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CONTENTS

STEVEDORING SAFETY IN HAWAII

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There are six stevedoring contractors in Hawaii. Two of these are in Honolulu, my home port; two are on the Island of Hawaii; there is one on Maui, and one on Kauai. My experience covers service with both Honolulu Companies and with Matson Terminals in San Francisco. In this experience, I have been given responsibility for safety on both a special assignment basis and on a general basis. At the present time, the Safety and Training Director of the McCabe Company is assigned to the Industrial Relations Section.

In four of these six stevedoring companies, the safety function is organized on a staff service basis with the staff safety officer reporting to either an Industrial Relations officer or the manager of the company. In the other two companies, one of which runs a rather specialized operation, the safety function is assigned as collateral duty to the Operating Superintendent. Generally speaking, in Hawaiian Companies, the safety function is most often included as part of the industrial relations function.

The stevedoring companies vary considerably in size. My company employs 480 longshoremen. Castle & Cooke Terminals, also in the Port of Honolulu, employs approximately 400 men. Hilo Transportation & Terminal Company situated in Hilo on the Island of Hawaii has 60 men. Kahului Railroad Company in Kahului, Maui, 70; and Kauai Consolidated Terminals Co. at Nawiliwili on the Island of Kauai, 60. Kawaihae Terminals, also on the Island of Hawaii at Kawaihae is small and has steady employees only to receive bulk sugar. Part time workers are brought in for ship operations. The companies handle over 1,000,000 tons of bulk and approximately 2,500,000 tons of general cargo annually. The general cargo figure does not include container tonnage. By far the greatest percentage of the bulk cargo handled at all ports, except Honolulu, is raw sugar. The great volume of container tonnage is stevedored by Matson Terminals using longshore labor borrowed from the McCabe Company.

Except for the McCabe Company, the stevedoring and terminal companies are owned and operated by the large Honolulu based corporations that have sugar interests on the various islands. All these corporations provide special staff safety assistance to their stevedoring companies when it is needed. Each of the stevedoring companies has its own longshore work force and in Honolulu, the companies lend each other men for peak work loads. The men are represented by the ILWU and although the industry bargains jointly with the Union, each company signs its own separate labor contract.

By far the greatest number of vessels served by the industry are engaged in berth line operations, therefore, most of the time, the longshoreman is assigned to work on vessels that are in first-class condition. With all these ideal conditions it can be readily seen that the Hawaiian stevedoring industry is in an unusually favorable position to chalk up a good record in the safety field. The obstacles that a company encounters in trying to achieve better safety performance are encountered to a lesser extent by Hawaiian stevedores.

In 1958, Mr. Robert Weir, manager of Kauai Consolidated Terminals, prepared a paper entitled: "What We Are Doing To Reduce Accidents." In this paper, he described a very thorough and carefully thought out program. I will be covering much the same ground in a different way.

In 1953, the Hawaiian industry applied the concept of industry cooperation to the field of safety. This concept had already been applied to the job of negotiating our labor agreements with the union. The form given to the concept was the Industry Safety Committee. The name given to the committee was the Safety Sub-Committee of the Stevedoring Industry Negotiating Committee. The program of the committee was to first agree on those features of a total safety effort that all companies could adopt, and then to propound recommendations on other safety matters which the companies would be free to adopt or not to adopt.

The agreed upon parts of the program were:

1. That the managers of the companies give it their wholehearted backing and support
2. That the primary responsibility for safety remain with the operating supervisors
3. That each company adopt a written safety policy
4. That each company join the National Safety Council
5. That each company comply with a uniform method of compiling injury and accident statistics and reporting these on an industry basis

The so-called voluntary part of the program included such subjects as methods of providing personal protective equipment, the kind of safety training that would be done, whether or not a standard recommended safety code would be adopted, policies on pre-employment physical examinations, and administration of first-aid programs.

An important part of the program was the staff help that was made available to the operating people. The staff people provided much of the initiative and follow-up that made the action program of the operating man complete. Staff people, because of the nature of their work were accustomed to finding out about each other's programs and policies so their help made the whole program easier to administer.

The most significant follow-up device used was the Annual Industry Report. This grew out of the requirement that the companies comply with the standard accident reporting procedure. The first annual report combined the results of three years of experience by going back and picking up 1951 and 1952 and reporting these years along with 1953, the first year of the program. A rather complete and technical annual report was published for each year through 1959. Since 1959, the cause analysis statistics part of the report has been dropped; and the accident statistics have been reported annually in a simplified two-sheet summary.

The annual report was a crowning success as a management audit technique. The first full year of experience that could be compared with the base period average was that of 1954. The 1954 report showed a frequency rate of 42 as compared to the three year average of 70. This was an improvement rate of 40 per cent. The severity rate and the average time charge figure showed an equally good improvement. The obvious conclusion was that the agreed-upon program and the spark provided by the industry approach had accomplished the desired result.

The audit convinced management that its course of action was wise and productive of good results. The industry settled down confident that it had the tools, the skill, and the knowledge to run a successful safety and accident prevention program, and that progress would result in the future from persistently applying the proven techniques of the program.

Progress, however, was not easy. In the next six years frequencies improved and varied from a low of 33 to a high of 39 or an average for the period of 36; this was a 49 per cent improvement over the base period figure. Since 1960, however, the average frequency rate has climbed to 48 and this is only 22 per cent lower than the base period frequency. To illustrate how elusive progress is, in 1964 the industry experienced 117 disabling injuries which is the lowest number ever recorded in its history. This compares with a base period average of 257. But the man-hours were also the lowest on record in '64, and the best we can say for the resulting frequency rate is that it is the 8th best recorded in the last 14 years. It is appropriate to ask here then, what has happened since 1960 to cause this worsening of the industry record? What has happened to stevedoring safety in Hawaii in the last four or five years? One of the more drastic changes was the great reduction in exposure hours brought on by technological change. This had to be done without offsetting safety improvements in the operations not affected by change.

