supposed to exercise reasonable caution in dangerous places; the old maxim of "One hand for the ship and one for yourself" is still a good one. These three deaths, under similar circumstances, occurring within so short a time, indicate the need for additional safety measures and for more common sense precaution on the part of seamen.

Death in the Bight of a Line

A ship was recently being overhauled in drydock. The Chief Mate, in charge of a work party consisting of the Boatswain and five seamen, was directing a test of the releasing gear on the #2 life raft. The raft had been hoisted from the skids by means of tackle attached to a wire bridle on the raft and to the mainmast crosstree. The hauling part was led to #3 port winch and several turns taken around the port forward niggerhead, the remainder of the 3" manila line being coiled down outboard of the winch. The falls were rove through two single ten-inch blocks on the crosstree through a double-sheave block at the raft and back, and thence to the winch on deck. A sudden shower had interrupted the work for about 25 minutes, and the job was resumed at approximately 3:25 p. m.

The Chief Mate was directing the operation from the top of the mainmast house. An A. B. was operating the winch with two men tending the line, while the Bo'sun guided the two others holding a guy line to the raft,

which had shown a tendency to slue while being lowered onto the skids.

When the Mate called out to "Hold her!" the winch, being out of gear, commenced "backing off," and the weight of the raft slipping and gathering momentum jerked the line from the men's grip and whipped the turns from the niggerhead. The winch is so constructed that when operated with both clutches disengaged there is no interconnection with the brake, which acts on the forward drum only when one or the other clutch is engaged; hence steam pressure alone was holding the load, and proved inadequate to take the strain. The machinery had stood idle in the rainstorm for nearly a half hour, and the condensed steam had not been drained from the pet cock before resuming operations.

The seaman who was clearing the line was not quick enough in heeding warning cries, and his left leg became entangled in a bight of the line. The weight of the slipping raft pulled him quickly to the block at the crosstree, where his leg was severed just below the knee, dropping him headfirst to the deck, 43 feet below, and killing him instantly.

The speed with which the accident took place made it impossible for witnesses to say exactly how the man's foot became caught in the line, but the use of a niggerhead not connected to a mechanical brake, and the failure to drain off condensed steam before resuming work after the winch had been, inoperative, were contributing factors to the tragedy, as well as the seaman's inability to get clear of the running line in time to avoid being carried aloft and dropped to his death.

Care should be taken in undertaking any such operation to see that the machinery is in proper working order and tackle is properly rigged and adequate to cover any unexpected slip. If the job demands it, preventer lines should always be rigged in addition.

The main point to be stressed, however, is that of being "safety-minded." Every seaman, whether he be a member of the working party or an onlooker, should study the job to be done, or that is being done, and make a mental note of the hazards that can be expected in such an undertaking. Having done this, he should locate himself so that he has the best chance of coming out uninjured if anything goes wrong. The experienced sailor will do this instinctively; others should think "safety" until they gain that experience which gives a quick understanding of the risks of their employment.

Traps for the Unwary

This article on personal injuries could be given other titles such as "Fools Rush In," or "He Put His Foot in It." It has to do with the injuries caused by failure to look where one is going, with some reference to special dangers and pitfalls.

There is limited room on a ship at best. All traffic passageways should be kept clear of unnecessary obstructions, such as hatch covers, cargo gear, ship's stores, and refuse. When such obstructions as cleats, pad-eyes, and the like are unavoidable, they should be painted a distinct color, such as bright orange, to attract attention.

Adequate light should be provided at all ladders, gangways, deck-house entrances, alleyways, and for passageways over deck cargo. (This, of course, is in wartime subject to such modification as black-out instructions may require.) Entering any dark compartment or hold without safe and proper flashlight is highly dangerous, and the use of matches or open lights should be forbidden. A safety chain should be kept across the door to the shaft alley escape trunk.

All openings without coamings or with low coamings should be safeguarded. Hawsepipes on the forecastle deck should be covered or railed off. Open manholes and engine-room floor plates removed for access can cause broken legs. Where the ship's accommodation ladder is in an almost horizontal position, or when any other runged ladder is at a similar angle, duck wards with cleats should be secured in place on them as walkways.

Vertical ladders, such as hold ladders and Jacob's ladders, should be inspected frequently for damage, particularly cargo-hold ladders which are subject to damage by drafts. Jacob's ladders should be kept free of grease or other slippery substances and should never *never* be secured to a pipe or chain hand rail. Personnel climbing a ladder or mounting steep steps should keep their hands free and use the man ropes or grab rails.

Where the deck, outside of the machinery spaces, is oily, sprinkle saw-

dust on it. In the machinery spaces, wipe it as clean as possible. Don't wear old, run-down, or greasy shoes, or any other footgear that detracts from sure-footedness. When the ship is rolling heavily or shipping green water, rig a wire lifeline with sufficient lizards. Finally, don't step into a coil or bight of a slack mooring line or other working gear, nor, in the interest of posterity, straddle one.

WATCH for these hazards:

1. Slippery, wet, or oily decks.
2. Ice and snow on catwalks and platforms.
3. Stumbling hazards.
4. Loose material under foot.
5. Worn or broken treads on stairs.
6. Stairs, scaffolds, or platforms without guard rails.
7. Insecure platforms or scaffolds.
8. Defective ladders or ladders not suited for job.
9. Open hatches.
10. Unguarded deck openings and manholes.

Flooding of Engine Rooms

Two cases of partial flooding of engine rooms and damage to machinery have recently come to the attention of the Coast Guard, which because of similarity of circumstances it was thought should be brought to the attention of the Service and the operators of vessels.

The vessels involved were both T2 tankers. It appears that vessel "A" was in a repair yard on the West Coast and vessel "B" was in a repair yard on the Gulf Coast. In each instance the cargo tank bulkheads were being tested by filling the tanks with water. On vessel "A" the inspection plates from the main condensers had been removed, presumably after closing the overboard discharge valve. On vessel "B" the impeller from the main circulator had been removed and the overboard discharge valve closed tight and lashed. Testing of the tanks on each vessel was carried out by filling the forward tanks, which set the vessels down by the head and raised the after ends sufficiently so that the overboard discharges were out of water. As the testing of the tanks proceeded aft the vessels were set down by the stern until the overboard discharges were below the surface of the water.

In vessel "A," the night engineer stated that up to midnight everything appeared to be normal in the engine room and that there was no water in the engine room bilge. However, at about 3 o'clock in the morning he noticed the vessel taking a list to port and upon entering the engine room he found that water was coming from the main condenser through the inspection openings and had partly flooded the lower engine room. Upon investigation he found that a gate valve in the main condenser overboard discharge line was partly open and with the assistance of the pumpman he was able to close the valve, but not until sufficient water had entered the engine room to damage 5 cargo room motors and the main propulsion motor. The night engineer had assumed that as the inspection plates of the condenser were off, the overboard discharge valve was properly closed. In this case it was found that the first assistant engineer was at fault in not properly closing the overboard discharge valve and that the night engineer was at fault in not checking the valves, particularly when he knew that the inspection plates were off and that the vessel's draft was changing due to the testing of the tank.

In vessel "B" it seems that the first assistant engineer instructed an employee of the shipyard to close the overboard discharge valve and then the first assistant checked to determine if it was closed and upon finding it closed he lashed the valve wheel with a rope. The third assistant engineer took over the watch in the evening and made a check of conditions in the engine room and found them satisfactory. He then went on deck to give instructions to an oiler to obtain some things for him ashore. About an hour later the third assistant was notified by the shipyard employee that water was entering the engine room at a rapid rate. The third assistant went below and found water entering the engine room from the main circulator where the impeller had been removed. He immediately went to the overboard discharge valve, removed the lashing and with the assistance of the fireman was able to turn the valve in both directions and finally succeeded in closing it several turns, preventing additional water from entering the engine room.

The vessel was placed in dry dock and one of the crew entered the overboard discharge line through an inspection plate on the main condenser and found a piece of 1- by 4-inch pine, approximately 3 feet long, lying in the discharge line just on the overboard side of the valve. Examination of this piece of wood showed that it had marks indicating it had jammed the valve.

The valves in question were 24-inch gate valves of the nonrising stem-type. The records of the investigations of these accidents fail to disclose whether either of these valves was fitted with a device to show clearly whether it was open or closed.

It is, of course, not uncommon for foreign substances to be lodged on the seat of a valve, such as pieces of wood, marine growths, etc. The presence of such substances can sometimes be detected by the "feel" of the valve while closing it. In closing overboard valves in cases similar to those set forth herein, the engineer should take every precaution to make sure that the valve is closed tightly on its seat.

Boilers Damaged by Insufficient Water

The reading and proper interpretation of a boiler water glass appears to be a simple matter, and it actually is; nevertheless, there is an alarming number of casualties reported where the haphazard misinterpretation of such readings results in disastrous consequences. Any licensed engineer knows how quickly tubes can be ruptured and blistered, headers damaged, and furnaces collapsed, if the fires are not immediately "secured" whenever there is insufficient water. It is, therefore, the professional responsibility of the engineer to accurately ascertain the water level in a boiler by more certain methods than visual sighting in a water glass, especially when any doubt about the quantity of water exists. The average layman can usually tell at a glance that the boiler failures in these casualties were caused by insufficient water due to sheer negligence and carelessness to the *n*th degree.

To accentuate the importance of accurate interpretation of boiler water glasses, a glaring example of faulty operation was recently brought to the attention of the Coast Guard, which illustrates such careless inattention to duty, and it is worthy of mention in order that conscientious engineers may direct it to the attention of such engineering personnel as are inclined to be lax in such matters.

This particular vessel was equipped with two Babcock & Wilcox high-pressure triple-fired boilers. During the course of the voyage, as the third assistant engineer was about to assume his regular watch, he was informed by the fourth assistant, whom he relieved, that some difficulty was being encountered in maintaining proper water level in the boilers. The third assistant engineer then directed the fourth to locate the first assistant engineer by telephone and inform him of the trouble. Since the first assistant engineer could not be located immediately, he remained below to help the third assistant solve the low water condition.

Shortly thereafter, the first assistant appeared in the engine room and the third assistant informed him of the trouble with the water, and, immediately, the three engineers began to look for the cause of the low water situation. However, approximately 45 minutes later the water level in the port boiler became dangerously low. At this time, the third assistant requested the fourth assistant to put the vertical reciprocating pump on the line, which was done. The third then noted that one of the glasses was about two-thirds full and, about 5 minutes later, he noted that the water glass was either entirely full or entirely empty. Assuming it was full of water, he ordered the fourth assistant engineer to secure the recipro-

cating pump, which was done approximately 3 minutes afterwards. Before any sign of water had been observed in the water glass, a tube in the port boiler blew out and steam was lost on the plant. Subsequent examination revealed that all the tubes below the superheater in the port boiler were ruptured and damaged to the extent that removal was necessary. The vessel proceeded to port under one boiler, where long delay and expensive repairs were necessitated.

It is interesting to observe that, in addition to the conventional water gage glass, these boilers were equipped with an approved type remote water level indicator as a secondary means for indicating the boiler water level. However, the testimony adduced in this case revealed that the engineers and engine-room personnel completely ignored the reading of the remote water level indicator, presuming it to be unreliable, although it was later proved that this remote water indicator registered the correct water level during the entire period of the low water difficulty.

In this case, as well as in the majority of reported low water boiler casualties, gross ignorance of the "procedure in case of low water" was displayed. In the first place, they failed in every incident to promptly "secure" the fires in the boilers after losing the water; secondly, they failed to make certain as to whether the indicated water level in the gage glass was true or false by the customary blow-down method, even though it had become apparent that true water level was in doubt. In the third place, they ignored the comparison of the water level of the conventional water glass with that of the remote indicator, which should have been made at frequent intervals prior to the low water trouble. In the last place, they failed to establish the degree of reliability that could have been placed in the remote water indicator if the boilers were operating under normal and subnormal water levels.

Low water is almost invariably the result of the engineer, fireman, or watertender having his attention diverted from his task, or inattention to duty. In most casualties, the records indicate that one of the following has occurred:

(a) Gage glass valves partly plugged.

(b) Drum valves partly plugged.

(c) Gage valves or drum valves inadvertently closed.

(d) Empty glass mistaken for a full one.

In all of the above cases, the true state of the water glass can be ascertained by blowing the gage glass down. Usually men who persist in assuming it to be full instead of empty, immediately restrict the feed water supply to lower the water level into sight again, whereas they actually reduce the water level still further. This is what happened in this case.

If either the top or bottom connection of the water gage is obstructed by scale or some other matter, a false indication of the water level will result. If any doubt exists concerning the actual water level in the boiler, the gage glass should be "blown through." Blowing through is accomplished by closing off tightly the top valve on the water glass and opening the drain. This will allow water to blow through the bottom gage glass connection and clear it out. The drain should then be closed, the top gage glass valve opened, and the bottom gage glass valve closed. The drain valve should then be opened to permit steam to blow through the top gage glass connection, cleaning it out. When the drain is closed and the top gage glass connection opened again, the water level in the boiler should be clearly indicated in the glass. If either one of the connections does not blow through the drain freely, it is an indication that an obstruction exists in the connection, and steps should be taken to correct this condition because a faulty indication of the water level would result. The gage glasses of most boilers are connected with a blow-down connection, which should be opened at regular intervals, while at the same time observing the water level in the boiler. After the drain has been opened, it will be observed upon closing same that the water level will reappear in the gage glass quickly and will fluctuate somewhat (temporarily). This is an indication that the connections are clear. If, however, after opening the drain and closing same, the water level in the glass reappears slowly, this indicates that the connections to the gage glass are not entirely clear.

Another factor which has a direct bearing on actual causes of dangerously low or high water conditions is improper feeding and firing, particularly with modern water tube boilers. For instance, if firing rate is sharply increased, there will be a definite tendency for the water level in the glass to rise; at the same time, more water is being evaporated and more feed is needed to replace it. In this case, there is a pronounced tendency for the inexperienced fireroom personnel to hurriedly close down on the feed stop valve because of the momentary rise in the water level. The correct action is to expect and accept the initial rise as a natural consequence of increased firing rate, and to open the feed stop still further to meet the increased water evaporation. The reverse takes place when there is a sharp reduction in the firing rate. Again the inexperienced fire-room personnel has a tendency to open the feed stop valve instead of closing it a certain amount. Therefore, the effect which an increase or decrease in the firing rate has on the water level in the gage glass must be known and expected, and the boiler must be fed in proportion to the steam generated.

The accident described in this article, as well as many others that have come to the attention of the Coast Guard, could undoubtedly have been prevented had the water level been properly checked by the foregoing method. In these modern times where chief engineers are responsible for boilers that generate water into steam at a tremendous rate, they should be very insistent in their demands that water gage glasses be blown down at frequent intervals to make sure the water level, as indicated in the glass, is a true and not a false water level.

The whole story in connection with boiler casualties, which are directly attributed to careless operation, cannot be set forth in this article. Investigations are now in progress covering the increasing number of boiler failures occurring on Victory-type vessels, and it is anticipated that other articles will soon be released on this subject.

Beware of Exposed Conductors of Electricity

Two men were killed recently and a third seriously injured while working around live bus bars and cable lugs in the engine rooms of T-2 tankers.

The incidents occurred on two Pacific Coast vessels at sea. On the first vessel, a faulty evaporator was in need of repairs and the Junior Third Assistant Engineer volunteered to take down and examine a short section of one-half-inch pipe line, located close to the forward engine room bulkhead at a point directly behind the evaporator. About 10 minutes later the First Assistant Engineer noticed the Junior Third stagger around the after end of the evaporator with his head badly bruised and swollen. He told the "First" that he had gotten overheated and had fallen on a hot pipe. An examination of the "Junior's" head by the First Assistant revealed three rather deep wounds on the left side, with the surrounding flesh burned. Being in serious condition, he was put to bed and later was sent ashore to a naval hospital, where he eventually recovered completely from his injury.

On the same vessel the next morning, the Third Assistant Engineer, off watch, reported to the "First" that he was ready to work overtime to locate the trouble and make the necessary repairs to the evaporator. He then started to take down the one-half-inch pipe line that the Junior Third had been working on. This pipe line was connected to the top of the diaphragm regulator located between the forward engine room bulkhead and the forward head of the evaporator about 6 feet above the 'tween deck compressor flat. In order to remove the last section of pipe, the Third Assistant climbed on top of the evaporator shell and maneuvered on his stomach directly over the diaphragm regulator. This position placed his body very close to a large number of high-voltage cable lugs. After having worked in this manner for about 20 minutes, he climbed down from evaporator to rest and cool off a bit.

He again climbed to the top of the evaporator shell and was in the act of turning his body when, without glancing upwards, he raised his hand over his head and struck a bar cable lug. A flash of blue flame resulted. The Third Assistant slumped over and fell partly off the evaporator with his leg caught between the shell and some pipe line. Simultaneously, the turbine driving the propulsion generator tripped out, thus idling that unit. When lowered down from the evaporator by the First Assistant and watertender, it was observed that the "Third" was not breathing and that his face had a bluish pallor. Immediate efforts were made to revive him by artificial respiration which was continued for several hours until his body began to stiffen and it became apparent that further effort would be useless.

On the second vessel, certain painting of the air compressor flat was indicated. The First Assistant Engineer called together three men, two wipers and one oiler, and instructed them to begin in the air compressor flat and work downward. He cautioned them to "keep away from bare electrical wires and hot steam pipes." The painting was carried out the first day without mishap.

The following day, the painting was resumed by the same three men. The First Assistant gave them no further instructions and did not inspect the area to see what had been accomplished. One of the wipers, while painting the overhead of the air compressor flat under the switchboard, within a few inches of three bus bars, was seen falling from the stepladder on which he was working, and at the same time the main motor was cut off the line. The victim, breathing weakly, was removed to the ship's hospital where it was noticed that three fingers of the right hand were badly burned at the tips. Purple splotches appeared on his body and artificial respiration was begun. It was continued for over 17 hours until he was pronounced dead by a medical officer from a passing Army transport vessel.

In the investigation of these two fatalities it was quite evident that the bus bars and cable lugs were uninsulated, unprotected, and unposted. While it is obvious to everyone that all necessarily exposed parts of high voltage conductors (2,300 volts on each of the vessels) involved herein should be guarded with wire meshing, metal covers, warning signs and tags, etc., it is not always practicable to do so. An analysis of the circumstances of these two cases reveals that the exposed sections were in ordinarily inaccessible locations. It is simply not intended that protective devices be a substitute for common sense and human precaution. The human being must sometimes guard himself.

On the first vessel, the Third Assistant Engineer crawled on top of the evaporator shell and was apparently aware of the proximity of the cable lugs. His death was merely a matter of momentary disregard or forgetfulness—a very ordinary human trait—as he adjusted his body leverage while in an unnatural position. His work could have been performed in comparative safety, as was demonstrated by the First Assistant Engineer who completed the job after the Third Assistant was killed.

On the second vessel, the wiper was killed while working from a ladder, apparently holding on with one hand and painting around bus bars with the other. His misfortune was a matter of insufficient instructions from his superior officer, the First Assistant Engineer. In this case, the First Assistant should not have limited his precautionary instructions to "keep away from bare electrical wires * * *," but should have taken the three men to the scene of the exposed parts and instructed them what to avoid while working in the vicinity.

As a general guide towards preventing the recurrence of incidents similar to the above, it is highly desirable that while working around exposed electrical parts, such parts should be deenergized, even stopping the vessel, if necessary. Or if the work can be postponed until arrival in port, this should be done. If not, then every precautionary effort must be taken to avoid a human circuit between live conductors and metal parts of the vessel. There are various schemes by which an individual can insulate himself against electrical shock.

It will be observed that one of these cases involved a repair job which might have been necessary. However, the painting of the overhead was a matter of maintenance which could readily have been deferred until the vessel was in port, where the current could have been cut off.

Reverting to the protection of hazardous places, in Section 32.9–8 of the Tank Vessel Regulations and also in the regulations for other classes of vessels, we find that, "It shall be the duty of the inspectors when inspecting a vessel to see that all exposed and dangerous places, * * *, are properly protected with covers, guards, or rails, in order that the danger of accidents may be minimized * * *." It is apparent that the exposed lugs and bus bars carrying a heavy current were not protected.

For those with mathematical minds, the following figures may prove convincing. The resistance of a human body is roughly 500 ohms, more or less, arm to arm, or head to foot. Placed across a potential of 2,300 volts, a current of 4.6 amperes would pass through the body. This represents a power of 10.5 kilowatts, or approximately 13 horses. This is quite a wallop for any man to experience, and survive. The sensible thing to do, of course, is to avoid that unlucky 13.

You can get a PERMANENT INJURY with a temporary repair job

Explosions on Motorboats

From the pier of a resort on the shore of Lake Michigan a jolly group was starting out on a speedboat run around the harbor one July afternoon. The boat was pushed away from the pier and drifted a minute while the operator started the engine. The starter took hold, then there was a blinding flash and explosion, followed by fire. As a result, three passengers were severely burned, three jumped overboard, and the rest had to be precariously transferred to another craft nearby. This motorboat, built before 25 April 1940, met the existing regulations for its type and age, and the fire was promptly extinguished by means of the required fire-fighting equipment, but the accident need not have happened if recommended practices for the safe operation of motorcraft had been followed.

Six days later, and a thousand miles away, a motorboat carrying a licensed operator and 2 crew members in addition to the 15 passengers out for a day's fishing trip from a New Jersey port experienced a somewhat similar accident, with even more serious results. The motor had been stopped and started several times during the trip, and an odor of gasoline had been detected by the operator not long before the accident. He had searched for the source and had wiped up a suspicious damp spot, throwing the rag overboard. A few minutes later, when the engine was again started, a terrific explosion ensued. Fifteen of the eighteen persons aboard were hospitalized as a result, and considerable damage was done to the craft itself by fire. This boat was violating no mandatory regulations, and the conduct of the crew was above reproach.

Yet, in each of these cases, there was a flagrant disregard for recommended practices for the care and safe operation of motorcraft while still keeping within the letter of the law. The operators failed to keep in mind that petroleum vapors are heavier than air and consequently accumulate in the lowest part of spaces or compartments containing them, where they are not readily detected. Accumulated petroleum vapors may lie dormant in the lower part of an engine compartment for a considerable length of time without mishap. However, should a source of vapor ignition be introduced, such as an electric spark, a lighted cigarette, an open flame, etc., a disastrous explosion may result similar to the explosions described herein.

