# PROCEEDINGS OF THE MERCHANT MARINE COUNCIL

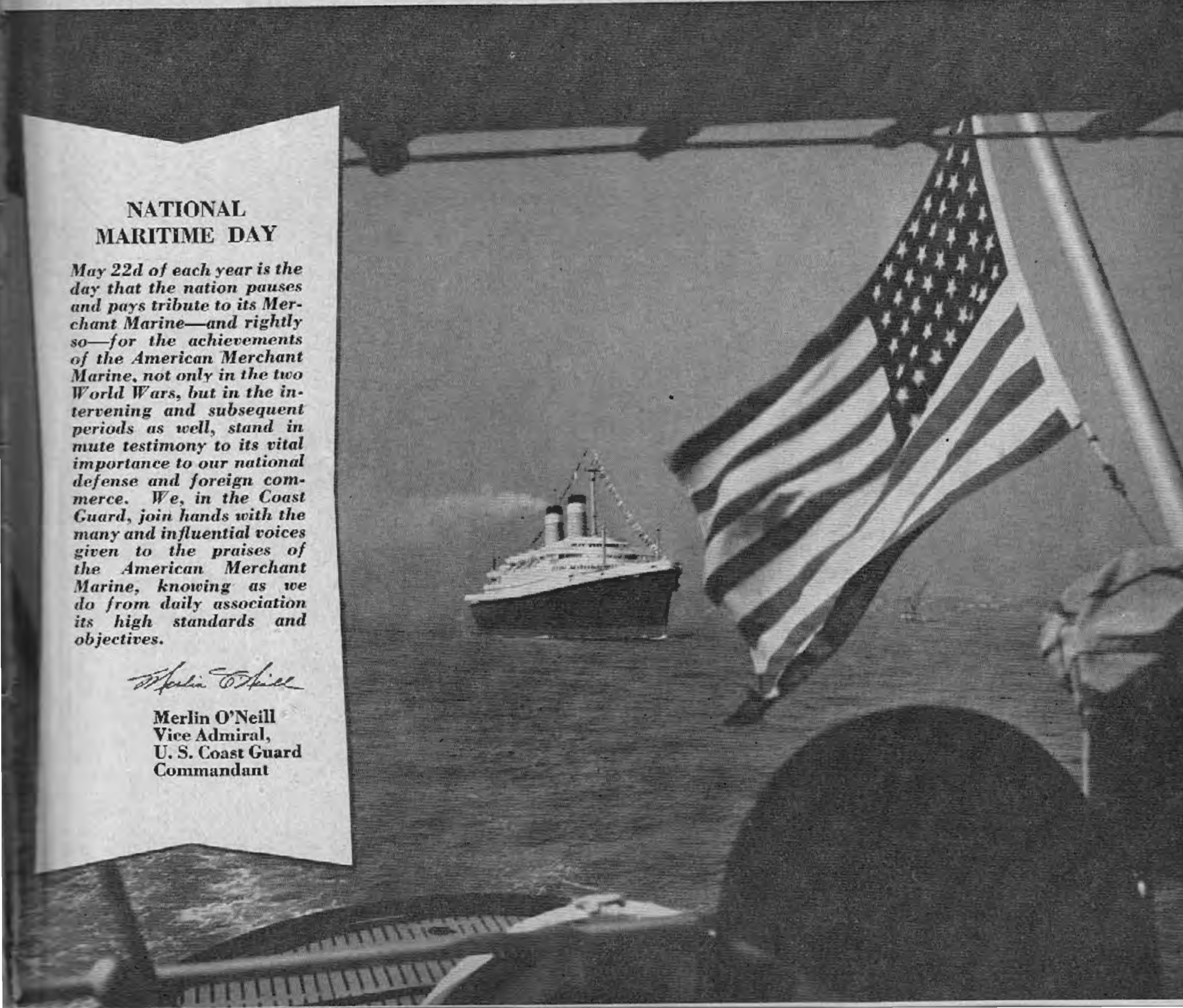
## UNITED STATES COAST GUARD

The printing of this publication has been approved by the Director of the Bureau of the Budget, March 11, 1952.

This copy for not less than 20 readers. PASS IT ALONG

CG 129

Vol. 11 May 1954 No. 5

## NATIONAL MARITIME DAY

*May 22d of each year is the day that the nation pauses and pays tribute to its Merchant Marine—and rightly so—for the achievements of the American Merchant Marine, not only in the two World Wars, but in the intervening and subsequent periods as well, stand in mute testimony to its vital importance to our national defense and foreign commerce. We, in the Coast Guard, join hands with the many and influential voices given to the praises of the American Merchant Marine, knowing as we do from daily association its high standards and objectives.*

Merlin O'Neill

**Merlin O'Neill**
**Vice Admiral,**
**U. S. Coast Guard**
**Commandant**

*Proceedings of the*

# MERCHANT MARINE COUNCIL

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## WILL YOU BUY THIS?

I'm an old familiar product you've seen advertised around. I was one of the standard brands long before brands or standards ever existed. I was just as vital in your great-grandfather's day as I am in yours, and I'll be just as vital in your great-great-grandchildren's lives. But in spite of my time-tested pedigree, the retailers claim I have always been a tough one to sell.

What's wrong? Can't be the lack of advertising. I've been displayed in papers and magazines from coast to coast.

What's wrong? Can't be the lack of selling points. I've been a bargain since the dawn of history. What's more, I'm for free. That's right, I've never cost anything. And what do I offer? A few minor advantages like happiness, health, well-being, security—and a major advantage like life itself. I don't claim to prevent bad weather or taxes, but I've been known to prevent human pain, sorrow, tragedy, poverty, death. Not bad for a free product.

What's wrong? Why don't I go over like foamy super-duper toothpaste or those perfumes that cause men to leave home?

I won't deny that it's got me baffled, or that it's brutally discouraging. But don't think for a moment that I'm thinking of calling it quits. No, the campaign will go on. I'll keep hammering away at human waste, indifference, ignorance. I'll sell myself to mankind if it's the last thing I ever do—or else my name isn't SAFETY!

—*States Marine Lines Safety Bulletin.*

## COUNTRIES WHICH HAVE ACCEPTED THE 1948 CONVENTION TO DATE

The International Convention for the Safety of Life at Sea, 1948, provides that acceptances become effective 3 months after deposit with the United Kingdom. In the November 1953 "Proceedings" the list of countries which have accepted the 1948 Convention and all territories to which the Convention has been extended was published. Since that date acceptances were deposited by the Government of Finland, Ireland, and Viet-Nam on August 13 and 19, 1953, and September 12, 1953, respectively. In accordance with Article XI (c) of the 1948 Convention these acceptances became effective for Finland on November 13, 1953, for Ireland on November 19, 1953, and for Viet-Nam on December 12, 1953.

# WHY SHIPS "SQUAT"

*A ship underway in a narrow and shallow channel may draw more water than her maximum draft as measured when she is stopped in still water. For example, this excess draft, or squat, could amount to 3½ feet or more for a tanker drawing over 30 feet of water and proceeding in the Delaware River at 13 knots. The how and why of this and other phenomena associated with ship navigation in restricted channels are explained, with pertinent drawings, in the following special article, which is reprinted from the May–June 1953 issue of the "Ships Bulletin" through the courtesy of the Esso Shipping Co.*

For centuries seamen have navigated the open seas and inland waters with the aid of charts. From the crude hand drawn charts of the early Mediterranean seafarers to the modern charts of today, endless research has improved these aids to the point where there is seldom an occasion for the navigator to question their accuracy. Of particular interest to the seamen are the coastwise and channel depths without which he would have to cautiously grope his way with the aid of a sounding device. Recognizing the importance of accurate soundings, charts are under constant revision to conform with surveys and reported depths.

Unfortunately, there is a fallacy with respect to these recorded depths—they do report the actual depth, but they are only an indication or guide to the Master as to the safe draft with which his vessel may proceed through these waters. This is particularly true in inland waters and the purpose of this article is to emphasize the phenomenon of "squat"—why ships underway in narrow and shallow channels draw more water than their maximum draft measured at rest in still water.

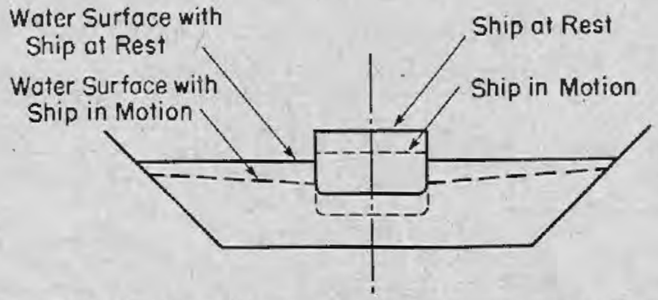


Figure 1. Sketch showing change of level of ship moving in restricted channel.

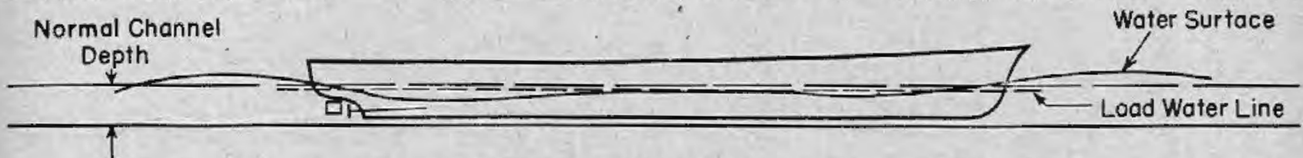


Figure 2. Contour of water surface in vicinity of ship underway in restricted channel.

For many years it has been observed that ships underway in narrow and shallow channels require more power to propel them at a given speed than would be required in deep and unrestricted waters. Coincident with these observations are reports of touching bottom in spots where the reported channel depth was several feet greater than the vessel's draft. Although considerable scientific research has been devoted to the study of power, speed and hull resistance, research and study as to the settlement or squat of vessels underway in narrow and shallow channels has been very limited.