One of the first great technological innovations was the Matson container program. On September 22, 1958, Matson inaugurated its West Coast-Hawaiian Islands Container Service. Containers were carried on the deck of the Matson C-3 Hawaiian Merchant. The containers were discharged to flat cars by a shore based whirly-type-gantry-crane and transported to the rail terminal where "break bulk" containers were sorted to the container freight station, and the "store-door" containers were sorted to trailers for pick-up by consignees' tractors.

Each container load of cargo, henceforth, discharged in Honolulu saved a substantial number of longshore manhours so that exposure hours were considerably reduced. The break-bulk operations were performed by non-longshore labor away from the dock areas, so even when there was cargo handling work to be performed in conjunction with a container movement, it was not performed by the longshoreman; once the container moved out of his jurisdiction, it was gone and there was no further work for him until it was to be loaded back aboard the ship. If there was cargo in the container at this point, the longshoreman did not put it there.

On May 24, 1960, the full container ship, the converted Matson C-3, the Hawaiian Citizen put into Honolulu on her maiden voyage from the West Coast. All the standing and running gear had been stripped from the Citizen. She had a capacity of 436 containers. She was discharged by a combination of the whirly crane previously mentioned and a specially designed type of gantry with a cycle of one container every two minutes. The containers were off-loaded to trailers or to the ground. If trailers were used, yard hustlers did the hauling. If the containers were grounded, straddle trucks were used to transport the container. These are similar in design to the straddle trucks used in lumber operations; however, they lift from the top and can double deck an 8′ x 8½′ x 24′ container.

On September 19, 1965, the Hawaiian Monarch, an Argosy Class vessel, replaced the Hawaiian Citizen as the carrier for the heavy volume container trade. The Monarch on its maiden voyage carried 650 containers westbound and 192 automobiles. Homebound she carried 589 containers, and 2500 tons of molasses.

The Monarch and the Hawaiian Queen, the second Argosy Class vessel which will sail on her maiden run in December of this year, cost Matson 17 million dollars. This investment is paid for by greater freight carrying capacity per voyage, additional voyages in a given period of time due to faster turn-around time, and by a greatly reduced requirement for longshore manhours.

The reduced requirement for longshore manhours, from a safety point of view, results in such a great reduction in overall *industry exposure hours* that a creditable frequency rate maintained on some consistent basis has become difficult to achieve. In the face of such a far reaching technological change in the industry, it becomes apparent that the gross improvements of the past may no longer be good enough to do the job.

The industry program needs to include the complete refining of the operating procedures used in the conventional operation to make sure that the safety elements of each cargo handling job and of each related cargo handling activity are completely prescribed. To the extent that it is practical, we should take our cue from the container and other specialized operations. These operations have been highly rationalized, and a great deal of capital has been expended to insure safe operations.

For example, the Hawaiian Monarch is designed to carry 192 "live automobiles" on eight decks located in hold No. 1. We encounter in such an operation the possibility of gas spills and the certainty of carbon monoxide emission along with the emission of exhaust fumes. Accordingly, we find that hold No. 1 is provided with five ventilation supply systems and utilizes a natural exhaust system. Four of the mechanical supply systems are designated as "At Sea" systems and are to be in operation at all times when there are any automobiles in hold No. 1, both at sea and in port. While at sea, the system is basically used to evaporate any gas spills, delivering about one CFM (cubic feet per minute) per square foot of deck area; in port, it assists in expelling automobile exhaust fumes.

The "In Port" system consists of a single 15,000 CFM blower located on the upper deck. It is to be in operation at all times when automobiles are being loaded or discharged and is principally used to expell auto exhaust fumes. The ducting is arranged to serve every automobile deck in hold No. 1 from the tank top to "A" deck. But it is intended that only one deck, the one currently being worked, shall be served at any given time. The selection of the deck to be served is by manually operated dampers in the supply trunk at the diffuser. Dampers at other than the working level shall be closed causing the entire capacity of the system to be supplied at the working level.

Both the "At Sea" and "In Port" systems are provided with a bridge alarm to indicate stoppage of the ventilation fans. Controllers and push buttons are wired for local manual start-stop, remote shutdown from the bridge and automatic shutdown by discharge of the CO_2 system for Hold No. 1. In addition to this efficient blower system, provision has been made for fire protection, ease of access, and fool-proof operation of the automobile hoisting mechanism.

As a fire control measure, all levels in hold No. 1 are provided with a smoke detection system which sounds an alarm on the bridge and a CO_2 fire extinguishing system. The CO_2 system for the auto hold is operated manually from the bridge or the CO_2 control station (located in the port side passageway on the 1st Deck just aft bulkhead 64). When CO_2 is discharged into the automobile spaces an alarm is sounded throughout the hold. All ship's personnel and longshoremen are instructed to leave hold No. 1 immediately upon hearing this alarm.

For safe access to all decks in hold No. 1, fully enclosed inclined ladders are provided. These are located at the ship's centerline against the aftermost bulkhead of each level. Entrance to the stairwell is provided at the Upper Deck, centerline, (the after end of the forward house). Self-closing doors lead to each automobile deck. This stairwell does not provide access to the crew quarters or any other non-automobile compartments.