To be safe, it is essential that all spaces or compartments which may have gasoline vapors in them be properly ventilated before attempting to start any type of motors within such spaces. Gasoline vapors are dangerous. A half pint of gasoline which has vaporized in a closed space or compartment may create a potential explosive power of 5 pounds of dynamite. To overcome the hazard of explosion, it is imperative that action be taken to prevent the accumulation of explosive mixtures, first by keeping gasoline or other petroleum products from spilling and vaporizing, and second by providing adequate means for ventilating these spaces or compartments. The next step is to eliminate all sources of vapor ignition in spaces which may contain explosive mixtures. By observing recommended safety practices, dangerous explosions can be prevented.

Although specifications concerning adequate ventilation of the various compartments are mandatory only on vessels constructed or decked over after 24 April 1940, the owners and operators of older craft engaged in carrying passengers should examine these craft themselves to see that they conform not only to Motorcraft Regulations but also with the recommended practices appended to these regulations. The fact that a vessel by the date of its construction is exempted from complying with certain requirements does not absolve the owners from responsibility for the safety of those whom they engage to transport, or from the observance of recognized safety precautions. The Recommended Practices for the Care and Safe Operation of Motorcraft are appended to Motorboat Regulations for the guidance of such owners in checking their safety equipment. It is strongly recommended that owners and operators of motorboats study the regulations and recommended practices carefully in order that accidents such as those described above may be reduced to a minimum.

The Wages of Carelessness

All the elements necessary for a disastrous explosion were present; a hundred gallons of gasoline had leaked into the bilges; the vapors from this gasoline had spread throughout the interior of the vessel; and there was a gasoline-driven, double-duty generator on board, which, if used to pump out the bilges, offered a source of ignition to the vapors.

This was the situation faced by the captain of a yacht one recent summer morning. The gasoline he had ordered from a local dispenser of marine supplies was then being pumped on board. During the refueling operations, the dock pumpman, who had heard sounds of leakage from below, shut down the gasoline pump and went into the engine room to investigate the cause of the apparent leak. He found the starboard tank leaking badly and, by comparing the amount of fuel he had unloaded with the amount in the tank, he estimated that at least a hundred gallons had leaked into the bilges. Before resuming refueling operations, the pumpman insisted to the captain that the bilges be pumped out and went on the dock to borrow a pump for that purpose. The only pump available was an electric pump which he refused because of the danger it offered as a possible source of ignition to the gasoline vapors.

When he had left the yacht, the gasoline-driven generator was in operation at slow speed charging batteries; as he returned he observed that the captain had apparently switched the generator over and that it was now being used to pump out the bilges. Nearing the yacht he heard, in rapid sequence, the speed of the generator suddenly increase, a loud exhaust explosion followed almost instantaneously by a tremendous explosion from the interior of the yacht, and saw an immediate outburst of fire. The casualty caused fatal burns to the captain of the yacht, serious burns to two other persons on board, and complete loss of the yacht.

The course that a SAFETY MINDED, reasonable, and prudent man would take to empty the bilges would have been to shut down all machinery offering a possible source of ignition to the gasoline fumes, take necessary precautions against possible asphyxiation, and then use a hand pump to bail the gasoline out of the bilges, being careful not to provide a source of ignition to the explosive vapors. The master, by his actions in this casualty, violated the very fundamentals of the rules for the safe handling of gasoline. Scientific studies have shown that a half pint of gasoline vaporized in a confined space may create a potential explosive power of 5 pounds of dynamite. This yacht had an estimated 100 gallons of gasoline in its bilges. No one would handle a ton and a half of dynamite in a careless manner. In this case a source of ignition was voluntarily offered to vapors rising from 100 gallons of gasoline having a potential explosive power of a large barrel of dynamite.

It exploded. Very little imagination is needed to picture the havoc wreaked on this 88-foot yacht.

The Coast Guard has repeatedly emphasized the necessity of being SAFETY MINDED when operating gasoline-propelled craft. During the last 6 months of 1945, however, reports of 25 cases involving the explosions of gasoline vapors on board gasoline-propelled craft were received at Coast Guard Headquarters. The occurrence of such a large number of these accidents shows that all those who handle gasoline on vessels are not, as they should be, SAFETY MINDED.

It is hard to believe that the captain in this case was not aware of the danger involved in using the gasoline-driven generator while the gasoline vapors were so prevalent. He was a man of experience and had received several issues of a master's license. His attention had been directed to the vapors and the gasoline in the bilges. The only conclusion that can be drawn is that he thought he could take the chance; that he could get away with it; that other ships might have explosions, but not his. This frame of mind is well suited to a soldier ordered "over the top," but even his chances are better than the man who takes his life in his own hands by voluntarily offering a source of ignition to highly explosive gasoline vapors. In the interest of their own safety and property, operators of vessels having gasoline-driven machinery are urged to follow the basic rules of safety in handling gasoline — BE SAFETY MINDED — observe the following rules:

1. Fuel tanks should be properly installed and vented.

2. Fueling should be completed before dark except in emergencies.

3. Whenever boat is moored at service station for fueling:

A. Do not smoke, strike matches, or throw switches.

B. Stop all engines, motors, fans, and devices liable to produce sparks.

C. Put out all lights and galley fires.

4. Before starting to fuel:

A. See that boat is moored securely.

B. Close all ports, windows, doors and hatches.

C. Ascertain definitely how much additional fuel the tanks will hold.

5. During fueling:

A. Keep nozzle of hose, or can, on contact with fill opening to guard against possible static spark.

B. See that no fuel spills get into hull or bilges.

6. After fueling is completed:

A. Close fill openings.

B. Wipe up ALL spilled fuel.

C. Open all ports, windows, doors and hatches.

D. Permit boat to ventilate for at least 5 minutes.

E. See that there is no odor of gasoline in the engine room or below decks before starting machinery or lighting fire.

F. Be prepared to cast off moorings as soon as engine starts.

The Coast Guard has available for distribution copies of the pamphlet entitled "Motorboat Regulations" which has, in addition to the regulations, excellent material on recommended practices for the care and safe operation of motorcraft. Copies of this pamphlet can be secured at the nearest Coast Guard Marine Inspection Office or upon request from the Commandant, U. S. Coast Guard, Washington 25, D. C.

ASPHYXIATION

An Old, Old Story

The following incident has happened before and in all probability will happen again. It has just happened.

It's the old story of death by asphyxiation when entering a sealed compartment without preliminary airing. This time, three lives were lost.

The incident occurred on an American vessel in an Italian port. The vessel, a Liberty type, was discharging a cargo of coal. Number 1 hold had been cleared. The chief mate, together with the boatswain and two AB's, entered the hold to inspect the two deep tanks. The deep tanks had not been used during the voyage and had been tightly sealed to exclude all minute particles of coal. The manhole cover to the starboard deep tank was the first to be removed.

The chief mate, upon directing a flashlight into the tank, spotted a piece of lumber which he decided to remove. He entered the tank and descended the ladder to the bottom. He took a few steps around. Then he started up again. Near the top of the ladder he fell backwards to the bottom of the tank about 10 feet below. The boatswain and one AB immediately entered the tank to remove the mate. The AB started up the ladder with the body of the chief mate, but before reaching a point where the second AB could assist, he fell backwards. The second AB sensed something radically wrong and scurried to the main deck for help.

Several men with an oxygen breathing apparatus, life lines, stretchers, and wrenches arrived at the scene. The second AB entered the tank using a dampened handkerchief across his nose and a life line around his chest. He was overcome and was pulled from the tank by means of the life line, suffering no after effects. The deck engineer, using the oxygen breathing apparatus, entered the tank and removed the body of the first AB. After this was done the breathing apparatus oxygen supply was depleted.

The tank top was then unbolted and removed. The third mate entered the open tank with a life line about his shoulders. He removed the bodies of the chief mate and the boatswain.

All three of the recovered bodies were rushed to a hospital in an ambulance. Shortly thereafter, the master was notified that the three men had been pronounced dead.

After contact with the American Consul, arrangements were made to embalm the bodies and retain them aboard the vessel until its return to the United States. Three weeks later, the bodies were forwarded to their next of kin.

It was concluded that the three deaths were not due to negligence or inattention to duty on the part of the master or any member of the crew other than those who inadvertently met death. The chief mate, a seaman with years of experience, should have known the danger that existed in entering a tank which had not been aired. The boatswain and AB, not realizing the cause of the chief mate's collapse in the tank, were overcome in an attempt to assist him.

In appraising this unfortunate incident the Master could only say, "It is beyond my comprehension why a licensed officer with the experience and ability of ---------, the chief mate, would enter any vacated long-sealed compartment before using the precautions with which he was entirely familiar, of testing it with one of the two flame safety lamps aboard ship."

The lesson to be learned from this accident has been taught many times before: NEVER, NEVER, NEVER enter any compartment which has been closed tightly for some time, without first checking its oxygen content. Human beings, even mariners, require oxygen for the sustenance of life.

Keep your mind on your work—IT'S SAFER!

Asphyxiation From Gasoline Fumes

Numerous articles have appeared in this and other publications emphasizing the precautions that should be exercised before an individual enters a space or compartment likely to contain poisonous gases or an atmosphere which is deficient in life-supporting oxygen. By illustrating with actual casualty cases, it has been shown how accidents have occurred through the failure of ships' personnel to heed the normal safety precautions, and it has been the hope of the Coast Guard that in this manner individuals would learn from the experiences of others, and the number of casualties of this type would be reduced considerably.

Only recently another casualty occurred through the failure of ship's personnel to take proper safety precautions, resulting in the asphyxiation of one man and the serious gassing of two others. The vessel concerned was a tanker which, at the time of the casualty, had just completed the discharging of gasoline at a foreign port. The shore personnel had requested that the lines be flushed with salt water, which necessitated a man descending into the pump room to open the sea suction. The chief mate and the first pumpman were aware of the fact that there were considerable gasoline fumes in the pump room even though both doors and the ventilating hatches were open.

Gasoline fumes in the pump room had been a cause for concern for some time. As a matter of fact, the quantity of gas was so great after leaving the last loading port that the master and chief engineer conferred on the advisability of turning back. The voyage was continued, however, when an examination revealed leaking glands on the cargo pumps and it was believed that, by taking up on these glands, the leaks could be stopped. Apparently this was effective as long as no cargo was being discharged but, as soon as unloading operations were begun, the leaking condition returned and the pump room filled up with petroleum fumes.

These facts were known to the chief mate and first pumpman when they were standing near the pump room discussing the need of sending a man below to open the sea suction in order to flush the lines with salt water. The first pumpman believed he could perform the task required and began to descend without any breathing apparatus or life line, even though a strong odor of gasoline fumes was emanating from the pump room. Upon reaching the second landing, he began to stagger. Two men rushed to his assistance and managed to get him on deck where he lay for about 10 minutes recovering from the inhalation of the gasoline fumes. The casualty report does not reveal why the man chose to risk his life when the presence of fumes should have immediately warned him that some form of breathing apparatus would be required. This vessel was equipped with one fresh air and two oxygen breathing apparatuses; however, the crew, including the officers, were, for the most part, in doubt as to their place of stowage on shipboard. It was undoubtedly the general lack of familiarity with the places where this equipment was kept which led to the pumpman descending into the gas-filled pump room without proper safety equipment.

While the pumpman was recovering from his first experience, two members of the crew searched for and located the fresh air breathing apparatus. Upon their return with the equipment, the pumpman had recovered sufficiently to state that with this mask he could make the bottom of the pump room. In spite of the man's willingness to try again to go below to open the sea suction, he should not have been permitted to do so. Having once been overcome only a short time before, his lungs and head were not clear enough to stand a second exposure and the possibility of a second whiff of the fumes.

Nevertheless, the mask was tested to insure proper operation and was then fitted tightly about the head of this individual. He again descended to the bottom of the pump room and attempted to open the sea suction. At this time, he was aware that he was getting dizzy again from gas which seemed to seep in around the top of the mask. Apparently the mask had not been properly fitted and, as a result, full protection was not afforded. The man again passed out—this time at the bottom of the pump room.

Due to the failure to attach a life line to the pump man prior to his entering the space, he could not be pulled out upon collapsing from the fumes. The investigation revealed that the reason for not attaching a life line to the man was because none was around at the time. It was locked in the boatswain's locker, the key to which was with the boatswain, who was ashore. Another key had been assigned previously to one of the officers present at the time of the casualty, but he stated that he did not take the time to find it since it was mixed up with a bunch of other keys in his desk.

Upon noticing the pump man's collapse, the chief mate called for a mask and was brought a spray-gun mask. This he donned and immediately proceeded toward the bottom of the pump room. Life lines had not been secured as yet. Inasmuch as a spray-gun mask is designed to filter out liquids suspended in the air in droplet form, such as is the case when spraying paint onto a surface, and is not designed to filter out gases in a dry state, this type of mask afforded the chief mate no protection and, as a result, he soon began to feel dizzy and made a rapid retreat. He managed to reach the second grating before collapsing, from which point he was assisted to the open deck.

About this time, the master arrived on the scene and, upon appraising the situation, immediately called for an oxygen breathing apparatus and life lines, both of which were obtained. The quartermaster was fitted with the breathing apparatus. The mask and valves were adjusted and tested prior to his descending into the pump room. It is not known, however, whether any attention was paid to the indicator, which shows the quantity of oxygen available in the cylinder. Although life lines had been secured and brought to the scene, the quartermaster entered the pump room without one being attached to him and without taking one to secure to the pumpman who was still lying unconscious below. The quartermaster reached the floor of the pump room and bodily carried the pump man to the first grating and then appeared about to collapse. From the investigation, it could not be determined whether he collapsed because of a leak around the face mask, the lack of sufficient oxygen because of his exertion, or because the oxygen cylinder was exhausted. Upon testing the cylinder the following day, there was no oxygen in it. When the master observed that the quartermaster was going to collapse, he descended without any mask or life line to the first grating in an attempt to assist him. While aiding the quartermaster, both he and the quartermaster collapsed at the foot of the ladder leading to the weather deck. Numerous attempts were then made by various members of the crew on deck to get life lines around the three inert men. Finally they were extricated and given artificial respiration until the ambulance arrived and removed them to the hospital. The pump man and the quartermaster recovered, but the master died at the hospital.

This casualty is of particular interest because, with the exercise of normal safety precautions at the very beginning, the foregoing series of events could have been prevented. In reviewing this case, there are certain

points which should be particularly noted, as follows:

(a) The failure of the chief mate and the first pump man to realize that the presence of gas fumes in the pump room necessitated the exercise of safety precautions. A fresh air or an oxygen-breathing apparatus with life lines should have been procured.

(b) Apparently the exhaust fan for the pump room was not put into operation until some time during the casualty. As soon as the odor of petroleum fumes was noticeable, ventilation of the pump room should have been provided either by blowers, wind sails, or other efficient means.

(c) Having collapsed once from the inhalation of gas fumes, the pump man should not have been permitted to make a second attempt, even though provided with a suitable mask.

(d) Entrance into gas-filled spaces should not be permitted until it has been definitely ascertained that the fresh air or oxygen-breathing apparatus is properly fitted and has been tested to insure proper operation. In the case of oxygen-breathing apparatus, valves should be tested and adjusted. The pressure indicator should be thoroughly checked in order to confirm that the oxygen cylinder is amply filled and is not liable to become exhausted during the period of its use.

(e) Spray-gun masks and the canister-type gas masks are of no use whatsoever in spaces where there is a deficiency of life-supporting oxygen.

(f) No person should be permitted to enter a space containing poisonous gases or an atmosphere which is deficient in oxygen unless a life line is attached to his body, even though he may be equipped with the proper type of breathing apparatus. While below, he should be continually watched by a man on deck who can observe the party's actions and immediately call help when assistance is needed. By means of the life line, rescue can be easily performed.

(g) The officers of a vessel should be thoroughly acquainted with the location of all breathing apparatus and life lines, and should conduct, at periodical intervals, drills to make certain that the crew is also acquainted with the location of the equipment, its use and proper operation. In this connection, the crew should also be thoroughly trained in the method of applying artificial respiration.

(h) Keys to cabinets, lockers, and other storage places where vital safety equipment is stored should be tagged for ready identification. Keys of this nature should not be thrown in a drawer with many other keys as in the foregoing case, since considerable time is lost in locating the desired key.

In this particular casualty, there was an obvious lack of experience on the part of the crew and the officers in the use of the equipment as well as in its location. The importance of both cannot be stressed too strongly. The delay in securing safety equipment and the time consumed by inexperienced crew members in donning such equipment can mean the difference between life and death to the man who has collapsed below. In the case set forth above, only 15 minutes elapsed between the time the pumpman originally entered the pumproom and the time the men were finally extricated, yet one of these men died. Remember that all cargo spaces and spaces which have been closed for a considerable period of time may possibly contain poisonous gases or be deficient in life-supporting oxygen and it is, therefore, necessary that the utmost precaution be taken before individuals are permitted to enter.

Carbon Monoxide Again Takes Toll

The ever present danger of asphyxiation by carbon-monoxide gas has been much emphasized in connection with closed garages and the exhaust from automobile engines ashore, but the fact that this odorless gas can be just as insidiously deadly from a stove in an unventilated space afloat is evidenced by the following recent incident.

It was the custom on a noninspected fishing vessel sailing out from New Bedford, Mass., to employ someone to sleep aboard as watchman after the supplies for a voyage had been loaded preparatory to sailing. Upon the occasion in question, a young dock laborer had been employed to watch the boat for two nights, and had brought a friend to share his vigil. As the weather was unusually cold, the two boys, aged 16 and 17, built a coal fire in the forecastle stove, and then closed castle bunks, and both were found dead a day later from asphyxiation by carbon-monoxide gas.

The only fault manifested in this off the air vent which leads through the deck, and also closed the shutter on the companionway. They then turned in for the night in the forecase was ignorance or thoughtlessness in closing all the openings through which ventilation might have taken place, and thus exhausting the air of all but the deadly gas. The action was a natural one, in view of the coldness of the night, and therefore it cannot be emphasized too forcefully that fire should never be allowed to burn in an unventilated living space with human beings, as the oxygen necessary for life will eventually be consumed, and unconsciousness and death will result from the lethal carbon monoxide.

When there is plenty of pure oxygen, as when the air is in motion, carbon monoxide mixes with it and is not dangerous. However, when released in closed places it is deadly poisonous.

One exposed to carbon monoxide in dangerous concentrations will be affected as follows: If he has been breathing even small amounts for a long time a tight feeling across the forehead will be the result, and this will be followed by a throbbing headache. In addition he becomes nervous, depressed, and dizzy. The face may become flushed and the eyeballs become bright red. A sickness in the stomach together with vomiting may occur. If exposed for too long a time the victim will pass out.

To render first aid, carry the patient to the fresh air at once. If he has stopped breathing or is gasping give artificial respiration, which practice should be known by every seaman.

Loosen the man's clothes. Rub his hands and feet. Keep his body warm with blankets and hot water bottles (don't let the bottles burn him). Keep him at rest.

Never let a carbon-monoxide victim get up and walk about until he is entirely recovered! Many lives have been lost because people thought the victim could walk off the effects right after he came to. Exercise simply speeds up the attack of the monoxide on the heart. When this happens, the patient may collapse and die before help can reach him. Keep the man "turned in"—it may be several days before he gets over being uncomfortable, dizzy, and nauseated!

Respiratory Equipment

It has been noted from studying the casualties occurring on merchant vessels that a considerable number of these have occurred through the failure of ship's personnel to understand the construction, purpose, and protective limitations of the respiratory equipment found on shipboard. In an effort to reduce the number of casualties occurring, the above points will be discussed in this article as they apply to the fresh-air breathing apparatus, the oxygen-breathing apparatus, the canister-type gas mask, and the flame safety lamp.

In using this equipment it is also necessary to clearly understand its proper upkeep, the correct adjustment and above all, its stowage location on shipboard. However, this can only be accomplished through the use of the respiratory protectors in drills and from a study of the instruction

booklet which accompanies each piece of equipment. For this reason the fitting and testing of protective equipment will not be discussed to any length in this article.

The fresh-air breathing apparatus is of simple construction, consisting of a facepiece, a hose, and a hand-operated pump. The pump is located in a carrying case and when in operation is placed on deck in the fresh air adjacent to the compartment being entered with suction so placed as to prevent ingress of contaminated vapors. A long 1-inch hose is led from the pump and attached to the facepiece. As the wearer makes his way through the gas-affected area, he trails the hose, keeping it at all times free and clear. Fresh air is pumped to him through the hose by an attendant at the fresh-air pump.

The only limitations to the fresh-air breathing apparatus are the length of hose which is generally less than 150 feet and the places which may be traversed without the hose becoming entangled and fouled. Since fresh air is provided for respiratory purposes there is no time limit to its use, and the equipment can be worn with safety in any concentration of gas and in any oxygen deficiency.

The oxygen-breathing apparatus is of more complicated construction than the fresh-air mask and is characterized by having the process of inhaling and exhaling accomplished entirely within the equipment carried by the wearer. In this apparatus the exhaled gases pass through a regenerator containing a chemical substance which purifies these gases by removing the carbon dioxide waste. This purified air is allowed to pass freely into the breathing bag from where it mixes with new oxygen coming from an oxygen cylinder which is also a part of the apparatus.

Since the breathing cycle is self-contained, this type of respiratory mask is also a reliable protection in any concentration of gas and in any oxygen deficient chamber. However, there is a limit to the length of time in which it may be used with complete safety. The oxygen-breathing apparatus is made in three sizes; the ½-hour size, the 1-hour size; and the 2-hour size. On this apparatus there is a pressure gage which indicates in atmospheres the pressure of the oxygen in the cylinder. In a full cylinder the pressure is approximately 135 atmospheres or 1985 pounds per square inch. When the gage indicator approaches the 15 atmosphere mark (printed in red) the wearer is advised to return to the fresh air where the oxygen cylinder, which is now rapidly approaching exhaustion, may be replaced by a full cylinder. It is important to note at this point that when the oxygen cylinder is used up and replaced by a new one, the regenerator must be emptied and refilled with new chemicals. Each new cylinder of oxygen requires a refilling of the regenerator. Unless these two items are replaced simultaneously the protection afforded by such an apparatus will be questionable.

