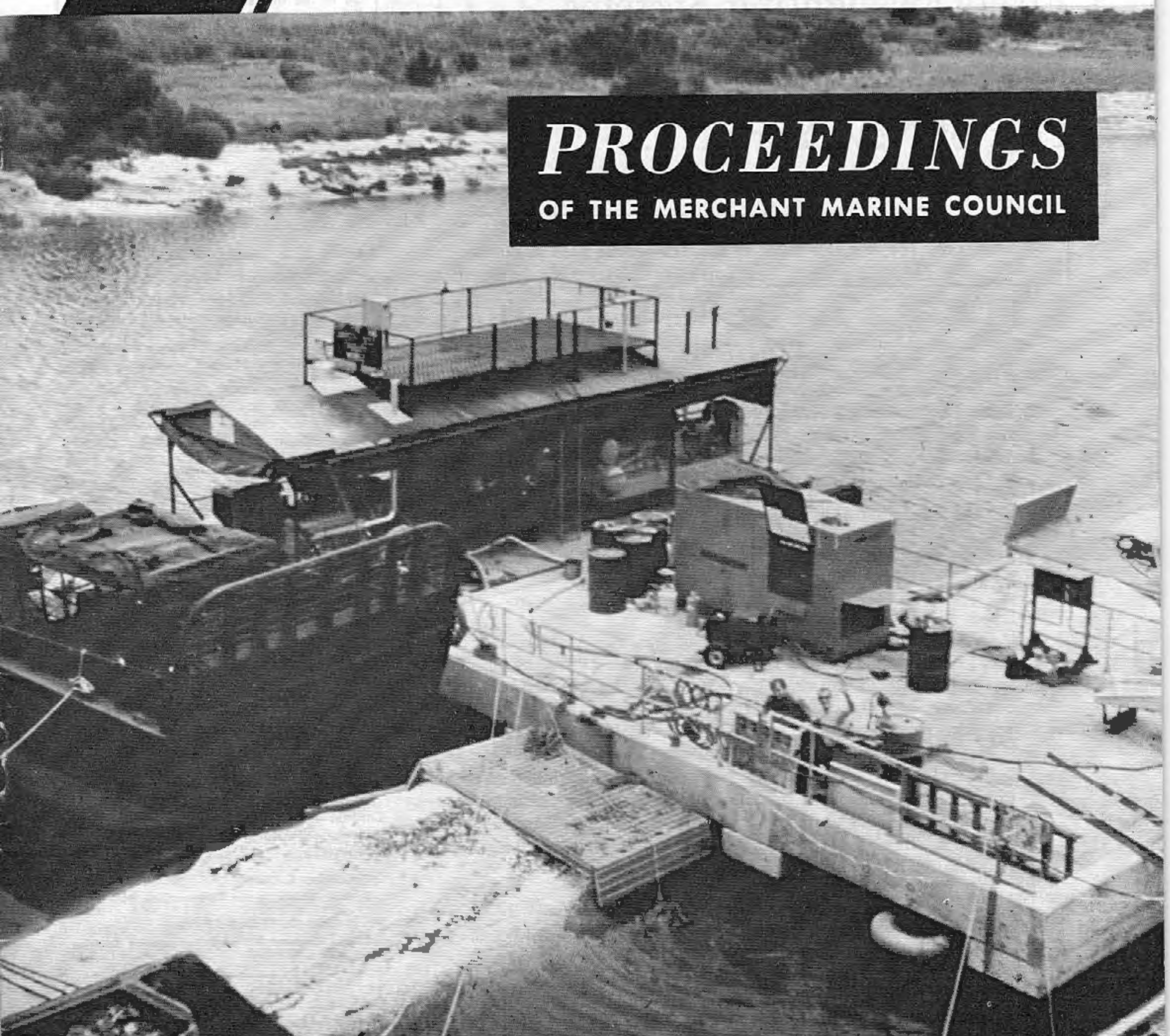
COAST GUARD

PROCEEDINGS

OF THE MERCHANT MARINE COUNCIL



Vol. 27, No. 10 CG-129 October 1970

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THIS COPY FOR NOT LESS THAN 20 READERS—PLEASE PASS IT ALONG

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FRONT COVER: View of the dock at the U.S. Coast Guard Sponsored Shipboard Fire and Safety Testing Facility during machinery space fire-detecting tests. Left, LCM housing National Bureau of Standards Instrumentation Van. Center, covered power barge with fire pump and air compressors. Right (on dock), main generator.

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PROCEEDINGS

OF THE

MERCHANT MARINE COUNCIL

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MARINE ENVIRONMENTAL FIRE AND SAFETY TEST FACILITY

Dale E. McDaniel
Hull Arrangements Branch, U.S. Coast Guard Headquarters

From an address before a session of the Marine Chemists Association, Twelfth annual seminar, Boston, Mass., on July 8 and 9, 1970.

It is not often that a shipowner offers to make his vessel available for systematic destruction—by fire, explosion, or other equally violent means. Yet, this is exactly what the Coast Guard had in mind when it established a Fire and Safety Testing Facility at Mobile, Ala. Some of the most significant advances in marine safety have come through full scale testing on an actual ship. It has been 25 years since the last full scale tests were undertaken in the United States and the article explains changes in the maritime community which make the facility a timely endeavor. This article also describes the facility and the excellent industry/government cooperation which made it a reality. The first test series conducted at the facility, machinery space fire-detecting tests, are examined. Finally, concentrating on interests of the Marine Chemists Association, the article explores future test possibilities.

INTRODUCTION

Near the end of World War II the Coast Guard began a series of full scale fire tests aboard the *Phobus*,[1] an old cargo ship which had been taken from the reserve fleet and placed at a berth in San Francisco Bay. These tests were investigating means for extinguishing fires in cargoes of cotton. Just as significant progress was being realized, reductions in force at the end of the war made it necessary to terminate testing. Despite attention being drawn to the need for resuming such testing[2] until recently, events did not make this possible.

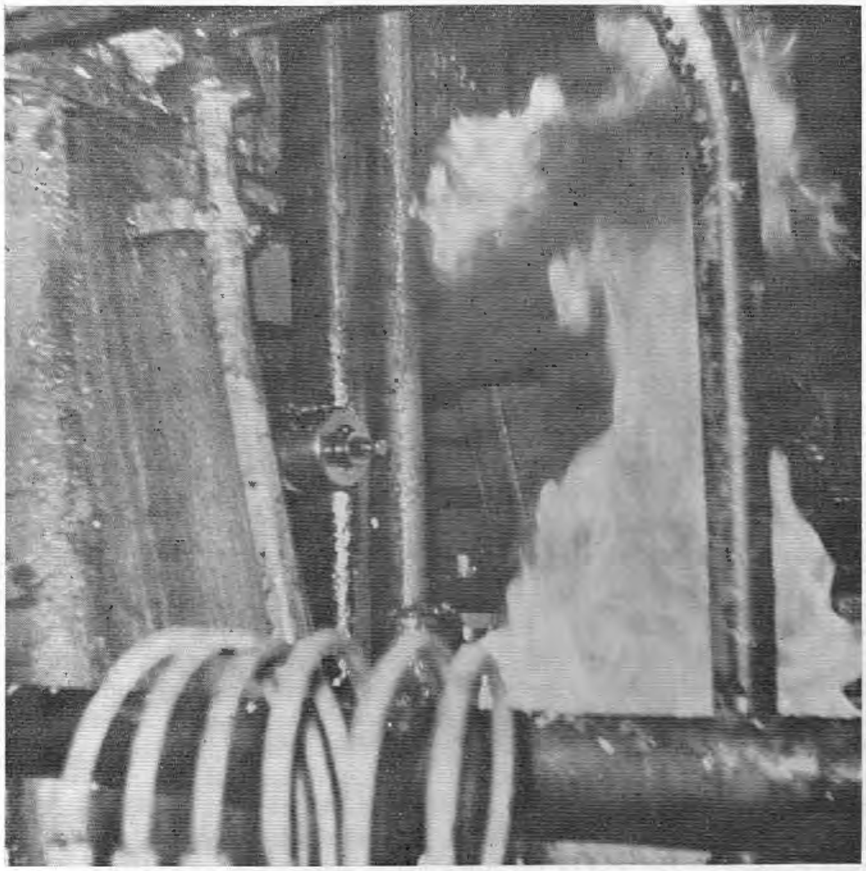
Since the *Phobus* tests there have been numerous changes in marine technology as well as in the means for dealing with safety problems. Traditional methods of carrying cargoes in break-bulk vesesls are being supplanted by container systems. Tank ships have grown to a size which only a few years ago seemed impossible. Chemical cargoes, with inherent compatibility, reactivity, and toxicity problems, are being moved in ever increasing quantities. Advances in machinery and control systems have made possible automated machinery plants, with associated reductions in the number of watch standing personnel. Greater sophistication in operating equipment has made vessels and their crews more dependent upon complicated control mechanisms. Rapid changes in material technology have made construction of large aluminum and fiberglass vessels a real possibility. Development of high-speed craft such as hydrofoils and hovercraft have helped bridge the speed gap between airplanes and ships.

Unfortunately, advances in safety have not always kept pace with advancing technology. Some progress is being made in improving the methods of measuring the effectiveness of marine safety programs,[3] but what was good yesterday is not necessarily good tomorrow. For example, lifesaving equipment aboard today's vessel is virtually the same as that aboard ships 30 or 40 years ago. For the most part, the same systems and operating techniques are used for

[1] William T. Butler, "Evaluation of Cotton Cargo Fire Extinguishing Tests Conducted on the S.S. *Phobus*" pp. 119-123, and Lloyd Layman, "Control and Extinguishment of Fires on Cargo Vessel," pp. 128–133, Proceedings of the Fifty-first NFPA Annual Meeting (May 1941).