The system provided for hoisting the autos in and out of the ship has been engineered for fool-proof operation and for maximum safety. The equipment is installed for operation through a side-port on A deck. It is essentially a bridge crane with a telescoping trolley arrangement. The operator being positioned in a cab which travels with the trolley, rides out over the side of the ship and back in over the hatchway. The cab is completely enclosed and is glassed in on three sides with jealousie type windows. These give protection from wind and rain as required and the operators' side-vision potential is as much as 240°. His vision down on the apron is complete, but into the hatch he can see only the hatchway area and the automobile ready for hoisting. By each deck opening, however, there is a microphone installed which the holdmen use to tell the winch driver to "hoist away."

The hatchway is similar in design to an elevator shaft. Four heavy duty tracks are installed, two on each side of the hatchway. These control the precision positioning of the automobile lifting cage. At the point where the cage first enters the hatchway, heavy duty "V" guides are installed on the hatchway at the top of each track to guide the cage into the track. The winchdriver achieves complete control by means of a single "joy-stick" lever. Fine adjustment and control of the movements of the cage are accomplished by automatic controls. The horizontal movement cannot take place until the lifting cage is "two-blocked" with the trolley.

Going outboard, the trolley automatically slows down when it approaches the outer limit of movement, and it must be fully extended before the carrier can be lowered. Coming inboard over the hatchway, the horizontal movement is automatically stopped. If the track positioners for the cage frame are missed, however, a by-pass control is provided for a fine adjustment. Once on the way down into the hatch, the lifting carrier is controlled by a pre-set deck selector switch. The switch has to be activated to get down to the next deck as each deckload of cars is discharged, and once it's set it stops the carrier frame automatically at the deck being worked. Also, the vertical motion downwards in the hatchway is slowed down a deck ahead of the one being worked.

On the vertical upward motion, the carrier frame is automatically slowed down just before "two-blocking." As each deck is passed on the way up a warning bell rings. A microphone is provided on each deck for the holdmen-winchdriver communication. There is also installed an emergency stop switch that can be used to stop the whole operation.

On the outboard upward movement, we find the same automatic slowdown of the carrier frame as it "two-blocks." Finally, there is mounted on the trolley frame, a depth gauge that is clearly visible to the winchdriver. This can be helpful in judging the point at which the downward movement of the auto cage over the side of the ship should be slowed. It also shows him that he has reached the deck level in the ship where the work is being performed.

Certain safety features have been installed for the handling of containers. On the

Monarch, the below-deck containers are stowed in cells and are interlocked vertically. The on-deck containers are interlocked vertically, and in addition are lashed down and the top tier is bridged horizontally. For the purpose of providing access to on-deck containers for unlashing and lashing work, ramps are fitted onto the ship that load from the upper decks of the forward house. These are of lightweight tubular construction and are raised and lowered by means of a hand-operated winch. A lightweight aluminum bridge similar in design to a dock plate is used to bridge the successive rows of containers. This is carried by the longshoremen. The longshoreman who is called upon to get on top of the containers to perform the unlashing and lashing work finds the hazards in the climbing part of his job minimized by the availability of such devices.

In the actual lashing and unlashing work, some men are assigned on deck and some on the containers. Safety shoes and hard hats are required. Workers on top of the containers require a safety belt. All containers are fitted with rings into which the line is attached to the belt can be secured. The container unloading and loading sequences are then carried out in a way that enables the men to easily coordinate their movements with the movements of the containers.

From this discussion of the safety features built into the Hawaiian Monarch design and its operations, you can readily see that the Steamship Company wants to make operations on this new vessel as safe as possible for the longshoreman. These new operations, especially those involving the containers, introduce a good many new and different tasks with their new and different hazards. These operations, however, can be rendered almost fool-proof and accident proof if the personnel is properly trained. There are far fewer men involved, so the problem of coordination is greatly simplified. The range of tasks to be performed is extremely limited when compared to the requirements of the conventional stevedoring operation. Since the degree of skill required to operate the intricate container cranes is great, only a chosen few qualify to do this work. The gear required to perform the operations is minimal. The movement of containers from ship to shore and back again is repetitive. The pace of work is rhythmical. All of these factors cause us to believe that after these operations have been with us for a time and they have been perfected, we can be reasonably sure that they will be accident free.

In addition to the rather dramatic change represented by the container operation, other changes have taken place that are also quite substantial.

Shift to Bulk Cargo—Fertilizer to the islands used to move in full bulk loads supplemented by steady imports of sacked fertilizer. Now small bulk lots of fertilizer come in and the bags have almost disappeared. With the shift to containers, more berth line compartments are available for bulk, and the addition of barge service to the islands has provided more space also. In April of 1959, a 10 silo bulk grain facility was built in the port of Honolulu, and in 1964, a flour mill was built at the same berth, and the number of silos increased. Now practically all feed and flour moves either by container or in bulk. Hence, except for foreign bagged fertilizer and the copra meal coming from the orient, the bagged cargoes have almost disappeared. Although bagged cargoes have produced more than their share of strains and sprains, they have also provided the stevedores with a great many exposure hours when the loads of sacks were built in the ship and sorted on the dock.

Shift to Unitized and Container Pineapple—The pineapple canners have been fighting hard for the past several years to lower their costs of distribution. They have as a result adopted the container and the unit load as primary methods of shipping. The container we have already talked about; the unit load has not yet been discussed. It goes without saying, the unit load eliminates hand handling. Loading units is primarily a high lift operation. A 5000 pound machine is used in the hatch to put the units into stow, and the holdmen simply land the loads and disengage the slings or the lifting bridle. Here again, longshore manhours per ton of canned pineapple stevedored have been greatly reduced.