The third type of respiratory protector is the canister-type gas mask. This item consists of a facepiece, an inhalation tube, an a canister. There are various types of canisters and, therefore, it is important to know what gases will be encountered in entering the space and to confirm from the label on the canister that it is designed to give protection from the gases in question. On shipboard two kinds of canisters are usually found, one being a general purpose type which affords protection against almost any kind of gas likely to be encountered, the other being a type designed for use against a particular refrigerant used. However, these canisters, regardless of type, give protection in gas concentrations up to 2 percent only and no more, with the exception that in ammonia gas they will give protection up to 3 percent.

The canister-type gas mask is usually equipped with an automatic timer which indicates the service time undergone by the canister. However, this timer is designed for carbon monoxide only since that gas is tasteless and odorless. Other gases can, as a general rule, be recognized by taste or odor and when the presence of such a gas is noticed in the mask, the timer should be ignored and a retreat to fresh air made at once. Regardless of the gas exposed to, do not remain in a space when the timer shows that the life of the canister is exhausted.

In connection with the canisters, it is important to be familiar with the time limits of their usefulness. Canisters are constructed with a hole in the bottom through which gases pass. At time of manufacture this hole is covered with a seal. With this seal intact, the canister may be used any time within 5 years from the date of manufacture which is noted on the canister. Before the canister is put to use this seal must be removed and the date of breaking the seal must be entered on the canister in ink. Do not enter this date with pencil because it will possibly become illegible after a short period of time. One year from this date of breaking the seal, the canister should be discarded even though it may not have been put to much service. In use the canister life should be based on the timer or when it is noticed that gases are passing through. However, a canister should not be used for more than 2 hours even though the timer may not show complete exhaustion of the canister and even though the passage of gases is not noticed by the wearer's sense of smell or taste. The service life of a canister as set forth above is based on a gas concentration of less than 2 percent. With a higher concentration, the service life will naturally be less and this should be kept in mind. The time limits of usefulness as set forth above are not to be considered as minimum periods of positive usefulness since the chemicals in the canisters deteriorate more rapidly in damp atmospheres, resulting in a shorter life than that indicated. The atmospheric condition surrounding the place of stowage has a considerable bearing on the shelf life of canisters and therefore the time limits as given should be considered as average limits under normal conditions only.

In using this type of mask it is very essential that the wearer know its protective limitations. The most important limitation is that the mask provides no protection in spaces where there is an oxygen deficiency. The air we breathe contains approximately 20 percent oxygen and 80 percent nitrogen. The gas mask will not afford protection when the oxygen content has been reduced to 16 percent. In order to detect the oxygen deficiency the flame safety lamp is used. This lamp will not burn when the deficiency of oxygen reaches the low point of 16 percent. Therefore, before using the canister-type mask, a flame safety lamp should be lowered into the space to be entered to first ascertain whether there is an oxygen deficiency. If the lamp goes out, the fresh-air mask or the oxygen-breathing apparatus must be used because the canister gas mask will afford no protection. Whenever the canister type of mask is worn the flame safety lamp should be carried along by the wearer of the mask. When the flame safety lamp goes out, he will know that a location has been encountered which is deficient in oxygen and a withdrawal to fresh air should be made at once.

The flame safety lamp has its limitation in that it will not reveal the degree of concentration of gases other than oxygen. It is possible to have sufficient oxygen in a space to support life and still have a concentration of carbon monoxide which will produce death. For this reason care must be exercised in entering spaces with a canister-type gas mask. Where possible, it is desirable to have the atmosphere of the space chemically analyzed so that a true picture of the hazards of the space to be entered can be known by the individual concerned.

The flame safety lamp is so constructed that it can be used with safety in spaces containing combustible gases. The lamp is equipped with a gauze mesh which permits the entry of gases. Should these gases be combustible, the ignition and burning is confined within the lamp so that the atmosphere outside the lamp will not be ignited with possibly an explosion. However, acetylene and hydrogen gases are of such light character that they will penetrate the fine gauze protector in the light and cause an explosion before the presence of the gas is known.

Although the fresh-air mask, oxygen-breathing apparatus, and canister-type gas mask together with the flame safety lamp have been discussed with regard to their construction, purpose, and protective limitations, they are not the only types of protective equipment which will be found on shipboard. However, the foregoing types are the only ones that should be worn in entering spaces liable to contain dangerous atmospheres. The other types, such as the spray-gun mask, will not afford protection in such spaces. They are designed for different purposes and their limitations should be known before making use of such masks.

There is one item of equipment which has not been mentioned as yet and which is very essential in the use of any of the foregoing breathing apparatus. That item of equipment is the life line. No individual should be permitted to enter any dangerous space without having a life line attached to him and without having a man on deck continually observing his actions so that aid can be called immediately when assistance is needed. By means of the life line, rescue can be easily performed without further endangering the lives of others.

Ship's personnel should make themselves fully acquainted with all of the foregoing respiratory equipment. The instruction booklets should be thoroughly studied so that the proper method of fitting and testing the equipment will be understood. Drills should be held periodically to train the crew in the proper fitting and adjusting of these masks. Occasionally it is a good idea to fill a confined space with smoke by burning rags in a bucket so that individuals can enter the area with the equipment and thus gain assurance and confidence of positive protection. When such a set-up can be arranged, the student should take the flame safety lamp along to watch so as to become familiar with the effect of gas or smoke on the blaze of the lamp. At the same time he gets the experience of breathing through the gas-mask canister or the fresh-air or oxygen-breathing apparatus as the case may be. Where breathing apparatus may be used by more than one person, the masks, especially any mouth and nose pieces, should be disinfected after each person has used them.

The importance of being thoroughly trained in the use and limitations of the respiratory equipment cannot be stressed too strongly. Only recently the Coast Guard was advised of a casualty on a tank vessel, the pumproom of which contained gasoline fumes and quite likely an oxygen deficiency. Through the failure of ship's personnel to know the location of the respiratory equipment and its use and limitations, four men entered this compartment and collapsed. Each man used a different type of equipment and through lack of familiarity with the equipment, did not derive the desired protection. The fresh-air breathing apparatus was used and apparently was not fitted properly, since gas leaked in around the facepiece. The oxygen-breathing apparatus was equipped with an oxygen cylinder which was nearly exhausted and did become exhausted during use. A spray-gun mask was used and this type of equipment provided no protection in such a dangerous space. The fourth man entered without any form of equipment. None of these four men was equipped with life lines which consequently hindered rescue. The collapse of each man and the lack of a life line for safety purposes further endangered the lives of their rescuers. This case well illustrates that when this equipment is in the hands of a novice, it may constitute a hazard to life, in being improperly used and in giving a false sense of security to the user. The effectiveness of this equipment depends upon the knowledge and skill of the ship's personnel.

Flame Safety Lamps[1]

Flame safety lamps are required equipment aboard passenger vessels. Flame safety lamps should be used to test the oxygen content before men are allowed to enter places where oxygen deficiency is liable to occur, such as holds in which a fire has been smoldering, or where solid CO_2 has been used as a refrigerant, or in deep tanks which have been filled with oil or molasses and which have not been thoroughly aired out; or in fuel or water tanks which may have been sealed for some time, etc.

As a special safety percaution men wearing gas masks in any part of the vessel where a deficiency of oxygen might be encountered should carry a flame safety lamp.

Normal air contains 21 percent oxygen. Candles or flame safety lamps cease to burn when the oxygen content is lowered to 16 percent. (Unconsciousness occurs in humans when the oxygen content drops to 10 percent.) Therefore, the user is warned of oxygen deficiency in time to withdraw to a place of safety.

The flame safety lamp with metal-gauze enclosure was invented more than a century ago, primarily for its safe light; however, it soon became the standard device for detecting the presence of explosive gases. It still is the most widely used device for this purpose and is also the most practicable means of detecting deficiency of oxygen in confined spaces.

A permissible flame safety lamp is similar in all respects to one that, after a series of tests, has been approved by the Bureau of Mines as safe for use in gassy spaces. However, safety depends largely upon the way lamps are maintained and used.

Occasional reports of gas ignitions by supposedly permissible safety lamps indicate much misconception as to the construction and assembly of lamps and of limitations in their use.

Because of excessive gumming regular motor gasoline is not suitable as flame-lamp fuel; however, the following suitable fuels are available:

1. Atlantic 70° naphtha (Atlantic Refining Co.).
2. Freedom safety-lamp fuel (Freedom Oil Works Co.).
3. Gulf, clear, 70 octane aviation gasoline (Gulf Oil Corporation).
4. Sinclair safety-lamp fuel (Sinclair Refining Co.).
5. Standard solvent naphtha No. 1 (Standard Oil Co. of New Jersey and subsidiaries).
6. Waverly safety-lamp fuel (Waverly Oil Works Co.).

These fuels are uncolored, straight-run gasoline having a medium distillation range of 90° to 330° F. Because all fuels may develop gumming properties on standing, especially if exposed to sunlight, they should be bought in limited amounts—not more than 1 month's supply—and kept in an opaque container.

When a lamp is refueled care should be taken not to spill the fuel on the relighter, as this decreases the intensity

[1] Excerpt from Miners Circular No. 44 published by the U. S. Department of the Interior, Bureau of Mines. Copies may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 10 cents per copy.

of the relighter spark and is also a source of vapor, which tends to destroy steady burning of the normal flame. The excess fuel should be poured from the fount after each filling.

One requirement for permissibility is that a new lamp shall burn at least 12 hours per filling with approximately 1 inch flame height. This insures that all lamps, if given reasonable care, will burn for at least 8 hours. Failure to burn for 8 hours is due chiefly to decreased fuel space in the fount as the cotton and wick become filled with gum. Lamps can be so neglected in this respect that they will not burn for 8 hours unless the founts are filled to overflowing.

Even though the lamp is not used there will be a gradual loss of fuel through evaporation from the wick. It is, therefore, advisable to have available a reserve supply of fuel. One satisfactory method of keeping a small reserve handy is to use a 1-pint copper-plated engineer's filler with screw cap on the filler spout. This filler should be kept filled with fuel and stored near the lamp.

The care that lamps receive depends upon the relative experience of the person in charge, age of lamps, conditions under which they are used, availability of lamp auxiliaries and repair parts, and degree of supervision and discipline.

The following factors in maintenance are suggested as essential to keeping permissible flame safety lamps in a safe and satisfactory condition.

Cleaning involves the removal of all dirt, rust, and inflammable materials from all parts of the lamp.

Cleaning the fount should include removal of any deposits from the relighter file wheel and of charred materials from the wick. The relighter then should be adjusted to give adequate sparking.

One of the most severe tests of a flame safety lamp in methane-air mixtures is to place it unlighted in an 8.5-percent mixture and then operate the relighter to produce an internal explosion, which drives the flame of the explosion through the gauze at high speed. To prevent external ignition the gauze wires must cool the flame in this very short time to below the ignition temperature of the surrounding mixture. Therefore, while the gauzes and glass are being cleaned all parts and surfaces should be inspected carefully for possible defects.

Any of the following defects in the gauze lowers the capacity of the gauze to cool the explosion flame and therefore decreases safety: A broken gauze wire, an enlarged mesh, mesh wires that have decreased appreciably in diameter by successive cleanings, and wires that are coated with scale or rust of lower thermal conductivity than the original wire. A gauze that has any of these defects should be destroyed to prevent further use.

The inspection also should show other possible defects, such as a cracked or chipped glass, a broken gasket, a gasket doubled back on itself, an inadequate relighter, or a deformed bonnet. Failure of a glass would expose the lamp flame and cause ignition of an external explosive mixture; a glass therefore should not be used if it is damaged in any way. A defective gasket usually does not form an adequate safety joint between the glass and gauze ring. A defective relighter is indirectly hazardous in that it invites unsafe opening of the lamp in an attempt to relight it.

The size of the bonnet louvers is determined by the opposing requirements of adequate ventilation in still atmospheres to give a freely burning flame and effective shielding of the gauzes in moving atmospheres; deformation of the bonnet usually interferes with normal burning of the lamp and may seriously lower its safety factor.

Each lamp part also should be examined as the lamps are assembled to make sure that all parts are included in the assembly, that each is in its proper place, and that asbestos gaskets are above and below the glass. When the bowl is screwed to the frame it should be turned until the glass can just be turned by a thumb and one finger to allow for expansion.

The following precautions should be observed in using a flame safety lamp:

Be sure that the lamp is locked.

Examine the lamp carefully to see that it is in good condition before using it.

Do not carry the key which opens the lamp with you.

Do not attempt to open the lamp in hold or tank. Always take into fresh air.

Be sure that lamp gauze is clean. Do not use one with rust, dirt, or oil on gauze.

Do not let lamp smoke. Soot may fill up the gauze.

Lamps that have not been used for some time may have rusty gauzes and hardened wick or gummy fuel. Do not use such a lamp.

OIL POLLUTION

Oil Pollution Is Dangerous

Oil spread on water may help to calm a rough sea, but oil on the surface of water in the vicinity of docks and anchorages is out of place and creates very dangerous conditions.

Only recently the master and the chief engineer of an American tanker were in a native boat going ashore from their ship. They rounded the stern of their vessel and headed for some concrete steps at the foot of the dock. As the boat struck these steps an open-flame lantern in the rowboat toppled over and ignited oil on the surface of the water. Immediately a huge fire broke out with flames at times reaching as high as the stack of the tanker. The last view those on the stern of the tanker had of the occupants of the rowboat showed that they had arisen from their seats in the boat and were trying to reach the steps so close to them.

The fire was of only a few minutes' duration and was quickly extinguished with the ship's hose and foam type extinguishers on the dock. There was no damage to the tanker but all three occupants of the rowboat were killed.

No satisfactory explanation was found as to the origin of the oil. The dock was constructed of concrete and in such a manner as to make it impossible for oil to accumulate on the water beneath the dock. All possible safety measures and precautions had been taken by the crew of the tanker before transfer operations were commenced. The sole possibility left is that perhaps proper precautions were not taken by the crew of a foreign tanker moored to the oil dock directly ahead of the American tanker.

Stringent regulations are enforced in domestic ports as to transfer operations, oil pollution, and the prevention of fire hazards. This accident happened in a foreign port where, apparently, such measures were not so rigidly enforced. It then becomes the responsibility of the master and his crew to act as their own guards.

This unfortunate accident was not caused by any negligence aboard the tanker. Some reflection is cast, however, on the judgment of master and the chief engineer, the heads of their respective departments in not noticing and realizing the inherent danger of having an open-flame lantern in a rowboat traveling through an oil slick. This account is made available to emphasize the potential dangers of oil pollution and in the hope that its telling may prevent accidents of a similar nature.

Violations of Oil Pollution Act

The spilling or pumping of oil into harbors creates one of the gravest fire and explosion hazards to vessels and waterfront installations. The Oil Pollution Act, 33 U. S. C. 431–437, seeks to prevent these dangers by making it unlawful for any person to discharge oil from a vessel into the coastal navigable waters of the United States. Violators of the act are subject to a criminal penalty of imprisonment of not less than 30 days nor more than 1 year and to a fine of not less than $500 nor more than $2,500. The violating vessel may be proceeded against for the collection of the monetary penalties.

The reasons this law should be implicitly obeyed are obvious and practical. This war with its vast increase of shipping and ship movements gives great urgency to these reasons. Yet this act is frequently violated. For example, during the year 1944, in the 8th Naval District Gulf Coast area, 121 cases of violation were reported.

Oil pollution violations have been the direct cause of serious war losses. On October 21, 1944, a comparatively small amount of oil spillage caused a flash fire at Berth 223, Los Angeles, which engulfed two Navy LSM's killing 10 naval personnel, 6 civilians, and injuring over 100 persons including 15 naval officers and seamen. Property damage in excess of $225,000, including over $100,000 damage to the LSM's, was incurred.

The LSM's 211 and 212 were moored side by side alongside the wharf at Berth 223. At 1:55 p. m. a spark from spot welding operations on the bow of the inboard LSM ignited flammable vapor from volatile oil floating on the water alongside the ship and trapped under the dock. The ignition of this oil and vapor resulted in a flash fire. A huge sheet of flame spread instantly upwind over the weather and gun decks of both vessels and downwind over the deck of the wharf. This sheet of flame caused the explosion of numerous oxyacetylene cylinders and fuel tanks of welding equipment located on the LSM's and wharf. This initial blast seared all persons in its path, and, while of only a few seconds duration, was undoubtedly responsible for the loss of life and injuries in this fire. It was among the personnel of the LSM 211 and 212 where the greatest loss of life occurred, either directly from burns or from leaping overboard and drowning.

A Coast Guard Port Security harbor patrol boat reported the fire by radio at the instant of its occurrence. The rapidity with which the flame spread may be observed by the photograph taken by a Coast Guard Port Security fire fighting unit about five minutes after the start of the fire. At this time the under structure and deck of the wharf, the LSM's 211 and 212, a portable power crane, 12 electric welding machines, and 10 trucks and automobiles were entirely involved with fire. The inboard LSM 211 had considerable fire on deck with smoke coming up from below deck. The outboard LSM was afire topside and in the forward gun turrets.

The two probable sources of oil spillage causing this disaster involved small quantities of oil. A tanker at Berth 151 in pumping ballast from the number 1 tank discharged from 50 to 150 barrels of toluene into the water an hour and five minutes before the fire occurred. A few hours before the accident a barge loading a cargo vessel with bunker fuel twice spilled an unestimated quantity of diesel fuel into the water because of faulty shipboard connections.

This disaster is clear evidence of the necessity not only of preventing any oil spillage in harbors but also of immediately reporting to the Coast Guard Captain of the Port any spillage observed. The danger of flash fires from oil spillage will continue to be great so long as harbors remain crowded and welding operations on piers and on shipboard continue at the present rate.

RADAR PLOTTING AND NAVIGATION

Radar Plotting

Elsewhere in this issue there appears in the column "Lessons from Casualties" an article on a collision in a fog in which one of the vessels had a radar in operation. There it was pointed out that despite the fact a vessel has a radar she is not relieved of the duty of complying with the rules of the road.

A number of articles have appeared in these "Proceedings" on the subject of radar. In these there was mention of the necessity of using the information furnished by the radar to make a plot to determine the track of the target. Because it seemed obvious that how to make such a plot would be within the knowledge of any officer on a bridge watch no discussion on this point was made.

However, the fact that there are on record four collisions in fog in which one of the ships had a radar in use leaves us no other impression than that there is a need for education on the matter.

Two of the four collisions were meeting situations and the other two were crossing cases. If these approaches had been made in broad daylight the officer on watch would have had little difficulty in estimating the situation. It might take him some time to determine if a vessel sighted dead ahead, hull down, involved a meeting or an overtaking situation, but in time he would have the answer. By taking bearings during the approach he could have determined if there was risk of collision.

Everything he could have done with his naked eye the radar can do, but better. Can he fix the speed of the other vessel? Can he accurately determine its course? Can he accurately determine the distance off? No, but the radar can supply the information which will enable him to do so IF he knows how.

The radar will, in addition to a bearing, supply the range. A series of such ranges and bearings will, if properly plotted (taking into account the movement of your own vessel during the intervals), tell you the course and speed of the vessel. Knowing this you know whether the approach is one of meeting, crossing, or overtaking. With this knowledge you are in a position to decide how to avoid that vessel.

Let us assume you are on watch on the high seas on a ship in a pea-soup fog (and don't forget to sound that whistle every 2 minutes even though you do have your radar in operation). Let us also assume the ship is making 15 knots, which is a moderate speed only as long as there is no collision. You or someone else is looking at the radar scope periodically or maybe continuously, and if it is periodically it should be much oftener than every 10 minutes. The radar is working beautifully and eventually a target is picked up dead ahead distant 10 miles.

Now if it were a clear day there would be no difficulty. There should be none with the radar supplying information. Your main concern is to determine whether you are in a meeting, crossing, or overtaking situation. Assuming that the bearing remains constant, you know that you are either overtaking or meeting the other vessel. A little thought on the matter will give you the answer. You know your speed is 15 knots and that you travel a mile every 4 minutes. If the target

is a lightship on station your ship will close it at the rate of her own speed, that is, every 4 minutes the radar range will be 1 mile less. If it takes more than 4 minutes for the range to decrease 1 mile, you should know that you are overtaking. Let us say it takes 6 minutes, you know then that the relative speed is 10 knots. With your speed of 15 knots you are gaining only at the rate of 10 knots, obviously the other vessel is making 5 knots on the same course. Conversely, if the range decreases 1 mile in less than 4 minutes, the two vessels are approaching on reverse courses. If she is making 5 knots, the relative speed of approach is 20 knots and the range should drop a mile every 3 minutes.

Having made the determination whether it is a meeting or overtaking situation you are in a position to take avoiding action. Take it early, give the other vessel a wide berth, and in the meantime keep her under observation in the radar scope for any possible changes in speed or course. After all, she might have a radar too and might have taken avoiding action also.

Let us take a crossing situation. Suppose you pick up a target three points on the starboard bow. If it were in sight, you would step to the pelorus and take a few bearings to see if the bearing changed. The same thing can be done with the radar. In addition to the bearings it will also give you the ranges. If the bearings change rapidly, the chances are good the vessels are going to pass well clear of each other. If the bearings do not change, or only slightly, the vessels are on collision courses and something has to be done. Here, again, get your information early, decide what best need be done and then do it early, keep the vessel under observation in the radar for any changes she might make which could nullify the action you took.

To make the plot, previously referred to, in order to determine the course and speed of the target is a simple matter. Suppose you are making 15 knots on a course north true and a target is picked up bearing 50° true at a distance of 10 miles. Take a piece of paper, or a plotting sheet, or a mooring and maneuvering board (H. O. 2665), or if the second mate doesn't object use the chart and run off a line indicating your course of north true. Then from a point on this line run off a line 50° true and at a point 10 miles to scale on this line plot the position of the target. Six minutes later the range and bearing is 8¾ miles on a bearing of 55°. During this time you have moved ahead 1½ miles. Plot this point and from there run off a line bearing 55° and mark a point 8¾ miles from your position. Draw a line joining the two positions of the target and extend it until it crosses your track. With the parallel rulers run this line down to the compass rose and you will find that the vessel is on a course of 282° true. Then with your dividers determine the distance between points. You will find that during the 6 minutes the vessel has moved a half mile, therefore her speed must be 5 knots.