A series of experiments carried out in model basins in this country (U. S. Navy's "David W. Taylor Model Basin") and abroad revealed some very interesting facts with respect to shallow water influence on trim and settlement or, as it is more commonly termed, squat. These experiments indicated that when a vessel is underway in still water, the water ahead of the vessel moves forward, outward and downward. At a comparatively short distance aft of the bow the forward motion ceases but the water still moves outward and downward to make way for the body of the vessel. Near this point the water starts to flow aft. This reverse flow continues to within a short distance aft of the stern where the water closing in and upwards behind the vessel has a forward motion.

Wherever changes in water velocity occur there is a change in the elevation of the water surface. In shallow water or restricted channels, the region of disturbed water about the vessel is confined to a much smaller area than in water of unlimited width and depth. Therefore, in a restricted channel, the reverse flow relative to the vessel has a greater magnitude than in open water for the same ship speed. Thus, the change in the water surface level, due to the reverse flow, results in a much greater sinkage, or squat, of the vessel in a restricted channel than in open and shallow water.

As illustrated in *figure 1,* in a restricted channel the change in water level, with resultant lowering of the vessel, due to high speed may result in the vessel scraping bottom.

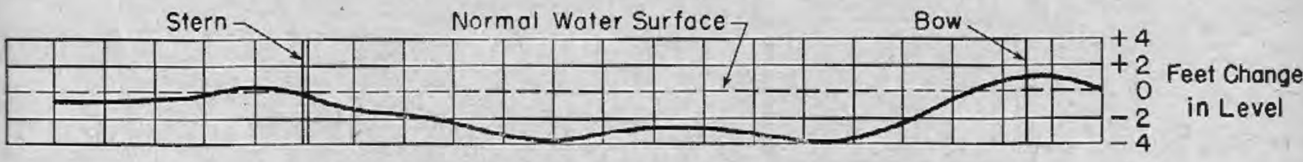


Figure 3. Water surface profile of ship on centerline of restricted channel.

To further illustrate, the profile of the water surface in the vicinity of the vessel underway on the centerline



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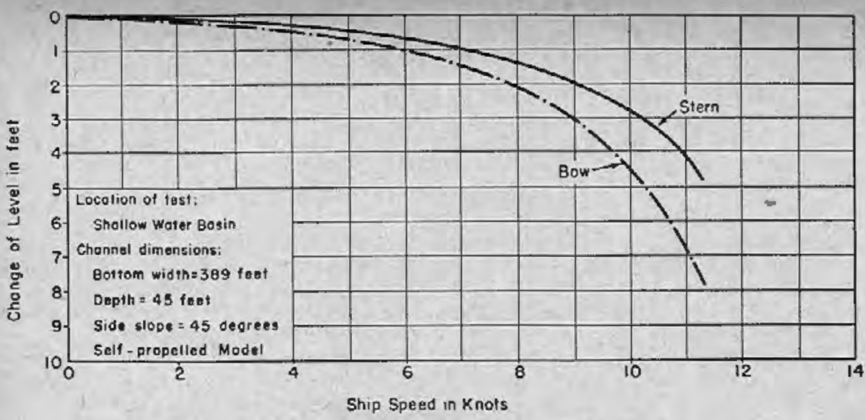


**Figure 4. Change of level of tanker model on centerline of restricted channel.**

of a restricted channel is reproduced in *figure 2*.

Note that the water surface ahead and astern of the vessel is slightly above the normal channel depth, while abreast of the vessel it is below the normal channel depth. This surface contour is generally responsible for the change in level or squat of the vessel.

Actual measurements taken at the U. S. Navy's "David W. Taylor Model Basin" of the wave profile around a tanker model on the centerline of a channel moving at the equivalent of 11 knots are illustrated in *figure 3*.

Note that change of the water surface level "stepped-up" to full size was about 3 feet. This would result in the vessel squatting about 3.5 feet and graphically illustrates that the sinkage in a restricted channel is due mainly to change in surface water level.

The graph reproduced in *figure 4* is taken from an account of tests carried out with a self-propelled model of a large tanker at the "David W. Taylor Model Basin." It graphically illustrates the change of level of the ship plotted against ship speed and indicates a considerable change in trim as the speed is increased. While not representing measurements taken of an actual vessel underway in a restricted channel, it shows what may be expected under specific conditions.

The model represented a single screw tanker of 720.6-foot load waterline length, 100-foot beam and 32.13-foot draft constructed on a 1:35 scale (approx.).

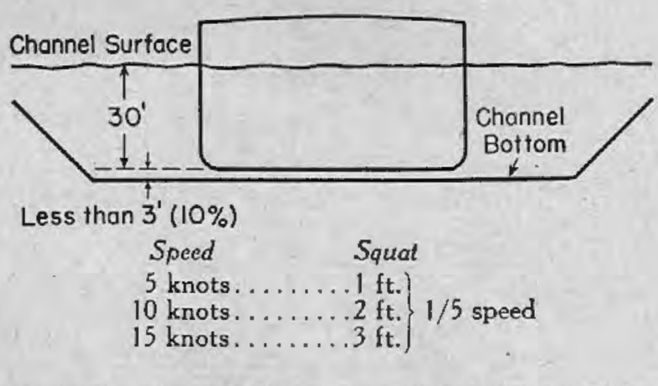


**Figure 5.**

Before drawing any conclusions from the model basin tests, it would be well to first examine the findings of the U. S. Army Engineers, resulting from surveys made by them in New York Harbor and in the Delaware River below Philadelphia.

##### OBSERVATIONS IN NEW YORK HARBOR

The survey made in New York Harbor was carried out in 1904, at which time it was brought to the attention of the U. S. Army Engineers that many transatlantic liners proceeding to and from their berths were touching bottom in spots where the U. S. Army Engineers in charge of the channel were unable to discover soundings less than the still water drafts. Some of these reported groundings indicated that these vessels' drafts alongside their piers were as much as two or three feet less than the depth of the dredged channel. This led to repeated complaints on the part of the steamship companies and resulted in the U. S. Army Engineers conducting a series of observations of vessels over 550 feet in length underway in the channel.

Observations were taken at three points, one where the channel was 80 to 100 feet deep, another where the channel depth was from 31.1 to 32.5 feet and a third where the depth was from 31 to 34.5 feet. The general procedure for taking the observations was first to determine the height above water of marks on the bow and stern before the vessel left the pier. These marks had previously been painted at known heights above the keel. As the vessel passed the observing station, the level of the marks was determined with reference to the station and as soon as possible thereafter the water level was determined with reference to the observing station. By triangulation it was then possible to arrive at the heights of the marks above a common water level. Circumstances, such as weather, list and similar variables rendered exact observations obviously impossible. However, the report demonstrated conclusively that vessels of the type observed, when underway in channels, settle at both bow and stern and that the shoaler the water and higher the speed, the more they settle. It was not practicable to formulate definite determinations as a result of these observations, but it was concluded that for vessels of the large (at that time) transatlantic type—

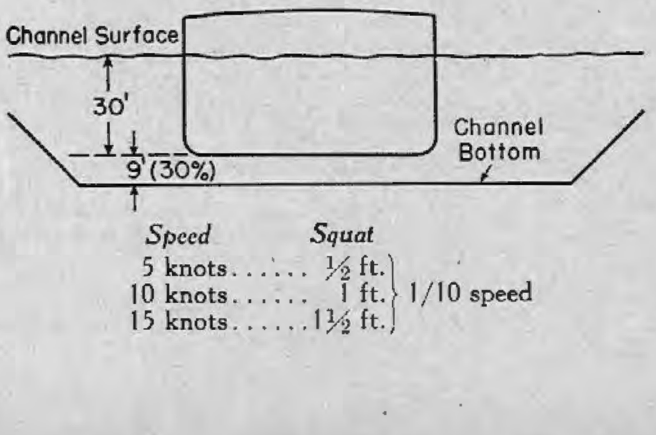


**Figure 6.**

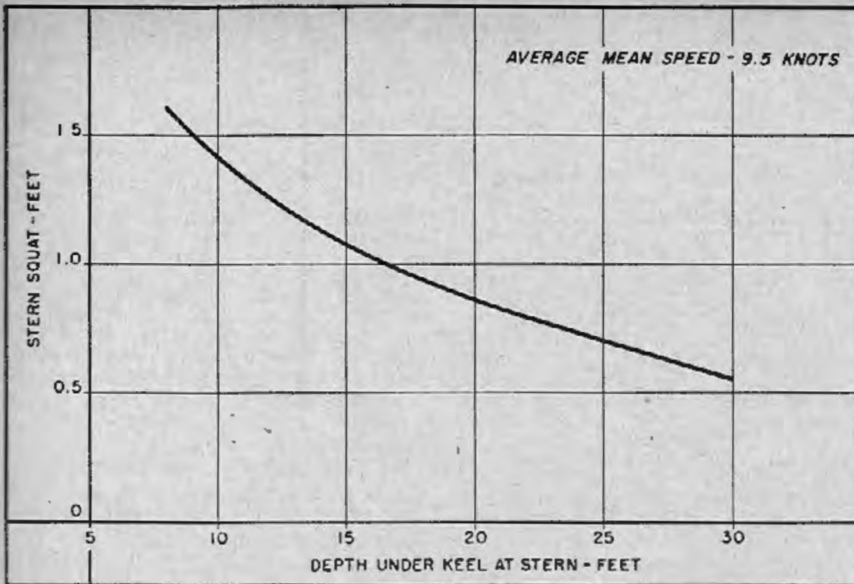


**Figure 7. Stern squat trend curve at 9.5 knots average mean speed.**

The increase of draft in feet, when the still water clearance under their keels was less than about 10 percent of the draft, would be about one-fifth the speed of the ship.

The application of this principle is illustrated by *figure 5*.

It was further concluded that—

> For a natural clearance of some 30 percent of the draft, the increase in feet would be about one-tenth the speed of the ship and, for intermediate clearances, intermediate fractions should be used.

The application of this principle is illustrated by *figure 6*.