Loading Scrap—In a small area such as is Hawaii, not much scrap cargo can be generated. Hence, the full ship gang was used for the operation of loading loose prepared scrap and, when the trimming was done, it was done by hand. This avoided acquiring high cost equipment for which there would be little use. The full-gang scrap operation used to result in quite a few manhours of work for the McCabe longshoremen. Now, we very rarely work a scrap ship. Two things have happened to produce this change.

First, we had to change the method to one using shoreside cranes and scrap chutes. Then, Hawaiian Western Steel built a mill at Barber's Point that requires 100 tons of scrap a day, so instead of the scrap being shipped to Japan, it is marketed locally. The old operation using full ship gangs would require at least 15 men per hatch. In the new operation, with tub dumping using either ship's gear or a shoreside crane, seven men are used. With crane and magnet dumping, the manning is reduced to two men. When the chutes are used, five men are added for each of two chutes. Here again, a good number of manhours of exposure have been lost. We have mixed feelings about this fact, because the scrap operations produced a disproportionate share of disabling injuries.

Changes in Ship Design—Since 1960, many improvements have been made in the design of vessels of berth line operators serving Hawaii. When a ship is equipped with topping lift and vang winches and twenty-ton booms at five of the six hatches and automatic hatch covers throughout the vessel, opening and closing and rigging time practically disappears. These operations in the conventional stevedoring operation rarely produce a disabling injury, so all the manhours of exposure that have been lost here were practically accident-free.

All this talk about loss of exposure hours sounds like a safety man's lament. The argument I've been advancing, however, is that the ability of the industry to control the hazards has not been impaired in an absolute sense, even though its performance in the last five years has worsened in a relative sense. Since 1960 the significant reduction in exposure hours has resulted in greater additions to the frequency rate with each disabling injury.

Technical Sub-Committee—In addition to the changes in the way stevedoring is carried on in the Islands, a very basic change in the way safety is administered took place in our industry. On March 21, 1960, the Secretary of Labor of the United States issued a set of Safety and Health Regulations for Longshoring. These were assigned to the Safety Division of the Bureau of Labor Standards for administration and enforcement. Longshore safety had become a matter of law. On September 16, 1960, the Hawaiian Industry added a Technical Sub-Committee to its Industry Safety Committee. The Sub-Committee was assigned these tasks:

1. Make quarterly inspections of all operations
2. Recommend corrective action to all companies based on the findings of the inspections
3. Make available technical material to assist safety training and education
4. Maintain records
5. Advise the Pacific Area Supervisor of the Bureau of Labor Standards of the results of the inspections

In addition to these basic duties, the Sub-Committee has evaluated the amendments to the regulations that have been issued from time to time and has presented the industry's views on the American Standards Association MH-Project, which was organized to formulate a standard code covering dock safety. Also, one of the Sub-Committee members has come back to Chicago every year to attend the annual meeting of the Maritime Advisory Cargo Handling Safety Committee which is a National organization of maritime organizations engaged in shorewide safety activities. The Sub-Committee has done effective work. The inspection work has helped the companies conform to the Federal Safety Code. In the meantime, all the companies had devised their own methods of training their supervisory personnel to live up to the requirements of the code.

The Industry program went along on this basis until Stptember 1, 1961. At this time, the Bureau of Labor Standards extended its safety division office to Hawaii. An area Safety Consultant was put in charge and placed under the supervision of the San Francisco office. The Consultant sought the assistance and cooperation of the Industry and this was freely given. He has been included in Sub-Committee discussions on various problems. He has done training in the companies. He has done training in the ranks of the men. The companies in turn have shared information about the activities of the safety consultant's office so as to be in a better position to satisfy the requirements of this office.

In the meantime, the companies got acquainted with the "citation." Each company that is issued a citation sends a copy to the chairman of the Technical Sub-Committee, and he in turn makes copies for everyone and distributes them with whatever comments he feels are appropriate. In this way, all concerned can more readily learn the relationship of the code to stevedoring in Hawaii, not only in terms of the problems that are encountered, but also in terms of the way the code is applied by the authorities to these problems. By far the major activity in all the companies now and for the past few years is getting around to all the operations on a daily basis to make sure that the Federal Safety Code provisions are complied with.

Individual Company Safety Activity—In addition to these *daily inspections,* the companies carry on a variety of safety activities. Some of the companies use *worker safety committees.* When they are used, the main objective is really twofold; to get the ideas of the men, to get them involved in the program, and to train them in the theory and practice of accident prevention.

Some of the companies use *incentive programs.* Kauai Consolidated Terminals, which has not had a disabling injury since August of 1963, gives each man a $10.00 credit towards a pair of safety shoes if he goes the full year without incurring a lost time injury. Hilo Transportation & Terminal Co. gives a gang boss a $25.00 war bond for each month the gang avoids a lost-time injury. McCabe, Hamilton & Renny Co. gives the superintendents a steak dinner each time a zero disabling injury month is recorded. Castle & Cooke Terminals uses a "silver dollar award" program. Each time a disabling-injury-free month is recorded, everyone in the company gets a printed certificate of award in which are inserted four Kennedy-half-dollars. (Silver dollars could not be obtained.)