[2] D. E. McDaniel, "Marine Fire Safety," Fire Journal, Nov. 1966, Vol. 60, No. 6.

[3] "A Study of Costs, Benefits, Effectiveness of the Merchant Marine Safety Program," Coast Guard May 1, 1968.



Typical 2-foot diameter pan fire of diesel oil. This was the "standard" fire used during machinery space fire-detecting tests.

extinguishing fires as were used at the conclusion of the *Phobus* tests. Sometimes use of old practices is perfectly satisfactory, and today's techniques simply represent refinement of still valid principles developed long ago. As an illustration, a series of tests aboard the *Nantasket*[4] in 1936 resulted in a then revolutionary new system of fire protection for passenger ships. This system has proven remarkably effective and only recently it was adopted as an international standard.[5] More often, however, continued use of old techniques means simply that insufficient attention has been given to possible alternatives.

One of the major barriers to rapid adoption of new safety techniques has been the inability to evaluate these techniques in an actual full scale marine environment. For such large scale tests to become a reality requires both a facility and the financial resources necessary to sponsor the work. With creation of the Coast Guard sponsored Shipboard Fire and Safety Testing Facility, the first of these requirements has been met. It is believed that the financial support will follow once the full potential of the facility is recognized.

THE FACILITY

The facility itself consists basically of an old T–1 tanker, the M/V *Rhode Island,* which is used as the test site. The vessel, on long-term loan from the U.S. Maritime Administration, was taken from the Mobile Reserve Fleet. It was then moved to its present location, a slip dredged in Little Sand Island. The island, on 10-year lease to the Coast Guard from the State of Alabama, is located across the Mobile ship channel from the city of Mobile. Once in the slip, the *Rhode Island* was closed in by means of a shell dike to preclude the possibility of water pollution. The only access to the island is by water. To provide the necessary support requires a small armada, donated by the Army and the Maritime Administration, and operating from the facility station located at the Coast Guard Brookley base. A concrete dock on the dike provides a convenient access and operating platform. Other requisite support equipment has been provided by the Coast Guard.

Despite its seeming simplicity, the facility did not come into existence overnight. It was first born in the imaginations of a dedicated group of industry persons: Capt. Kent Savage, National Fire Protection Association; Paul Hammer, Marine Consultant; and the late Charles Culver, Atlantic Richfield. This group first conceived of the project as an industry-sponsored venture in 1966. After considerable effort, they were unable to obtain title to the test ship *Rhode Island*. They did succeed in paving the way for location of the facility in Mobile, however, and when the Coast Guard picked up leadership of the project in 1968 they were able to build on this group's work. When the facility was officially dedicated in August 1969, Charles Culver's work in the project and devotion to improving marine fire protection was recognized through a plaque presented in his honor.

The cooperation which was evident during establishment of the facility expressed the widely held conviction that full-scale testing was long overdue. To insure a continuation of this cooperation, the Coast Guard established broadly based operating procedures for planning and evaluating the tests.

[4] "Fire Tests on the Steamship *Nantasket*," Trans. SNAME, vol 44 (1936).
[5] R. I. Price, "Fire Safety in Future Passenger Ships," Fire Journal, January 1969, Vol 63, No. 1.

FACILITY OPERATION

The facility is intended to permit full-scale, marine environmental testing under the sponsorship of any group or organization desiring to advance maritime safety. For example, tests might be formulated, conducted and evaluated under the sponsorship of the Coast Guard, another Government agency such as the Navy, a private organization such as the American Petroleum Institute or the Marine Chemists Association, or some combination of these bodies.

Operation of the facility itself is under general supervision of the Coast Guard. And, because the Coast Guard has entered into agreements with other groups such as the State of Alabama and Mobile Chamber of Commerce, final decisions on proposed test work will be made by the Coast Guard. In reaching such decisions and in scheduling tests, reviewing proposals and evaluating results the Coast Guard seeks the advice of an Ad Hoc Advisory Group on Test Planning. This group is composed of experts in the marine and fire protection fields including representatives of the Navy, Maritime Administration, National Bureau of Standards, NASA, American Petroleum Institute, Underwriters Laboratories, and National Fire Protection Association.

In addition, contact with and advice of other organizations and individual companies is sought through periodic, open meetings.

The first test series conducted at the facility offers a good example of these procedures in operation.

MACHINERY SPACE FIRE DETECTING TESTS

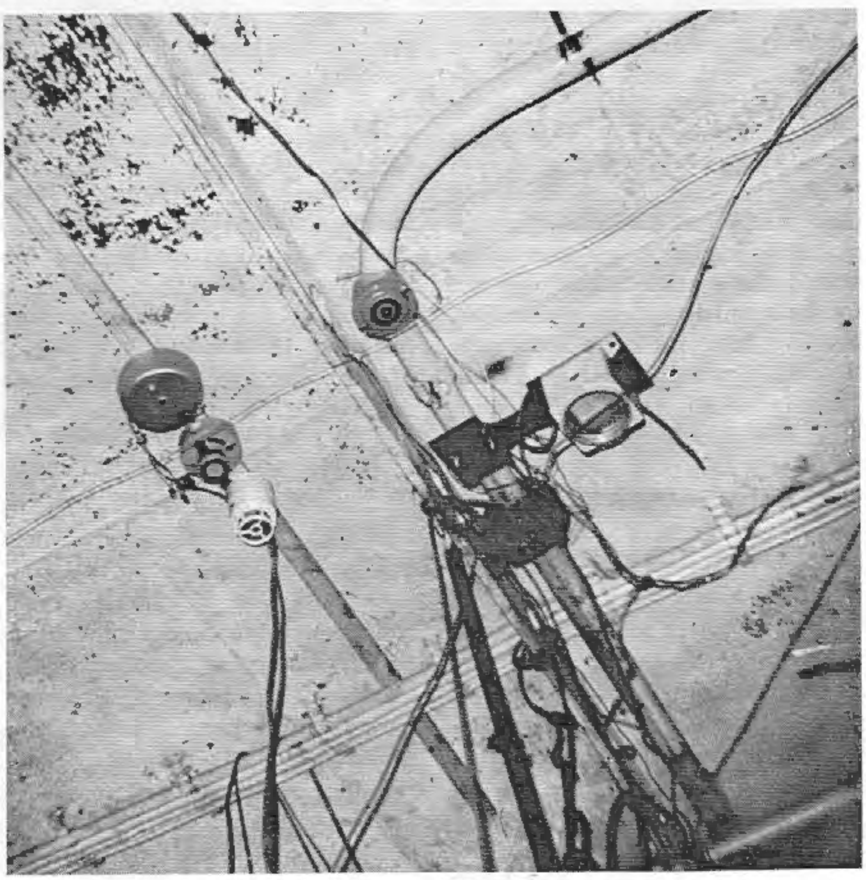
It was clear during efforts to establish the facility that the first test series should be closely planned and supervised by the Coast Guard. This was necessary in order to accurately answer a myriad of questions regarding conduct of tests at the facility. It was decided that the first tests should be conducted in the machinery space, and be used to evaluate fire detecting systems, fire extinguishing systems and piping materials. Problems were currently being encountered in all of these areas. Fire detection in machinery spaces was becoming increasingly important because of reductions in personnel. Little installation data existed. In the extinguishing and material fields, new products were being introduced at rapidly increasing rates. A rough test plan involving all of these features was drawn up and presented to an open meeting involving some 100 participants. Discussions disclosed the need to modify the program in considerable detail.

A modified program was prepared and presented to the Ad Hoc Advisory Group for consideration. The most significant change from the original plan was separation of the detecting tests from extinguishing and material tests. This was necessary to prevent the detection systems from being destroyed by the more intense fires during extinguishing tests. It was agreed by the advisory group that detecting tests should be conducted first and that the first series should be designed to:

- measure the relative performance of various types of detecting devices, and
- develop information on detector placement as related to environmental conditions.

This approach was then discussed with a number of individual detection system manufacturers, several of whom agreed to participate. The tests were to be conducted under the gen-

Cluster of various types of detectors evaluated during machinery space fire-detecting tests. Types of detectors evaluated included combustion products, smoke, infrared, ultraviolet, fixed temperature, and rate of rise.



eral direction of the Coast Guard; individual devices were to be installed by manufacturers; the National Bureau of Standards would record results; standby firefighting capability would be provided by the Mobile Fire Department and the Alabama State Dock's fireboat *Lurleen;* the report would be prepared by the Coast Guard and reviewed by the ad hoc advisory group plus individual participants.

The test plan called for nine different types of detection devices (2 ultraviolet, 1 infrared, 2 reflective smoke, 2 combustion products, 1 rate anticipation, and 1 rate of rise) to be installed in three fire areas. Temperatures in the fire area were to be monitored by the National Bureau of Standards. Oxygen levels and carbon monoxide concentrations at a single point in the machinery space were to be analyzed also. Small pan fires, 2 feet in diameter, would be set in each of these areas using diesel oil fuel. This type of fire was selected for two reasons. First, the diesel oil fuel was representative of the most common machinery space fires. Second, a fire of this incipient size, if not detected rapidly, could readily involve the entire machinery space. Although limited recording capabilities would make it necessary to identify the general area in which fires were to be started, the exact locations were not fixed until all detectors were installed. Six fire locations were eventually selected. Since installed machinery aboard the *Rhode Island* was inoperative, two 37,500-CFM power intake fans were to be used to vary environmental conditions. The National Bureau of Standards had previously conducted a survey of air movements in the machinery space to determine the air-movement pattern and assist in detector placement. For each of the six fire locations, fires were to be conducted under three different ventilation conditions giving a total of 18 individual fires, all different in location or condition.