### DELAWARE RIVER SURVEY

The U. S. Army Engineers made their survey in the Delaware River below Philadelphia during 1937. The purpose of the survey was twofold: first, to determine the amount of squat actually occurring with vessels of the various types operating in the existing channel and, second, to secure sufficient information to indicate the working relationship between squat and the factors of vessel speed and depth of water under the keel.

This survey is of particular interest as it included a study of 462 observations covering 98 tanker movements.

Essentially, the methods followed in conducting this investigation were similar to those previously followed by the U. S. Army Engineers in New York Harbor. Observing stations were established on shore at points adjacent to the channel. The still water drafts and depths of water under keels of vessels alongside piers was determined and these same vessels' marks were observed as they passed down the channel. The reverse of this procedure was followed with vessels inbound. As the actual speed of the vessel through the water was desired, corrections were made for the velocity of the currents in the river at the time of the observation. Likewise, corrections were made for tidal and salinity differences existing between the piers and the observing stations. Every effort was made to insure accuracy and it is felt that the conclusions reached furnished the most up-to-date practical information available at this time.

In a study of this nature it was impossible to secure for any one vessel data for a complete range of speeds with a constant depth under the keel or for a range of depths under the keel with a constant speed. It was therefore necessary, in analyzing the data, to group the vessels according to their characteristics and then to determine curves of average trends for each group. A comparison of observations revealed that bow and stern squat of the vessels in each group differed in amount and, due to conditions of loading and trim, the depth of water under the keel also differed. Therefore, it was necessary, in plotting curves showing relation between depth under keel and squat, to use either the bow or stern or a mean of the two. In general, the stern depth was used in the studies (described later), as it was noted that the draft at the stern was less subject to variation than at the bow.

The squat trend curves illustrated in *figures 7* and *8* are the average curves of the four tanker groups studied. All curves illustrate, in general, that the size of the vessel was found to have less bearing on squat than would be expected.

Only one curve is shown in *figure 7* as the curves of the four groups were similar.

Two curves are shown in *figure 8* to support the theory that the rate of increase of squat with speed bears a direct relationship to the variations of depth of water under the keel.

### CONCLUSIONS

As a result of the survey described above, the U. S. Army Engineers concluded that:

(*Continued on page 87*)

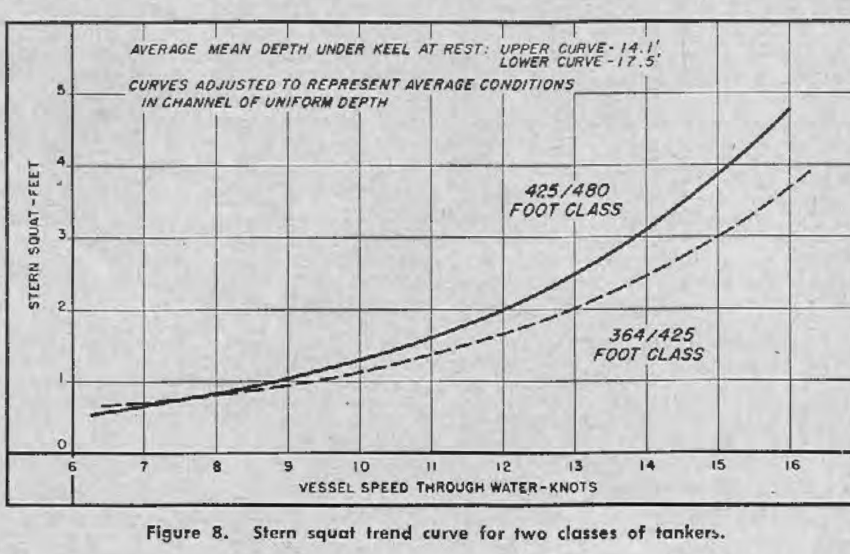


**Figure 8. Stern squat trend curve for two classes of tankers.**

# Side Lights on the Rules

In the last issue of the "Proceedings," we compared Rule 8, International Rules, with the equivalent provisions in the rules applicable to Inland Waters, the Western Rivers, and the Great Lakes. In this article, we shall continue the comparison of the International Rules with the local rules for vessels in United States waters.

Rule 9, International Rules, provides special lights and shapes for vessels that are fishing, whether they be under way, at anchor, or made fast by their gear. The requirements are rather complex.

Rule 9, International Rules, states:

LIGHTS, ETC., OF FISHING VESSELS

*Rule 9.* (*a*) Fishing vessels when not fishing shall show the lights or shapes prescribed for similar vessels of their tonnage. When fishing they shall show only the lights or shapes prescribed by this Rule, which lights or shapes, except as otherwise provided, shall be visible at a distance of at least 2 miles.

(b) Vessels fishing with trolling (towing) lines, shall show only the lights prescribed for a power-driven or sailing vessel under way as may be appropriate.

(c) Vessels fishing with nets or lines, except trolling (towing) lines, extending from the vessel not more than 500 feet horizontally into the seaway shall show, where it can best be seen, one all round white light and in addition, on approaching or being approached by another vessel, shall show a second white light at least 6 feet below the first light and at a horizontal distance of at least 10 feet away from it (6 feet in small open boats) in the direction in which the outlying gear is attached. By day such vessels shall indicate their occupation by displaying a basket where it can best be seen; and if they have their gear out while at anchor, they shall, on the approach of other vessels, show the same signal in the direction from the anchor ball towards the net or gear.

(d) Vessels fishing with nets or lines, except trolling (towing) lines, extending from the vessel more than 500 feet horizontally into the seaway shall show, where they can best be seen, three white lights at least 3 feet apart in a vertical triangle visible all around the horizon. When making way through the water, such vessels shall show the proper coloured sidelights but when not making way they shall not show them. By day they shall show a basket in the forepart of the vessel as near the stem as possible not less than 10 feet above the rail; and, in addition, where it can best be seen, one black conical shape, apex upwards. If they have their gear out while at anchor they shall, on the approach of other vessels, show the basket in the direction from the anchor ball towards the net or gear.

(e) Vessels when engaged in trawling by which is meant the dragging of a dredge net or other apparatus along or near the bottom of the sea, and not at anchor:

(i) If power-driven vessels, shall carry in the same position as the white light mentioned in Rule 2 (a) (i) a tri-coloured lantern, so constructed and fixed as to show a white light from right ahead to 2 points ($22\frac{1}{2}$ degrees) on each bow, and a green light and a red light over an arc of the horizon from 2 points ($22\frac{1}{2}$ degrees) on each bow to 2 points ($22\frac{1}{2}$ degrees) abaft the beam on the starboard and port sides, respectively; and not less than 6 nor more than 12 feet below the tri-coloured lantern a white light in a lantern, so constructed as to show a clear, uniform, and unbroken light all round the horizon. They shall also show the stern light specified in Rule 10 (a).

(ii) If sailing vessels, shall carry a white light in a lantern so constructed as to show a clear, uniform, and unbroken light all round the horizon, and shall also, on the approach of or to other vessels show, where it can best be seen, a white flare-up light in sufficient time to prevent collision.

(iii) By day, each of the foregoing vessels shall show, where it can best be seen, a basket.

(f) In addition to the lights which they are by this Rule required to show vessels fishing may, if necessary in order to attract attention of approaching vessels, show a flare-up light. They may also use working lights.

(g) Every vessel fishing, when at anchor, shall show the lights or shape specified in Rule 11 (a), (b) or (c); and shall, on the approach of another vessel or vessels, show an additional white light at least 6 feet below the forward anchor light and at a horizontal distance of at least 10 feet away from it in the direction of the outlying gear.

(h) If a vessel when fishing becomes fast by her gear to a rock or other obstruction she shall in daytime haul down the basket required by sections (c), (d) or (e) and show the signal specified in Rule 11 (c). By night she shall show the light or lights specified in Rule 11 (a) or (b). In fog, mist, falling snow, heavy rainstorms or any other condition similarly restricting visibility, whether by day or by night, she shall sound the signal prescribed by Rule 15 (c) (v), which signal shall also be used, on the near approach of another vessel, in good visibility.

NOTE.—For fog signals for fishing vessels, see Rule 15 (c) (ix).

IT IS SUGGESTED THE READER REFER TO CG–169, "RULES TO PREVENT COLLISIONS OF VESSELS AND PILOT RULES FOR CERTAIN INLAND WATERS OF THE ATLANTIC AND PACIFIC COASTS AND OF THE COAST OF THE GULF OF MEXICO;" CG–172, "PILOT RULES FOR THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AND THE ST. MARYS RIVER;" AND CG–184, "PILOT RULES FOR THE WESTERN RIVERS AND THE RED RIVER OF THE NORTH;" WHICH CONTAIN THE LOCAL RULES TO PREVENT COLLISIONS BETWEEN VESSELS ON THE LOCAL WATERS OF THE UNITED STATES. REFERENCES TO RULES AND ARTICLES THROUGHOUT THIS SERIES MAY BE FOUND THEREIN.

In contrast, both the Great Lakes Rules and the Western Rivers Rules are silent as to special lights and shapes for fishing vessels. The Inland Rules, and the Pilot Rules published pursuant thereto, which do provide specifically for fishing vessels, contain much simpler requirements. These requirements are to be found in Article 9, Inland Rules, and Section 80.32a, Pilot Rules for Inland Waters, which state:

LIGHTS, ETC., OF FISHING VESSELS

*Art. 9.* (a) Fishing vessels of less than ten gross tons, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the colored side lights; but every such vessel shall, in lieu thereof, have ready at hand a lantern with a green glass on one side and a red glass on the other side, and on approaching to or being approached by another vessel such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

(b) All fishing vessels and fishing boats of ten gross tons or upward, when under way and when not having their nets, trawls, dredges, or lines in the water, shall carry and show the same lights as other vessels under way.

(c) All vessels, when trawling, dredging, or fishing with any kind of drag nets or lines, shall exhibit, from some part of the vessel where they can be best seen, two lights. One of these lights shall be red and the other shall be white. The red light shall be above the white light, and shall be at a vertical distance from it of not less than six feet and not more than twelve feet; and the horizontal distance between them, if any, shall not be more than ten feet. These two lights shall be of such a character and contained in lanterns of such construction as to be visible all around the horizon, the white light a distance of not less than three miles and the red light of not less than two miles.