Programs such as these have a sound psychological base. They signify to the employee that he is not being taken for granted. The employee knows he is expected to work safely; but a cold business-like statement of the duty doesn't have much appeal. The warm personal recognition of the incentive program appeals to him as an individual, and awakens in him an extra sense of responsibility. To not respond, is to ignore the efforts of the company to reach out to him, and an employee cannot bring himself to do this. Hence, although they have to be changed from time to time, incentive programs carried on by the companies have brought good results.

Periodically the companies repeat their first-aid training programs for supervisors. This has been found necessary to maintain qualification certificates and to focus attention on the supervisors' responsibility for the safety of the men.

Almost all the companies have invited the Labor Department's area safety consultant to help out with supervisory training. The Bureau's safety training specialists from the Washington office have been asked from time to time to put on their very excellent program on safety for supervisors. All companies participate in the National Safety Council's Marine Section Safety Contest in the general stevedoring category.

All companies make available personal protective clothing at cost and most even share the cost of the hard hat. Only one company has ever stocked safety shoes; the others have taken orders and have secured the services of a special representative to handle the safety shoe account. Extraordinary items of personal protection such as special gloves, goggles, and respirators have been issued as required.

Each company issues a written summary of safety experience each month. These are sent to the supervisory force and interested parties such as insurance company safety engineers and the safety people in the other companies.

All of these activities are evidences of a healthy safety effort being made in the industry, and in the final analysis, it is an effort that will not be denied. In the last several years, it has absorbed changes that have been inimicable to good safety performance without too great a penalty. Changes such as increasing weekly compensation benefits and granting free choice of doctor have had their individual adverse effect on the achieving of good safety performance. There have been many other changes that have been equally adverse to the general safety effort. This year, for example, in our experience through August, we have chalked up a total of 56 disabling injuries. Of this number, 25 were strains and sprains of one kind or another. This could be discouraging to our Safety Director, but he sees in such a record, a fairly high degree of hazard control. If the strains are mostly caused by the men involved, this fact speaks well for the operation. So although the comparative statistics upset us a little bit, we are convinced the substance of the industry safety approach is sound, and we intend to stick with it. It has taught us all a good lesson. It has shown us what can be done with the device of industry cooperation. We intend to strengthen the industry effort. We need to refine the technical safety job we do. We are convinced that just as soon as the technological change and the government regulation of the last five years has been completely accommodated, we will reverse the current trend and go on to achieve new industry safety records.

MANUFACTURERS' CONTRIBUTION TO STEVEDORING SAFETY

By O. S. CARLISS
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Although what I am going to say may be applied generally to all manufacturers of equipment used to handle material on the docks, in the holds of vessels, and in transfer operations, I will confine my remarks specifically to industrial trucks.

Not too many years ago materials handling in the transportation industries was limited to cranes or hoists, hand trucks, and men. The size of the load determined the number of men required. Accidents were frequent and often severe if not disabling. Records for the period preceding World War II reveal the great number of hernia cases, crushed fingers and toes, and cuts and abrasions that were treated. A great deal of this has changed.

The war years quickly taught us that there wasn't enough time to handle the staggering amounts of material that had to be shipped overseas, by manpower alone. There just weren't enough men. Some new method for handling material had to be found.

The U. S. Navy conducted studies to reduce "turn around time" and to release as many men as possible for other duties. The National Academy of Sciences made a careful survey of the Occupational Hazards in the Stevedore Industry.

The answer, which has carried over to the whole shipping industry was mechanized handling—the degree of mechanization depending upon the type of cargo being handled.

Mechanized handling, to be effective, must start when the goods are first being packed —it should not be an afterthought.

The packaging should be planned with the materials handling techniques clearly understood. When this is done goods can be handled both efficiently and safely.

All areas of interest, shippers, carriers, equipment manufacturers, organized labor, insurance companies, and government bodies have worked together to develop standards and codes to cover the handling of goods as they travel from source to destination. In all of this, the prime concern has been for safety of the men handling the loads and operating the equipment.

The manufacturers have had a vital stake in this program. Too often we hear the old cliche about companies not caring, not being interested or concerned about the people who operate our equipment. This is not true. If the workers do not like a piece of equipment and complain about using it, if the equipment doesn't take the usual abuse expected for the operation, if maintenance costs run high, or "down time" is excessive, the users won't buy the equipment. Although I believe that manufacturers are sincere in their efforts to constantly improve their products and to make them safer to operate, the economic forces of the marketplace will force the improvements whether the manufacturer wants to or not.

Over the past twenty-five years the manufacturers of industrial trucks have worked diligently to provide robust, safe, and economic materials handling equipment suitable for a wide range of application.

During the period of transition from the non-elevating platform truck to the modern fork truck, a large portion of the effort expended in design has been directed toward providing a safer product.

The first formalized Safety Code for Powered Industrial Trucks was issued in 1950, by the American Standards Association, after four years of work. This code was reviewed and reissued in 1955. It was again studied, improved, and enlarged—to be issued as ASA B56.1 in 1959. Today this is the code accepted throughout the world. It is the basic document for the safety code recently approved by the Federation Europeenne de la Manutention. It is the basis of all considerations for the work undertaken by the International Standards Organization in the same area. Now in 1965 a complete review of this code is under way to improve it and better equipment will be built in accordance with the code.

One paragraph in the introduction to this code has particular significance:

> "The use of powered industrial trucks is subject to certain hazards that cannot be overcome by purely mechanical means, but only by the exercise of intelligence, care, common sense, and adequate maintenance. Serious hazards are overloading, instability of the load, obstructions in the path of travel on left, and the use of equipment for a purpose for which it was not intended or designed."

There are many areas under the general heading of "Safety"—where the manufacturer must play an important part in the development of safe equipment and safe methods of materials handling.