In addition to these recorded responses, visual observation of portions of the space would be possible by means of a video camera mounted in the upper portion of the casing. Final installation changes were agreed to at the test site immediately prior to installation of the equipment.

The test participants installed a total of 73 individual detection devices. Unlike normal system installations, each device in this series was wired to permit individual response. Thus, the time of response of each device in each location could be measured. Due to the nature of automatic recording equipment available, it was necessary to make a last-minute change in the way in which responses would be recorded. It was originally intended to make an automatic record of device response, but instead devices were arranged to cause illumination of a panel lamp when they were triggered by a fire. Response time of each unit was thus recorded manually by noting the time of illumination of each lamp. A portable video camera was also used to make a permanent record of panel lamp response times. After some early difficulties in trying to achieve ignition by the intended remote means, it was decided to light the fires manually. Once these early difficulties were passed the test series progressed smoothly. Ignition of the first fire took place on May 26th, almost on schedule. It was possible to conduct the entire 18 tests, including several repeats, plus two unscheduled tests involving oily rags, in two and one-half days.

As anticipated from earlier trials, the 1.25 quarts of diesel fuel used gave a free-burning fire of approximately 4–5 minutes. The oily rag fires continued to smolder beyond this period and were eventually extinguished by personnel entering the space. The maximum air temperature recorded during the free-burning fires was approximately 200° F, this at a height of approximately 10 feet above the pan. One series of fires was conducted below the floor plates. This heated the steel plates enough to require cooling the plates after each test so that subsequent tests could be undertaken without risk of secondary ignition.

Evaluation of the test results is now underway. The first draft of the report should be circulated to the Ad Hoc Advisory Group on Test Planning and the test participants within 2 weeks. Within 6 weeks the final report should be available. Preliminary indications are that several types of devices gave a satisfactory indication of the fire. The most responsive devices seemed to be the line of sight (ultraviolet and infrared) although the need for carefully engineering installations of these devices was equally clear. For example, some rather crude sensitivity tests indicated that the ultraviolet and infrared devices would respond to ignition of a match or lighter within 6–8 feet of the detector. This would necessitate some control over installation of these types of systems to prevent false alarms. Both combustion products devices and one type of smoke device also responded well, with indications that a lesser number of these devices might give adequate total coverage. Response of these devices was less rapid when the test fire was located near an exhaust or intake duct. The other type of smoke device gave much slower and less reliable response, even though it was the same general type and had roughly the same sensitivity setting as the first smoke detector. The thermal devices responded only when located in the immediate vicinity of the fire. The need for on-site engineering and placement of devices was obvious. It appears that some excellent information on response times and detector placement will be developed.

The sensitivity of detectors used in these tests was what the manufacturers would normally recommend for installations of this type. Previous tests of particulate matter suspension in an operating machinery space indicated a very clean atmosphere. Different operating conditions might require lower sensitivity settings to prevent false alarms. Detector response would be affected accordingly. In fact, the test series was intended only to measure response time and did not consider the many operating and service life factors necessary to achieve a good, practical installation.

An extension of these tests, broadening the areas of coverage and improving the method of recording response is now being investigated. A report of both phases will be available for public review when completed.

THE FUTURE

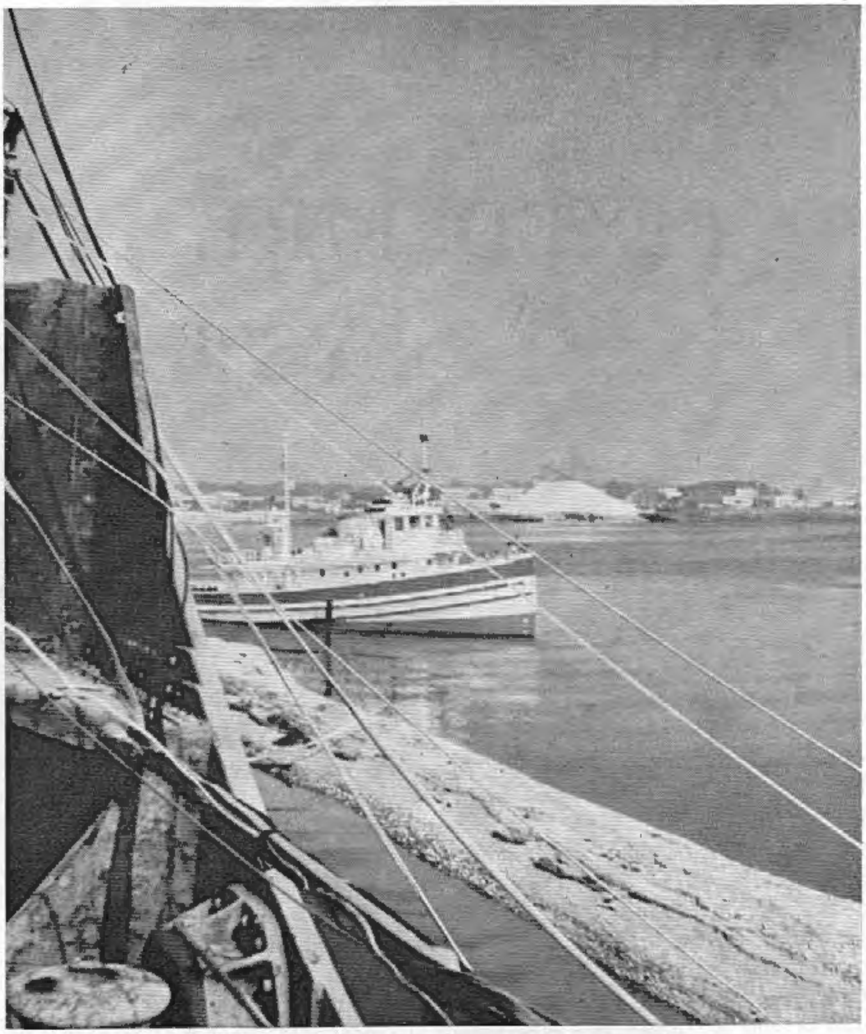
Test programs are now being developed to follow the detecting series. The immediate programs will continue with the series originally planned for the machinery space. Specifically, they will evaluate the efficacy of fire extinguishing systems, the performance of various piping materials, and possibly combined detecting and extinguishing system. Extinguishing systems which will likely be evaluated include carbon dioxide, bromotrifluoromethane (Halon 1301), dibromotetrafluoroethane (Halon 2402), light water, high-expansion foam and possibly dry chemical. Of these, only carbon dioxide is in current use. Evaluation of piping materials will consider the relative performance of newer materials such as polyvinyl chloride and glass reinforced plastic as compared to more traditional metallic materials.

Tests in other positions of the vessel could include evaluation of petroleum and/or polar solvent extinguishing systems and a study of requisite application rates for such systems. Dry cargo and container cargo systems are other possibilities. Some tests of materials used for construction of accommodation houses and internal compartmentation are likely.

Of particular interest to the Marine Chemists Association could be tests investigating the venting and dispersion of cargo vapors, evaluation of tank cleaning or gas freeing techniques, static charge generation, methods of inerting tanks and similar studies. This group would undoubtedly be able to propose far more investigations within your area of interest than these few suggested.

A final test aboard the *Rhode Island* might be the investigation of explosion suppression systems. If the system doesn't work, or perhaps even if it does, the *Rhode Island* will have served her purpose far beyond anyone's expectations. Upon her final retirement she could be replaced by another vessel, perhaps a cargo ship.

The test possibilities are limited only by the imagination and by the commitment of groups such as the Marine Chemists Association which are dedicated to advancing marine safety. The possibility is there. Your thoughts, suggestions and most importantly your participation in seeing the *Rhode Island* meet and even exceed the record of her predecessors, *Nantasket, Gaspar De Portola,* and *Phobus* are welcome. ⚓



Lurleen, *the Alabama State Dock's fireboat, peeks around the end of the dike enclosing the fire test ship M/V* Rhode Island *(foreground). The* Lurleen *provided backup support during fire detecting tests.*

FIXED FIRE FIGHTING SYSTEMS

"Nothing is more dangerous than for a seaman to be grudging in taking precautions lest they turn out to be unnecessary." Admiral Chester W. Nimitz

FIRE EXTINGUISHING SYSTEMS should be reliable and capable of being placed into service in simple, logical steps. The more sophisticated the system is, the more essential that the equipment be properly designed and installed. It is not possible to anticipate all demands which might be placed on fire extinguishing systems in the event of an emergency. However, potential casualties and uses should be considered, especially as related to the isolation of the equipment, control, and required power from possible disruption from a casualty. Fire protection systems should, in most cases, serve no other function than firefighting. Improper design and installation can lead to a false sense of security that can be as dangerous as no installation at all.

Firefighting equipment is not a substitute for required structural fire protection. These two aspects have distinct primary functions in U.S. practice. Structural fire protection protects passengers, crew and essential equipment from the effects of fire, long enough to permit an escape to a safe location. It is also designed to contain the fire to the source of origin. Firefighting equipment, on the other hand, is for the protection of the vessel. Requirements for structural fire protection vary with the class of the vessel and are the most detailed for passenger vessels. However, approved fire extinguishing systems are generally independent of the vessel's class. Automated vessels require additional consideration of required firefighting equipment because the reduced number of personnel produces fewer men available to combat fires.