The point at which the two lines cross is 8.1 miles from your position at time of the first bearing and is 7.8 miles from the first position of the target. If both vessels maintain their courses and speeds your vessel will arrive at the point in 32 minutes while it will take the other vessel 1 hour and 34 minutes.

Don't be satisfied with only two bearings. In the instant case the target vessel might have increased speed to 15 knots right after the second bearing, thus changing the situation as to involve risk of collision. Unless a continuing plot is made any change in the situation would not be detected.

The vessel picked up by radar has been referred to here as the target. This is a poor selection of words as a target is usually thought of as something to hit. This is one case where in missing the target you get satisfaction.

Radar Navigation

When radars were first installed on merchant vessels there was optimism that vessels so equipped would never become involved in collisions. There was a tendency to think that the radar itself would prevent such casualties. Seven collisions involving American ships equipped with radar emphasize that avoidance of a collision is solely dependent upon the action taken by the officer in charge of the navigation of a ship.

These seven collisions in fog consisted of two cases in which the radars were not in operation, two crossing situations, and three meeting situations. In one collision each of the vessels involved was operating her radar while in the other six only one of the vessels was fitted with radar. Of these seven collisions only one has reached the courts and a decision handed down. This was a case in which the radar was not being used. There is little precedent at this time on which to base any duties which may be laid upon radar-equipped vessels, therefore it is necessary to speculate on what duties the courts are likely to require of radar equipped vessels.

But before tackling such speculation it will be well to consider just what are the capabilities and limitations of radar. First a radar will at its best supply a bearing and a range somewhat greater than the distance along the line of sight. It is necessary that the pulsations emitted by the radar transmitter hit some object and be reflected back to the receiver, which converts the elapsed time into distance. The effective range is dependent among other things upon (1) the height of the radar antenna, (2) the size and character of the target, and (3) the effective height of the target above water. Thus a ship the size of the *America* would be detected at a greater distance than would a trawler; a steel hull would be detected at a greater range than would a wooden hull of the same size. We commonly think of a target as something to hit. As far as the radar is concerned the other vessel is a target because it has been hit; but as between vessels, although referred to as a target, it is a target in which the greatest satisfaction is received in missing it.

Dependent upon the three factors mentioned a radar will detect a target within its effective range and produce a pip on the scope. However, interference caused by rough sea conditions, rain, and snow can obscure the radar scope so that targets will not appear through the sea-return or rain and snow-clutter apparent on the screen. In a rough sea a small craft may not be detected if, at the time pulses are sent out along its line of bearing, the boat happens to be in the trough of the sea.

Knowing the information that radar can supply, what use can be made of this information? A single range and bearing will merely give a point at which the target was located at a given time. If a series of points can be obtained we know from our study of geometry that a line can be produced. Thus, a series of radar ranges and bearings will, when plotted correctly, give the course and speed of the target. Continuous observation thereafter will indicate any changes in course or speed which the vessel may make. Having this knowledge the officer on watch, taking into consideration other factors such as sea room, depth of water, presence of other vessels, etc., can determine the best action to take to avoid the target.

The one court decision holds that in a fog a vessel equipped with radar must use it. In the case of the *Barry-Medford* (65 Fed. Supp. 622), the *Barry* sighted a fog bank dead ahead and entered it 12 minutes later without any reduction in its speed of 18 knots. During the interval and up to the time of collision 2 minutes after entering the fog bank the radar was

not operated. The court stated, "The failure of the *Barry* to use her radar is the most serious and sinister aspect of these cases. The perfection of that device is thought to have invoked a new concept of responsibilities attaching to vessels so equipped, touching their handling in or near a fog are * * *. I cannot so read that case [The *Pennsylvania*] as to find refuge for the *Barry* in its ample folds, for the stipulated proof here is that the offending ship could have informed herself of the presence and track of the Medford in abundant time to have avoided by a wide margin any danger whatever of striking her. Under such circumstances it is impossible to yield to the argument for the *Barry*, that her conduct is to be condoned to any extent, in view of her failure to employ the very device which was installed to prevent a collision * * *."

Here, then, is a duty laid upon radar equipped vessels to use the radar in or near a fog. Dictum in the opinion indicates that with a radar in operation the court would require further that a series of ranges and bearings be taken and plotted to determine the course and speed of the target in time to take avoiding action. The court said "for the stipulated proof here is that the offending ship could have informed herself of the presence *and track* of the Medford in abundant time to have avoided by a wide margin any danger whatever of striking her." [Italics added.]

At night in clear weather under normal conditions a radar can detect a vessel before its lights can be picked up with glasses. Also, under normal conditions the lights of a vessel can be picked up and bearings taken to determine if the vessel is on a collision course in sufficient time for the burdened vessel to take such avoiding action as may be necessary to enable her to keep out of the way of the other. The question arises whether radar will be required to be used on a dark night with a clear atmosphere. Ordinarily the answer will be in the negative. However, there are two situations where a vessel might be held at fault for failure to use her radar.

Oftentimes the lights of a vessel are sighted but the officer on watch is unable to determine until the vessels are close aboard whether his vessel is a burdened or a privileged vessel. Having the dictum that the track of a vessel can be determined by radar it may well be held, where a collision occurs by reason of a failure to interpret properly the sighted lights, that if such doubt could have been cleared up by using the radar a vessel will be held at fault for failure to do so.

The second situation in which a vessel may be held at fault for failure to use radar on a clear dark night is that of a fast vessel approaching waters in which it is reasonable to expect small craft fitted with lights which need not be visible for a distance greater than 2 miles. Here, because of the great speed of the vessel, the time permitted to estimate the situation and to determine what action on its part is required by the rules is relatively small. With radar in operation the small vessels could be picked up, under average conditions, at greater distances than the ranges of visibility of their lights, with a corresponding increase in time for study of the situation.

It is in running in reduced visibility that most problems will arise, as is proven by the seven collisions in fog. Article 16 of the International Rules provides, "Every vessel shall, in a fog, mist, falling snow, or heavy rainstorms, go at a moderate speed, having careful regard to the existing circumstances and conditions." In a fog a speed of 15 knots by a vessel with her radar in operation is moderate only so long as she is able to avoid collision by intelligent application of the information supplied by the radar. There is no doubt that the courts will apply the present rule as to what is moderate speed in a fog even though one of the vessels involved in a collision had a radar in operation. The fact that a collision has occurred is indicative of a lack of careful regard to the existing circumstances and conditions. Careful regard to these would require a determination of the track of the other vessel plus proper avoiding action.

If no action is taken to make a running plot, or if the target is first picked up at such a short range, either because of the character of the target or because of inattentive observation of the radar scope, that there is likely to be insufficient time to determine the track in time to take avoiding action, it is only reasonable to require a vessel to reduce to that speed which will enable her to be stopped in half the range of visibility. An instance of a case in which such a rule might be applied is that in which a ship running at 15 knots detected a target at 2½ miles slightly on the starboard bow. No plot was made and at such a short range it is unlikely that there would have been time enough to determine its track and to decide on avoiding action. Reduction in speed immediately upon detection of a close vessel will allow more time for determining track and at the same time will bring the vessel in compliance with the rule on speed in a fog. In two other cases the radars picked up the other ships at ranges of 8 miles. Here there was no need of slowing down immediately but inasmuch as no plots were made the speeds being made are not likely to be held as moderate.

Reference has been made to certain conditions which may create such interference that targets will not appear through the sea-return or rain-clutter on the screen. Here, not only is the vessel fog bound but also the radar. A vessel in such a case should be considered as though she had no radar. It is true that pips may appear in some sectors on the scope but in those sectors which are obscured it is not reasonable to take a chance that no vessels are in those areas. In the event that the interference is marked a reduction to sighting speed will be necessary to avoid liability for running at excessive speed.

What of the case when in a fog a vessel forward of the beam is picked up by radar? Is the vessel required to stop her engines and then navigate with caution? If the pertinent rule is interpreted literally the answer is NO. The rule states: "A steam vessel hearing, apparently forward of her beam, the fog signal of a vessel the position of which is not ascertained shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution." Two elements are required (1) the hearing of a fog signal forward of the beam, and (2) the position of the other vessel is not ascertained.

Ordinarily a radar will detect a vessel long before its fog signal can be heard and usually there will be sufficient time to determine the track of the vessel and thus avoid her, with the chance that her fog signal will never be heard. Assuming that after avoiding action is taken its signal is heard, there is no requirement that the engines be stopped as her position is ascertained. However, if there is any doubt that the vessels will clear, common sense, which is another phrase for good seamanship, would dictate a strict compliance with the rules including a reduction of speed until all danger has passed.

Once action has been taken and it is apparent that the vessels will pass safely, the master still has the burden of running a continuous plot to insure that the other vessel makes no change in course or speed which will nullify the action previously taken. In this connection, although the stress has been on the avoidance of collision, the value of a record of an accurate plot might be mentioned in the event a collision does occur. With a log of ranges and bearings and times it is possible to show that the other vessel was not running at a moderate speed with the hope that divided damages will be the decision of the court.

The discussion up to this point has been directed to situations in which only one of the vessels was equipped

with radar. These are relatively simple as compared with the problems involved where both vessels approaching in a fog are equipped with radar. Present day radars are not equipped to determine if another vessel within radar range has a radar in operation. That being so the vessels cannot be considered as being within sight of one another so that the burden can be placed on one or both vessels as it might in clear weather. Instead the case is one of good seamanship and each should assume that the other is not radar equipped.

In the approach of two radar equipped vessels in a fog there are five possible situations:

(1) Neither vessel is using radar;
(2) Both are using and neither is plotting the information;
(3) Only one vessel is using radar;
(4) Both are using but only one is plotting the information; and
(5) Both are using and plotting.

In the event of a collision in any of the above situations it is likely that in the first two cases, where neither vessel is using radar or where no plotting is made, each vessel will be held at fault, if the ruling in the *Barry* case is followed. Where only one of the vessels is using radar or in the case where both are using but only one is plotting the same result is likely, although the conditions may be such that only one may be held at fault. Assuming that the vessel which is not using the radar, or is not using it effectively, is running at a moderate speed and otherwise complies with the rules it is possible that the other vessel will be held solely at fault on the theory of the "last clear chance" doctrine, and especially so if she maintains a speed which is high. Of course where both vessels are running at high speed, there is no question but that divided damages would be the decision.

It is the last situation, where each vessel is tracking the other, that will offer difficult problems. With existing radars, neither can determine if the other is also operating a radar. Thus, in a crossing situation in fog it cannot be held that the vessel which has the other on her starboard shall keep clear. The case is more like one of special circumstances and each is bound to keep clear of the other. What avoiding action is to be taken is a matter of good seamanship. Assuming that the vessels are picked up at such ranges as will permit time for tracking, normally the action to be taken should be that which would be taken if the vessels were in sight of each other. In what develops to be a meeting situation the normal action to be expected would be for each to change course to the right. In a crossing situation if the plot indicates that the vessels will pass well clear of each other, no action is required. If they are on collision or near collision courses, the safest procedure would be for the vessel with the other on her starboard hand to reduce to a speed which is moderate for the visibility, until such time as it is evident that danger of collision no longer exists. A continuous plotting will, of course, be required for determination of any changes in course or speed which increase the possibility of collision. And if the target is first detected at such a short range that there is little opportunity for accurate tracking, prudence would require a reduction to moderate speed and compliance with the other rules for navigation in reduced visibility.

In summation radar equipped vessels, in times of reduced visibility should use the radar; determine the track of targets; run at sighting speed when (1) the target is first detected at a short range, (2) no plot is being made, or (3) rain, snow, or sea return obscure the radar screen; maintain a continuous plot to detect any changes of course or speed by other vessel; take such avoiding action as would be dictated by good seamanship and prudent navigation.

There is no intent to convey any thought of approval of radar equipped vessels running at immoderate speeds in thick weather. The records show that those involved in collisions have done so, and being realists, we anticipate others will also. The rules on fog navigation are still in effect. We do wish to emphasize, however, that, regardless of how helpful radar is, it takes a human being to take the action necessary for avoidance of a collision.

Radar Did Not Prevent These Collisions

A Federal District Court ruled that a vessel was solely responsible for a collision in failing to operate her radar set prior to entering a fog bank. (The *Medford*, 65 Fed. Supp. 622.) The facts served as the basis of the article "Collision in Fog Bank" which appeared in the June 1946 issue of the Proceedings.

The Army transport *Thomas Barry* was proceeding on an easterly course in the vicinity of George's Bank at a speed of 18 knots. A fog bank was sighted dead ahead at 1015 and was entered at 1037½ without any reduction in speed. The first fog signal was sounded on the whistle on entering the fog and a second was sounded about a minute later. The collision occurred very shortly after, at 1039, when the *Barry* struck the trawler *Medford* on the starboard side just forward of amidships. As the *Barry* picked up sternway in response to a full-astern bell given after sighting the trawler the bow was withdrawn from the hole in the *Medford* and the latter sank immediately.

The *Barry* was equipped with a radar and there were assigned and on board two Navy radarmen to operate the set when necessary to do so. Attempt was made to locate the radar operators by messenger in order to put the radar in operation before entering the fog but they could not be located in time. The court commented that no effort was made to contact them over another modern device, the public-address system.

In the previous article the discussion was pointed toward the duties of a vessel approaching or sighting a fog bank. It was explained that the courts have held that a vessel is required to give warning of its approach on a fog bank by sounding fog signals and to reduce speed before entering it.

On the use of radar the court had this to say: "The failure of the *Barry* to use her radar is the most serious and sinister aspect of these cases. The perfection of that device is thought to have invoked a new concept of the responsibilities attaching to vessels so equipped, touching their handling and operation in or near a fog area * * *. I cannot so read that opinion [The *Pennsylvania*] *as* to find refuge for the *Barry* in its ample folds, for the stipulated proof here is that the offending ship could have informed herself of the presence and track of the *Medford* in abundant time to have avoided by a wide margin any danger whatever of striking her. Under such circumstances, it is impossible to yield to the argument for the *Barry*, that her conduct is to be condoned to any extent, in view of her failure to employ the very device which was installed to prevent a collision, and to operate which she carried two men having special rating in the United States Navy to attest their qualifications, and who had no duty on the ship other than to operate the radar unit * * *."

This case is the first collision reported to the Coast Guard in which one of the vessels was equipped with a radar. Another collision which occurred at about the same time has been reported, and it is interesting to note that one of the vessels was fitted with a radar and had it in operation prior to the collision. A Victory ship heading southward from New York in a fog picked up with the radar a target bearing slightly on the starboard bow and distant about 2½ miles. Despite the use of this "anti-collision" device a collision was not

avoided and an auxiliary yacht was sunk with loss of life.

It would appear that after detection of the yacht was made by the radar no effort was made to take a series of ranges and bearings to determine the course and speed of the target vessel. If this had been done the mate on watch would have had information which, if used intelligently, would have enabled him to take avoiding action.

These cases serve to indicate that an understanding of the limitations of radar and of the intelligent use of radar is necessary if casualties such as these are to be avoided.

Reliable radar ranges are dependent upon several factors. The most important are (1) the height of the radar antenna; (2) the size of the target; and (3) the effective height of the target above water. The first factor may be considered as a fixed one although the height of the antenna will vary with changes in draft of the vessel. The other two are variables and because of this they should provide information to the radar operator.

A ship such as the *America*, for example, would be first picked up on a radar at a much greater distance than would a trawler. Similarly sections of the coast of California would be picked up at a greater distance than would the New Jersey shore. The range at which an object is first detected therefore gives some indication as to the size of the target and of its effective height above the water.

The effective height of the target above water is a matter that should be considered carefully in making a landfall with radar. Unless some thought is given to the nature of the shore the navigator can be mislead as to his actual distance from the shore line, with a possible stranding the result of his failure to appreciate the situation. Assuming an approach on a coast where low, flat land extends inland for some distance, the range indicated on the radar is more than likely to be that of high land back from the shore line. Unless this is realized the actual distance from the shore line is less than it is thought to be, giving the officer the impression that the ship is farther off shore than it actually is. To minimize this danger the Coast Guard is conducting experiments with radar reflectors and radar beacons. Reflectors are mounted on buoys, daymarks, and lighthouses. Some of these devices are effective in extending appreciably the distance at which buoys are picked up. Radar beacons have been experimentally installed to provide azimuth lines from headlands or lighthouses for additional identification, especially where the radar pattern is not outstanding by reason by low-lying land targets or submerged dangers far from good radar targets. In addition to these experiments the Coast and Geodetic Survey have produced special charts with colored areas corresponding to radar displays. Since the radar display is often quite different from the ordinary chart by reason of the outstanding prominence of high hills, these charts are specially prepared to furnish this information in addition to the usual information supplied in the standard chart.

Weather conditions may limit the effectiveness of the radar. Under rough-sea conditions the radar scope can be obscured by sea return anywhere from ½ mile up to 7 miles or more, depending upon the type of radar and the condition of the sea. Heavy snow or rain may completely obscure the screen such that a vessel within radar range will not be detected or will be detected only by the most careful scrutiny of the scope and manipulation of the controls. Under such conditions the courts, no doubt, will hold a vessel at fault in a collision if in poor visibility the speed is not moderate and if a proper lookout is not maintained. In a rough sea a small vessel or berg may not be detected if, at the time pulses are sent out along its line of bearing, the vessel or berg is in the trough of the sea. Here there will be no reflection of the pulses to the radar receiver and consequently no target will appear on the screen.

Present-day radars are limited as to the minimum range at which a target can be held. This minimum may vary from 90 to 400 yards. A vessel may be picked up at a distance of 12 miles and can be held on the screen until it gets within the minimum effective range. However, the officer who permits another vessel to come within that range and disappear from the screen is very liable to have it next appear in his port or starboard side.

Much useful information can be gained by using the radar in clear weather when other vessels are in sight, when making landfalls or when running in pilot waters. The experience thus gained will aid in proving the effectiveness of radar and also its limitations. It is only by such practice that one gains the confidence which is necessary for trust of the radar under conditions of poor visibility.

Recognition of radar's limitations and knowledge of its uses will be of benefit to the officer relying on it. However, he should never place his total reliance on radar to the exclusion of the rules of the road and the principles of good seamanship. Radar, in and of itself, will not prevent a collision but, subject to the limitations mentioned above, it will provide information which will permit the officer on watch to avoid one.

Head and Head With Radar

The cases of collisions of radar-equipped vessels reported in the "Proceedings" up to now have been of collisions in which only one of the vessels involved was radar equipped. Recently, reports have been received of two collisions in which each of the two vessels involved in each collision had its radar in operation prior to and up to the time of collision. The approaches were made in dense fog, and each vessel had the other in its radar scope. One collision occurred in pilot waters and the other on the high seas.

It so happened that the approach in each case was that of a meeting situation. In each collision one vessel changed course to the left and the other to the right in an effort to avoid the collision. Because the actions taken in each case were the same it will be well to consider how radar-equipped vessels approaching other vessels head and head might best avoid collisions.

Article 18 of the International Rules of the Road and article 18 of the Inland Rules are quite specific on the action to be taken by each vessel in a meeting situation when they are in sight of each other. Each shall alter her course to starboard, so that each may pass on the portside of the other.

For a number of reasons those rules cannot be held to apply in approaches in a fog of radar-equipped vessels on other vessels. We need only consider that a radar-equipped vessel cannot be certain that the vessel showing up in the scope is also radar equipped and thus aware of the presence of another vessel.

Despite this it seems that some uniform action might be taken by a vessel fitted with radar. Such action can be made only on the assumption that there is sufficient sea room, that there is but one vessel apparent in the P. P. I., and that the pip appears before the fog whistle of the other vessel is heard.

Let us assume that a radar-equipped vessel is proceeding in a fog on the high seas and picks up a vessel ahead in the scope at a distance of 8 miles. It may be either dead ahead or very fine on either bow. At first glance it is not possible to know if the situation is one of overtaking or one of meeting. But as we pointed out in a previous article, if the range decreases 1 mile in less time than it takes your vessel to travel 1 mile and the bearing does not change it should be clear that it is a head and head approach.

Having determined that the approach is one of meeting, what is the best avoiding action to take? CHANGE COURSE TO THE RIGHT is our suggestion. If each radar-equipped vessel in a meeting situation would change course to the right, it is believed that the chance of collision would be lessened. However, this reduction of chance of collision can only be obtained if the masters of all radar-equipped vessels take such avoiding action in a meeting situation.

As mentioned above, a radar vessel cannot be certain that the other vessel is also radar equipped. But suppose it isn't. In that case she is not aware of your presence and it is likely she is holding a steady course unless she is at a point where you could expect her to make a change of course to head for a buoy or a lightship. Not being aware of your presence, if you have changed course to the right, and have not been content with just a small change, you will be broad on her bow at a good distance before she hears your fog signal, if she ever does.

One might argue that you could just as well have changed course to the left in the above case and the result would be the same. Perhaps it would if you could only BE SURE that the other vessel didn't know you were there. But we are trying to develop an argument for changing course to the right. Suppose that the other vessel was also radar equipped and followed our suggested action of changing course to the right and that you took a chance that she had no radar and decided to change to the left. If each of you were tracking the other as the admiralty courts require, each should realize that something was wrong, with the possible conseqence that each might change course in the opposite direction. Such jockeying could well lead to a collision which might have been avoided if each had changed course to the right in the first place.

It is admitted that when the other ship is a few degrees on the starboard bow there will be doubt as to the advisability of crossing her bow by changing course to the right. There is risk in such action, of course, unless it has been firmly established that it is a true meeting situation. For example, a radar vessel on course north true may pick up a vessel 5° on the starboard bow at a distance of 8 miles. If she is on a course of 170° the bearing will change very slowly to the right while the range will decrease more rapidly, the rate of decrease depending upon the speeds of the vessels. Admittedly the situation is a dangerous one and to attempt to cross the bow could be more dangerous. Inasmuch as there would be some doubt in the early stages whether the approach is a true end-on approach the best procedure would be to stop, observe closely the change in bearing and distance, and then proceed with caution at a speed which is moderate for the visibility.

The rules of the road require that a vessel, whether radar equipped or not, proceed at moderate speed in a fog. Until such time as the courts rule otherwise, or the rules of the road are amended to provide for radar navigation, it will be well for radar-equipped vessels to reduce to moderate speed after a target is picked up in the radar if they are not already running at moderate speed. The slower the speed the slower is the rate of approach of vessels with an accordingly longer time for study of the information supplied by the radar.