First, is the design and construction of the equipment. Safety must be designed and then built into a piece of equipment. It cannot be added as an afterthought or an appendage.

Early in his design—the manufacturer must consider the operator. This comes under the heading of "Human Engineering" where the designer is concerned with the physical dimensions of the operator area, the placement of controls, and the protection of the operator.

Protection of the operator by means of an overhead guard is important, and such a guard should be used at all times. A great deal of study has gone into establishing tests for overhead guards. Today, the specifications of a suitable guard can be found in ASA B56.1. I cannot urge too strongly the use of overhead guards, especially where loads are piled or stacked higher than the operator when he is on the truck, or higher than personnel who must work in that area.

Our experience has been that the design, manufacture, and testing of overhead guards should be left to the manufacturer. He is the one who best knows how to mount the guards on his truck, and how to obtain the requisite strength without interfering with visibility.

The stability of a truck under operating conditions is essential for safety. It was the manufacturers who made the studies, analyzed the results and finally proposed the four basic stability tests outlined in B56.1. The four static tests were developed to provide a true indication of the dynamic effects of operation on the stability of the truck, both empty and loaded. The final test values were chosen only after a careful study had been made of thousands of trucks actually in operation in various materials handling operations.

Today these tests have world-wide acceptance. The test values established are intended for normal truck operation on smooth floors with vertical stacks. Where the operating conditions are abnormal, it may be necessary to deviate from the established values, but the four tests remain valid as a means of determining the operating characteristics of the truck.

Adherence to these test values by the manufacturer does not guarantee that the truck cannot be turned over, but it does mean that when properly operated, the truck will remain stable.

Brakes on an industrial truck are also important. Yet too severe braking of a loaded truck might result in spilling the load with equally disastrous results. The manufacturers conducted many tests before braking specifications could be developed. The final values, as shown in B56.1, are the direct result of those studies. One important point to be remembered is that braking is a driver-controlled function. The brakes on a vehicle must be adequate to stop it and hold it on the maximum grade encountered in operation. On a fork lift truck with a load and mast elevated, the driver must exercise great care in applying his brakes. Most important, he should be moving at a very low speed any time he has the load elevated, and should only move to stack or unstack the load. All travel should be done with the load in a lowered position. With all this, the final success of the operation will depend upon driver skill—not unlike driving a car on a slippery road.

There is available on some trucks, a speed limiting device which prevents the truck from attaining normal travel speeds when the load is elevated. The manufacturers have provided one solution to the problem, but I have found instances where the operators have made such devices inoperative. This we cannot control.

It is simple to say, "Do not overload the vehicle." It is an entirely different problem to make such a rule workable, especially since the weight of a pallet load or container or shipping crate is not known, and the markings are not readily seen by the truck operator. Here again, some manufacturers are offering sealed hydraulic relief valves. These relief valves in the hydraulic lifting circuit cannot be expected to precisely limit the load carrying ability of the truck, especially when the "load center" has equal effect to actual weight on overturning the truck.

A sealed valve cannot be adjusted without breaking the seal. It can prevent the lifting of dangerously over capacity weight loads. This is certainly a step in the right direction, but not a cure-all.

One problem area, fuel handling, has recently received attention. The most common industrial truck used in stevedoring operations is gasoline powered. Thru the combined efforts of the United States Coast Guard, the operators and the manufacturers, a non-spill fuel handling system has been devoloped which should permit safe refueling of the trucks and other gasoline engine powered equipment. This device is still very new, and all of us are having some difficulties in installing it, especially on existing trucks. But it is available, and it does work.

The fire hazard from improper or careless refueling cannot be minimized. Due to the structural design of piers, wharves, and especially ships, a relatively small fire constitutes a tremendous danger to personnel in the vicinity. The use of diesel fuel tends to reduce this fire hazard, but I still would recommend using the non-spill system.

All internal combustion engines produce carbon monoxide; some types, such as gasoline powered, more than diesel and propane. This problem has received a great deal of attention from the manufacturers. The real solution to the carbon monoxide problem is still adequate ventilation. If enough fresh air is blown into the hold of a vessel where a truck is operating, in all probability, the carbon monoxide content will be kept down to an acceptable level, below 100 parts per million.

One device which will substantially reduce the emission of carbon monoxide is the Oxy-Catalytic muffler. There are some important points to remember about these devices. First, they must be carefully maintained and periodically checked. Second, leaded gas tends to poison the catalyst and may reduce the effectiveness of the unit. Third, they must run hot to burn the carbon monoxide. Fourth, they are bulky and susceptible to damage. Fifth, the overall effectiveness of such a unit will depend upon how well the engine is maintained.

Four or five years ago we ran a series of tests using an oxy-catalytic muffler. These tests were conducted in a sealed room where we could duplicate conditions of operation and continuously measure the CO content of the atmosphere. We found with a properly adjusted carburetor and reasonably well maintained engine, the oxy-catalytic muffler eliminated CO. But we also found with a poorly adjusted carburetor, running rich, (as carburetors tend to do as they go out of adjustment) the muffler could not handle the added load. The result was a higher CO content than we had when operating a well adjusted engine with the oxy-catalytic muffler disconnected. The real danger is that CO is not detected by the operator or others in the vicinity, and the operator really has nothing but the heat indicator on the muffler to tell him it is working. Nothing tells him if all the CO is being burned to CO_2, if it is all burned to CO_2, or whether the CO_2 content is within allowable limits. So ventilation is necessary with or without the muffler.