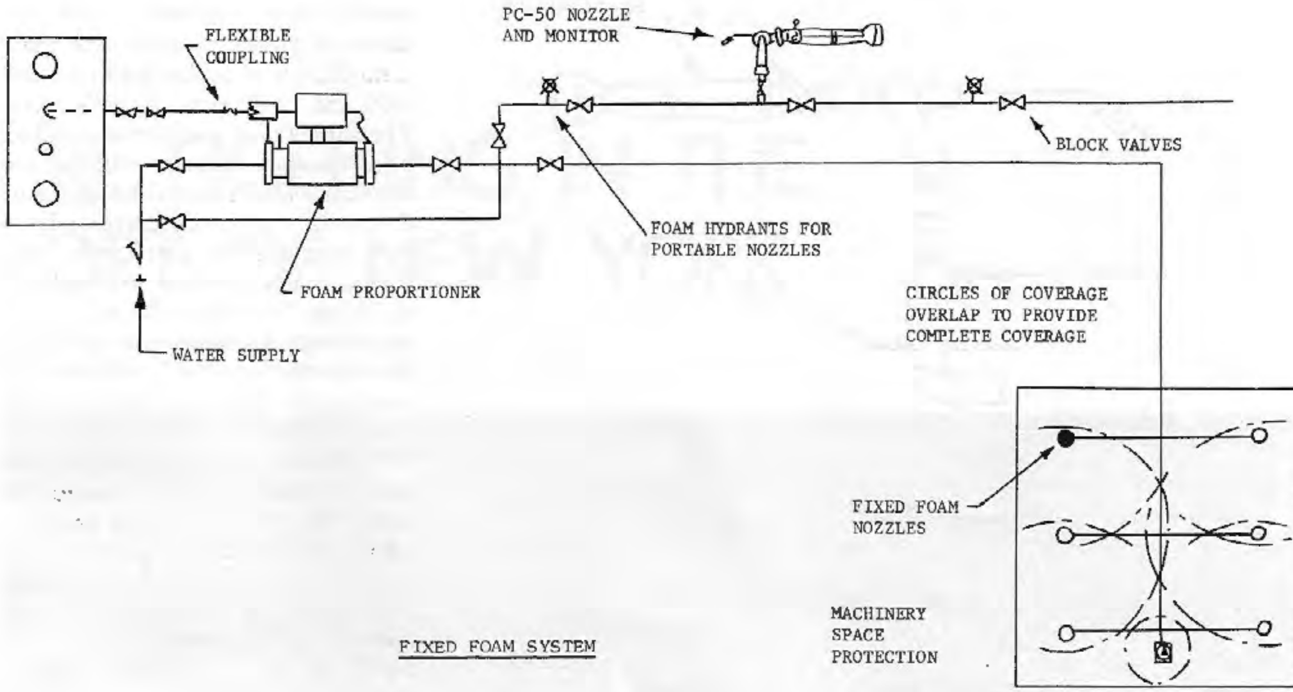
Let us now examine how the five major types of fixed-firefighting systems operate.

THE CARBON DIOXIDE SYSTEM

Carbon dioxide is an extinguishing agent that has many desirable properties. It will not damage cargo or machinery and leaves no residue to be cleaned up after a fire. Even if the ship is without power, a charged CO_2 system can be released. Since it is a gas, CO_2 will spread and penetrate to all parts of the space. It does not conduct electricity and therefore can be used on live electrical equipment. It can be effectively used on most combustible materials in a confined space. There are two disadvantages to CO_2: (*a*) It has little cooling effect; (*b*) It is only available in a limited quantity.

CO_2 extinguishes fires by reducing the oxygen concentration to a point where the atmosphere will no longer support combustion. This concentration of CO_2 must be maintained for a sufficient period to allow the maximum temperature to be reduced below the autoignition temperature of the burning materials.

In a "Cargo System" CO_2 protective system the agent is generally released over a period of time. Fires in class A combustibles carried in cargo spaces generally start with some smoldering and production of large quantities of smoke. Only when sufficient heat is produced to reach the "flash over" temperature (temperature at which solid combustibles give off sufficient gases to support continued rapid combustion) will rapid burning occur. Until this time the rate of burning is relatively slow. Time to flash over for a ship's hold would perhaps be at least 20 minutes. This allows time to prepare firefighting equipment, men, and to plan a fire attack. Carefully sealing the hold



FIXED FOAM SYSTEM

prior to release of CO_2 is extremely important. Cargo systems are intended for use against this kind of fire.

Fires in machinery and similar spaces are generally class B. In this type of fire it is seen that the heat buildup is rapid. The safety of the vessel depends to a great extent upon the contents of the machinery spaces. For this reason it is important to introduce the extinguishing agent quickly. This also prevents heat from possibly causing failure of bulkheads, making it possible to maintain a high concentrate of CO_2. Quick release keeps these structural members from reaching high temperatures. In these "Total Flooding Systems", extinguishment of the fire is a direct product of a sudden, massive release of carbon dioxide.

MECHANICAL FOAM SYSTEMS

Mechanical foam is produced by introducing foam concentrate in proper proportions into a flowing stream of water and aspirating with air. Aboard ship, the foam concentrate is normally introduced by means of proportioning equipment at some central location on the vessel. The foam solution thus formed is pumped through fixed piping to foam nozzles, monitors, etc., at the area to be protected. Air is mixed with the foam solution at the nozzle and foam is produced. Foam extinguishes a flammable liquid fire by forming a continuous blanket over the burning liquid, separating the combustible vapors from the oxygen in the air necessary for combustion. Because foam contains water dispersed in a very thin film, it also has cooling properties. Once formed the blanket has the ability to reseal itself should it become broken. It is not readily dissipated by heat. The intended use of foam is against flammable liquid fires where a surface area is present which may be blanketed.

Foam is of limited use on most class A fires due to its inability to effectively cover other than horizontal surfaces for long periods of time, its limited cooling ability, and its inability to penetrate deep-seated fires. Foam may also be used to blanket flammable liquid spills which are not burning to prevent escape of combustible gases and subsequent ignition.

WATER SPRAY

Water spray systems take advantage of water's great cooling effect for firefighting. Breaking water into small droplets allows it to vaporize quickly, more readily, and more completely, thus absorbing more of the fire's heat. Water spray systems may be designed to perform any of a number of functions, such as extinguishment of fire, control of fire, or exposure protection. The objective of most shipboard installations is complete extinguishment of the fire. In special purpose spray systems, as may be installed aboard LPG carriers, the function may be to reduce the quantity of heat absorbed by the tank or surrounding structures. Water

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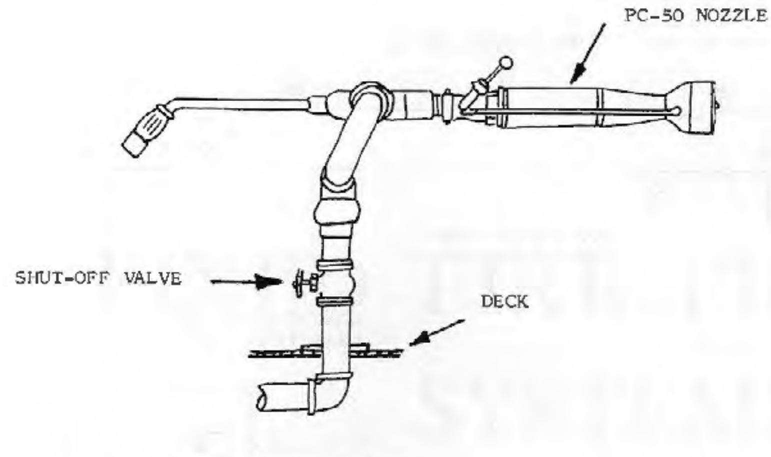
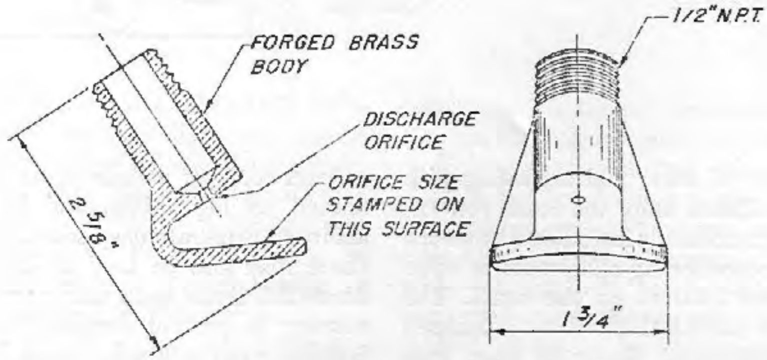
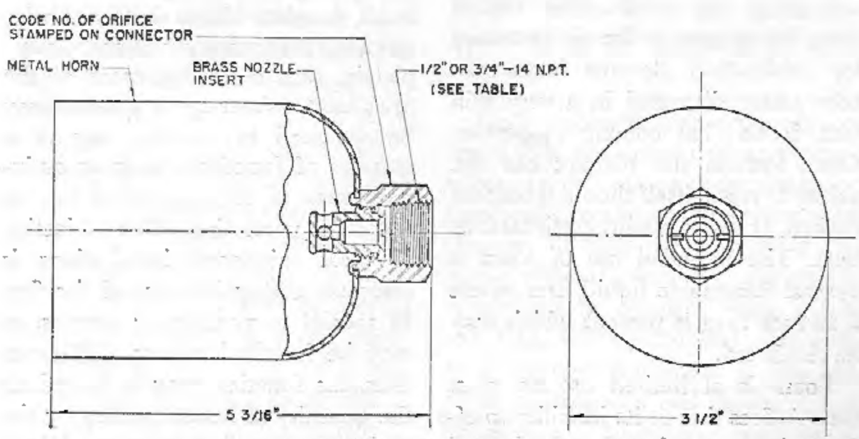


PC-50 NOZZLE ON MONITOR



C-O-TWO BAFFLE TYPE NOZZLE



C-O-TWO MULTI-DISCHARGE NOZZLE

spray is often preferred for the protection of pump rooms because there is no danger of asphyxiation as with CO_2 and no mop up as with foam. The supply of water is inexhaustible.