*80.32a. Day marks for fishing vessels with gear out.*—All vessels or boats fishing with nets or lines or trawls, when

(*Continued on page 87*)

# Your Port Forum

Q. Describe the stowage and method of securing life floats and buoyant apparatus aboard ocean passenger vessels.

A. Life floats and buoyant apparatus must be stowed in such a manner as to be readily launched and must not be secured to the vessel except by lashings which can easily be slipped. When stowed in tiers, the separate units must be kept apart by suitable distance pieces and cannot be stowed more than four high. Life floats exceeding 400 pounds must be so stowed as not to require lifting before launching.

Q. On vessels equipped with winches for lowering lifeboats, what speed of lowering the loaded boat should be regarded as satisfactory when the winch is fitted with a governor brake?

A. Between 40 and 120 feet per minute, except on emergency boats where it should be 60 to 160 feet per minute.

Q. Why is 6 x 19 plow steel wire rope commonly employed on United States merchant vessels for cargo runners and 6 x 37 wire rope sometimes used for topping lifts and guys?

A. 6 x 19 plow steel wire rope is commonly used for cargo runners because it is designed to withstand considerable abrasion due to the comparatively larger diameter of the outer wires and the quality of the metal used in its manufacture. Runners are subject in common use to abrasion on hatch coamings, gunwale bars, bulwarks, and other parts of the vessel, as well as constant wear at the winch drum, sheaves, etc.

6 x 37 wire is somewhat more flexible, has equal or greater strength when made of the same quality steel. However, due to the smaller diameter of the outer wires its capacity to resist abrasion and corrosion is lessened, and when it is used it is commonly employed for topping lifts or guys which are not subjected to as much "wear" as runners and a good coating of anticorrosive lubricant can be maintained with normal care.

Q. How often must motors in motor-propelled lifeboats be operated?

A. Where motor-propelled lifeboats are carried, the motor of each lifeboat must be operated in the ahead and astern position for a period of not less than 5 minutes at least once in each week.

Q. What equipment must be provided on gasoline-powered lifeboat motors to prevent fire caused by carburetor backfire or gasoline dripping into the bilge?

A. Carburetors must be fitted with backfire flame arrestors and if not of the down-draft type, then carburetor drip pans covered with flame-arresting wire screens must be placed under the carburetor to prevent drippage into the bilge.

Q. How are motor-lifeboat gasoline tanks vented, i. e., what means are provided to prevent the gasoline becoming "air-bound" in the tank and not flowing to the fuel line?

A. Gasoline tanks are vented by a very small diameter hole, usually in the filling caps. Care must be taken, particularly when boats are being painted, to see that this hole is not plugged.

Q. How often must watertight doors in subdivision bulkheads be operated on passenger vessels?

How often must watertight doors in subdivision bulkheads be inspected on passenger vessels?

A. All watertight doors in subdivision bulkheads must be operated daily.

It is the duty of the master to see that all watertight doors in subdivision bulkheads that may be opened at sea, and all mechanisms, remote controls, and indicators connected therewith, shall be periodically inspected, at least once in each week that the vessel is navigated, to assure that they are in proper operating condition.

Q. What are the functions of the cutoff control levers on the marine uniflow engine?

A. The cutoff control levers perform all the functions of the throttle and the reversing gear. By manipulating the two cutoff control levers the engine can be started, stopped, reversed, and brought from slow to full speed in either direction.

Q. Why is a round pin shackle stronger than a screw pin shackle of the same pin diameter?

A. Round pin shackles are stronger than screw pin shackles of the same diameter because the diameter of the pin is not reduced by threading.

Q. What is the best method of determining the ultimate strength of shackles, hooks, rope, and other fittings in order to know the safe working load?

A. The best method of determining the ultimate strength is to have the manufacturer's warranty; otherwise his stated ultimate strength.

Q. How would you test the air tanks of a lifeboat for tightness?

A. The air tanks of a lifeboat may be tested for tightness by removing the cap for the test plug on each tank and applying 1 pound or less air pressure. Leaks may be determined by the failure of the tank to maintain the pressure. If the source of the leak is not apparent, soapy water brushed over the tank will assist in determining the origin. Tanks may also be tested on a warm day when the temperature will have caused the air in the tank to expand. Air will be blown out the test plug when the cap is removed until it equalizes with the atmospheric pressure.

Q. Explain how you would check a suspected crank pin for cracks.

A. The Whiting test or the Magnaflux method may be used. For the Whiting test the suspected area is coated with penetrating oil, then dried and covered with a Whiting mixture. The oil seeping out of the crack stains the whiting and thus discloses the location of the crack. This method is useful for only the coarser and well-developed cracks. The Magnaflux method is applied by magnetizing the part and applying a finely divided magnetic powder. At even the finest crack the magnetic-flux leakage attracts the powder and makes the crack visible by causing the powder to deposit in a ridge along the crack.

Q. What precautions should be taken with respect to portable stanchions on a gangway or accommodation ladder?

A. Portable stanchions should have pins or toggle bolts securing them in their sockets to prevent their being accidentally withdrawn.

Q. In using an accommodation ladder at anchor in a seaway how can boats be prevented from getting under the ladder due to their rising and falling with the waves?

A. A stout timber lashed or otherwise secured to the lower-out-side end of the accommodation ladder or platform and extending down into the water will prevent boats getting under the gangway.

Q. What objection could be raised to a number of men such as troops marching in step up a gangway?

A. Troops or other bodies of men coming up a gangway should break step as rhythmic marching could create stresses far in excess of that due to the weight of the men.

Q. What should be kept in mind when using the main engines on a stranded vessel?

A. If the vessel is aground forward only, the action of the propeller may turn the vessel broadside to the beach. If the bottom is soft or sandy the action of the propeller may build an island around the vessel. Moreover, on a soft or sandy bottom the condensers may become choked by sand and mud.

Q. How often must lifeboats be stripped, cleaned, thoroughly overhauled, and painted?

A. At least once each year.

Q. What is the requirement relative to the length of lifeboat falls?

A. The falls should be of such length that the lifeboat may be lowered to the water at its lightest draft and listed 15°.

Q. Name the principal adjustments which may be required to be made on a reciprocating engine. Why are these adjustments made?

A.(1) Thrust adjustment—in order to maintain proper alinement of the engine.

(2) Piston clearances—periodically required to prevent the piston from bumping the cylinder head and to provide correct clearance space for cylinder condensation and smooth operation.

(3) Valve setting—to provide correct distribution of steam to and from each working cylinder.

(4) Bearing clearances—to prevent pounding, to permit lubrication and prevent overheating, and to aid in maintaining proper alinement.

(5) Alinement of piston rods—to prevent uneven wear on the bearing surfaces of the engine and to prevent pounding of slippers on guides.

(6) Steam tightness of piston rings, valves, and stuffing boxes.

Q. Why is the hauling part of a heavy lift purchase usually led to the mast rather than directly to the winch?

A. The hauling part of a heavy lift purchase is usually led to the mast in order to reduce the compressive stresses on the boom and to reduce the strain on the topping lift.

Q. When is the tension of a topping lift at a maximum; i. e., at what angle with the mast of a boom is the heaviest stress put on the topping lift due to the weight of the boom and any weight being lifted?

A. When the angle with the mast is greatest; that is, when the boom is low, the tension on the topping lift is at the maximum.

Q. What length of time should be allowed the engineers to raise steam on:

(1) Water-tube boilers?

(2) Scotch boilers?

A.(1) Two hours or longer.

(2) From 12 to 24 hours.

Q. How must the water light required as equipment for a life raft aboard ocean cargo vessels be attached to the life raft?

A. By 12 thread manila lanyard 3 fathoms in length.

Q.(1) In hoisting a weight, what part of a tackle has the greatest stress?

(2) In lowering a weight, what part of a tackle has the greatest stress?

(3) What is the reason for the answers to the preceding two questions?

A.(1) The hauling part.

(2) The standing part.

(3) The reason for the answer to the preceding two questions is that to the original weight is added the successive amounts of friction at each sheave to be overcome.

Q. What precautions should be enforced when men are working with pneumatic or electric chipping hammers?

A. Men working with pneumatic or electric chipping hammers should wear goggles. Portable electric tools should be grounded so that personnel are not subjected to hazard through short circuit.

Q. What vessels are required to have a wire cable stretched between the deckhouses in order to facilitate communication between both ends of the vessel?

A. Such a cable is required on all vessels where the distance is more than 150 feet between deckhouses. A wire cable, with a traveler and endless whip, must be stretched between the deckhouses, not less than 5 feet above the deck, at all times when the vessel is loaded and being navigated. Loose rings with lanyards attached may also be placed on the cable, in addition to the traveler and endless whip, if deemed necessary by the master.

A fore and aft raised bridge may, however, be accepted instead of the wire cable and traveler.

The penalty for failure to have such a cable may lead to a suspension of license of the master or officer in charge.

Q. What are the troubles that may be indicated by the overflowing of the hot well?

A.(1) The float may be stuck, causing the feed pump to slow down or stop.

(2) The pump may be stopped for other reasons.

(3) The pump may be throttled down too slow.

(4) A coil in the feed water heater may have burst.

(5) The feed pump may have lost suction, due to a plugged line or the water being too hot.

(6). The condenser may be leaking badly.

(7) The filtering materials may be plugged with oil or grease.

Q. On merchant vessels, when using booms to handle heavy weights or delicate objects, how do you reduce dynamic stresses; that is, stresses due to change of velocity of the load, such as taking up fast on a load at rest, increasing speed of hoisting, or suddenly stopping?

A. Dynamic stresses are reduced by using a tackle with multiple parts at the moving block so that the object moves slowly with respect to the speed of the winch. Using the low gears in a winch fitted with more than one set of gears also works toward the same purpose. Doubling up on derricks fitted with single whip falls is a common means of reducing potential dynamic stresses as well as increasing power and reducing boom thrust. By reducing the speed of hoisting or lowering, dynamic stresses are minimized and the ease of handling of delicate objects is increased.