The action of changing course to the right is recommended only for an actual meeting situation. This can be determined only by keeping an accurate record of times and the bearing, and distances observed at those times. With this information a track can be made and the speed and course of the other vessel plotted.

The discussion has been directed only to a situation in which only one vessel is apparent on the scope. If there are two or more vessels in the scope the obligation of keeping track of each would demand an extremely slow speed in order to provide time for estimating the situations as well as to comply with the rules on speed in a fog.

The suggested avoiding action is submitted for the consideration of you officers who depend upon radar for navigating in a fog. Any comments on this suggestion are requested as well as any questions you may have on this or other matters. Much of the material appearing in the "Proceedings" is based on actual casualties. In that respect we are like an undertaker in that we get something to do only when disaster occurs. We seldom, if ever, hear how casualties or break-downs were avoided. It is our thought that some of you could contribute articles on such preventative measures which would be of help to others finding themselves in similar situations. We hopefully offer the pages of the "Proceedings" to you as a forum on professional matters.

Collision in Fog Bank

Shortly after entering a fog bank, a passenger vessel hit and sank a fishing trawler. This collision raises several questions on safe navigation for a vessel approaching and entering fog banks, particularly for officers in charge of the navigation of vessels.

In daylight, under conditions of good visibility, the passenger vessel was proceeding on a course which took the vessel into a bank of fog. No change in course was made although the fog bank might have been skirted if this had been done.

On entering the fog a signal was sounded on the whistle as required by the applicable rules of the road. Almost instantly the trawler loomed out of the fog, but at such a short distance that the collision which took place could not have been avoided by any means which were open to the larger vessel. As a result the trawler was sunk with the loss of several of her crew.

The rules are very clear on what is required of the trawler in a case such as this. However, apparently there is doubt in some minds as to what is required of the vessel which is approaching a fog bank from an area of clear visibility.

Unfortunately the rules are not explicit on this point. Pertinent articles of the international rules, for example, provide (1) that *in a fog* a prescribed signal shall be made and (2) that every vessel shall, *in a fog*, go at a moderate speed, having careful regard to the existing circumstances and conditions.

While it might be argued that when in the clear area the vessel is not *in a fog* and thus not bound by the above rules, such argument has not been accepted by the admiralty courts which have had occasion to decide on similar cases. Good seamanship, which in a case like this is nothing more than common sense, would demand that a warning of a vessel's approach be given and a reduction in speed be made.

In the case of *The Papoose*, 85 F. 2d 54, the court said:

"The serious matter is the failure of the *Wright* to sound fog signals. Though she was not actually in the fog, she was running along a heavy bank but 300 yards distant, out of which a ship might emerge at any time as *The Papoose* in fact did. Both the Inland Rules, art. 15 (33 U. S. C. A., sec. 191) and the International Rules, art. 15 (33 U. S. C. A., sec. 91) provide that ships must sound signals as described 'In fog, mist, falling snow, or heavy rainstorm, whether by day or night . . .'. Compliance requires the sounding of the signals by a vessel not only when she is herself in the fog, but is so close to it that her position should be made known to a vessel which the fog might be hiding. *William H. Taylor*, 278 Fed. (2 CCA); *Perkionen*, 27 Fed. 573 (D. C.). In view of these decisions the argument here made that there was no positive breach of the statute cannot be treated as sound."

The decision rules only on the matter of sounding a fog signal, but the same result was reached in a case which had before it the question of speed of a vessel entering a fog bank. In that case the court held that the rule on moderate speed in a fog applies to steamers entering a fog bank as well as to those in the fog (*The Charlotte*, 128 F. 38).

The decisions do not state at what point the fog rules become binding on a vessel approaching a fog bank. In line with the rulings of the courts on what is moderate speed in a fog, it would seem, if the circumstances require it, that the fog signal be started and a speed be set as would enable a vessel to come to a standstill, by reversing her engines at full speed, before she could collide with a vessel which might emerge from the fog.

Some may say that if the passenger vessel had been equipped with radar the collision would not have occurred. There has been much publicity on radar in recent months and frequently it is referred to as an "anticollision" device. So it may well be, but so is the steam whistle an "anticollision" device. They are "anticollision" devices only if the humans having control of them use them properly and at the right time.

Radar in this instance would have been an "anticollision" device only if the mate on watch had ordered it started in sufficient time for it to have "warmed up" by the time the vessel was no less than 2 or 3 miles from the fog. It would have detected the presence of the trawler in the fog, but avoidance of a collision would, as it always does, depend on a human being, the officer in charge on the bridge.

TANKERS—FIRES AND EXPLOSIONS

Fires on Tankers

IN A RECENT CASE of collision between a loaded tanker and a freight vessel, a full cargo tank on the tanker was ruptured by the bow of the freighter and the contents of the tank were immediately ignited. Just prior to the impact, the master of the tanker had thrown the helm hard right in an endeavor to swing the stern of his ship out of the way of the oncoming freighter. This maneuver was in vain and the tanker was struck near the after part of the parallel portion of the ship. The flames following the collision spouted upward about 30 feet and the sight of this fire so terrified the master, officers, and crew of the tanker that immediate abandonment was ordered. No attempt was made to use the CO_2 smothering system, fire hose, or even to stop the engines. In fact, the port lifeboat was launched with the ship making full speed and the helm hard right.

The ship was equipped with two lifeboats, located one on either side of the engine room aft, two life rafts, one located on the port side abaft of the pilot house and the other on the starboard side abreast of No. 6 tank, and two donut rafts, one on top of the pilot house and the other on top of the engine room skylight. The starboard life raft and lifeboat were destroyed at once by the flames. The port lifeboat was the one which was launched in abandoning ship.

Four men remained on the vessel and attempted to steady the port boat as it was being lowered. Under the influence of the ahead motion of the engines and the right rudder, the boat was in imminent danger of being crushed and swamped as soon as it hit the water. Accordingly, it was cast off and the four men were left on board the vessel. In all of this confusion one life was lost, a man who, apparently even more terror stricken than the rest of the crew, jumped overboard and was drowned while the port lifeboat was being launched.

At this time, apparently, the panic which had possessed the crew subsided and the four men left on board went to work to save the ship. The Chief Mate headed the vessel up into the wind and the engineers released the CO_2 gas into the cargo tanks, started the fire pumps, and played the hose on the flames. They also launched the port life raft and attempted to tow it alongside. However, it was soon smashed and the men then lifted the donut raft from the top of the pilot house and placed it near the port rail for use in case they needed to abandon ship in a hurry.

After about an hour a Coast Guard lifeboat came alongside and offered to take off the four remaining men. The tanker's engines were then stopped, the ship was anchored, and after several attempts, the four men were removed. A naval tug was then requested to go alongside the tanker and extinguish the fire. This she finally succeeded in doing with her fire hoses.

The performance of the officers and crew of this tanker shows the extent to which panic can undermine good judgment even in well-trained men. Apparently the fire on board the vessel had such an effect upon the crew that all they could think of was to abandon ship without waiting to evaluate the situation and see if there was a chance of saving the vessel or her cargo.

It is always easy after an event to sit in judgment and say what should or should not have been done, but in this case the correct procedure is so obvious that it is felt that it should again be brought to the attention of the seafaring fraternity.

There was a releasing lever for the CO_2 system on the vessel under discussion, right outside the pilot house, and even if abandonment had been justified, it would have taken the master scarcely a second to have tripped this lever on his way aft to the boat. At the very least, the engines should have been stopped and an attempt made to get way off the vessel before launching the lifeboat, as was shown by the necessity of casting off before the last four men on the vessel could board the lifeboat, in order to prevent its being crushed against the ship's hull.

It should be clearly understood that a tank full of gasoline or oil practically never explodes after it is set afire. This being the case, opportunity is afforded to fight a tanker blaze as long as the engine room is intact and the smothering system still workable. The correct procedure would have been for the master to have swung the ship so that the injured tank was on the lee side, thus preventing the flames and smoke from crossing the deck or getting down into the engine-room ventilators. The engines should then have been slowed so that in case abandonment became necessary, the ship would not have been traveling so fast as to make the operation of launching a lifeboat or raft a dangerous one.

CO_2 gas is not a very efficient fire extinguisher in a broken tank, owing to the fact that it cannot be retained, and thus the smothering effect is partially lost. However, it should have been turned into the burning tank as well as the adjacent ones, for the cooling effect it would have had on the fire and to prevent the spread of the blaze. Then, all available fire hoses should have been used to wash the oil from the deck of the ship into the sea, and finally, they should have been turned into the ruptured tank itself. These water hoses should be used both as a cooling and extinguishing agent on the flames and for their cooling effect on the surrounding deck and interior bulkheads, where the latter are within reach of the streams. If possible, the cargo pumps should have been started and sea water pumped into the ruptured tank so as to wash the remaining oil into the sea through the break in the ship's side.

The foregoing procedure has been developed through the experiences of

hundreds of tankermen whose ships have suffered broken tanks, fires, etc., through enemy action, collisions, and other casualties. It is not contended that all tanker fires should be dealt with in exactly the same way or that there are no occasions in which instant abandoning may not be indicated. However, in the majority of cases an effort should be made to get the flames under control, and in a great many instances it will be found possible for the ship's crew to extinguish the blaze by an intelligent use of the fire-fighting equipment available on board.

In the subject case it is felt that such precipitate abandoning was not justified by the circumstances and that if the master and crew had remained on board and fought the fire as described above, there is a strong probability that they could have extinguished it themselves, or at least maintained it under control until outside aid arrived.

Fuel Oil Tank Explosion

The rules and regulations applicable to tank vessels have recently been amended by the addition of a new section which states that riveting, welding, burning or like fire-producing operations shall not be undertaken within or on the boundaries of bulk cargo spaces or in spaces adjacent thereto, until an inspection has been made to determine that such operations can be undertaken with safety. It is further stated that such inspections shall be made and evidenced by the issuance of a gas-free certificate by a certified gas chemist or by some other authorized person. Although this regulation is not applicable to cargo vessels, the same hazard prevails on such vessels when fire-producing operations are undertaken on or near fuel oil tanks or other tanks containing combustible or inflammable liquids.

Only recently an explosion occurred on a Liberty ship, killing two men and injuring five others. The vessel on which the casualty occurred was one of a group of Liberty-type vessels which were in a shipyard for operational repairs and for conversion work in preparation for the carrying of troops. One of the items called for in the specifications was the construction of a steel medical locker which was to be formed by the erection of three sides against the existing engine-room bulkhead. The locker was to be secured by welding the bottom edges of the three sides to the No. 3 port deep-tank top.

Prior to commencing this work, the No. 3 port and starboard deep tanks were partially emptied by gravitation. This process removed all but approximately 100 barrels of fuel oil from each tank. This transfer of fuel oil was not a precautionary measure as a result of the contemplated hot work but constituted a part of normal shipboard operations. The chief engineer was not aware that any hot work was contemplated near these tanks.

The erection of the medical locker was started without any apparent attempt being made to ascertain the contents of the adjoining compartments. The sides were erected and tack welded without mishap. It was while the bottom edges of the sides were being welded to the tank top that sufficient heat was generated for the ignition of the explosive vapors in the fuel oil tank. The explosion which followed tore a hole in the ship's hull below the water line and also opened up the fuel tank into the machinery space. It was in this space that two men were killed and three were injured by the force of the explosion. The machinery space was flooded and the vessel settled to the bottom with a slight port list in approximately 25 feet of water.

Prior to and during the erection of the medical locker on the fuel oil tank top, there apparently existed among all individuals concerned an indifference as to whether the tank was gas-freed or not. No attempt was made to ascertain the contents or the condition of the tank to insure that it was safe to perform hot work thereon. Since similar work had previously been performed on other Liberty ships without gas-freeing the tanks, and since no casualty had occurred, caution was apparently disregarded. Each individual in a supervisory capacity assumed that the man above him had taken care of the necessary details to insure safe operation, and no check was made to confirm the individual's own belief.

It was further revealed in the investigation of this casualty that some individuals had the erroneous opinion that as long as the hatches and manhole plates were bolted down securely and the sounding pipes were plugged, it was safe to work on the outside of oil tanks without gas-freeing the interior. They felt that it was only necessary to secure such certificates when tanks were open or when work was to be performed on the inside of the tanks. This is entirely fallacious, since the heat generated by welding and burning will be transmitted by the steel plates and, in this manner, it is possible for tank boundaries to become heated to the ignition point of the fuel oil vapors inside the tank, at which time an explosion will occur. It must be remembered that combustible materials will ignite when they are heated to the ignition point, regardless of whether the heat is provided by an open flame, spark, or by conduction.

Tanks which have been used for the carriage of inflammable or combustible liquids are a potential danger when hot work is contemplated within or on the boundaries of the space or in spaces adjacent thereto. When fire-producing work is contemplated on or near any tanks containing or having contained an inflammable or combustible liquid, make certain that it is safe for the performance of such work. The sad part of this case is that two men lost their lives, with five others being injured. These men were no doubt expert in their line, and the loss of their services in the war effort will be felt. In addition, the services of the vessel will not be available for war use for some time to come, and the ship will occupy a berth in our already overcrowded repair yards. Cases like this can be avoided by proper direction and supervision by those in charge.

Necessity for Fire and Boat Drills on Coastwise and Inland Vessels

The rules and regulations for vessel inspection require that fire and boat drills be held weekly on all passenger vessels, on all self-propelled tank vessels, and on all other vessels of over 500 gross tons. The records show that this regulation is complied with quite consistently on ocean-going vessels, although even here there is considerable room for improvement. However, there is a very strong tendency on the part of vessels navigating coastwise and inland waters to neglect this rule, possibly with the idea that as the vessels concerned are close to shore it would be comparatively easy to abandon the ship without any great difficulty in the case of necessity.

This impression is very far from the truth. It is too late to teach effective fire fighting to a crew after the fire breaks out and it is generally much too late to teach correct abandon ship practices after an emergency arises. There is very little, if any, difference in degree of difficulty in extinguishing a ship fire whether the vessel is 1 mile from land or a thousand. It is true that in some instances fireboats are available to aid in extinguishing the blaze, but, on the other hand, a vessel may be in the middle of one of the Great Lakes or in a lonely stretch of one of the rivers where no outside aid whatsoever is available. Under these circumstances skill in fighting the fire and, if necessary, in abandoning ship is just as necessary

as it would be in the middle of the Atlantic Ocean.

These remarks are emphasized by two recent casualties with which the Coast Guard had to deal. The first was described in detail in the April 1944 number of the Proceedings of the Merchant Marine Council. In this case a small tanker was rammed and one tank set on fire. The starboard lifeboat and life raft were consumed in the blaze and without hesitating an instant the master and the crew attempted to abandon the vessel. Just prior to the collision, the helm had been put hard right in an endeavor to avoid the other ship and with the rudder in this position and the engines proceeding full speed ahead the remaining lifeboat, which was located on the port side of the after house, was launched. By some miracle it was not swamped or smashed when it hit the water but was successfully cast off with all but five of the crew on board. Of these five, one man had jumped overboard in his panic and was drowned and the other four upon finding themselves marooned on the ship calmed down and attempted to fight the fire. Their efforts were unsuccessful but they remained on the vessel in comparative safety for a considerable length of time and were finally taken off by a Coast Guard boat. The fire was extinguished shortly thereafter by a Navy fireboat. The vessel concerned was a coastwise tanker and the incident described occurred in one of the large bays on the Atlantic Coast.

Upon investigation it was found that fire drills had not been held as required by the regulations and, as a consequence, when the emergency arose nobody on board was familiar with his first duty which should have been to trip the CO_2 lever in order to discharge the smothering gas into the burning and adjacent tanks and the second duty which was to get the fire hoses into commission. All anyone could think about was to get away from the ship. Assuming the latter to be necessary, the crew attempted to launch a lifeboat located on the port side of the vessel when the ship was traveling full speed and under the influence of a right rudder. Under these circumstances it is, as stated above, a miracle that the boat was not smashed in the act. If these men had had a thorough training in fire drills it is probable that they could have extinguished the fire themselves without calling for help from anyone. Also if they had been well trained under oars and in handling small boats and it became necessary to abandon they would have put the helm amidship and slowed or stopped the vessel so that an orderly abandonment could have been carried out.

The second case represents an almost equally futile tragicomedy and an even greater neglect in the matter of fire drills. The vessel in question was loaded with benzol and had returned to port on a freezing winter night because of heavy weather. About midnight the weather moderated and the voyage was resumed. The ship was just getting under way when there was a dull thud and simultaneously fire was seen on deck and on the water in the way of the after starboard tanks, indicating that one of those tanks had ruptured. A subsequent investigation did not disclose the cause of the explosion. As the anchor had just been secured an attempt was made to re-anchor the vessel. During the short time since getting under way the hawse pipes had frozen over and it was impossible to drop the anchors. The engines were being maneuvered under various signals, the final bell being a full-speed-astern signal.

On this vessel, as well as on the former one, no effort was made to fight the fire. Steam was not turned into the cargo tanks nor were the fire hoses used. No formal orders were given to abandon ship. However, as soon as it was seen to be impossible to drop the anchors, the men on deck launched the port life raft and a donut raft. Two of the ship's officers leaped overboard and swam to the life raft. About this time the burning oil from No. 8 tank, influenced by the astern motion of the ship, had drifted forward and surrounded the bow of the vessel. The blazing oil in the water heated the forward tanks so that they exploded also. After this, various members of the crew jumped overboard. At this time the master and several crew members were still on board and were attempting to launch the port lifeboat. No one had a jackknife or any other means of cutting the lashings which held the canvas cover of the boat. Finally the boat was launched with the cover in place. The master and four others jumped on board the canvas cover of the boat and all of these except one man were washed overboard.

In all this confusion it apparently occurred to no one to stop the engines or to notify the chief engineer who was handling the engines that the ship was being abandoned. He finally came up on deck and saw that he and the first assistant engineer were the only persons left on board and also that the blazing vessel was backing straight for an ammunition loading pier. At about this time a Navy tug rammed the stern of the vessel, sheered it away from the dock and then returned and picked off the two engineers. Out of the 16 men on board this vessel 10 were drowned.

None of these men received fatal or even serious injuries from the fire. They were all of them either drowned or frozen to death and it is a sad commentary on the state of affairs aboard this vessel to realize that a moderate amount of skill in handling the lifesaving equipment would probably have saved every man on board.

As stated previously no organized effort was made to fight the fire. After the abortive attempt to re-anchor the vessel, the men on deck apparently oblivious of the engineers below and the fact that the vessel was going astern and aiming toward a dock crammed with high explosives, launched a lifeboat and a life raft in such a manner that they were practically useless from a lifesaving standpoint. As a probable explanation of this fiasco it was found that no fire drills had been held on this vessel for over 3 months instead of the once a week required by the rules and regulations.

A fire on shipboard is a terrifying experience whether the vessel is an oil tanker or a dry cargo vessel and unless officers and men have been trained in the proper procedure to the extent that they react in the correct way, automatically, a panic as in these two cases is quite likely to occur. The officers as well as the men need instruction and practice in all lifesaving procedures and they should, by virtue of their position, act as leaders and set an example for the crew in diligent and enthusiastic participation in these exercises.

Fire drills should be held at least weekly on all inspected vessels and they should be made as realistic as possible. The old-fashioned fire drill where an announcement was made that the drill would be held at one bell in the afternoon and the boatswain and his gang went around ahead of time laying out the hoses is practically useless. About all this type of exercise teaches is where each man's station is.

The fire drill should be held unexpectedly and instead of leading each fire hose out and turning the water on for a few minutes and then securing, a specific location for the fire should be specified as, for instance, the after quarters, No. 1 hold or the galley. The exercise should consist of bringing as many streams as possible to bear in this location. The men should be instructed in the use of the fire extinguishing system (CO_2, foam, etc.).

On large vessels, a special fire-fighting detachment under the boatswain or one of the ship's officers should be organized. This group

should be equipped with axes, special fog spray nozzles, fire extinguishers, oxygen-breathing apparatus and any other special fire-fighting equipment on board. This group should take the lead in fighting the fire. Fire drills should be held occasionally at night as well as in the daytime, particularly after the crew becomes adept.

Boat drills should be held by lowering the boats into the water and exercising the crews under oars. The occasional fatalities which occurred during the war when boat crews actuated the releasing gear prematurely, let go of boat falls on the run and did other dangerous things demonstrate that a great improvement is possible and necessary in the ability of many seamen to handle lifeboats. Complaints have justly been made that inspectors will show up to conduct a boat drill to find most of the officers and crew absent. Remember you can not learn to fight a fire or handle a boat while ashore. If the foregoing program seems too stiff to you, you should remember that when you shirk fire and boat drills you are endangering your own life and those of your shipmates just as surely as if you paid no attention to traffic lights on a busy city street.

WOOD ALCOHOL POISONING

Liquid Death

Review of personnel casualty reports discloses the lengths to which some seamen will go to get what they believe to be a drink of intoxicant and their utter ignorance of the effects of some of the mixtures. Wood alcohol, since it is carried by most ships as part of the paint locker stores, is the most common ingredient. Apparently there seems to be prevalent a fallacious belief that if wood alcohol is filtered through a loaf of bread, its toxic properties are removed. There is, of course, absolutely no foundation for this belief, but nevertheless case after case shows that somebody gambled his life or his eyesight upon it.

The casualty reports make pretty grim reading, for death by methyl alcohol is an agonizing one. A ship's maintenance man mixes hair tonic and wood alcohol and dies 6 hours after drinking it, first having lost his sight; a ship's cook, abstracting it from the paint locker, dies after 2 days of agony; a boatswain, securing his supply from the same source, mixes it with fruit juice with the same fatal result.

Sometimes the casualty is due to lack of knowledge that the ingredient is poisonous, though this would never be the case when the alcohol comes from the paint locker. For example, two seamen arranged to purchase what they thought was grain alcohol from a Navy seaman at the base where the ship was discharging. Actually it was wood alcohol stolen from that ship's cargo. One of the seamen died and the other was hospitalized with permanent loss of sight.

The urge for drink leads to utter disregard of elementary caution. Thus one second mate died from drinking carbon tetrachloride which happened to be in a half-filled beer bottle. The odor should have told him that it certainly was not liquor. Perhaps the most remarkable case involved a first assistant who believed that the steward had some liquor in his medicine cabinet, and finding there a bottle marked "Poison," announced that he wasn't going to be fooled by that trick and took a drink. The contents happened to be sulphuric acid!