Water spray is most effective on flammable liquid fires with flashpoints above the water temperature; however, even gasoline fires can be controlled and sometimes extinguished by its use. The extinguishing mechanism of water spray in any fire situation depends upon the type of product burning, the degree to which the fire has progressed, etc. Normally with fuel oils, and similar products with high flashpoints, water reduces the temperature of the burning liquid to below the flashpoint. This is accomplished by causing a surface emulsion (small drops of water suspended in nonwater soluble compounds) of the liquid and by reducing heat transfer back to the liquid surface from the base of the flame. Thus, a fire may be extinguished even before the entire body of the liquid is cooled below the flashpoint. In addition, water applied in a fine spray to hot fires is vaporized as it absorbs the fire's heat, forming steam which tends to smother the fire in enclosed spaces. The spray also cools the surrounding structural members reducing the danger of reignition once the fire has been extinguished.

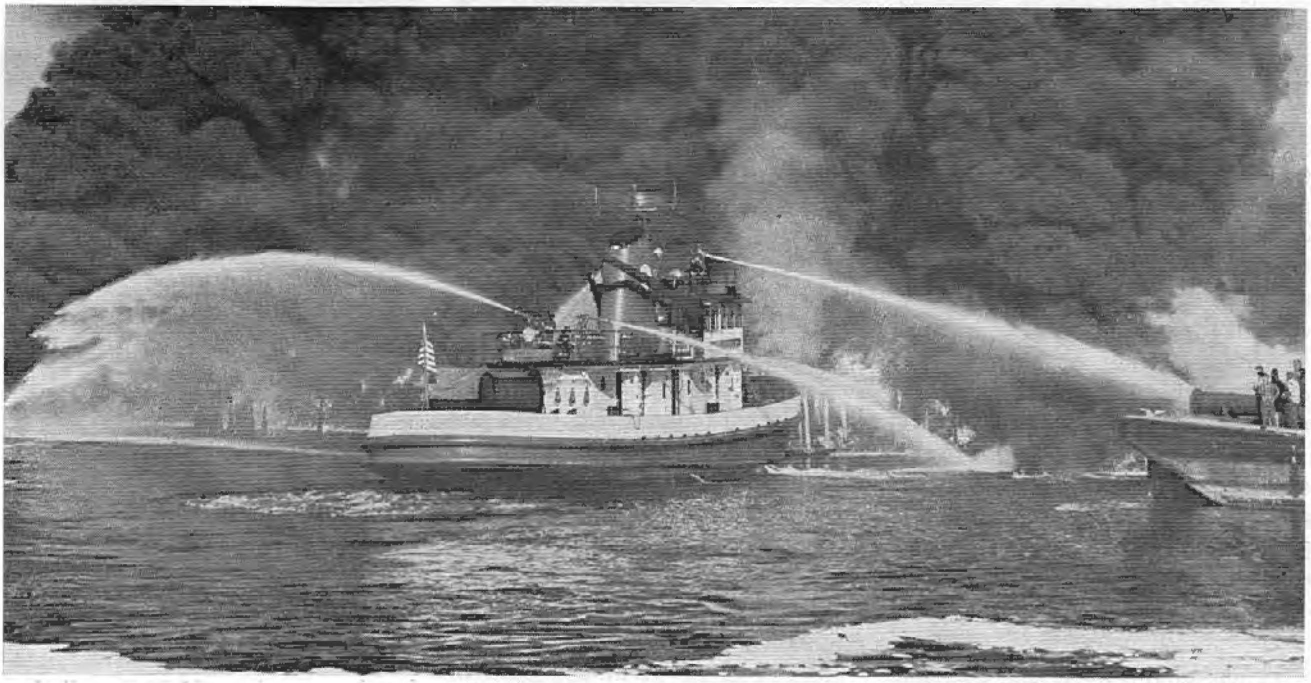
MANUAL SPRINKLING SYSTEM

A sprinkling system will accomplish two things: (*a*) It will extinguish fires in class A combustibles, as well as in high flashpoint (above 200° F) combustible liquids; (*b*) It will control heat output from flammable liquid (e.g. gasoline) fires and at the same time offer protection to the overhead of the protected space. In installations protecting vehicular decks the system should be designed to protect the structural integrity of the vessel, confine the fire to the location

(*Continued on page 193*)

FIRE FIGHTING IN THE PORT OF NEW YORK

Jeff Blinn, Associate Editor
Tow Line, Moran Towing & Transportation Co., Inc.



Courtesy New York Fire Department

The Governor *Alfred E. Smith* is a fireboat, operated by the Marine Division of the New York City Fire Department. The vessel entered the service between 1958 and 1961. Her length is 105 feet, and she is powered by twin 500-hp. diesels and a second similar pair of diesels for pumping. She is shown spraying 20,000 gallons of water per minute on a recent fire. The changing needs of firefighting along the city's waterfront have sent the fireboat into honorable retirement.

ALONG THIS EXTENSIVE waterfront of New York are a great number of public and private installations from manufacturing plants and parks to wasteland harboring hulks of vessels of a bygone era. There are depositories of inflammables, piers and warehouses of modern and ancient vintage, shipyards both active and dormant which all present their own unique problems should fire start.

Attending these installations are all manner of water conveyance—tankers, passenger liners, general cargo and containerships, railroad carfloats, ferries and a host of others which also present individual problems should fire start.

Crossing the port's many waterways are bridges, tunnels, pipelines, and conduits needing protection should fire start.

Not unlike the work of the harbor tug, where no two tasks are exactly alike, the fireboat and her crew find new problems with each major blaze.

The life hazard on the water is the primary concern of the firefighting forces, with thousands of persons on passenger liners and ferry boats, many hundreds on sightseeing and excursion vessels, commercial craft and pleasure boats underway in all sections of the harbor.

The monetary value of piers and other waterfront facilities amounts to many billions of dollars. Shipping and cargo moving in and out of the harbor add billions of dollars more to the fire protection responsibility of the marine firefighters.

The New York port complex because of its high population density and enormous use of petroleum products is an extremely high fire risk area. For example, there are over 4 billion gallons of storage capacity for oil and oil products around the shoreline in 277 separate facilities. Pipelines carry upwards of 30,000 gallons of petroleum under the harbor waters each minute.

Petroleum tanker traffic in the area varies from day to day but can run as high as 100 million gallons in transit at one time. During 1968 approximately 2,500 tankers of all types entered the Port of New York carrying over 20 billion gallons of oil and oil products. Supplementing the tanker traffic are offloading lighters and bunkering barges with a total capacity of over 40 million gallons. Operating skillfully and aggressively, our harbor firefighters attempt to contain the blaze as close to its area of origin as possible. At the same time, of course, they must protect the surrounding area.

A brief summation of a few of the major fires of recent years will serve to illustrate the variety of techniques involved in fighting fires of differing origin under various conditions.

NAPHTHA TANKER FIRE

In one of the worst ship disasters ever experienced in the port of New York, a tanker loaded with more than five and a half million gallons of highly flammable naphtha caught fire after collision with an empty tanker.

A major bridge was threatened as well as shore installations including an oil company terminal with many tanks containing inflammables. A major artery of the port was in danger of being blocked should the ships sink in the area.

U.S. Coast Guard and police launches, tugs and private boats were fully occupied with the recovery of persons in the water and shoreside firemen were busy setting up protection for shore installations when the first fireboats arrived.

As soon as the volatile substance burning so fiercely was identified as naphtha, a foam attack was ordered. Apart from controlling the fire on the water and at the ruptured tank of the vessel, the primary object was to separate the two ships thereby lessening the potential volume of fire.

Fireboat *Alfred E. Smith* upon arriving at the scene was ordered in between the burning vessels and, using all monitors to extinguish fire and cool down both tankers, acted as a wedge to force the ships apart.

With the *Firefighter* also maneuvering in between the tankers with her 20,000-G.P.M. streams fully utilized, the light tanker was moved away by Moran tugs. The remaining fire on the tanker was quenched by another fireboat, the *John J. Harvey*, as the ship was being towed to an anchorage off Bay Ridge.

On the other vessel fog streams were used to cool deck plates and to protect the firemen once they were able to board her. Great quantities of foam were used to spread a suffocating blanket over the fire and its escaping vapors. Five fireboats were fighting the fire at various times during the nearly 12-hours it took before the last traces of flame were extinguished.

This vessel was eventually towed to Gravesend Bay where some 90 percent of her cargo was salvaged but the fire damage was so extensive that at the request of her owner she was sunk later in the Atlantic by the Coast Guard cutter *Spencer*.