Ships may occasionally be seen with spring or hydraulic type shock absorbers on the lifting gear which have the same purpose.

Q. What markings do the Coast Guard regulations require for watertight doors and associated equipment?

A. All watertight doors in subdivision bulkheads must be numbered conspicuously on both sides on an etched plate or its equivalent in not less than three-eighths inch letters and figures ("W. T. D. 1", "2", "3", etc.). If a stenciled or similar notice is used, the letters and figures must be at least 1 inch high. If the construction is such that the number cannot be seen with the door in the open position, a similar number must be placed on the frame or other location immediately adjacent to the door. All watertight door remote control stations must be marked in the same manner, and in addition, the direction of operation of the lever or wheel to open and close the door must be conspicuously marked.

Q. Describe the construction of life preservers and state how they are tested.

A. Life preservers are reversible and vestlike, with recessed under arms to allow the front and back sections to fit around the upper part of the wearer, and held in place by straps on both sides, the whole of such construction and character being such as to support the wearer in an upright or slightly backward position. The buoyant materials in general use are block cork, balsa wood, and kapok.

Life preservers must pass a buoyancy test which consists of submersion in fresh water for 48 hours, following which they must support in fresh water a net weight of 16.5 pounds.

## HOW TO BURN BUNKER OIL

Set the burners open wide
Do not touch the valves at side,
Keep the pressure on the pump
And up the bally steam will jump.
If the smoke is black and thick
Open up the fans a bit,
If the smoke is thick and white
To slow the fans will be quite right.
For when sufficient air is given,
No smoke ascendeth up to heaven.
And if the jets refuse to squirt
Assume the cause is due to dirt.
Should the flame be short and white
You have combustion clear and bright,
But should the flame be yellow and long
Combustion is entirely wrong.
A wise man to his heater sees.
And keeps it at 200 degrees,
To have it more is not quite wise,
Because the oil may carbonize.
If you keep the filters clean
No drop in pressure will be seen,
And should the pump kick up a ruction
There's likely air within the suction.
There's more to this than what's shown here
If to the rules you do adhere.
Junior Engineers should know them,
Or their boilers may explode them!

——— Unknown.

## THERMOMETER WELLS

A recent material failure reported to Coast Guard Headquarters concerned the failure of a thermometer well in the main steam line of a Victory type vessel. Although this particular type of failure is rare, similar questionable installations may be in service on other vessels and timely action may avert additional failures of this type.

In this case there were no injuries, nor any material damage, other than the ruptured thermometer well. On some installations, however, a failure of this sort could cause serious injury to personnel in the immediate area, and in all cases the plant would have to be shut down for replacement, causing considerable inconvenience and possibly endangering the vessel.

Thermometer wells are manufactured to suit conditions surrounding the purpose for which they are intended, that is, built of a sufficient strength to meet service conditions. In making replacements of thermometers or thermometer wells, care should be exercised in ascertaining that the equipment was manufactured for the pressure and temperature to which it will be subjected. In this day of increasing operating pressures and temperatures, it is imperative that this prudent practice be adhered to in order to avert possibly serious casualties.

The thermometer well which failed was presumably intended for use on a reduction gear casing, or similar location, where the pressure of the medium to be gaged is negligible and the temperature comparatively low, probably not over 200° F. Its installed location, however, subjected it to a pressure of 450 p. s. i. and a temperature of up to 750° F.

## INTERNATIONAL LOAD LINE CONVENTION, 1930

The Government of Costa Rica acceded to the International Load Line Convention that was signed at London on July 5, 1930, on October 1, 1953, in accordance with the provisions of article 23 thereof.

Countries which have ratified or acceded to the International Load Line Convention of 1930, or to which the Convention has been extended in accordance with article 21 thereof, are listed below, together with the date of deposit of ratification or accession or application:

| | |
|---|---|
| United Kingdom | October 1, 1932. |
| Argentina | October 19, 1935. |
| Australia, Commonwealth of | February 17, 1936. |
| Belgium | May 29, 1935. |
| Brazil | December 31, 1937. |
| Bulgaria | September 4, 1933. |
| Burma | April 1, 1937. |
| Canada | October 1, 1932. |
| Chile | May 24, 1933. |
| China | August 19, 1935. |
| Costa Rica | July 1, 1953. |
| Cuba | December 9, 1932. |
| Danzig | August 4, 1933. |
| Denmark | August 13, 1931. |
| Dominican Republic | October 28, 1947. |
| Ecuador | February 28, 1950. |
| Egypt | July 24, 1936. |
| Estonia | March 17, 1934. |
| Finland | October 1, 1932. |
| France | October 1, 1932. |
| French Indochina | November 15, 1938. |
| Germany | September 6, 1933. |
| Greece | December 4, 1934. |
| Honduras | June 10, 1948. |
| Hong Kong | July 1, 1938. |
| Hungary | January 16, 1933. |
| Iceland | November 26, 1932. |
| India | October 1, 1934. |
| Irish Republic | February 8, 1934. |
| Israel | July 15, 1949. |
| Italy | October 1, 1932. |
| Japan | June 11, 1935. |
| Japan, for Chosen, Taiwan, and Leased Territory of Kwantung | July 12, 1935. |
| Latvia | January 29, 1932. |
| Liberia | March 25, 1949. |
| Mexico | June 6, 1934. |
| Netherlands | April 9, 1932. |
| Netherlands East Indies and Curacao | February 27, 1933. |
| Newfoundland | April 1, 1936. |
| New Zealand (including Western Samoa) | October 1, 1932. |
| Norway | October 1, 1932. |
| Panama | July 13, 1936. |
| Peru | March 30, 1933. |
| Philippine Republic | September 30, 1949. |
| Poland | September 6, 1933. |
| Portugal | October 1, 1932. |
| Roumania | January 1, 1933. |
| Siam | July 11, 1933. |
| South Africa, Union of | February 24, 1947. |
| Soviet Union | October 1, 1932. |
| Spain | October 1, 1932. |
| Sweden | October 1, 1932. |
| Straits Settlements | January 2, 1939. |
| United States of America | June 10, 1931. |
| Uruguay | February 8, 1939. |
| Yugoslavia | February 26, 1934. |

## GOOD TO THE LAST DROP

The problem of safely launching a lifeboat from a ship at sea has occupied the minds of mariners for centuries untold. While development and change in this particular field has been slow, the last half century or so has seen a remarkable evolution in lifeboat handling. With the advent of wire boat falls, lifeboat winches, and gravity davits, safety in the use of lifeboats took a tremendous stride forward. These new devices, which permitted the uniform and smoothly controlled lowering of lifeboats under almost any conditions, also made practical the use of automatic releasing gear to instantaneously and simultaneously release the hooks from the falls on both ends of a lifeboat. The latter device is extremely helpful to the man in charge of the boat, especially when the boat is rising and falling in a seaway. What seaman who has ever been lowered into a rough sea in a lifeboat with independent hooks will ever forget that hair-raising thrill when one end did not get unhooked, the other end fell deep in the trough between seas, and the boat almost stood on its end? And, is there a seaman who has experienced this treatment who cannot do *without* a repeat performance?

Rottmer type lifeboat releasing gear, which is presently found on the majority of American ships with power lifeboat winches, is an efficient and dependable automatic apparatus that will provide the type of quick and positive release which is so valuable to a coxswain lowering to a rough sea. This gear is activated by a shaft running the length of the boat which, when rotated by moving a hand lever through an arc of approximately 180°, revolves a sturdy metal sleeve around the movable shank of the boat hooks at each end. As the hand lever approaches the end of its 180° arc, a notch or recess in the metal sleeve moves into place in front of the shank of the hook and the weight of the lifeboat causes the hook to tumble backward, the shank swinging up through the recess of the sleeve. A smooth and rapid activation of the hand lever then produces a positive and instantaneous release of the boat. When in its hooked-on and locked position, the lever lies in a metal channel on the bottom of the boat where it is locked in place by a metal pin which must be pulled out before the releasing gear can be operated. The hand lever is painted red and a warning: "DANGER—LEVER RELEASES HOOKS" is mounted in raised letters on the lever.

Unfortunately, in spite of designed safety features, warning signs and colors, and all other possible precautions which can be taken, there remains one element of danger in the use of this releasing gear which cannot be eliminated—the man who irresponsibly or stupidly releases the gear while the boat is still suspended high in the air, sending it crashing to the surface.

A casualty involving the accidental dropping of a lifeboat with the loss of one life occurred last fall on a freighter in a southern port. The ship was undergoing annual inspection and No. 2 motor lifeboat was hanging from the falls, stripped of all provisions, air tanks, and gear for cleaning, painting, and inspection of the boat. Two carpenters from a shore repair gang entered the boat to restow the equipment and reinstall the floor boards. The carpenter snapper noticed that there were no wire gripes or preventer slings rigged from the davit heads under the boat to prevent an accidental drop. He left the scene to procure a wire gripe. While waiting for him to return, helpers on deck began to pass up floor boards to the two carpenters in the boat to "save time" while waiting for the gripe. About 5 minutes after this job was started, the boat suddenly dropped from the falls, hit the chocks, and then slid overboard and dropped to the water, carrying both carpenters with it. One man was seriously injured in the crash and died 3 hours later in the hospital. The other man suffered no serious injuries.

The surviving carpenter testified that he and the other occupant had noticed the disengaging lever standing inclined at about a 45° angle to the port side of the boat and that they had shouted a warning to each other and had started to climb out just before the boat dropped. This position of the lever was just about the exact point of release, as was later demonstrated. Although the lever had been lashed down in its locked position the previous afternoon after the first coat of paint had been applied to the interior, obviously someone had cast off the lashing and partially rotated the lever, not realizing the possible effects.

During boat drill on a passenger vessel, one boat was delayed at the embarkation deck when the other boats were almost down to the water. A man in the boat rotated the releasing gear handle apparently in the belief that this would expedite the lowering of his boat. It did—but 9 persons were seriously injured and 1 died.