Alternatively, the engine can be adjusted so that it is not producing any CO. But when this is done, you will probably find it is running so lean that it doesn't have any power, and still you should ventilate to remove the CO_2.

Due to the unique construction of both vessels and piers, there must always be a great concern over fires. Realizing this, the United States Coast Guard has provided for the use of certain types of internal combustion engine powered trucks depending upon the cargo being handled. Basically there are two types of truck, the G, D, LP and the GS, DS, LPS. the "S" models have certain additional safeguards, primarily, to prevent the emission of sparks or hot carbon particles or flame in the event of a backfire. Generally, this model should be used where combustible materials are being handled. For specific details check the Underwriters' Laboratories bulletins and the Code of Federal Regulations. This is another area where thru study, design, and collaboration with the certifying organizations to establish proper test procedures, the manufacturers have worked to provide safer equipment.

So far, I have been discussing the design and construction of internal combustion engine powered trucks. There are also electric powered trucks. Prior to World War II, battery operated platform trucks and small dock cranes were quite popular. The main disadvantages were weight of the trucks and battery, low speed, and the need for charging equipment. There have been many changes over the last five years. One of the most significant change is the use of solid state electronic control. In this way, the manufacturer has been able to supply a truck having performance characteristics about equal to a gasoline powered truck. These new controls eliminate the large banks of resistors commonly used on older design electric trucks. The result has been more power available to do work, and a reduced fire hazard due to the elimination of the resistors.

The battery manufacturers have been busy too. Over the last ten years, they have practically doubled the capacity of the battery of any given size. This has contributed to some reduction in overall truck weight. Battery charging equipment is now usually of the rectifier type with no moving parts and much simplified controls. All these improvements enhance the usefulness and safety of electric trucks for stevedoring operations.

The Industrial Truck Association is a trade association of industrial truck manufacturers with headquarters in Pittsburgh. The major activity of this association is its engineering committee. The prime considerations of the engineering committee are safety and standardization of those elements affecting truck operation. The engineering committee has worked diligently with the ASA, ASME, government agencies and other bodies, developing appropriate codes and standards for safer equipment and safer operation of that equipment. The ITA also maintains communication with the Federation Europeene de la Manutention (European Materials Handling Federation) and cooperates with European manufacturers and users in developing adequate recommendations covering both design and operation. Also, the ITA is represented on ASA Sectional Committees MH9, Longshoring Safety on the Docks MH11, Power or Hand Operated Trucks (ASA Sectional Committee MH11 represents the United States on International Standards Organization Technical Committee 110—Power or Hand Operated Handling Trucks), and B56, Sectional Committee on Safety Code for Powered Industrial Trucks. In addition to the actual design and construction of the truck, the manufacturers have worked thru the Industrial Truck Association to develop maintenance instructions as embodied in Section 9 of ASA B56.1.

The individual manufacturers also provide service manuals to guide the maintenance and repair of their products. All the improved design work is of little value unless the equipment is maintained in good working order.

Section 8 of ASA B56.1 covers specific safety rules and regulations. These rules were developed jointly by the many interests represented on an ASA committee. Here again, the individual manufacturers have material available for driver instruction. It is valuable information if the drivers read it over and over again; it does little good resting in someone's desk drawer.

To assist in properly training drivers in the safe operation of their equipment, various manufacturers offer Driver Training Programs. Such programs are prepared to assist users in developing driver training programs which can be slanted to their particular needs. A properly trained driver will be capable of moving more material per shift and of moving it safely. In the long run he becomes an asset not a casualty.

In spite of the strides which have been made in the post-war years, the accident rate is still very high. The latest available reports reveal some interesting data. Two thirds of the disabling accidents occur on shipboard, and most of these involve manual operations such as stowing, breaking out cargo, making up drafts, or breaking down drafts in the hold.

Dockside, the story is somewhat different. 17 per cent of all pier accidents are attributed to heavy vehicle traffic on the docks. Significantly, only slightly more than 2 per cent of all stevedoring accidents were the result of gear or equipment failure.

The greater use of containers, and palletized loads, due to the increased weights involved, will require more and better mechanized handling. Today, many operators have full time safety engineers studying every aspect of the problem. Because, besides the moral obligation and the normal concern for anyone who is injured in any way, there is the inescapable cost of these accidents, and ultimately these staggering costs must be passed along to the consumer.

Reports from the various agencies all make one observation—the need for worker training in safe practices. All the booklets, codes and regulations mean very little unless the individual worker knows about them, studies them, and follows the instructions. The problem centers around teaching and practicing safety under a system of casual employment. It is going to take the combined efforts of labor, management, and the equipment manufacturers to effectively reduce the accident frequency in stevedoring.

STEVEDORING SAFETY IN THE PORT OF BOSTON

By JOHN S. DENNEHY
Manager, Boston Shipping Association, Inc., Boston, Mass.

As I was sitting in my office thinking of my talk for this session, my gaze centered upon a picture on the wall of the Nuclear Ship Savannah. High in the clouds above the new ship Savannah was the old Sailing Ship Savannah, with its billowy sails, propelled by the wind. The new vessel is propelled by nuclear energy, not dependent on the vagaries of wind and weather but a self-sustaining unit.

How does our safety program on the waterfront compare? Have we modernized the approach to safety, or do we depend on the vagaries of thoughtless acts of omission and commission, which are divorced from the thorough thinking employed in adequate motivated thought—or have we gone even a step further and become dependent on legislation alone for our safety program?