BULK SULPHUR FIRE

A vessel containing 2,000 tons of bulk sulphur destined for Bombay, India, reported a fire in her No. 4 hold on a Sunday morning while at dock in Brooklyn.

Her Master had already ordered some 50 cylinders of CO_2 discharged into the hold before the arrival of units of the fire department. The hold ventilation blowers were closed, exhaust ports and hatch pontoons were covered with canvas to retain the CO_2 gas.

Chief of the department John T. O'Halgan, upon his arrival held a conference with the captain of the cargo ship and, after a check that indicated no unusual heat conditions in either of the adjoining holds, it was decided to maintain a sealed hold and to discharge sufficient CO_2 gas to guarantee reduction of oxygen to a point where combustion would be impossible.

Discharge of six cylinders per hour for at least 48 hours would be necessary, it was determined.

Constant air samples were being taken by men from fireboat *Alfred E. Smith* of holds Nos. 3, 4, and 5 until favorable readings were received. Hold No. 4, the fire hold, was opened and ventilated with portable blowers while longshoremen removed cargo down to the lower hold which contained the bulk sulphur.

A fog stream was used intermittently to prevent dust from rising as mask-equipped firemen dug in a preselected area and soon uncovered patches where the sulphur had burned. The fire was then completely extinguished.

No water was used for extinguishment purposes to avoid contaminating the cargo but 328 50-lb. cylinders of CO_2 were necessary to quell the fire.

BULK COFFEE FIRE

A similar use of CO_2 gas was employed in another vessel which arrived in New York four days after a fire was discovered in her coffee cargo.

The ship's CO_2 system had been used to a limited degree but more CO_2 was introduced by the fire department both at anchorage and later at the vessel's berth.

It was not until 2 days after the arrival of the ship that the hold which had contained the fire was uncovered. Wood cribbing showed deep char and burned coffee bags and coffee attested to the fire.

No water had been used in fighting the fire and there was no damage to the vessel or to the remainder of the cargo. CO_2 used with patience had again extinguished a fire with a minimum of damage.

FIRE ON LINER

A passenger liner had a serious diesel engine room fire on September 7, 1966. An intense fire amidship in the engineroom between the boilerroom forward and the engineroom aft quickly destroyed electrical cable creating a dead ship with complete darkness below the main deck areas.

A roaring fire raced up the fidley from the engineroom bringing steel bulkheads to white heat which ignited combustible materials on six decks above. These fires were brought under control with minimum use of water in passageways, cabin spaces and public areas.

Firefighters operating with breathing apparatus and portable lighting facilities worked in a dark, hot, smoke-filled, and gaseous atmosphere for many hours to stretch hose lines and apply foam on the burning fuel oil. After the fire was under control, there was no change in the trim of the vessel and stability was never a problem because of the judicious use of water and mechanical foam in the correct amounts and the right locations.

Every marine company has an area of responsibility referred to as their "Company District" where they methodically inspect piers, marinas, vessels, and other waterfront facilities so as to prevent fire. Violation orders are issued, reinspections are made and noncompliance is pursued in the courts when necessary. The great majority of shipping industry people are extremely fire conscious and very cooperative in correcting violations called to their attention. Rightfully so, more time is spent on preventing fires than on extinguishing them. ⚓

FIXED FIREFIGHTING SYSTEMS

(*Continued from page 190*)

of origin, and wash the flammable liquid to a safe location. Installation on vehicular decks, such as aboard ferry vessels, is the primary use of sprinkler systems in this country.

Sprinklers have one basic discharge pattern and must distribute water in accordance with a standard distribution pattern established by Underwriters Laboratories. Regulations require a minimum application of $0.12 gpm/ft^2$.

As with water spray systems, the greatest drawback of a sprinkler system is its unreliability. Sprinkler lines and sprinkler heads have a tendency to clog with foreign matter if not tested frequently and flushed with fresh water after testing. Fire pump suction seachests for sprinkler pumps have become so clogged as to cause fire pump motors to burn up due to debris accumulated in the seachests during prolonged periods between testing. Long experience has demonstrated that because of the difficulty in testing without damaging the interior and finishings proper maintenance is seldom performed and the system will not operate as designed.

BROMOTRIFLUOROMETHANE (CF_3BR or HALON 1301) SYSTEM

Bromotrifluoromethane is one of many halogenated "vaporizing liquids" and "liquified gas" extinguishing agents introduced in recent years. Halogenated compounds all have similar chemical formulations; they are formed by the replacement of hydrogen in methane or ethane by the halogens: fluorine, chlorine, bromine, and, occasionally, iodine. A "vaporizing liquid" is an extinguishing agent which is liquid at normal temperatures and pressures. On the other hand, a "liquified gas" is gaseous at normal temperatures and pressures; it may be liquified by compression enabling it to be stored as a liquid.

The halogenated agents have a high extinguishing efficiency per unit weight. This makes them particularly suitable for installations which are weight critical, such as hydrofoils. (To date, hydrofoils are the only craft for which CF_3BR has been approved by the U.S. Coast Guard.)

Toxicity is a serious drawback to the use of halogenated agents. The natural and heat-decomposed vapors of many of the halogenated agents are quite toxic, particularly the heated or pyrolyzed (chemical decomposition of the halogen by heat) vapors. Toxicity was the primary reason which led the U.S. Coast Guard to remove carbontetrachloride extinguishers from marine service. Bromotrifluoromethane exhibits less toxic properties than other halogenated agents.

Fixed fire-extinguishing systems have proved to be a valuable tool in the containment and extinguishment of marine fires. All fire-fighting equipment should be kept in readiness and be capable of being used at a moment's notice. Constant maintenance will prevent failure of the equipment and, perhaps, save the vessel and her crew but a lax attitude toward the preparedness of the fire-fighting equipment can only mean disaster. ⚓

—*Maritime Reporter & Engineering News*

Seamanship Safety Award

—Merry, Calvo, Lane & Baker, Inc.

Capt. Carl Smith (center), skipper of the SS Oregon Mail, *with the American Mail Line annual Seamanship Safety Award. His ship, the SS* Oregon Mail, *received the award, which is presented to the vessel with the best safety record. The award represents the AML ship receiving the least number of time-lost accidents for the year based on her total number of man-hours of exposure. On hand during the presentation ceremony were Capt. Paul F. Stumpf (left), AML safety director, and Capt. Harry A. Greenwood, AML vice president, operations.*

U.S. Coast Guard Academy Announces Annual Competition

The U.S. Coast Guard Academy has announced that the next annual competition for appointment will commence with the December 5, 1970 administration of the College Entrance Examination Board (CEEB) tests. The December CEEB test results will be the latest ones accepted for evaluation for the class of 1975. Interested high school candidates should contact their guidance counselors for assistance in registering for the prescribed CEEB tests and must submit the required Coast Guard application form to the Academy by December 15, 1970.

Appointment to the Academy is obtained solely through competitive examination; there are no congressional appointments or geographical quotas. The competition consists of the candidate's high school rank, his performance on the College Entrance Examination Board (1) Scholastic Aptitude Test, (2) English Composition Achievement Test, and (3) either Level I or Level II Mathematics Achievement Test, and his leadership potential as demonstrated by his participation in high school extra-curricular activities, community affairs, or part-time employment. Most successful candidates rank in the upper half of their class and demonstrate a high degree of proficiency in the mathematical and scientific academic areas. However, any high school senior or graduate, who will have reached his 17th but NOT his 22d birthday by July 1, 1971 and who is a citizen of the United States, unmarried, and of good moral character is eligible to compete for an appointment.

Coast Guard cadets obtain an excellent undergraduate education at no personal cost and, in addition, receive pay and allowances fully adequate to fulfill all their ordinary living expenses. The constantly updated Academy curriculum offers liberal arts, engineering, and professional subjects, with a choice of either an engineering-physical science, social science, or marine science-oceanography emphasis. These areas of academic interest, combined with the varied elective courses, establish a solid foundation for a challenging career. Graduates of the Academy are awarded a Bachelor of Science degree and are commissioned as Ensign in the U.S. Coast Guard. Selected officers may pursue further postgraduate education and specialized training in many leading civilian and military graduate or professional schools in such fields as aviation, business administration, electronics, engineering, law, naval architecture, and oceanography.

Applications and additional information may be obtained by writing to: Director of Admissions, U.S. Coast Guard Academy, New London, Conn. 06320. ⚓

Q. As engineer in charge of a watch, what would you do if you heard a continuous ringing of the general alarm bell: (more than 10 seconds)

(A) See that water was supplied to deck fire line.

(B) Evacuate the engine and fire rooms.

(C) Secure the propulsion unit.

(D) Go to boat stations.

(E) Secure boiler burners.

A. (A) See that water was supplied to the deck fire line.

Q. High velocity fog may be changed to low velocity fog by:

(A) Changing nozzle cone to a larger orifice.

(B) Pulling nozzle handle all the way back.

(C) Inserting an applicator in the all-purpose nozzle.

(D) Putting the handle in the forward position on the all purpose nozzle.

(E) Decreasing pump outlet pressure.

A. (C) Inserting an applicator in the all-purpose nozzle.

Q. Water spray can be used to extinguish an oil fire because the effect of a:

(A) Solid stream will break up the fire.

(B) Fine spray will cool and smother the fire.

(C) High velocity spray will break up the fire.

(D) (B) and (C) above.

A. (B) Fine spray will cool and smother the fire.

Q. It is desirable to have which effect for a class "B" fire:

(A) Quenching.

(B) Cooling.