On a freighter holding boat drill in a foreign port, the disengaging apparatus on No. 3 lifeboat was tripped, sending the boat plummeting downward 24 feet and injuring 3 seamen but not seriously. One seaman admitted tripping the gear. He could not explain his action other than that he had become confused by the activity in lowering No. 4 lifeboat and felt that it was time to release No. 3.

Another lifeboat accident from a similar cause occurred on a transport in a west coast port. A workman entered a lifeboat to paint the releasing gear handle red as a warning against operating it prematurely, then in the painting process, he lifted it and the boat dropped, landing on the gangway. Three men were seriously injured.

Perhaps as long as ships go to sea, there will be men aboard them who foolishly press buttons, open valves, pull handles, and rotate lifeboat disengaging levers—either to see what will happen or because they don't know any better. But, why?

## THE BIG SLEEP

One of the most popular forms of suicide consists of running an automobile engine in a closed building or running the exhaust into the car with a hose so that a relatively painless death by carbon monoxide poisoning will result. That the same result may be obtained accidentally in a motorboat may not be appreciated by many pleasure operators. However, a recent casualty in a 26-foot cabin cruiser, where one man died of carbon monoxide poisoning and six other persons were made violently ill, emphasizes the dangers of exhaust gas leaking into boats and the insidious characteristics of this gas.

On a clear calm fall day the owner of the above pleasure boat, accompanied by his wife, four adult friends, and a 9-year-old girl, set out across the bay on a fishing trip. A small pet fox terrier was also along.

About one hour later, while running at half speed and with no apparent wind circulation, the terrier became sick. Soon afterward the young girl became ill, vomited, kicked her feet, and screamed. Gradually, all the occupants of the boat became sick, and two became comatose.

Apparently none of the party was able to think clearly or to rationalize what the difficulty was. (This numbing of the mind is one of the dire effects of carbon monoxide poisoning.) Fortunately, however, one of the men was still sufficiently conscious to signal an approaching motorboat for help, and shut off the gasoline engine.

When the engine was stopped, it was about one hour and a half since the puppy had become ill. During this interval all persons in the boat, except the man who signaled for help, had passed out and were not conscious when help arrived.

Upon being towed ashore by the assisting motorboat, all the occupants were transferred to a nearby hospital. All soon recovered without permanent injury, except for one man, aged 56, who was dead before he arrived at the hospital.

Approximately 1 week prior to this casualty, a patch consisting of half round of rubber hose had been clamped over a leak in the exhaust pipeline under the seat in the after end of the cockpit. This exhaust pipe passed through the transom, near the waterline, permitting water to run back into the line, and it became the dispenser of death. Although this is a common type of installation, the presence of water in the end of the exhaust line hinders the free exodus of exhaust gases and abets the leakage of exhaust gases if there is a leak in the line.

In the combustion of any fuel such as the gasoline used in many pleasure boats, the products of combustion contain carbon dioxide and carbon monoxide. While carbon dioxide is inert and harmless (except that it will not support combustion or life), carbon monoxide is far from harmless and the presence of this gas in air being breathed has harmful effects upon the body proportionate to the amount breathed. Carbon monoxide, classed as a chemical asphyxiant, is absorbed readily into the blood stream where it combines chemically with the hemoglobin of the blood and thus renders it unavailable for oxygen carriage. The affinity of carbon monoxide for hemoglobin is approximately 300 times that which the hemoglobin possesses for oxygen. The anoxia produced by the lack of oxygen carriage destroys brain cells and causes eventual death if the exposure is prolonged. Preceding death, the symptoms are dizziness, nausea, severe headache, lethargy, stupor, loss of control of body functions and reflexes, and unconsciousness resulting in death if relief is not afforded. Fortunately, carbon monoxide is not a cumulative poison, it does not collect indefinitely in the blood stream. In pure air and with regular respiration, small amounts of this gas will be gradually ventilated out of the blood.

For the treatment of a person overcome by carbon monoxide fumes, a doctor should be obtained as quickly as possible, and the patient should be hospitalized. If a doctor is not immediately available, first aid treatment is similar to that for shock. Most important, respiration must be continued or started, if it has stopped, and artificial respiration applied whenever there is doubt. Warmth and rest for the patient are essential. Oxygen inhalation may be helpful. Stimulants, however, should not be used in first aid treatment without the advice of a doctor. The recovery process from the effects of carbon monoxide hemoglobin in the blood must be produced by the body itself and in most cases recovery will be complete if the exposure has not been too long or the concentration too high.

One of the most dangerous factors concerning carbon monoxide gas is that its presence is not readily detectable. Colorless, tasteless, and lighter than air, the first indications of its presence in air being breathed may be its effects on the body and mind, and then it may be too late, if the person affected is alone. Carbon monoxide is one of the most important poisons associated with human life and industry. In fatalities it is outdistanced by only one other poison, methyl (wood) alcohol. It accounts for more deaths than all other gases combined (disregarding chemical warfare). Since the average carbon monoxide content of the exhaust from diesel and gasoline engines may be as high as 7 percent and an atmosphere containing as little as 0.2 percent of carbon monoxide is capable of destroying life, the lethal possibilities of a leak of exhaust gases into the interior of a motorboat are readily apparent.

Many small craft equipped with gasoline or diesel engines probably have a leak of some size between the exhaust manifold of the engine and the exhaust opening on the exterior of the hull. It is likely that these craft have been operated countless times with carbon monoxide entering the interior of the vessel under circumstances where there has always been enough true or relative wind to circulate and remove the poisonous gas before it reached a toxic concentration. On many such craft either the engine and exhaust piping, or the occupants, are in the open and freely ventilated section of the craft so that toxic concentrations have never been felt. However, it is also likely that the time will someday arrive when such a craft will be operated under the ideal conditions for carbon monoxide poisoning, that is—the wind will have the same velocity and direction as the boat, resulting in no apparent wind or still air in the boat, or the occupants will remain inside a closed compartment where the gas is collecting, and disaster will strike. Time and energy spent in locating and remedying exhaust leaks inside your motorboat may be repaid to you in the finest reward of all—your life.

## THOUGHT FOR FOOD

Hardly a person has ever visited a tropical port without becoming acquainted with the pleasures (?) of one form or another of illness from food or water contamination. The most prevalent form of sickness is dysentery, with its attendant nausea, fever, and diarrhea, which is caused to a great extent by the use of human fertilizer and other unsanitary practices that help carry germs from one human to another. However, sicknesses and infections much more serious than dysentery can be readily contracted from consuming contaminated food, water, beer, wine, etc., and it behooves the prudent seaman or traveler to eat and drink with the greatest of care while visiting in any foreign tropical land.

The crew of an American freighter recently had good cause to ponder the effects of indiscriminate eating and drinking in a port of Portuguese East Africa. A prolonged drinking spree lasting throughout the night before the vessel's day of departure seems to have been the source of the trouble. A large portion of the deck crew undertook to drink up the supply of Scotch, rye, gin, beer, local wines, and everything else of an alcoholic nature in one of the local "palaces." Failing to accomplish this mission, they carried as much of the remaining supply as they could afford back to the ship, and the orgy continued at an intermittent pace throughout the next few days at sea. (During the later investigation, somehow nobody could quite testify as to how long the fiesta lasted or how much was drunk.)

Not long after sailing, the master was notified that there was considerable alcoholic beverage aboard. He organized a searching party, confiscating all the wine and liquor he could find, and threw it overboard. Some of the supply, hidden with diabolical cleverness, was missed and was nursed through the following days by some of the seamen who believed in the "hair of the dog" remedy.

During the following few days most of the crew felt somewhat less than healthy but apparently believed that their state of health was a hangover of a magnitude commensurate with their indulgence. As the feeling persisted, first one and then another of the crew reported sick, and finally four men were relieved of their duties and were placed on the binnacle list. It is easy to see how, under these conditions, the master at first attributed their condition to alcoholism.

As the voyage progressed the men's condition fluctuated from almost well and ready to turn to work to sicker than before. Some of the symptoms experienced were stomach cramps, fever, nausea, and diarrhea. The master administered medical treatment to the best of his ability and judgment but did not request medical advice by radio, still believing up to the eighth day from port that these men were suffering the effects of prolonged drinking.

Finally on the ninth day after leaving port, one of the men suddenly became delirious and died within a few hours. It was apparently not until this death that the illness appeared to the master to be of a serious nature. He then sent a MEDICO and after an exchange of messages, a tentative diagnosis of liver poisoning was suggested by the USPHS, and the master was advised to seek the nearest port where professional medical treatment was available. Course was altered accordingly for the nearest foreign port, but too late to save the life of a second seaman who died the following day, less than 24 hours before reaching port.

The two remaining sick men had become progressively worse, and they were in critical condition when placed in the shoreside hospital where their illness was diagnosed as Botulism, a food intoxication with a fatality of over 60 percent. The two deceased seamen were buried at sea, so it could only be assumed that they had suffered from the same illness. It was noteworthy, however, that the two seamen who eventually recovered had not been as overindulgent of alcohol as the two who died.

Upon the vessel's arrival in the United States, medical doctors and bacteriologists consulted on this case expressed the opinion that the term Botulism was used erroneously by the foreign doctors and that the offending illness was more apt to have been a form of food poisoning of lesser severity which is contracted more easily than Botulism. In the debilitated condition of the seamen who engaged in the alcoholic orgy, if the Clostridium Botulinus had struck, the mortality rate would have been much higher and quicker. The rundown physical condition of the two seamen who died was probably a strong contributing factor to their eventual demise, since the type of food poisoning that they were concluded to have had is not usually fatal unless complicated by other conditions such as physical weakness.

Unfortunately, the master had not appreciated the fact that the two men who first became ill at sea had not been as overindulgent as the two who became ill later. If he had, he might have concluded that the men's condition was not attributable to alcohol and sought medical advice by radio much sooner than he did. However, the master of a freighter cannot be expected to be all things to all men and certainly not a professional diagnostician.