Part of the safety measures taken aboard every ship could well be a warning to the crew as to the ghastly and certain effects that flow from drinking wood alcohol or any other so-called intoxicant whose origin is unknown.

Caution, Poison

In the February 1945 issue of the Proceedings of the Merchant Marine Council there appeared an article entitled "Liquid Death" which vividly depicted the foolhardiness of some seamen in their endeavor to secure an intoxicating drink and of their complete ignorance of the disastrous effects of some of the mixtures. This has been brought to the attention of the Coast Guard again by a recent casualty wherein the drinking of methyl alcohol, or wood alcohol as it is often called, resulted in the death of five men and the hospitalization of another in a serious condition.

Some members of the crew had gathered together in one of the staterooms to enjoy a few drinks. The ingredients for the drinks were methyl alcohol procured from the engine storeroom and fruit juices obtained from the steward. Several drinks were mixed for those members present and with the passing by of other individuals, it wasn't long before approximately half of the crew had taken at least one drink of the concoction.

One of the newcomers while mixing himself a drink noticed that on the gallon jug of methyl alcohol there was a red label reading "Caution, Poison" with the sign of the skull and crossbones underneath. Immediately he questioned the instigator of the drinking party as to the contents of the jug. The reply was that he was sure that the alcohol was not poisonous because it had been tested prior to its use. A spoonful of the alcohol had been burned and since there was no residue after the burning, the giver of the party had come to the wholly false conclusion that it was safe to drink and that the skull and crossbones label had been placed on the jug merely to deter its use as a beverage. The newcomer was not satisfied with this statement and, after advising those men present in the room that the alcohol they were drinking was poisonous, he left. The warning made no impression, however, and the drinking continued.

The following morning several members of the crew complained of severe headaches and stomach cramps but none of them seemed to consider their condition as serious. During the afternoon the heavier drinkers appeared to be in a drunken stupor but they continued to do their work about the ship. In the early evening some of the individuals were found groaning and in a dazed condition. They soon fell into coma and died without regaining consciousness.

The amazing fact is that some of the ship's officers participated in this drinking party and that they paid no heed to the label and its warning that the contents were poisonous. Licensed officers are supposed to possess qualities of leadership as well as to exercise good judgment, but those concerned were certainly devoid of both.

All these prevalent fallacious beliefs that the toxic properties of wood alcohol can be removed by filtering through a loaf of bread and that a liquid is not poisonous if there is no residue after burning a little on a spoon, should be discarded at once. Methyl or wood alcohol is a deadly poison and there is nothing than can be done on shipboard or elsewhere to remove or lessen its poisonous qualities. Denatured alcohol is likewise poisonous. This liquid is obtained by adding to ethyl or grain alcohol a denaturant which makes the liquid dangerous to drink. The containers of these two alcohols should be labeled as poison and such a label should be respected. It must be remembered that labels are used for the purpose of describing the contents and are not used to deceive people. Death by methyl alcohol is an agonizing one. If you value your life, avoid drinking it.

First-Aid Treatment for Wood Alcohol Poisoning

The dangers of drinking wood alcohol were contained in articles which were published in the "Proceedings" in February and July of last year. In the cases covered by those articles nine deaths occurred as a result of drinking wood alcohol.

Since the publication of these casualty reports an article on the treatment of wood alcohol poisoning was printed in the 12 January 1946 issue of "The Journal of the American Medical Association." The report is one of the treatment used by four Navy medical officers in 31 cases. Good results with this treatment in 26 out of the 31 cases were achieved by Capts. O. A. Brines and M. J. Capron and Commanders W. B. Chew and E. H. Berger. The other five died within 3 hours after being admitted to the hospital in a critically ill state.

The men had drunk wood alcohol in amounts estimated at from about 3 ounces to about 1 pint. Many also had drunk beer ranging in amounts to 21 cans. One of those saved was unconscious for about 12 hours.

Wood alcohol can produce intoxication but its action is slower than that of ethyl alcohol. The symptoms of such intoxication may be delayed as much as from 9 to 36 hours, during which time the drinker may be able to perform his work.

The indications of wood alcohol poisoning consist of a sudden weakness, headache, nausea, and a dimness of vision. Blindness may follow quickly. Labored breathing and cyanosis may also appear with death following shortly thereafter. If death does not take place the victim may go into a coma which may last for several days before there are signs of improvement.

The treatment recommended calls for medications and tests, all of which are not available on the average merchant ship. In short, the treatment is to introduce alkalis into the system in order to overcome quickly the acid condition resulting from the breaking down of the wood alcohol into formic acid and formaldehyde.

The following first-aid treatment based upon the treatment followed by the Navy doctors is recommended:

1. Have patient vomit, if possible.
2. Place victim in bed at rest.
3. Administer 4 grams of sodium bicarbonate by mouth every 15 minutes at first—up to 100 grams daily. If the patient is unconscious, give it by a stomach tube.
4. Have patient take plenty of liquids.
5. Give 1 ounce of whiskey every 4 hours for a day or two.
6. Protect eyes from the light.
7. As soon as these measures are carried out collect a urine specimen and test for acidity. Keep administering sodium bicarbonate as directed above until the reaction is alkaline.
8. It is important that the eyes be kept covered at all times until all usual disturbances have disappeared.

MISCELLANEOUS

Ears Are Not Direction-Finders

Divine Providence, in giving us two eyes, provided a stereoscopic vision which assists us in estimating depth and distance. Similarly, our two ears, on opposite sides of our head, afford in some measure the possibility of judging the direction from which sound emanates. But in each case the "base line" is so short that a high degree of accuracy in estimating either distance by eye or direction by ear is not possible.

This is particularly true of sound. Not only is the aural base line short, with a possibility of variance in acuity between the two ears, but the conditions under which the sense of hearing is chiefly relied upon by the navigator—thick weather or low visibility—seriously and erratically affect the transmission of sound waves. A prudent ship's officer, under such conditions, should never rely upon his hearing to give him more than an approximate direction of a sound signal heard in a fog. Yet officers will gamble their ships upon the accuracy of their hearing. Two recent collisions are examples of this.

In one case the two vessels were approaching upon almost opposite courses. Vessel A was steering 247° true and vessel B 70° true. The weather was thick and both were sounding the prescribed fog signals. In subsequent testimony the master of A placed the other vessel, by her whistle, 5° upon his starboard bow. The master of B similarly testified that A's whistle was first heard one point on his port bow. As a matter of fact the vessels were practically head on.

Acting wholly upon his estimate of the position of B, and in violation of the rule governing steam vessels meeting nearly head on, the master of A turned his vessel to port and blew two blasts on his whistle. In the meantime B had correctly hauled to starboard and blown one blast. A struck B on the port side and sank her.

There was some question as to whether, even after the port turn of A, the collision might not still have been avoided if both vessels had checked speed to bare steerageway and navigated with caution until they had passed each other, as the rules require. But A's turn to port was the direct cause of the loss of B, and this turn was made because a shipmaster was betting his ship on being able to place B within 5°!

A second case, occurring by coincidence on the same day, was almost a duplicate of the first. Here again the two vessels were on exactly opposite courses. Sound signals were heard by each for a matter of 8 or 10 minutes before actual collision. Speeds had been checked to slow by both vessels. But vessel C pulled off to port, while D turned to starboard. At the investigation the master of C said that he thought D was about dead ahead but that the mate on watch placed her "a little on the starboard bow" so he accepted the mate's judgment and ordered left rudder.

In the meantime both ships were blowing cross signals and danger signals to each other but apparently failed to stop, and if necessary reverse, until the situation became clearer. Instead, the master of C turned still farther to port, until he was practically at right angles to the course of D who had hauled 10 points to starboard. When collision was imminent, he gave his ship full right rudder in the effort to swing his stern away from the oncoming D, but it was futile. D cut half-way through C and though the master of D held his bow in the hole long enough to save all the crew of C, that vessel sank.

Again, violations of the precautionary rules, both as to speed and cross signals, were contributing causes, but the fact stands out that a master gambled his ship on his mate's eardrums and those eardrums were wrong. Even had they been right, in this case as in the first, the meeting was still so nearly end-on as to require a port to port passing. None of these considerations were weighed.

A similar collision occurred between the *Crete* and the *Cornell* in 1936 on Lake Superior. Both ships were approaching each other in fog and darkness at full speed. The *Cornell* placed the *Crete's* signal to starboard and turned to port. The *Crete* blew one blast and turned to starboard. Because of failure to reduce speed early enough, collision was inevitable.

The officers of both ships were found at fault and disciplined for vio-

lation of rule 15, but again there was evident the fatal over-confidence in the human ear. The Pilot Rules have no such confidence. International and Inland rules consider risk exists when a sound signal is heard anywhere forward of the beam, or an arc of 180°. Great Lakes and River rules, with less cross traffic, consider risk exists if a sound signal is apparently located within an arc of 90° ahead. These rules are not only mandatory, they are the result of years of experience of countless deck officers. They cannot be violated with impunity.

Overtaking in Narrow Waters

The suction effect of two ships passing close aboard each other at other than very slow speeds has long been recognized. It was the subject of exhaustive study in the collision between H. M. S. *Hawke* and the S. S. *Olympic* in British waters in 1911.

Less appreciated, perhaps, is the extent of water displacement and disturbance well ahead of a vessel moving at speed, particularly if that vessel is of a full form. This displacement is exaggerated if the vessel is moving in a confined waterway or channel. It can be noticed in any jetty-protected entrance by observing that the water level rises on the jetty at any point well in advance of the passage of that point by the vessel's bow. In other words, a full-bodied vessel, such as most cargo ships, tends to push ahead of her a small hill of water, sometimes as much as a foot high and extending in a semicircle around her stem. The actual extent depends on the vessel's lines, her speed, and the nature of the channel. The fact that a certain amount of water is pushed bodily ahead, before it can slip past the bows, tends also to cause a hollow or trough somewhere amidships of the vessel.

In the case of two steamers passing on opposite parallel courses these displaced waters act to some degree to keep the ships apart: the bow of each tends to be deflected away by the mound of water created by the movement of the other. But where two vessels are not passing bow to bow the effect may be very different and should be given careful consideration by the master of the burdened vessel.

A clear example of the need for care is given in a collision case occurring in the Delaware River some years ago. Two full-bodied cargo steamers were proceeding down river, the leading one at a speed of about 9 knots while the second was overtaking her at about 12 knots. Weather conditions were clear, with no wind. It was shortly after nightfall.

The overtaking vessel blew two blasts, and was answered by the leading ship which was keeping well to the right-hand side of the channel. At that particular point the river is quite wide, giving the illusion of ample sea room, but actually the ships were obliged to pass in a narrow (300-foot) dredged channel. The sum of their cross-sectional areas amounted to almost 20 percent of the area of the channel prism.

When the overtaking vessel's bow had drawn abreast the stern of the other, the latter took a rank sheer to port, across the bow of the overtaking ship. That vessel backed hard with full left rudder, but collision was unavoidable. Fortunately, enough change of direction and loss of headway was produced by the overtaking vessel so that the contact was broadside to, and comparatively minor damage was suffered.

In the investigation the burdened vessel claimed that, after passing signals were exchanged, the overtaken ship had failed to maintain course and speed, but instead had altered course under circumstances which rendered the collision inevitable. The overtaken vessel denied altering her rudder and claimed that the sheer taken was due to suction of the overtaking ship.

Actually, of course, this was the case, although it was water displacement rather than suction which caused the sheer. The two vessels were occupying a substantial amount of the cross section of the channel. As they drew abreast the displaced waters were further restricted. That pushed ahead of the overtaking vessel impinged upon the port quarter of the overtaken ship sufficiently to throw her stern to starboard.

An example of the opposite effect of displaced waters is found in a similar case where the overtaking steamer sheered into the leading vessel. This occurred in a 30-foot dredged channel with a bottom width of 150 feet. The overtaken vessel was of 60-foot beam and was drawing 28 feet. The vessel coming up astern was of 40-foot beam and 17-foot draft. It will be noted that not only was the larger vessel clearing bottom by only 2 feet, but that the cross-sectional area of the two accounted for almost 40 percent of the channel prism. In this case the bow wave of the burdened vessel was insufficient to affect the much larger leader, but when the bow of the former came about amidships of the overtaken vessel the suction of her trough caused the smaller craft to swing sharply into her, seriously damaging both vessels.

The obvious answer in such casualties is to avoid overtaking in a narrow waterway unless it can be done at a very slow speed. When a large vessel is overtaking a similar one, both steaming at practically full speeds for their respective hulls, the water disturbance, not to mention the tendency to "smell" bottom, renders the steering of both vessels subject to serious aberration.

Insuring Safe Cargo Gear

Defective cargo gear is a source of great potential danger, not only to longshoremen but to the ship's personnel and perhaps to the ship itself. Under hard usage running gear deteriorates rapidly and weaknesses will develop in out-of-the-way spots. If not searched for and remedied, these weaknesses may cause a casualty of serious nature which will occur without the least warning. The only effective precaution is constant vigilance as exercised in frequent and thorough inspections. This is one of the paramount duties of the ship's chief officer.

All cargo gear should be taken down and overhauled periodically—twice a year, at least, and more frequently in the case of ships on short runs. Topping lift blocks should be struck down, pins drawn and greased, and sheaves noted for uneven wear. Masthead pad eyes should be inspected at this time. Blocks on the boom should be similarly inspected and the boom gooseneck sighted. Falls should be carefully gone over and if stranded to any extent should be discarded and the good portions used for strongback bridles or davit guys. All blocks, pins, and swivels should be kept adequately lubricated at all times.

Standing rigging should not be neglected, particularly preventer stays. Their turnbuckle threads should be heavily coated with a nondrying lubricant, like white lead and tallow, and covered with a canvas breeching. Nowadays most standing rigging is cast into sockets, but where eye splices are used they should be carefully examined for corrosion, particularly if parcelled and served. This covering should be cut away at least every 2 years to permit inspection of the splice.

Wooden booms should be examined for checks and where these are serious, they should be payed with marine glue. Ironwork on wooden booms should be examined for fit as well as wear. Topping lift stoppers should be of proper sized chain, frequently inspected. Where wire topping lifts are made fast on a cleat, the turns should be carefully seized together so as to prevent jumping off.

Preventers should always be made fast around the boom head, independent of other gear, and set well taut.

Preventers and vangs should lead as nearly as practicable at right angles to the boom. All falls should lead through lizards on the boom, so that a slack fall will not hang in a bight. Double-burton falls should always be shackled to a ring—never to a shackle which might open if the draft is hoisted into a flat catenary. Except for the cargo hook itself, open hooks should not be used anywhere in cargo gear. Do not use a snatch block for even temporary purposes if it is possible to use a regular block.

Strongback bridles should be of such length that each arm of the span makes an angle of not less than 60° with the strongback. The wire splices should be served to prevent hand injuries. Bridle hooks should secure near enough to the ends of the strongback so that men can hook and unhook them without going out on the strongback. Each end of the bridle should be fitted with a short manila pennant, by which the strongback can be guided into position. Strongback sockets should be kept free of dirt and trash to insure that strongback goes all the way home when seated.

Worn or split hatch boards should be discarded, and every effort should be made to prevent damage to such board. Skids or dunnage should be used on tween deck hatch covers when drafts are being landed thereon. Stevedores should not be allowed to use hatch boards for loading platforms or other similar purposes. The boards should be carefully and neatly piled near the hatch but out of the way. A cargo space should never be worked through a section of a hatch—all covers and strongbacks should be removed if it is to be worked at all.

In closing a hatch every board should be in its proper place and should secure the maximum rest upon the strongback lip. Short boards are a menace, but still more dangerous is a hatch, covered with its tarpaulin, but without all of its hatch boards in place. This practice, and that of leaving an open, unworked hatch without life lines rigged, have been the cause of many fatalities.

Accentuate the Positive

During the war when a great many ships' officers of all ranks were not as experienced as in peacetime, masters and chief engineers were very emphatic in requiring that they be called in case the watch officer was in doubt about any procedure to be followed or whenever anything occurred which seemed to him to be out of the ordinary. By implication this has been interpreted by many junior officers to mean that they could not perform any but the most routine duties without first calling the master or chief engineer. In general, this is a good thing, as no commanding officer of a vessel would wish, for instance, to have the course changed without his knowing about it, and no chief engineer would want a boiler cut out or the speed of the engine changed without prior notification.

However, this rule can be, and in several recent incidents has been, interpreted too literally. It does not mean, for instance, that in the case of low water in a boiler, a third or second assistant engineer must call the chief engineer and wait for his permission before putting out the fires. He should act immediately in this sort of emergency, put out the fires first and then call the chief.

A very serious case of a too literal interpretation of the foregoing rule has recently come to the Coast Guard's attention. In the case in question, a ship had been proceeding by dead reckoning for some time. The master left the bridge at 12:10 a. m. after leaving orders that the mate on watch (the second officer) was to change course and slow down at 1:00 a. m. (Incidentally, as a landfall was expected at 1:00 a. m. and the ship had been proceeding under dead reckoning, it is doubtful if the master should have left the immediate vicinity of the bridge under these circumstances.) The second officer had taken over the watch at midnight, at which time the vessel was proceeding full ahead at approximately fourteen knots in a hazy atmosphere with light rain. At 12:20 a. m. land was reported dead ahead, although according to the dead-reckoning position no land should be visible at that time nor on that bearing. The watch officer saw the land but thought it several miles away. At 12:28 a. m. the lookout again reported land ahead. Realizing by this time that the vessel was off her course, the second mate then put the engines on "stand-by" and left the bridge to call the master and apprise him of the situation. The master proceeded to the bridge immediately, saw breakers dead ahead at about 500 yards, rang full astern and gave the vessel a hard right rudder. It was too late; the vessel grounded lightly but was able to back free under her own power. Damage was estimated to be approximately $50,000.

In the Coast Guard's opinion, neither the master nor the second mate used good judgment in their handling of the situation. It is felt that the master should have been immediately available under the circumstances and, assuming that the captain was not on the bridge it is thought that the second officer failed in his duty by not taking prompt action when land was first sighted at a time and on a bearing which were not expected. A check on the position of grounding showed that the vessel was about 40 miles north and west of her dead reckoning position.

The sight of land ahead by the lookout should have indicated that the vessel was considerably distant from her dead reckoning position and that precautionary measures were needed. This was the time to have called the captain. At the second time land was reported the second officer showed that he was aware that a situation of potential danger existed by his acts in ringing "stand-by" and going for the master. He stated that the reason he left the bridge to go on this errand himself was that he could not trust the stand-by man to get the captain up in a minimum length of time. This statement makes it all the more reprehensible that he did not slow down or stop the vessel before leaving the bridge. No harm could have resulted from this and it is possible that the grounding could have been prevented. A capable mate or assistant engineer in charge of a watch is supposed to be able to deal with most emergencies himself although he is, of course, supposed to call the master or chief engineer as soon as possible. However, his first duty is to the ship and any watch officer cannot be considered to have done his full duty in a case such as that just described if he merely throws up his hands, sends for the master and allows the ship to run aground when a timely stop or full astern bell might have saved her.

Instruction of Green Lookouts

The posting of a lookout at night or in low visibility is a basic safety precaution which no master neglects. But the mere stationing of a hand in the bow, or upon the bridge or elsewhere if the bow station is unsafe, is not sufficient. It is the responsibility of the officer in charge of the ship to assure himself that the lookout is, in fact, performing his duties vigilantly throughout his watch. Undoubtedly, in many instances a watch officer in a high, protected charthouse has better visibility than a lookout exposed to the weather on an open forecastle deck. But this should not allow the officer to disregard the lookout or to tolerate negligence in making reports, even though the reported object may already have been noted by the bridge.

An example of the result of such tolerance was shown in a collision occurring between two steamers on a dark night and in clear weather.

The prescribed complement of one of these vessels was such that an ordinary seaman was standing lookout watch. Unfortunately, it was this seaman's first trip to sea. The two ships came together through unskillfull handling on both sides. The part played by the lookout had little or no bearing on the actual collision since the lights of both vessels had been clearly visible for some time. Nevertheless, the lookout had made no report and, upon examination, testified that he did not know what reports to make or how to make them.

Although the stationing of an ordinary seaman at the lookout is lawful, and although there has to be a first trip for every man going to sea, the vessel was held at fault because the officer of the watch, having received no reports from the lookout, made no effort to investigate the reason and thereby learn that this lookout was ignorant of his duties.

No watch officer should take for granted his lookout's performance. In all cases lookouts should be specifically designated as such and, if necessary, instructed in their duties. Any failure on their part to function efficiently should be immediately looked into and corrected.

SAFETY PROGRAMS

MARINE SAFETY

It is encouraging to know that the majority of ship operators are actively engaged in the conduct of safety programs. The National Safety Council has a Marine Section, members of which present papers and hold discussions on matters of safety affecting personnel of their organizations.

Each year the National Safety Council conducts a National Safety Congress and Exposition. The past one, which was the Thirty-sixth such Congress, was held in Chicago the latter part of October. During the session the Marine Section announced the winners from among the marine industry for the year ending June 30, 1948.

In the Cargo and Passenger Vessels Unit the average frequency rate for accidents was 9.90. The Chesapeake & Ohio Railway Co., Newport News, Va., was placed first with frequency rate of 7.60. Second place was taken by Standard Oil Co. (Indiana), Chicago, Ill., with a rate of 8.73. Still below the average rate was the Pittsburgh Steamship Co., Cleveland, Ohio, which finished in third place with a frequency rate of 9.44.

In the Tankers Division the three award winners also had frequency rates below the average for their unit. Esso Transportation Co., Ltd., Aruba, N. W. I., Pan American Petroleum & Transport Co. and Subsidiary Cos., New York, N. Y., and the Atlantic Refining Co., Philadelphia, Pa., finished in that order with rates of 4.28, 8.58, and 15.85, respectively, as compared with the average rate of 16.43.

Likewise in the Harbor Equipment Unit the winners in each group were well below the average frequency rates. In group A, where the average was 11.37, Corps of Engineers, North Atlantic Division, had a frequency rate of 4.04; Erie Railroad Co., Jersey City, N. J., 4.46; and Corps of Engineers, Lower Mississippi Valley Division, 7.06. The winners in group B and their rates were the Corps of Engineers, Missouri River Division, 5.28; Atlantic Coast Line Railroad Co., Port Tampa Terminal, 5.54; and Corps of Engineers, Ohio River Division, 5.70. The average rate for the group was 11.87.