(C) Blanketing.

(D) Non-conducting.

A. (C) Blanketing.

Q. If a previously approved fire extinguisher is not currently approved, but in good working order: (NOTE: *Do not consider carbon tetrachloride in answering.*)

(A) You must replace it as soon as possible with an approved model.

(B) You must replace it at next annual inspection with an approved model.

(C) You may continue its use until not in good working order.

(D) It must be reported to Coast Guard as soon as possible.

A. (C) You may continue its use until not in good working order.

Q. What should be done first when an electrical fire is discovered?

(A) Stop ventilation.

(B) Stop the vessel.

(C) De-energize the circuit.

(D) Apply the extinguishing agent.

A. (C) De-energize the circuit.

Q. Describe the combination letter and number symbol used to classify hand portable fire extinguishers carried aboard ocean passenger vessels.

A. The letter indicates the type of fire which the unit could be expected to extinguish and the number indicates the relative size of the unit.

Q. State some of the advantages of carbon dioxide as a medium for extinguishing fires aboard ship.

A. 1. Non-corrosive and nontoxic.

2. Discharged as a gas and thus introduces no liquid into the vessel.

3. As a non-conductor of electricity it is safe to use around energized electrical equipment.

4. It will not damage even the most delicate material or machinery.

5. As a gas it can penetrate into voids and spaces in and around cargo.

6. It does not deteriorate and may be stored for indefinite periods.

7. It is effective on carbonaceous matter, flammable liquids and electrical equipment.

8. Probably the fastest acting extinguishing agent in common use.

Q. State some of the advantages in the use of water fog equipment over solid streams of water in firefighting aboard ship.

A. The advantages in the use of fog over a solid stream of water are:

1. Protection to the men handling the hose.

2. Rapid reduction in temperature.

3. Exclusion of oxygen from the material involved in the fire.

4. Circulation of fog over a wide area of the space in which the fire is located.

5. Due to the small amount of water necessary for extinguishment, conservation of machinery, fittings, furnishings, or cargo, and maintenance of the vessel's stability.

Q. (a) How many complete recharges must be carried for each gas mask required to be carried aboard ocean passenger vessels?

(b) Where must the spare charges be stowed?

A. (a) One.

(b) In the same location as the equipment it is to reactivate.

Q. State the three methods by which fire spreads and what should be done to prevent this in combatting fires on board vessels.

A. Fire is spread by conduction of heat to adjacent surfaces, by direct radiation, and by convection.

The spread of fire is prevented on ships by cooling of surfaces adjacent to the fire or in some cases moving combustibles, by cooling of the burning material or shutting off its supply of oxygen, and by shutting down so far as possible ventilation.

MERCHANT MARINE PERSONNEL STATISTICS

MERCHANT MARINE OFFICER LICENSES ISSUED

FISCAL YEAR ENDING JUNE 30, 1970

DECK

Grade	July through September (1969)		October through December (1969)		January through March (1970)		April through June (1970)	
	Original	Renewal	Original	Renewal	Original	Renewal	Original	Renewal
Master:								
Ocean	40	359	74	220	54	312	71	323
Coastwise	5	26	6	17	4	35	10	26
Great Lakes		8	4	18	33	91	3	15
B.S. & L.	10	42	15	72	10	60	8	59
Rivers	6	58	8	53	9	74	11	57
Radio Officer Licenses issued	26	217	15	132	15	123	8	86
Chief Mate:								
Ocean	67	86	57	90	54	86	56	87
Coastwise		1		1		2	1	
Great Lakes						1		1
B.S. & L.								1
Rivers					1	1		
2d Mate:								
Ocean	87	96	86	101	91	103	106	101
Coastwise		1						
3d Mate:								
Ocean	73	104	46	44	43	66	128	108
Coastwise	1	4	3			1		
Pilots:								
Great Lakes	10	15	4	22	45	75	43	26
B.S. & L.	55	87	46	106	52	82	59	85
Rivers	61	136	77	210	62	155	67	111
Master: Uninspected vessels	26	30	19	23	17	16	27	30
Mate: Uninspected vessels	3	3	5	1	7	4	12	2
Motorboat operators	334	390	273	280	610	841	1,195	932
Total	804	1,663	738	1,390	1,107	2,128	1,805	2,050
Grand total	2,467		2,128		3,235		3,855	

ENGINEER

Grade	July through September (1969)		October through December (1969)		January through March (1970)		April through June (1970)	
	Original	Renewal	Original	Renewal	Original	Renewal	Original	Renewal
STEAM								
Chief engineer:								
Unlimited	27	376	46	350	52	466	54	427
Limited	2	45	2	45	7	66	5	43
1st assistant engineer:								
Unlimited	74	156	53	154	80	206	68	163
Limited	2	21	1	4	4	27	2	11
2d assistant engineer:								
Unlimited	94	290	102	242	180	264	123	243
Limited	1	2	1	4	11	5	2	5
3d assistant engineer:								
Unlimited	106	301	61	201	80	230	162	270
Limited	10			2	6	25	6	8
MOTOR								
Chief engineer:								
Unlimited	18	61	19	62	27	93	21	60
Limited	18	79	13	72	14	95	20	101
1st assistant engineer:								
Unlimited	14	32	29	24	22	32	13	22
Limited	5	25	8	29	11	38	8	29
2d assistant engineer:								
Unlimited	16	24	17	24	24	27	38	23
Limited	1	4	3	5	3	3	3	5
3d assistant engineer:								
Unlimited	72	316	25	255	38	242	111	297
Limited	3	4	1	39	2	13	1	19
Chief engineer:								
Uninspected vessels	30	18	39	24	21	17	22	30
Assistant engineer:								
Uninspected vessels	6	4	11	8	7	9	5	15
Total	499	1,758	431	1,544	589	1,858	664	1,762
Grand total	2,257		1,975		2,447		2,426	

Type of document	July through September (1969)					October through December (1969)					January through March (1970)					April through June (1970)				
	Atlantic coast	Gulf coast	Pacific coast	Great Lakes and rivers	Total	Atlantic coast	Gulf coast	Pacific coast	Great Lakes and rivers	Total	Atlantic coast	Gulf coast	Pacific coast	Great Lakes and rivers	Total	Atlantic coast	Gulf coast	Pacific coast	Great Lakes and rivers	Total
Staff officer	3	8	16	3	30	3	5	5	------	13	------	6	8	1	15	1	4	2	1	8
Continuous discharge book	------	------	------	------	0	------	------	------	------	0	------	------	------	------	0	------	------	------	------	0
Merchant mariner's documents	2,596	1,350	1,783	1,520	7,249	1,397	1,043	1,403	897	4,740	1,555	1,170	1,208	498	4,431	1,390	1,577	1,553	2,086	6,606
AB any waters unlimited	103	59	108	21	291	91	51	67	20	229	62	57	89	23	231	90	69	81	25	265
AB any waters, 12 months	101	80	71	60	312	88	44	77	28	237	65	47	77	18	207	70	54	61	54	239
AB Great Lakes, 18 months	1	------	17	23	41	2	------	9	9	20	4	------	10	9	23	1	1	9	14	25
AB tugs and towboats, any waters	1	6	18	------	25	5	9	9	1	24	3	18	17	1	39	9	26	20	------	55
AB bays and sounds	------	------	------	------	0	------	------	1	------	1	------	------	1	------	1	------	------	------	------	0
AB seagoing barges	------	------	------	------	0	------	------	2	------	2	------	------	------	------	0	1	------	------	------	1
Lifeboatman	338	27	94	1	460	114	16	58	1	189	70	15	56	1	142	155	35	74	6	270
Q.M.E.D	208	66	140	67	481	269	57	82	29	437	261	86	87	42	476	225	75	99	65	464
Entry ratings	2,531	1,249	1,752	1,449	6,981	1,329	966	1,372	844	4,611	1,443	1,095	1,188	447	4,173	1,258	1,507	1,512	1,985	6,262
Tankerman	47	109	3	74	233	56	134	14	58	262	61	135	9	58	263	73	210	57	110	450
Total	5,929	2,954	4,002	3,218	16,103	3,354	2,325	3,099	1,887	10,665	3,524	2,629	2,750	1,098	10,001	3,273	3,558	3,468	4,346	14,645

FIRE PREVENTION WEEK, 1970

By the President of the United States of America

A Proclamation

Uncontrolled fires continue to place a costly drain on the American economy. The tragedy of more than 12,000 deaths each year by fire is coupled with annual property losses exceeding $2 billion.

It is hard to realize that responsible citizens permit this to happen when most fires can be avoided. Each of us can reduce this waste simply by eliminating fire-producing conditions and by being alert and careful in handling fire.

NOW, THEREFORE, I, RICHARD NIXON, President of the United States of America, do hereby designate the week beginning October 4, 1970, as Fire Prevention Week.

I call upon our citizens, singly and as a nation, to actively support fire prevention through civic groups, schools, business, labor, and farm organizations, State and local governments, and the fire prevention groups, including their own community fire departments, and the National Fire Protection Association. I urge the news media and other public information agencies to cooperate in promoting Fire Prevention Week as a prelude to year-round fire prevention efforts.

I also ask all Federal agencies, in cooperation with the Federal Fire Council, to assist the national effort to reduce loss of life and property from fire.

One way in which we can all assist this effort is by the reduction and elimination of false fire alarms. False alarms require the use of valuable fire fighting equipment which should be reserved for the bona fide protection of life and property. May this week be a reminder for all citizens to take appropriate action to arrest the needless and unwarranted interference with normal fire fighting operations and the ensuing cost to the taxpayer.