The source of the bacteria, virus, or other microorganism which affected the men was never definitely ascertained. It could easily have been food which was consumed ashore, either before or during the drinking party, or it could have been one of the bottles of wine or other beverage. Whether or not the germ came from a bottle, it is certain that the prolonged drinking bout was a helpful contributing factor to the development of the illness in weakening the men who were afflicted.

In eating or drinking in any foreign port, especially in tropical countries or other lands where standards of living and sanitation are low, prudence dictates the greatest care in selecting what is to be consumed. Any raw vegetables or fruits can easily be contaminated by human fertilizer. Water, meat which may be improperly cooked, and bottled drink (except for a well-known brand) are suspect and may be dangerous for human consumption. Eating and drinking in high class restaurants, hotels, and clubs where the conditions of cleanliness and care would be expected to be of the highest order (there are almost always such places) may be slightly more costly to the seaman or traveler, but may well mean freedom from a fatal or at least most uncomfortable illness in any port where standards of sanitation are known to be low. Eating and drinking the good food and water provided on American ships *before* going ashore, while less glamorous than dining in one of those quaint little cafes ashore, may well mean a much healthier voyage home.

## DON'T CALL IT "AIR"!

The chemical properties of oxygen are one of the most vital natural factors governing human lives. Deprived of oxygen, human lives quickly fail, fires die out, power plants die, ships, trains, and planes falter and stop, food no longer grows. Furthermore, the readiness with which oxygen combines with other elements is the key to many processes upon which humans have grown to depend.

However, the rate of oxidation may vary tremendously. Oxygen combines very slowly with ferrous metals in low moisture air to form rust. In the ignition of gunpowder, oxygen combines with nitrates with the speed of lightning to form the gases used to impel projectiles. Somewhere in between in the scale of rapidity lies the combustion of various fuels which energize the multitudinous processes of modern civilization.

But, irrespective of the type of fuel, the rate and intensity of combustion varies directly as the availability of oxygen. In ordinary combustion, oxygen is removed from the air to combine with the element being consumed to form smoke and hot gasses at a reasonable rate which can usually be controlled by limiting the availability of fuel and air. On the other hand, when combustion takes place in an atmosphere rich in oxygen, it may have overpowering speed and intensity, often in the form of an explosion.

A simple example of the combustive power of concentrated oxygen is the burning of iron or steel with a stream of oxygen. In cutting off a piece of plate of considerable thickness, the oxyacetylene flame can be used to heat one spot to the molten point. The acetylene gas can then be stopped and only a stream of oxygen directed at this molten point. True combustion of the steel or iron takes place readily and hot iron flows like melted butter under the stream of oxygen.

Not realizing the terrific effect of a high concentration of oxygen on the simplest form of combustion recently cost one workman his leg and many painful burns while working on a tank vessel. Employed as a shipyard welder-burner, first class, he had been burning with an oxyacetylene torch in a cofferdam under the engineroom, while the vessel lay at a shipyard. After an hour or two, the air in the small compartment was foul and the smoke was heavy. The workman stopped burning for a few minutes and then released some compressed oxygen about the compartment in an attempt to purify the atmosphere, opening only the oxygen valve on his torch. He claimed to have waited a considerable time for the oxygen to settle or disperse. However, when he relit his torch there was an instantaneous flash fire in the small compartment. Before the workman could drag himself out through the manhole, he was severely burned over a large area of his body.

The welder-burner was dragged into the engineroom and his smoldering clothes pulled off. Upon being transferred to a hospital in a highly critical condition, it was determined that he had lost approximately 40 percent of his skin. The left leg was later removed just above the knee as a result of burns.

Although the oxyacetylene torch used was found to be in good condition, and the experienced workman probably lit his torch the same as he had always done, it is very likely that a small amount of acetylene leaked from the torch before it was lit or that the man did not promptly light off when he opened the acetylene valve. This small amount of acetylene gas in the compartment provided the fuel necessary for combustion, and the heavy concentration of oxygen lying in the cofferdam intensified the combustion so that it flashed throughout the space. Instantaneously, the man's clothing also became fuel.

Some of the rules for the safe handling and use of bottled oxygen prepared by the Compressed Gas Association include the following*:

(a) Do not refer to oxygen as "AIR." Call it by its proper name "OXYGEN."

(b) Never permit oil, grease, or other readily combustible substances to come in contact with oxygen cylinders, valves, regulators, gages, and fittings. Oil and oxygen may combine with explosive violence.

(c) Do not handle oxygen cylinders or apparatus with oily hand or gloves.

(d) *Never* use oxygen as a substitute for compressed air. It is dangerous to use oxygen for pneumatic tools, to start diesel engines, for imposing pressure in oil reservoirs, for paint spraying, for blowing out pipelines, etc.

(e) Never attempt to mix gases in an oxygen cylinder. Never attempt to transfer oxygen from one cylinder to another.

(f) In welding shops and industrial plants using both oxyacetylene and electric welding apparatus, care should be taken to avoid the handling of these equipments in any manner which may permit the compressed gas cylinders to come in contact with electric welding apparatus or electrical circuits.

(g) Be sure that all connections are gas tight and remain so, and that the connected hose is in good condition and does not have leaks.

The most important points to remember in using compressed oxygen are that it accelerates and intensifies combustion often to the violent or explosive stage, and that almost anything will burn when ignition is supplied in the presence of concentrated oxygen.

Authoritative and educational advice on safety precautions in the use of oxygen in industry may be found in a pamphlet entitled *Safe Practices for Installation and Operation of Oxyacetylene Welding and Cutting Equipment*, obtainable from the International Acetylene Association, 30 East 42d St., New York 17, N. Y., or in one called *Gas Systems for Welding and Cutting*, NBFU Pamphlet No. 51, obtainable from the National Board of Fire Underwriters, 85 John Street, New York 7, N. Y.

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## TRAGEDY OF ERRORS

A "tragedy of safety errors" all the way down the line placed new emphasis on the oft-repeated warning that firearms must be handled with the greatest of caution.

The parachute signal pistol hardly falls into the category of lethal weapons, but carelessness turned this instrument of safety-at-sea into an item of tragedy for an innocent bystander.

Here are the facts in the case:

A seaman on the SS. *Blank Victory*, who should have had more sense, modified a 12-gage shotgun shell and fitted it into a parachute signal pistol. His purpose remains vague, but we hope he will learn from this article that his foolhardy carelessness seriously injured John Doe, a Maritime Administration warehouse storekeeper.

John was engaged in inspecting and tallying stripped materials received from the SS. *Blank Victory*. While trying to breach the pistol to assure that it was not loaded, it accidentally discharged. Nine lead pellets and assorted wadding entered John's left leg on or just above the ankle bone.

There was a whole succession of other errors of omission and commission in this case. The storekeeper broke a cardinal rule in handling firearms—never point a gun at anyone you do not intend to shoot. The agent charged with stripping the ship failed to comply fully with the regulation which specifies that pyrotechnics and ammunition are not to be included with materials for warehousing, and it must be assumed that breaching arms to assure that they are not loaded is a part of this charge.

No sensible seaman would load a signal pistol in the fashion described above, but it must be kept in mind that parachute signal pistols can be dangerous even when loaded with the proper cartridges. Never point a gun of this type at your own legs or arms, and certainly never point one in the direction of a shipmate.

—*Maritime Administration. Safety at Sea.*

## TEACH AND BE TAUGHT

The accident we have in mind happened some years ago, and while it may be uncommon it is an outstanding example of lack of education and failure to teach the next guy some of the things you may have down pat.

This incident focused about a newly certificated able seaman, who was sent aloft to paint the stack. During his time as O. S. he apparently lacked the curiosity to learn how one makes himself fast and secure in the bosun's chair. Following promotion, on his first assignment to use the chair, apparently it was too embarrassing to admit he didn't know the method. Instead he thought he would take his chances, and pass himself off as the A. B. everyone thought him to be—who would know the difference?

After being hoisted to a height of about 30 feet, our able seaman married the standing and hoisting parts, then attempted to secure himself. Trouble was he didn't pass the bight correctly—in fact, he never passed it and in short order he released his grip and landed you know where.

Obviously two important aspects of safety were sadly neglected in this case:

1. The man's own lack of curiosity to learn an extremely pertinent portion of his required duties.

2. His superiors failure to insure and ascertain if the man was qualified to do the job, and if not, to show the way.

All of this goes back to an old saying, "Only a few good seamen are born, most are made by experience and knowledge obtained from others."

Make it a practice to teach others and you will have a smoother running and safer ship.

Oh, yes—you may be interested to know that our friend who plummeted 30 feet landed squarely on another shipmate—both were hospitalized.

—*Moore-McCormack Lines Safety News Afloat.*

# AMENDMENTS TO REGULATIONS

[EDITOR'S NOTE.—The material contained herein has been condensed due to space limitations. Copies of the Federal Registers containing the material referred to may be obtained from the Superintendent of Documents, Washington 25, D. C.]

## DEPARTMENT OF THE TREASURY

### UNITED STATES COAST GUARD

[CGFR 54-11]

AMMONIUM NITRATE PHOSPHATE FERTILIZER MIXTURES

SHIPMENT ABOARD VESSELS

1. The transportation of ammonium nitrate phosphate fertilizer mixtures, a homogeneous mixture consisting of approximately 60 percent ammonium nitrate and 40 percent phosphate salts, mainly dicalcium phosphate, is subject to the requirements in 46 CFR Part 146. Certain restrictions for the transportation of this material have been enforced since the Texas City disaster in 1947.

2. The Commandant, United States Coast Guard, on February 9, 1954, relaxed the requirements of 46 CFR 146.22-30 in the regulations entitled "Explosives or Other Dangerous Articles on Board Vessels" which are applicable to materials described as "ammonium nitrate phosphate fertilizer mixtures consisting of 60 percent by weight of ammonium nitrate and 40 percent phosphate salts, mainly dicalcium phosphate."