As indications of the efforts of some companies to reduce accident frequency rates on their ships extracts from papers presented before the National Safety Congress are quoted in the following paragraphs.

MOORE-McCORMACK LINES, INC.

T. D. Morris, Supervisor of Safety and Cargo Damage Prevention

In 1947 the Merchant Marine Index Bureau advises that there were 32,353 injuries to seamen. The figures for the first half of 1948 showed that 18,437 seamen were injured. Those figures represent the result from an exposure of 72,000 men on 1,800 ships. For the year 1947 you can add 26,377 seamen who suffered illness, giving you a total illness and injuries for 1947 of 58,730. There is a lot to be done in the Marine Industry before we can say that our ships are safely and efficiently run. And just one more figure. We determined in my company during 1947 for accident causes alone our average was approximately $100 per crew member. In a 35-ship fleet you can appreciate the expenditure involved.

For the purpose of analysis we classify our accidents according to six basic accident causes:

1. Incomplete Operational Procedure or Design.
2. Departure From Operational Procedure.
3. Inherent Hazards.
4. Personal Hazards.
5. Workmen's Methods.
6. Not Otherwise Classified.

Under these basic causes are subheadings, as for instance, under "Incomplete Operational Procedure or Design" we have the following subtitles: (*a*) Failure of ship's gear; (*b*) Gangways and accommodation ladders; (*c*) Unguarded machinery. We have found in the year 1947 that the greatest number of accidents aboard our vessels occurred under the basic accident cause No. 2, Departure From Operational Procedure, and under No. 5, Workmen's Methods. Now in order to get along with some actual case histories, I will give you examples under each of the basic categories.

"Incomplete Operational Procedure or Design"—A junior engineer making a routine inspection of the engine room while on watch was injured when a belt on a compressor flew off and hit his hand, almost entangling it in the compressor. The initial fault here was lack of a guard on the machine. In other words, the design of the machine was incomplete. It lacked an essential SAFETY feature. The responsibility there is not too readily assigned. But after the one accident it becomes the immediate responsibility of the watch officer and the Chief Engineer to see that a guard is requested for the machine. It further becomes the duty of the Safety Department to follow up the request and make certain that the guard is installed.

An example of "Departure From Operational Procedure" occurred on the *Scanstates* while operating on the Baltic run. A seaman was painting the interior and exterior of a hatch ventilator situated on the forward port corner of No. 4 hatch. He was using a ladder. The bos'n told the seaman to secure the ventilator to prevent its turning, and there was a properly designed and operating pin whose sole purpose was to stop the ventilator in train. The bos'n also told the man to lash his ladder in place. There was a proper and adequate lashing secured to the ladder, and there were any number of places where the ladder could have been safely lashed. The seaman did not obey the bos'ns orders, the roll of the ship caused the ventilator to turn, the unlashed ladder fell and the man went over the side. He was cut to pieces by the propellor and his body was never recovered, although a lifeboat searched for some time. Here the man was at fault for not carrying out his orders, and some can say the bos'n was at fault in not seeing that the orders were executed. Just how far we should go in mothering our able seamen is a matter for each company itself to decide.

An accident which I classify under "Inherent Hazards" occurred on the S. S. *Berkeley Victory* while docking at Argentina. An able seaman was putting a rope stopper on a mooring hawser to hold the strain while the hawser was being transferred to the bits. While the seaman was making the turns with the stopper, an unexpected strain was put on the mooring hawser through the effect of the wind or the tide, and the man's hand was caught between the stopper and the mooring hawser. The second officer fortunately was alert and cut the stopper as soon as he saw what was happening. His action probably saved the man's arm. It could not be said that the man was doing his job unsafely. He was an experienced seaman and had performed the operation many times. But those of you who are familiar with this particular deck operation can recognize that it is inherently dangerous and even with skill and extreme caution, injuries can occur.

There are, however, certain conditions that help to avoid this risk; deck space should be clear, adequately lighted and dry, and last, but most important, personnel should be aware of the danger of their operation, and proven skilled in the particular task before it is assigned to them.

Now when it comes to corrective action, we have to keep in mind over how large a field our corrective action must spread. When these accident reports are received and analysed by the Safety Department, the chances are that the individual ship, and the individual personnel have learned a lesson. Where design is at fault, where methods are wrong, where procedure is unsafe, the information in the hands of the Safety Department must be promulgated to the entire fleet. The lesson of one ship must be passed on to the personnel of others, and with a high rate of personnel turn-over, the ship's officers afford our best means of indoctrinating the men. We must keep our officers informed of the latest Safety practices, and we must insist that they apply these practices. They must investigate and report their accidents, and they must lead and direct their crews in the known safe methods.

I would like to say in conclusion that only through the cooperation and interest of the entire Marine Industry, labor and management included, can we hope to control the accidents to the personnel on our ships. Indoctrination must be effected, and the efforts of labor and management must be toward the stabilization of our crews, so that proper indoctrination can be accomplished. The reports of these meetings of the Marine Section have shown that our steamship companies and our labor unions are desirous of cooperating to keep the American vessel the safest on the seas. To reach this goal we all seem to need some positive direction; some real navigational instruments.

SOCONY-VACUUM OIL CO.

Capt. E. W. Fiske, Jr., Marine Transportation Department

Safety, I am glad to say, is a big and important subject with Socony-Vacuum, just as it is with many other forward thinking and progressive companies. Safety efforts are company-wide, with regular programs and supervisors in all of our refineries, bulk terminals and similar land installations. Ships, though, present somewhat of a different problem when it comes to setting up specific safety programs.

Of course, we use all the standard methods aboard our ships for making our men safety-conscious. This is in addition to installing safety equipment wherever it is needed or seems to be needed. We find our bulletin boards valuable in this respect. They're not the final answer by any means; but they're just as close as we can come to it, I suppose, until some better idea comes along.

One way in which we promoted safety recently was a slogan contest in which everyone aboard our ships was invited to submit a slogan in less than 10 words on the dangers of shipboard smoking. We got several thousand answers—many of them pretty bad, as you might expect. But the general result was just what we had hoped for, a lot of consciousness about the dangers of shipboard smoking. (Back cover of "Proceedings" submitted by slogan winner.)

Such devices as this work fine. Our captains reported to us, at the conclusion of the contest, that their men were more conscious than ever of the dangers involved in a surreptitious cigarette. Trouble is, though, the results are only temporary. Altogether too soon for us, the matter will slip back again into whatever recesses of our men's minds that such things usually go.

We're finding that our Suggestions System — another company-wide plan—also has a definite safety value. Recently Socony-Vacuum modernized and liberalized its Suggestions System to make it one of the most profitable, for the employees, that ever came along. This fact has been well-established with our employees. Hence they're out to earn every dollar they can with suggestions—and safety suggestions pay off just as well as any others. I might add, too, that some absolutely swell suggestions have come to us as a result of it.

PITTSBURGH STEAMSHIP CO.

D. L. Buchanan, Manager of Industrial Relations

Most of the accidents sustained by personnel aboard bulk carriers on the Great Lakes are attributable to carelessness on the part of the injured seaman. In analyzing our lost time injuries for the season of 1947 from the standpoint of Cause and Responsibility, it was found that 93 percent were the injured's own fault. With due consideration to the construction necessary to fit the vessels for carrying their cargoes of iron ore, limestone and coal, protective devices have been employed. Despite the installation of safety equipment, the human equation is chiefly the cause of all accidents. I shall endeavor to give you the details of some of our typical injury cases.

On the fifth day after attaching to his ship during spring fitout, a 33-year-old ordinary seaman serving as deck watch, was assisting the Second Mate and another seaman in removing the anchor chains used as winter moorings from the river bank. This deck watch was ordered to go aboard the vessel to obtain two hammers from the Engineer. He secured a sledge hammer weighing about 14 pounds and a machinist's hammer. In descending the ship's ladder, he carried these tools over his right shoulder, grasping the hammer handles with his right hand. When about half way down, he missed his grasp and fell over backwards, landing on his back on the wooden platform or catwalk extending out from the bank of the river. He fell a distance of 10 or 11 feet and sustained a compression fracture of the twelfth dorsal and first lumbar vertebrae causing him to be off his ship for 86½ days.

An investigation revealed that this was a 28-foot regular ship's wooden ladder securely lashed in position amidships and held firmly in position at the bottom between two 2 x 4 timbers, which were nailed in place on the platform. Inasmuch as the vessel was still in her winter mooring berth, the ladder rigged in this manner was on an estimated angle of 65° to 70°. The accident occurred in broad daylight with the weather clear and the wind blowing strong from the south. The injured man stated that the rungs were clear and dry and that he had no recollection of slipping. The canvas parcel bag, which customarily hangs by the ship's ladder when the vessel is in port during the season, was not yet over the side. In looking back upon his accident, the seaman said he should have thrown the tools from the deck onto the bank or lowered them by the use of a line.

The facts surrounding this accident are similar to most of those involving the use of the ship's ladder. The Officers and Safety Committees repeatedly warn our men to have both hands free when descending or ascending the ladder.

A check of our casualty experience a few years ago reflected that numerous accidents were sustained by our seamen while handling mooring lines. In analyzing these cases it was found that the injured men were not properly using the becket attached to the eye of the cable, but were committing the unsafe act of placing their hand between the eye of the cable and the spile. Many of these cases were serious since some of the men were maimed for life due to part of the hand being amputated. A concentrated effort was made to reduce the number of such accidents to our personnel by continually high-lighting this hazard to the Mates and Safety Committees. This constant repetition has apparently produced results since our records show that in 1945 there were 16 injuries from handling lines. 1946 it was reduced to 6 cases and in 1947 only 3 such injuries. In the season of 1948 to date, only one injury has occurred in this category.

In an analysis of our injuries for the year 1947, we were somewhat surprised to find that 54.8 percent of the men sustaining lost time injuries had sailed for more than 1 year. When compared with the 9.6 percent for those who had sailed from 6 months to 1 year and the 35.6 percent for the injured men with 1 week to 6 months sailing experience, it appears either that the old saying "familiarity breeds contempt" is true or else the experienced men are performing more hazardous jobs.

This same survey reflected that 53.4 percent of our injured seamen were 30 years of age and over, while 30.2 percent were between 21 and 30 and, startlingly enough, only 16.4 percent were 20 years of age or under. The preconceived notion that the majority of those injured were the young, inexperienced men has been exploded. Either the quicker reflexes of our younger men or the close supervision and detailed instruction given them because of their youth accounted for this.

The unlicensed crew aboard bulk carriers learn how to handle the equipment by on the job training. The licensed officers and members of the Safety Committee show and tell the new man how to safely perform his job. After being instructed, he is observed to make sure that he is properly and safely handling the equipment.

For instance, an ordinary seaman is shown the safe procedure in opening and closing hatches, whether it be on a wooden hatch vessel, one with telescopic leaf hatches or a single piece hatch ship. If this seaman were on a ship with telescopic hatches, he would be first assigned to placing one end of the bridle on the hatch knob located on the center leaf. He would be cautioned not to stand on the hatch, but rather on the deck between the hatches to avoid the danger of being thrown into the hold. This man would also be warned not to follow the hatch too closely as it was opening or closing, since if one of the leaves became fouled there would be the danger of its coming askew into the space between the hatches. This same ordinary seaman would be instructed that in being landed on the landing boom, he should hold tightly onto the rope and wait until his feet touched the dock before getting off the bosn's chair. He would have been cautioned that in handling the mooring cables, he should use only the becket and to stand back out of the bight of the line. Many of the instructions given this seaman are contained in the Lake Carriers' Association booklet "Recommendations for the Prevention of Accidents Aboard Ship."

Our aim and purpose is to reduce the number and severity of the accidents sustained by our personnel. To this end the injury reports received are carefully analyzed and studied. The primary causes of our lost time accidents are: (1) Failure to recognize an unsafe condition or practice; (2) Error in judgment; (3) Failure to establish safe working procedures; and (4) Violation of specific instructions. If we are to achieve our goal of reduction and eventual elimination of personal injuries aboard bulk carriers, our safety program must be geared to remedying the hazards highlighted by the casual classification analysis. In our fleet this focuses attention upon the continuing need for training and instruction of the individual seaman to insure his being safety minded. The minutes of one of our Safety Committees aptly expressed the thought recently as follows:

"We agree that personal contact is one of the most effective ways to promote safety. Upon observing a crew member performing a duty in an unsafe way, the supervisor, or in our case the Mates, Engineers, and Boatswain, must approach the crew member in the proper manner at the proper time and explain not only the proper way to perform the job, but also how he was doing it wrong in the first place."

SAFETY HANDBOOK

Another example of safety promotion is the excellent handbook issued by United States Protection and Indemnity Agency, 116 John St., New York 7, N. Y., for the use of shipowners and operators whose policies are written in companies represented by the Marine Office of America.

Entitled "Accident Prevention for Tank Ships" the book treats exhaustively of the subject as pertains to day-to-day operations on tank ships. The material is based on actual accident experiences, causes, effects and results in their operation. Many years of experience in tankship safety are contained in the safety recommendations contained therein.

Why take a Chance!
So little to gain—
So much to lose

HAND TOOLS

1. Select the right tool for the job—never use a makeshift.
2. Use only tools in good condition—no cracked or broken handles, none without handles, no tools with mushroomed or broken heads.
3. Keep keen-edged blades sharp; store them safely when not in use.
4. Do not use a hammer with a hardened face on a highly tempered tool such as a drill, die, or jig. Chips may fly.
5. Use wrenches of the right size for the job. Face the jaws of an adjustable wrench in the direction of the pull.
6. Never apply a wrench to moving machinery; stop the machine; then remove all tools before starting it again.
7. See that pipe wrench jaws are sharp and chains in condition so they will not slip.
8. Never use any tool in such a way that you will be injured if it slips.

MERCHANT MARINE OFFICERS APPLYING FOR COMMISSIONS IN THE COAST GUARD

The first examination for eligible merchant marine officers making application for a permanent commission in the Coast Guard will be held on April 4, 5, and 6, 1949, in various cities throughout the United States and its territories. All applications sent to the Commandant (PTP), U. S. Coast Guard, Washington 25, D. C., which are postmarked prior to March 6, 1949, will be definitely processed and applicants notified as to eligibility prior to the examination. Any applications postmarked subsequent to March 6, 1949, will be processed, if possible, prior to the examination date. For details see the article and regulations described in the December "Proceedings," page 212.

APPENDIX

Amendments to Regulations

TITLE 33—NAVIGATION AND NAVIGABLE WATERS

Chapter I—Coast Guard, Department of the Treasury

SUBCHAPTER C—AIDS TO NAVIGATION

[CGFR 48-59]

AIDS TO NAVIGATION; REVISION OF REGULATIONS

The regulations concerning Aids to Navigation were formerly published in Chapter IV of Title 33, Code of Federal Regulations; these regulations have been revised to effect editorial changes, to clarify their intent, and to incorporate statements of policy, long established procedures not heretofore published, and other requirements so that all regulations, procedures, and policies affecting the public will be codified and available in one place, insofar as practicable.

By virtue of the authority vested in me as Secretary of the Treasury by 60 Stat. 237, 5 U. S. C., Sup. 1001, et seq., as well as the statutes cited with the regulations below, the regulations in §§ 20.80-1 to 20.80-25, Subpart 20.80, Part 20, Subchapter A, Chapter I, Title 33, are cancelled, and the regulations in Subchapter C, Chapter I, Title 33 (formerly Chapter IV of this title), are revised to read as follows:

Part
60 General.
62 United States Aids to Navigation System.
64 Marking of Wrecks.
66 Private Aids to Navigation.
68 Lighting of Bridges.
70 Interference with or Damage to Aids to Navigation.
72 Marine Information.
74 Costs and Charges.
76 Sale and Transfer of Aids to Navigation Equipment.

* * * * *

[F. R. Doc. 48-10955, Filed Dec. 15, 1948; 8: 51 a. m.; 13 F. R. 7772, Dec. 16, 1948.]

Due to lack of space it is not possible to reprint these regulations in the "Proceedings," but copies of the Federal Register for December 16, 1948, may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 20 cents per copy, so long as copies are available.

Safety Pays—in Time, Protection, and Lives

SUBCHAPTER E—NAVIGATION REQUIREMENTS FOR THE GREAT LAKES AND ST. MARYS RIVER

(CGFR 48-65)

PART 92—ANCHORAGE AND NAVIGATION REGULATIONS; ST. MARYS RIVER, MICH.

VISUAL SIGNALS ON VESSELS AGROUND IN CHANNEL

The purpose of the following amendment to the regulations for navigation in the St. Marys River is to bring the regulations into agreement with Rule 30 (c) in Public Law 448, 80th Congress, approved March 18, 1948, insofar as practicable. The regulation has been changed to require that, in addition to the lights now prescribed, a vessel aground in a channel shall also display the anchorage lights prescribed by statute. The minimum distance separating the red lights is still six feet in order that observers in the lookout towers located along the St. Marys River may not be confused.

This amendment to the regulations regarding visual signals is published without prior general notice of its proposed issuance for the reason that notice, public rule making procedure, and effective date requirements in connection therewith are hereby found to be contrary to the public interest. The amendment does not require a vessel to carry any additional equipment not previously required by either the act of March 18, 1948, or any of the regulations of the Coast Guard.

Any person who may feel aggrieved by the promulgation of this amendment may appeal therefrom to the Commandant (CMC), United States Coast Guard, Washington 25, D. C., in writing within thirty days from date of publication of this document in the Federal Register. The written appeal shall be presented in triplicate and shall include data and views as to why the regulations shall not be amended.

By virtue of the authority vested in me as Commandant, United States Coast Guard, by section 1, 29 Stat. 54-55, 34 Stat. 136, as amended, 33 U. S. C. 474, and section 101 of Reorganization Plan No. 3 of 1946, 11 F. R. 7875, the following amendment to the regulations is prescribed, which shall become effective on and after January 1, 1949:

Section 92.10 (formerly § 323.10) is amended to read as follows:

§ 92.10 *Visual signals on vessel aground in channel.* (a) A vessel aground in a dredged channel, completely blocking the channel, shall carry from sunset to sunrise, in addition to the white light or lights prescribed for a vessel at anchor, two red lights in a vertical line one over the other, not less than six feet apart, in such position and height as to be readily visible to vessels bound up and down the channel.

(b) A vessel aground in a dredged channel, but so as to permit passage with safety, shall carry from sunset to sunrise, in addition to the white light or lights prescribed for a vessel at anchor, a red light over a white light hoisted vertically not less than six feet apart, in such position and height as to be readily visible to vessels bound up and down the channel. (Sec. 1, 29 Stat. 54, 55, 34 Stat. 136, as amended; 33 U. S. C. 474; sec. 101, Reorg. Plan No. 3 of 1946, 11 F. R. 7875)

Dated: November 24, 1948.

[SEAL] J. F. FARLEY,
Admiral, U. S. Coast Guard, Commandant.

[F. R. Doc. 48-10491; Filed Dec. 1, 1948; 8:50 a. m.; 13 F. R. 7347, Dec. 2, 1948.]

SUBCHAPTER H—ROUTES FOR PASSENGER VESSELS

[CGFR 48-56]

PART 105—NORTH ATLANTIC PASSENGER ROUTES

The purpose of reissuing the regulations regarding North Atlantic passenger routes is to effect editorial changes necessary to bring them up to date and to redescribe the procedures regarding imposition of fines and to transfer this function from the collector of customs to the Coast Guard District Commander, since Coast Guard facilities are now able to handle this function.

By virtue of the authority vested in me as Secretary of the Treasury by R. S. 161 (5 U. S. C. 22) and sec. 3, 49 Stat. 1923 (46 U. S. C. 738b), the following amendments to the regulations are prescribed to become effective upon publication in the Federal Register.

Part 105 (formerly Part 3) is amended to read as follows:

Sec.
105.01 Passenger vessel defined.
105.05 Filing notice of ship routes.
105.10 Designation of ship route.
105.15 Notices deemed public documents; posting of notice in customhouse.
105.20 Posting copy of notice on vessel.
105.25 Report of deviation from ship route.
105.30 Penalty for violation of regulation.
105.35 Communication of violation to Coast Guard District Commander.
105.40 Procedure on violation.

AUTHORITY §§ 105.01 to 105.40 issued under R. S. 161; 5 U. S. C. 22 and sec. 3, 49 Stat. 1923; 46 U. S. C. 738b.

§ 105.01 *Passenger vessel defined.* For the purpose of this part, a vessel shall be deemed to be a passenger vessel if it carries more than twelve passengers.

§ 105.05 *Filing notice of ship routes.* The owner or operating agent of any passenger vessel of the United States crossing the North Atlantic Ocean shall file with the collector of customs of the home port of such vessel, and, if the United States port from which such vessel sails is different from the home port, with the collector of customs at that port, notice of the ship routes which he proposes such vessel will follow on its east-bound and west-bound crossings. Such notice or notices shall be filed prior to the first sailing of the vessel from a port of the United States. Upon any subsequent North Atlantic voyage of such vessel beginning at the same port in the United States, no further notice shall be required if it is proposed that the vessel will follow the same routes, but whenever it is proposed that such vessel, when crossing the North Atlantic Ocean, will sail from a port in the United States other than that specified in the last previous notice, or will follow a route or routes different from the route or routes specified in such last notice, notice of the proposed route or routes shall be filed, as aforesaid, before the vessel sails.

§ 105.10 *Designation of ship route.* The proposed route of any passenger vessel of the United States crossing the North Atlantic Ocean shall, whenever practicable, be designated in any notice required hereby in the terms used to designate the North Atlantic Lane Routes, as established by the proper authorities. Such route shall avoid, as far as practicable, the fishing banks of Newfoundland, north of latitude forty-three degrees north during the fishing season; and shall, as far as circumstances will permit, pass outside of regions reported or known to be endangered by ice.

§ 105.15 *Notices deemed public documents; posting of notice in customhouse.* All notices of proposed ship routes filed with collectors of customs shall be considered public documents and copies thereof shall, while effective, be continuously posted by the respective collectors of customs in a place in the customhouse to which the public has free access.

§ 105.20 *Posting copy of notice on vessel.* The owner or operating agent of any passenger vessel of the United States crossing the North Atlantic Ocean shall cause a copy of the proposed ship routes of the vessel to be continuously posted, while effective, in a public place in the passenger space of the vessel.