IN WITNESS WHEREOF, I have hereunto set my hand this second day of July, in the year of our Lord nineteen hundred seventy, and of the Independence of the United States of America the one hundred ninety-fourth.

RICHARD NIXON.

AMENDMENTS TO REGULATIONS

Title 33 Changes

Chapter I—Coast Guard, Department of Transportation

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

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

Delegation To Modify Speed Limits

1. Sections 92.49(a) and (b) and 92.51 prescribe various speed limits for vessels of 50 gross tons or over while navigating certain reaches of the St. Marys River. Section 92.49 (c) delegates to the Coast Guard District Commander the authority to modify most of these speed limits during each season of navigation when he finds that safety in the navigable channels of the river so requires. These modifications are required to be published in the Notice to Mariners and to be given necessary publicity by other means.

2. During the past few years there have been periods when the water level in the river has been much higher than the normal level. Small boats and piers along the river have been damaged, acreage bordering the river has been destroyed by erosion, and unprotected structures have been undermined. In addition, it has been found that during these periods of high water level, excessive water action constitutes a considerable hazard to persons along the shore and to some small boats while underway. Some of the damage and hazard result from the action of waves generated by passing vessels. Numerous complaints have been received by the Coast Guard from the owners of riparian property.

3. During the spring and summer of 1969 the water level in the St. Marys River was unusually high. The Commander, 9th Coast Guard District issued a notice of proposed rule making dated July 1, 1969. The notice proposed permanent reductions in some of the existing speed limits in specified reaches of the river. The notice was sent to approximately 2,000 addressees. Several petitions, containing about 370 signatures, and 35 written comments were received in response to the notice. The petitions and most of the comments favored the proposed reductions. However, two comments suggested, as a substitute for the proposal, that authority be delegated to the District Commander to make temporary reductions in the existing speed limits. The District Commander has recommended to the Commandant that the existing speed limits be left unchanged and that the District Commander be delegated the authority to make temporary reductions whenever the need exists.

4. Section 92.49(c) now authorizes the District Commander to modify the speed limits for vessels of 50 gross tons and over navigating between Everens Point and Big Point and between Nine Mile Point and the lower end of West Neebish Channel. However, this delegation is conditioned on a finding by the District Commander that safety in the navigable channels of the river requires the modification. The basic statute does not require this restrictive condition. The Chief Counsel of the Coast Guard has construed the statute (33 U.S.C. 474) to require that all interests affected by the speed of vessels in the river, including the protection of the property of the riparian owners, be given due consideration prior to the issuance of suitable speed limits. Accordingly, the recommendation of the District Commander to broaden the delegation of authority is accepted. This document delegates to the District Commander the authority to reduce the existing speed limits whenever he deems it necessary to best serve all the interests affected by the speed of vessels in the river. This approach is in consonance with the statute as construed by the Chief Counsel since it does not unreasonably restrict commerce while protecting riparian property when the need arises.

5. This document further revises the present paragraph (c) to include a provision that the regulations of the District Commander be published in the *Federal Register*. Finally, the revision incorporates the provisions of the existing § 92.51 into the revised § 92.49 since it prescribes speed limits for vessels of 50 gross tons or over and is logically related to § 92.49.

6. The revision of § 92.49 effected by this document incorporates an interpretative ruling of the basic statute by the agency charged with its enforcement and several editorial changes. Accordingly, it is hereby found that notice and public procedures thereon are not required and this revision can be made effective in less than 30 days.

(Federal Register of August 4, 1970.)

Approved Equipment

Commandant Issues Equipment Approval

U.S. Coast Guard approval was granted to certain items of lifesaving, and other miscellaneous equipment and materials.

Those interested in these approvals should consult the Federal Register of August 15, 1970, for detailed itemization and identification.

MERCHANT MARINE SAFETY PUBLICATIONS

The following publications of marine safety rules and regulations may be obtained from the nearest marine inspection office of the U.S. Coast Guard. Because changes to the rules and regulations are made from time to time, these publications, between revisions, must be kept current by the individual consulting the latest applicable Federal Register. (Official changes to all Federal rules and regulations are published in the Federal Register, printed daily except Sunday, Monday, and days following holidays.) The date of each Coast Guard publication in the table below is indicated in parentheses following its title. The dates of the Federal Registers affecting each publication are noted after the date of each edition.

The Federal Register will be furnished by mail to subscribers, free of postage, for $2.50 per month or $25 per year, payable in advance. The charge for individual copies is 20 cents for each issue, or 20 cents for each group of pages as actually bound. Remit check or money order, made payable to the Superintendent of Documents, U.S. Government Printing Office. Washington, D.C. 20402. Regulations for Dangerous Cargoes, 46 CFR 146 and 147 (Subchapter N), dated January 1, 1970 are now available from the Superintendent of Documents price: $3.75.

CG No.	TITLE OF PUBLICATION
101	Specimen Examination for Merchant Marine Deck Officers (7–1–63).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (5–1–68). F.R. 6–7–68, 2–12–69, 10–29–69.
115	Marine Engineering Regulations and Material Specifications (3–1–66). F.R. 12–18–68, 6–17–70.
123	Rules and Regulations for Tank Vessels (5–1–69). F.R. 10–29–69, 2–25–70, 6–17–70.
129	Proceedings of the Merchant Marine Council (Monthly).
169	Rules of the Road—International—Inland (9–1–65). F.R. 12–8–65, 12–22–65, 2–5–66, 3–15–66, 7–30–66, 8–2–66, 9–7–66, 10–22–66, 12–23–67, 6–4–68, 10–29–69, 11–29–69.
172	Rules of the Road—Great Lakes (9–1–66). F.R. 7–4–69, 8–4–70.
174	A Manual for the Safe Handling of Inflammable and Combustible Liquids (3–2–64).
175	Manual for Lifeboatmen, Able Seamen, and Qualified Members of Engine Department (3–1–65).
176	Load Line Regulations (1–3–66). F.R. 12–6–66, 1–6–67, 9–27–67, 7–12–68, 6–5–69, 7–26–69, 10–29–69.
182	Specimen Examinations for Merchant Marine Engineer Licenses (7–1–63).
184	Rules of the Road—Western Rivers (9–1–66). F.R. 9–7–66, 5–11–67, 12–23–67, 6–4–68, 11–29–69.
190	Equipment Lists (8–1–68). F.R. 11–7–68, 11–8–68, 11–16–68, 11–19–68, 11–20–68, 12–11–68, 12–18–68. 2–11–69, 2–18–69, 2–21–69, 2–26–69, 3–15–69, 3–27–69, 4–4–69, 4–12–69, 4–19–69, 4–25–69, 4–26–69, 4–28–69, 5–3–69, 5–9–69, 6–18–69, 6–19–69, 7–1–69, 7–15–69, 7–17–69, 9–12–69, 9–25–69, 10–10–69, 10–11–69, 10–22–69, 10–31–69, 11–19–69, 12–13–69, 1–27–70, 1–30–70, 2–3–70, 2–26–70, 3–11–70, 3–14–70, 3–25–70, 4–14–70, 5–7–70, 5–27–70, 7–18–70, 7–21–70, 8–15–70
191	Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel (5–1–68). F.R. 11–28–68, 4–30–70, 6–17–70.
200	Marine Investigation Regulations and Suspension and Revocation Proceedings (5–1–67) F.R. 3–30–68, 4–30–70.
220	Specimen Examination Questions for Licenses as Master, Mate, and Pilot of Central Western Rivers Vessels (4–1–57).
227	Laws Governing Marine Inspection (3–1–65).
239	Security of Vessels and Waterfront Facilities (5–1–68). F.R. 10–29–69, 5–15–70.
249	Merchant Marine Council Public Hearing Agenda (Annually).
256	Rules and Regulations for Passenger Vessels (5–1–69). F.R. 10–29–69, 2–25–70, 4–30–70, 6–17–70.
257	Rules and Regulations for Cargo and Miscellaneous Vessels (8–1–69). F.R. 10–29–69, 2–25–70, 4–22–70, 4–30–70, 6–17–70.
258	Rules and Regulations for Uninspected Vessels (5–1–70).
259	Electrical Engineering Regulations (3–1–67). F.R. 12–20–67, 12–27–67, 1–27–68, 4–12–68, 12–18–68, 12–28–68, 10–29–69, 2–25–70, 4–30–70.
266	Rules and Regulations for Bulk Grain Cargoes (5–1–68). F.R. 12–4–69.
268	Rules and Regulations for Manning of Vessels (5–1–67). F.R. 4–12–68, 4–30–70.
293	Miscellaneous Electrical Equipment List (9–3–68).
320	Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf (11–1–68). F.R. 12–17–68, 10–29–69.
323	Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (7–1–69). F.R. 10–29–69, 2–25–70, 4–30–70.
329	Fire Fighting Manual for Tank Vessels (7–1–68).

CHANGES PUBLISHED DURING AUGUST 1970

The following have been modified by Federal Registers:

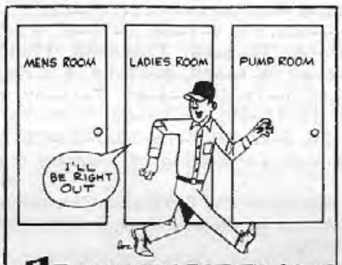
CG–172, Federal Register, August 4, 1970.

CG–190, Federal Register, August 15, 1970.

Marine Safety Posters

FIRE PREVENTION

TANKERS



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