3. The Commandant, United States Coast Guard, on February 9, 1954, pursuant to the recommendations of the Interagency Committee on the Hazards of Ammonium Nitrate, based on the findings and report of the National Academy of Sciences and other available information, in order to permit a greater distribution of ammonium nitrate phosphate fertilizer mixtures consisting of 60 percent ammonium nitrate and 40 percent phosphate salts, mainly dicalcium phosphate, currently in popular demand by agricultural interests, has found it was necessary to invoke emergency provisions in R. S. 4472, as amended (46 U. S. C. 170), to allow the shipment of such fertilizer mixtures by relaxing the requirements of 46 CFR 146.22-30 with regard to the degree of isolation required for waterfront facilities used in loading or unloading this commodity within the continental United States, its territories or possessions, except the Panama Canal Zone. Before this date such ammonium nitrate phosphate fertilizer mixtures could be loaded or unloaded only at isolated waterfront facilities meeting the requirements of Federal and local regulations covering dangerous cargoes.

4. By virtue of the authority vested in me as Commandant, United States Coast Guard, by Treasury Department order No. 120, dated July 31, 1950 (15 F. R. 6521), and R. S. 4472, as amended (46 U. S. C. 170), the following interim instructions may be followed in lieu of the requirements of 46 CFR 146.22-30 applicable to materials which are described as "ammonium nitrate phosphate fertilizer mixtures consisting of 60 percent by weight of ammonium nitrate and 40 percent phosphate salts, mainly dicalcium phosphate":

a. The formulation must be composed of ammonium nitrate and dicalcium phosphate, in the approximate proportions of 60 percent by weight of ammonium nitrate and 40 percent dicalcium phosphate, packaged in multiwall paper bags or metal drums.

b. The facility to be used shall be so located as to permit unrestricted passage to open water. The vessel shall be moored bow to seaward, and shall be maintained in a mobile status either by presence of tugs or readiness of engines.

c. The proposed facility shall not be located in areas of dense population, nor where facilities of high value and/or high hazard exist.

d. The facility must meet with the requirements specified for a designated waterfront facility (33 CFR 126.15), and be provided with abundant water supply.

e. The master or officer in charge of unloading the vessel shall insure that the following safety precautions are observed:

(i) Hose lines must be connected and laid out and tested before unloading operations commence.

(ii) Smoking, except in designated areas, the use of open lights, welding or burning, or other ignition sources in the hold, on deck, or on the dock immediately adjoining ammonium nitrate material shall be strictly prohibited.

(iii) A fire watch shall be provided by the master and stationed in the hold from which the material is being discharged.

(iv) Ruptured containers, spilled material, and trash must be immediately removed from the vessel.

(v) In the event of fire large quantities of water must be used and maximum ventilation established. The area must be cleared of all unnecessary personnel and vehicular equipment.

5. In dealing with the problem of determining the suitability of a pier at which this material is to be handled, the main object is to insure that high hazard facilities, such as petroleum tank farms, chemical plants or industries handling inflammable materials, are not in the immediate vicinity. Likewise, vessels unloading this material should be clear of other shipping and away from passenger trade terminals. With regard to dwellings, distances from commercial warehousing districts and waterfront activities to populated communities should afford sufficient protection for inhabitants in surrounding areas. Obviously, areas of dense population, i. e., tenement districts, housing projects, etc. in close proximity to the pier facility proposed to be used in unloading subject material, preclude the issuance of a permit. This reasoning is based on findings that ammonium nitrate phosphate consisting of dicalcium phosphate reacts similarly to other oxidizing materials and that the chance of explosion is nil when such material is properly handled. The primary object of the safety precautions is to prevent fire and to extinguish incipient fires quickly, using large volumes of water before they become uncontrollable.

Dated: February 26, 1954.

[SEAL] A. C. RICHMOND,
*Rear Admiral, U. S. Coast Guard, Acting Commandant.*

[F. R. Doc. 54-1577; Filed, Mar. 4, 1954; 8:50 a. m.]

## TITLE 46—SHIPPING

### CHAPTER I—COAST GUARD, DEPARTMENT OF THE TREASURY

[CGFR 54-12]

MISCELLANEOUS EDITORIAL AMENDMENTS

The miscellaneous editorial amendments contained in this document clarify the requirements and bring them up to date. The amendments to 46 CFR 2.01-5 and 2.75-10 revise and bring up to date procedures followed in connection with vessel inspections. The amendments to 46

CFR 24.01–10 (c), 25.35–1, and 25.40–1 clarify the requirements for carburetor backfire flame arresters and ventilation for uninspected pleasure vessels. These changes contain the determination that the regulations in Part 25 do not interpret or apply the provisions of section 2 of the act of October 9, 1940, as amended (46 U. S. C. 463a). The amendment to 46 CFR 137.09–50 (a) removes the mandatory requirement that the witness must identify the person charged. The purpose of this change is to prevent the miscarriage of justice by preventing a witness to testify who cannot identify the person charged. The requirements in this section set forth in chronological sequence the procedural steps incident to the orderly presentation of evidence through witnesses. The revision will permit a witness to testify without requiring the witness to identify the person charged.

## TITLE 33—NAVIGATION AND NAVIGABLE WATERS

### CHAPTER I—COAST GUARD, DEPARTMENT OF THE TREASURY

[CGFR 54–10]

PART 135—LIGHTS FOR COAST GUARD VESSELS OF SPECIAL CONSTRUCTION

EXEMPTIONS OF STATUTORY REQUIREMENTS FOR COAST GUARD PATROL BOATS

This is the third document describing exemptions of statutory requirements for Coast Guard vessels. The other documents (CGFR 53–50 and 53–61), dated November 25 and December 23, 1953, were published in the Federal Registers dated December 1 and 31, 1953 (18 F. R. 7641, 7642, 8897, 8898).

## EQUIPMENT APPROVED BY THE COMMANDANT

[Editor's Note: Due to space limitations, it is not possible to publish the documents regarding approvals and terminations of approvals of equipment published in the Federal Register dated March 25, 1954 (CGFR 54–13). Copies of these documents may be obtained from the Superintendent of Documents, Washington 25, D. C.]

### AFFIDAVITS

The following affidavit was accepted during the period from 15 February to 15 March 1954:

*Industrial Fittings Corp.*, 32 Industrial Avenue, Little Ferry, N. J., Fittings.

## SIDE LIGHTS ON THE RULES

*(Continued from page 78)*

under way, shall in daytime indicate their occupation to an approaching vessel by displaying a basket where it can best be seen. If vessels or boats at anchor have their gear out, they shall, on the approach of other vessels, show the same signal in the direction from the anchor back towards the nets or gear.

It will be noted that in Inland Waters fishing vessels of less than 10 gross tons under way without any gear in the water need not carry colored side lights. Instead, such fishing vessels may carry and show a combination red-green lantern when approached by or approaching near another vessel.

Fishing vessels of 10 gross tons or upward when underway without gear out in the water must carry and show the same lights as other vessels underway.

All fishing vessels, regardless of the type of fishing engaged in, need carry only two all around lights, One of these lights must be red, the other white, with the red light above the white light. The vertical separation between the two lights must be at least 6 feet, but not more than 12 feet. The horizontal separation between them, if any, cannot be over 10 feet. The specified minimum visibility for the lights is 2 miles for the red light and 3 miles for the white light.

The required daymarks for fishing vessels in inland waters with gear out are as follows:

(1) If underway; a basket where it can be seen best.

(2) If anchored; a basket in the direction from the anchor back towards the nets or gear.

While neither Article 9 nor Section 80.32a provides for a flare up light to attract attention, under Article 12, Inland Rules, fishing vessels, like other vessels, may show a flare up light to attract attention.

Article 9 is likewise silent as to the use of working lights on fishing vessels. Moreover, Section 80.36, Pilot Rules for Inland Waters, prohibits the use of lights not required by law, if they interfere with distinguishing the signal lights.

Another respect in which the Inland Rule is silent is in regard to lights for a fishing vessel that is at anchor or is made fast to a rock or other obstruction by her gear.

Thus, it can be seen that here is another instance in which there are great differences in the Rules.

## WHY SHIPS "SQUAT"

*(Continued from page 77)*

(a) Squat increases with an increase in speed, the rate of increase becoming greater with higher speeds.

(b) For any given speed, the squat generally increases with a decrease in depth under keel.

In addition to these conclusions, it was observed that:

(a) Vessels loaded on an even keel, or down at the bow, had a tendency to produce a bow squat of greater magnitude than the corresponding stern squat.

(b) For commercial vessels operating under average conditions, the factors of speed and depth under keel had a greater effect on squat than the size of the vessel.

(c) For a given power, the speed attained by a vessel decreased with a decrease in depth under the keel. This effect was appreciable for depths of 25 feet or less under the keel.

It should be borne in mind that the quantitative results obtained in the Delaware River survey are applicable only to channels or waterways having cross-sectional areas similar to those existing at the observing stations. Squat values obtained in more restricted channels would undoubtedly exceed those encountered in this survey.

In concluding their report, the U. S. Army Engineers pointed out that for tankers whose drafts exceeded 30 feet and for speeds in excess of 13 knots, squats of at least 3.5 feet could be anticipated in the Delaware River.

The conclusions reached by the U. S. Army Engineers in no way differed from the predictions of the model basin experiments. Tests run in model basins have, however, indicated one point that the Engineers were unable to verify, namely—that for extreme speeds, above those possible to attain during the surveys, neither trim nor settlement would vary greatly from those to be expected in deep unrestricted waters.

While the foregoing conclusions and observations cannot be accepted as applying to any vessel differing from those observed or models tested, particularly when it is realized that the channel conditions were set ones and, as all channels vary with respect to depth and width, we must accept the fact that when proceeding through restricted channels—where the depth of water under keel is three feet or less—speed should be reduced to the minimum required for good steerageway in order to minimize squat.

## A WORD FROM THE WISE

Accustom yourself to master and overcome things of difficulty; for if you observe, the left hand for want of practice is insignificant, and not adapted to general business, yet it holds the bridle better than the right, from constant use. —*PLINY*.



U. S. GOVERNMENT PRINTING OFFICE: 1954

CARE=SAFETY