§ 105.25 *Report of deviation from ship route.* If the master of any passenger vessel of the United States crossing the North Atlantic Ocean finds it necessary for any reason during the course of a voyage to deviate more than 20 nautical miles from the proposed ship route of such vessel, he shall be required by the owner or operating agent of such vessel, as soon as he arrives in the United States, to report such deviation to the collector of customs of the home port of such vessel and, if the United States port from which such vessel sailed is different from the home port, to the collector of customs at that port, together with a written statement explaining the necessity for such deviation.

§ 105.30 *Penalty for violation of regulation.* For each violation of section 3 (a) of the act of June 25, 1936, or of any provision of §§ 105.05, 105.10, or 105.20, the owner, or operating agent, of the passenger vessel involved in such violation shall be liable to a fine of not exceeding $100.

§ 105.35 *Communication of violation to Coast Guard District Commander.* Information with respect to a violation or possible violation of section 3 (a) of the act of June 25, 1936, or of this part coming into the possession of any officer or employee of the Treasury Department shall be communicated promptly to the commander of the Coast Guard district within which the home port of the vessel is located or if the United States port from which the vessel sailed is different from the home port, to the Commander of the Coast Guard district within which that port is located.

§ 105.40 *Procedure on violation.* The district commander receiving information with respect to a violation of section 3 (a) of the act of June 25, 1936, or of this part shall make an investigation to determine the actual facts involved. If after such investigation the District Commander determines a prima facie violation of section 3 (a) of the act of 25 June 1936, or of any provision of §§ 105.05, 105.10 or 105.20 has occurred, he shall follow the procedure in 46 CFR, 2.50–20.

Dated: December 21, 1948.

(SEAL) E. H. FOLEY, Jr.,
Acting Secretary of the Treasury.

[F. R. Doc. 48-11319; Filed, Dec. 28, 1948; 8:58 a. m.; 13 F. R. 8640, Dec. 29, 1948]

TITLE 46—SHIPPING

Chapter I—Coast Guard, Department of the Treasury

[CGFR 48-67]

DISTRESS SIGNALS IN LIFEBOATS AND LIFE RAFTS

The amendments regarding requirements for distress signals for lifeboats and life rafts published in the Federal Register dated October 30, 1948, 13 F. R. 6411 et seq., were to allow an additional alternate to existing requirements and establish a minimum standard specification for hand orange smoke distress signals. A notice postponing the effective date of the regulations was published in the Federal Register dated November 24, 1948, 13 F. R. 6921. A notice regarding proposed changes in the requirements for distress signals was also published in the Federal Register November 24, 1948, and a public hearing was held by the Merchant Marine Council on November 30, 1948, at Washington, D. C. At this hearing the appeals submitted and all comments, data, and views on the regulations published October 30, 1948, were considered. The only change made in the requirements published October 30, 1948, was to advance the date January 1, 1949, to June 1, 1949, as the date by which all distress signals not bearing a date of manufacture have to be removed from merchant vessels subject to Coast Guard inspection. *It is, therefore, ordered,* That the proposed regulations published in the Federal Register October 30, 1948, 13 F. R. 6411 et seq., as postponed by a notice published November 24, 1948, 13 F. R. 6921, shall be made effective on and after the date of publication of this document in the Federal Register with the exception that the date "January 1, 1949" shall be changed to "June 1, 1949."

By virtue of the authority vested in me as Commandant, United States Coast Guard, by R. S. 4405 and 4417a, as amended, 46 U. S. C. 375, 391a, and section 101 of Reorganization Plan No. 3 of 1946, as well as additional statutes cited with the various regu-

lations below, the following amendments are prescribed:

SUBCHAPTER D—TANK VESSELS

PART 33—LIFESAVING APPLIANCES

EQUIPMENT; LIFEBOATS, LIFE RAFTS, AND BUOYANT APPARATUS

Section 33.3–1 (e) is amended to read as follows:

§ 33.3–1 *Tank ship lifeboat equipment; ocean and coastwise—T/OC.*

* * *

(e) *Distress signals.* Twelve approved hand red flare distress signals in a watertight container, and 4 approved floating orange smoke distress signals; or 12 approved hand red flare distress signals in a watertight container, and 12 approved hand orange smoke distress signals in a watertight container; or 12 approved hand combination flare and smoke distress signals in a watertight container. Service use shall be limited to a period of 3 years from date of manufacture. Distress signals not bearing date of manufacture shall not be carried after June 1, 1949. (For specifications for the above signals, see subparts 160.021, 160.022, 160.023, and 160.037 in Subchapter Q of this chapter.)

(R. S. 4417a, sec. 5 (e), 55 Stat. 244, as amended, 46 U. S. C. 391a, 50 U. S. C. 1275)

SUBCHAPTER G—OCEAN AND COASTWISE GENERAL RULES AND REGULATIONS

PART 59—BOATS, RAFTS, BULKHEADS, AND LIFESAVING APPLIANCES (OCEAN)

1. Section 59.11 (e) is amended to read as follows:

§ 59.11 *Lifeboat equipment.* * * *

(e) *Distress signals.* Twelve approved hand red flare distress signals in a watertight container, and 4 approved floating orange smoke distress signals; or 12 approved hand red flare distress signals in a watertight container, and 12 approved hand orange smoke distress signals in a watertight container; or 12 approved hand combination flare and smoke distress signals in a watertight container. Service use shall be limited to a period of 3 years from date of manufacture. Distress signals not bearing date of manufacture shall not be carried after June 1, 1949. (For specifications for the above signals, see subparts 160.021, 160.022, 160.023, and 160.037 in Subchapter Q of this chapter.)

(R. S. 4426, 4488, 4491, 49 Stat. 1544, 54 Stat. 346, sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 404, 481, 489, 1333, 50 U. S. C. 1275)

2. Section 59.52 (a) is amended to read as follows:

§59.52 *Equipment for life rafts.*

* * *

(a) *Distress signals.* Twelve approved hand red flare distress signals in a watertight container, and 4 approved floating orange smoke distress signals; or 12 approved hand red flare distress signals in a watertight container, and 12 approved hand orange smoke distress signals in a watertight container; or 12 approved hand combination flare and smoke distress signals in a watertight container. Service use shall be limited to a period of 3 years from date of manufacture. Distress signals not bearing date of manufacture shall not be carried after June 1, 1949. (For specifications for the above signals, see subparts 160.021, 160.022, 160.023, and 160.037 in Subchapter Q of this chapter.)

(R. S. 4426, 4488, 4491, 49 Stat. 1544, 54 Stat. 346, sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 404, 481, 489, 1333, 50 U. S. C. 1275)

PART 60—BOATS, RAFTS, BULKHEADS, AND LIFESAVING APPLIANCES (COASTWISE)

1. Section 60.9 (e) is amended to read as follows:

§ 60.9 *Lifeboat equipment.* (See § 59.11 of this chapter, as amended, which is identical with this section.)

2. Section 60.45 (a) is amended to read as follows:

§ 60.45 *Equipment for life rafts.* (See § 59.52 of this chapter, as amended, which is identical with this section.)

SUBCHAPTER Q—SPECIFICATIONS

PART 160—LIFESAVING EQUIPMENT

SUBPART 160.037—SIGNALS, DISTRESS SMOKE, ORANGE, HAND, FOR MERCHANT VESSELS

The regulations in §§ 160.037–1 to 160.037–7, inclusive, were published in the Federal Register October 30, 1948, 13 F. R. 6412–6415, inclusive, and the effective date of these regulations was postponed by a document published in the Federal Register November 24, 1948, 13 F. R. 6921. The text of the regulations as published October 30, 1948, shall become effective on and after the date of publication of this document in the Federal Register.

Regulations in effect. The amendments contained in this document as well as the specification previously published in the Federal Register October 30, 1948, change the requirements only to the extent that distress signals not bearing date of manufacture shall not be carried on merchant vessels subject to inspection by the Coast Guard after June 1, 1949, and allow an additional alternate to previous requirements for distress signals. The total quantity of distress signals required in each lifeboat and life raft has not been changed.

Dated: December 9, 1948.

[SEAL] J. F. FARLEY,
Admiral, U. S. Coast Guard, Commandant.

[F. R. Doc. 48–10956; Filed, Dec. 15, 1948; 8:51 a. m.; 13 F. R. 7783, Dec. 16, 1948]

Equipment Approved by the Commandant

AFFIDAVITS

The following affidavits were accepted during the period from October 15 to December 15, 1948:

Barco Manufacturing Co., 1801 to 1815 Winnemac Avenue, Chicago 40, Ill. Pipe fittings.

Boston Electro Steel Casting, Inc., Roxbury 19, Mass. Castings.

Crawford Steel Foundry Co., 521 East Southern Avenue, Bucyrus, Ohio. Steel castings.

Globe Steel Tubes Co., Milwaukee 4, Wis. Fittings.

Hahn-Pitz Corp., 286 Scholes Street, Brooklyn 6, N. Y. Valves and fittings.

Michigan Steel Casting Co., Foot of St. Aubin Avenue, Detroit 7, Mich. Castings.

S & H Bronze Bearing Co., 340–344 North Avenue, East Cranford, N. J. Castings.

Trenite Foundry Corp., Trenton, N. J. Iron castings.

Union Steel Castings, Division of Blaw-Knox Co., 62nd & Butler Sts., Pittsburgh 1, Pa. Castings.

Waterman Foundry, Division of Waterman Steamship Corp., P. O. Box 1248, Mobile 7, Ala. Castings.

CERTIFICATION OF ARTICLES OF SHIPS' STORES AND SUPPLIES

Articles of ships' stores and supplies certificated from October 25, 1948, to December 25, 1948, inclusive, for use on board vessels in accordance with the provisions of Part 147 of the Regulations Governing Explosives or Other Dangerous Articles on Board Vessels are as follows:

Gendron Chemical Co., 158 14th St., Hoboken, N. J. Certificate No. 264, dated December 16, 1948, Water Soluble Degreaser—101.

Motor Chemical Corp., 840 North Michigan Avenue, Chicago 11, Ill. Certificate No. 260, dated October 29, 1948, PD–F.

Standard Oil Co. (Indiana), 910 South Michigan Avenue, Chicago 80, Ill. Certificate No. 261, dated October 29, 1948. Superla Insect Spray

With DDT. Certificate No. 262, dated October 29, 1948. Superla Junior Aerosol With DDT (automatic atomizer).

Underwood Chemical Corp., 121–125 Broad Street, New York 4, N. Y. Certificate No. 263, dated November 12, 1948. Chex-Flame.

FUSIBLE PLUGS

The Marine Engineering Regulations and Material Specifications require that manufacturers submit samples from each heat of fusible plugs to the Commandant for test prior to plugs manufactured from the heat being used on vessels subject to inspection by the Coast Guard. A list of approved heats which have been tested and found acceptable during the period from October 15 to November 15, 1948, is as follows:

The Lunkenheimer Co., P. O. Box 360, Annex Station, Cincinnati 14, Ohio. Heat Nos. 311 through 321.

H. B. Sherman Manufacturing Co., 22 Barney St., Battle Creek, Mich. Heat Nos. 670 through 675.

WELDING ELECTRODES

The Bureau of Ships, Navy Department, has tested the following electrodes and found them satisfactory and they are therefore added to the Coast Guard's list of welding electrodes:

Air Reduction Sales Co., Forty-second Street, opposite Grand Central, New York 17, N. Y. (Arcrods Corp. manufacturer.) Airco 312, Type E6016.

General Electric Co., Schenectady, N. Y. (Arcrods Corp. manufacturer.) W–32, Type E6016.

Wilson Welder and Metals Co., Inc., Lincoln Building, Forty-second Street and Grand Central, New York 17, N. Y. (Arcrods Corp. manufacturer.) 512, Type E6016.

Operating Positions and Electrode Sizes

The $\frac{1}{8}$" and $\frac{5}{32}$" diameter electrodes will be allowed for all position welding. The $\frac{3}{16}$", $\frac{7}{32}$" and $\frac{1}{4}$" diameter electrodes will be allowed for horizontal fillet and flat positions. The $\frac{5}{16}$" diameter electrode will be allowed for flat position only.

TERMINATION OF APPROVAL OF EQUIPMENT

By virtue of the authority vested in me as Commandant, United States Coast Guard, by U. S. 4405 and 4491, as amended (46 U. S. C. 375, 489), and section 101 of Reorganization Plan No. 3 of 1946 (11 F. R. 7875), as well as the additional authorities cited with the specific items below, I find that the oxygen breathing apparatus described below is less suitable, as compared with other apparatus now available, for emergency work aboard ship because of its additional weight and size occasioned by its increased capacity which is in excess of that required by the regulations for merchant vessels, and the approval is terminated with the consent of the manufacturer and the other approvals are terminated because the items of equipment are no longer being manufactured, as follows:

GAS MASKS AND OTHER BREATHING APPARATUS

Termination of Approval No. 160.011/17/0, McCaa two-hour oxygen breathing apparatus, Bureau of Mines Approval No. BM–1303, MSA General Assembly Dwg. No. A990–1, Revision 3 dated 11 August 1939, Dwg. No. A990–2 dated 15 September 1931, Mine Safety Appliances Co., Braddock, Thomas, and Meade Streets, Pittsburgh 1, Pa. Approval No. 160.011/17/0 was published in the Federal Register July 31, 1947.

(R. S. 4417a, 4426, 49 Stat. 1544, 54 Stat. 1028, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 367, 391a, 404, 463a, 50 U. S. C. 1275; 46 CFR 35.4–5 61.18, 77.18, 95.17, 114.18)

LIQUEFIED PETROLEUM GAS VALVES, FITTINGS, AND GAUGES

Termination of Approval No. 162.018/6/0, Rego pop type safety relief valve, liquefied petroleum gas service, marked "Rego No. 2417", bronze body, resilient composition seat disc, threaded connection, Dwg. No. 2417 and Catalog No. L-500, approved for 2" pipe size, maximum allowable working pressure 100 p. s. i., manufactured by The Bastian-Blessing Co., 4201 West Petersen Avenue, Chicago, Ill. Approval No. 162.018/6/0 was published in the Federal Register of July 31, 1947.

Termination of Approval No. 162.018/10/0, Roney rotary liquid level gauge, liquefied petroleum gas service, marked "Rego No. 2472", bronze body, Dwg. No. 2472 dated April 8, 1939, manufactured by The Bastian-Blessing Co., 4201 West Petersen Avenue, Chicago, Ill. Approval No. 162.018/10/0 was published in the Federal Register of July 31, 1947.

Termination of Approval No. 162.018/11/0, Roney rotary liquid level gauge, liquefied petroleum gas service, marked "Rego No. 2472A", bronze body, Dwg. No. 2472A dated April 8, 1939, manufactured by The Bastian-Blessing Co., 4201 West Petersen Avenue, Chicago, Ill. Approval No. 162.018/11/0 was published in the Federal Register of July 31, 1947.

Termination of Approval No. 162.018/12/0, Roney rotary liquid level gauge, liquefied petroleum gas service, marked "Rego No. 2472B", bronze body, Dwg. No. 2472B dated June 30, 1939, manufactured by The Bastian-Blessing Co., 4201 West Petersen Avenue, Chicago, Ill. Approval No. 162.018/12/0 was published in the Federal Register of July 31, 1947.

Termination of Approval No. 162.018/13/0, Rego fixed liquid level gauge, liquefied petroleum gas service, marked "Rego No. 2163", bronze body, fitted with vent hole and seal plug, Dwg. No. 2143 and Catalog No. L–500 Section LJ, manufactured by The Bastian-Blessing Co., 4201 West Petersen Avenue, Chicago, Ill. Approval No. 162.018/13/0 was published in the Federal Register of July 31, 1947.

Termination of Approval No. 162.018/15/0, Rego tank angle valve, liquefied petroleum gas service, marked "Rego No. 2892", bronze body, paraprene valve disc and c. i. rubber diaphragm, flanged tank connection, Dwg. No. 2892, revised April 10, 1941, Alt. G and Catalog L–500 section LE, approved for $1\frac{1}{4}$" port opening, manufactured by The Bastian-Blessing Co., 4201 West Petersen Avenue, Chicago, Ill. Approval No. 162.018/15/0 was published in the Federal Register of July 31, 1947.

(R. S. 4417a, and sec. 5 (e), 55 Stat. 244, as amended; 46 U. S. C. 391a, 50 U. S. C. 1275; 46 CFR Part 38)

CONDITIONS OF TERMINATION OF APPROVALS

The termination of approvals of equipment made by this document shall be made effective upon the thirty-first day after the date of publication of this document in the Federal Register. Notwithstanding this termination of approval on any item of equipment, such equipment manufactured before the effective date of termination of approval may be used so long as it is in good and serviceable condition.

Dated: June 2, 1948.

(SEAL) MERLIN O'NEILL,
Rear Admiral, U. S. Coast Guard,
Acting Commandant.

[F. R. Doc. 48–5134; Filed, June 8, 1948; 8:56 a. m.; 13 F. R. 3098, June 9, 1948]

INVESTIGATING UNITS

Coast Guard Merchant Marine investigating units and merchant marine details investigated a total of 520 cases during the month of October 1948. Of this number charges were preferred involving 10 licensed and 56 unlicensed men. No hearings were held because examiners were not available.

Merchant Marine Personnel Statistics

MERCHANT MARINE LICENSES ISSUED DURING NOVEMBER 1948

DECK OFFICERS

	REGION	Atlantic coast		Gulf coast		Great Lakes and rivers		Pacific coast		Total	
		O	R	O	R	O	R	O	R	O	R
Master	Ocean	24	95	22	28		1	20	65	66	189
	Coastwise	1	6	7					1	8	7
	Great Lakes		2				3				5
	B. S. & L.	2	32		4			3	15	5	51
	Rivers		5		3		13		2		23
Chief mate	Ocean	25	8	14	11			23	7	62	26
	Coastwise		2	1	1			1		2	3
	Great Lakes										
	B. S. & L.	1	6					5		6	6
	Rivers			1		5	10			6	10
Second mate	Ocean	28	27	9	4	1	2	23	25	61	58
	Coastwise				1						1
Third mate	Ocean	10	41	3	10		7	11	10	24	68
	Coastwise										
Pilots	B. S. L. & R.	52	106	16	15	35	17	28	49	131	187
Uninspected vessels	Master	1						6		7	
	Mate							1		1	
Total		144	330	73	77	41	53	121	174	370	634
Grand total		474		150		94		295		1,013	

ENGINEER OFFICERS

Steam	Chief engineer:										
	Unlimited	11	101	7	22		7	13	52	31	182
	Limited	2	35	1	8		38		5	3	86
	First assistant engineer:										
	Unlimited	21	26	7	12		1	22	24	50	63
	Limited	1	2			2	3		3	3	8
	Second assistant engineer:										
	Unlimited	23	41	3	10	3	4	29	24	58	79
	Limited				1	1				1	1
	Third assistant engineer:										
	Unlimited	1	30	4	8		2	5	16	10	56
	Limited						1				1
Motor	Chief engineer:										
	Unlimited	1	22	1	1		2	3	18	5	43
	Limited	4	21	8	3	4	2	5	10	21	36
	First assistant engineer:										
	Unlimited							1	2	1	2
	Limited	1	1	1		1	2	3	1	6	4
	Second assistant engineer:										
	Unlimited		4					2	1	2	5
	Limited		1								1
	Third assistant engineer:										
	Unlimited		14		1		2	5	20	5	37
	Limited		2								2
Uninspected vessels	Chief engineer	1					1	1		2	1
	Assistant engineer										
Total		66	300	32	66	11	65	89	176	198	607
Grand total		366		98		76		265		805	

ORIGINAL SEAMEN'S DOCUMENTS ISSUED MONTH OF NOVEMBER 1948

Region	(1) Staff officer	(2) Continuous discharge book	(3) U. S. merchant mariner's documents	(4) AB any waters unlimited	(5) AB any waters 12 months	(6) AB Great Lakes 18 months	(7) AB tugs and towboats any waters	(8) AB bays and sounds[1]	(9) AB seagoing barges	(10) Lifeboatman	(11) Q. M. E. D.	(12) Radio operators	(13) Certificate of service	(14) Tankerman
Atlantic coast	37	112	779	259	122	4	0	1	0	323	147	6	750	9
Gulf coast	5	2	115	83	33	0	0	0	0	35	47	2	106	18
Pacific coast	14	0	340	60	52	1	1	0	0	151	71	2	272	6
Great Lakes and rivers	2	0	275	15	23	5	0	0	0	22	46	0	238	36
Total	58	114	1,509	417	230	10	1	1	0	531	311	10	1,366	69

[1] 12 months, vessels 500 gross tons or under not carrying passengers.

NOTE.—Columns 4 through 14 indicate endorsements made on U. S. merchant mariner's documents.

WAIVERS OF MANNING REQUIREMENTS FROM 1 NOVEMBER TO 30 NOVEMBER, 1948

Region	Number of vessels	Deck officers substituted for higher ratings	Engineer officers substituted for higher ratings	Able seamen substituted for deck officers	Ordinary seamen substituted for able seamen	Qualified members of engine department substituted for engineer officers	Wipers or coal passers substituted for qualified members of engine department	Wipers, coal passers or cadets substituted for engineer officers	Ordinary seamen or cadets substituted for deck officers	Total
Atlantic coast	8				8		7			15
Gulf coast										
Pacific coast	7		1		4		2			7
Great Lakes	3	1				1	1			3
Total	18	1	1		12	1	10			25

NOTE: In addition, individual waivers were granted to permit the employment of 24 able seamen holding certificates for "any waters—12 months" in excess of the 50 percent authorized by general waiver.

CREW SHORTAGE REPORTS FROM 1 NOVEMBER TO 30 NOVEMBER, 1948

Region	Number of vessels	Ratings in which shortages occurred												Total
		Chief mate	Second mate	Third mate	Radio	Able seamen	Ordinary seamen	Chief engineer	First engineer	Second engineer	Third engineer	Qualified member engine department	Wiper or coal passer	
Atlantic coast	5					3	2					3		8
Gulf coast	2					3								3
Pacific coast	8											1		1
Great Lakes	133	3	8	12		39	8	1	11	10	23	54	14	183
Total	148	3	8	12		45	10	1	11	10	23	58	14	195