The legislation which we have been living with can effectively remedy the mechanical deficiencies that have existed, such as unsafe gangways, poorly fitting hatch boards, poorly stowed cargo and the like—but it behooves me to determine how such legislation can effectively impart safety into the minds of our longshoremen.

The daily unsafe acts such as throwing stevedore gear into the ship's hold or onto the dock, failure to lock and secure pontoons, failure to keep walk and work areas free of bridles, wires and guys, and putting that extra carton on an otherwise safely built draft cannot be resolved alone by the police action of the Department of Labor.

How do we avoid these unsafe acts of omission and commission?

How do we motivate?

Must we always learn through experiences?

Must the longshoreman be hurt or maimed before he learns?

We can emphasize economies that inure to an employer with a low accident frequency and compensation rate, but the benefits to the employee are far more fruitful.

The conversion from the sailing ship to the nuclear ship took experimentation, so, too, must our approach to safety take experimentation. The present day thoughts of "will do" to the updated thinking of what we "should do" concerning safety must have a renaissance and rebirth of new progressive thought.

The embryonic thinking of safety programs with such innovations as hard hats and safety shoes of the Clipper Ship era must progress from the thoughtless thinking of the fellow employee and his acts of commission warranting such outward visible protection, to a positive frame of mind which will promulgate the safety attitude. The unmotivated action of the hatchman who has thrown a sling into a hole, or the holer who has left protruding nails in dunnage in a walkway, must someway be moved to realize the potential consequence which could result in injuries or death to a fellow employee.

In nearly all instances the Clipper Ship did make port and did discharge its cargo. Therefore, why have we interested ourselves with innovations which have perfected the power that is found in the Nuclear Ship Savannah. The answer is obvious, that there was no guarantee as to when and if the Clipper Ship would make port. Nor do we have such guarantee now that the Nuclear Ship will make port, however, we must admit that we have reduced the probabilities.

Likewise, if we can find the solution to the control of the unmotivated action of the employee, we will reduce the frequency of uninhibited disinterested action on the part of that longshoreman whose conduct may result in injuries and sometimes death.

You must know that changing times demand changing approaches. The operator that sits in his office and claims a perfected safety program providing minimum accident frequencies that is affording him a reduced compensation rate could be the very man to whom I am directing my thoughts.

In preparing my talk I read extensively the thoughts of other men of far greater talent. I have read articles concerning positive programs, industrial innovations, supervisory responsibility and attitudes of all phases. The end result was that the most enjoyable and well written treatments on the subject of safety were not necessarily the most thought-provoking. Therefore, I have reached but one conclusion and have decided to tell you what I believe has been successful in the port of Boston.

Formerly, we in the Port of Boston, prior to World War II, like many other ports, considered manpower expendable. The accepted philosophy of a dead man per mile of tunnel construction or a dead man per floor in building skyscrapers, was common knowledge. Then when the war came and absenteeism and lost time from accidents became a major concern to the employer because of the limited manpower available, he began positive programs of safety to avoid assembly line breakdowns and achieve production schedules.

We can note with pride and envy their remarkable progress through the years. We also note that they are still not satisfied and continue to make every effort along the lines of "Three-E" thinking.

By "Three-E" thinking we are referring to engineering, education and enforcement. They have engineered their operations to be as safe as possible. They have enforced regulations apropos to specific endeavors, and though splendid their educational programs have been, it is my belief that the ultimate has fallen short of fulfillment. We have in the past trained our employees and at the same time minimized educating them. In educating the employee we are broadening their knowledge and understanding, in training we are developing their skill and expertness of this knowledge and understanding.

We must now progress our safety programs to the "Three-M's" of Education—Modernization, Motivation and Manpower. By cliches and symbolisms we are not trying to impart to you gentlemen a "gray flannel suit" approach to safety. It is management's mandate to modernize its efforts and motivate the thinking of its manpower. Safety must be an integral part of the man-and-machine combination. It has been done with the machine using various methods. Now we must modernize the "thinking" of our manpower, if we are to realize true progress.

The legislation has provided, by compulsion, a safe place for the longshoreman to work with its regulation on the employer. A further burden has now been thrust on that same employer—the obligation to overcome stoic thinking on the part of the longshoreman, to instill a frame of mind that will motivate a safety consciousness at all times. We, in our area, have progressed to controlling the overt acts of *commission* that are obviously unsafe. Our next endeavor has been to indoctrinate the employee to positive thinking, to remedy his acts of *omission* and, therefore, to act for himself by remedying the negation of inaction of thoughtless conduct where results had demanded motivating action.

It is my belief, though doggedly the progress has been at times, that we have indoctrinated our employee "not to throw that sling into the hold of the ship." We must now endeavor to have positive thought of "putting the sling onto the cargo hook" and lowering it into the hold.

Our supervisors must also be updated. No longer can we allow production alone to be his only motivation. He must realize that his duty encompasses the safe working philosophy concurrent with production. It must be an integral part of his production effort. He must be further educated so that he can train his employee in safe work habits without the legislative enforcement of the Department of Labor and the accompanying monetary penalties which it provides.

To this end, in Boston in early August of this year, with the cooperation of the Department of Labor, expert instruction was provided to educate our supervisory help in the value, coincidental with production, of a sound safety philosophy. This was a further attempt on the part of management to plant the seeds of positive thinking and cultivate the fruits of safe work habits in the labor force.

Through the expert instructions provided by the Department of Labor, Bureau of Labor Standards, a symposium of safety was held to motivate and modernize the attitude of the supervisory personnel we have alluded to.

In finalizing our steps toward modernizing the thinking in our supervisory personnel, we attempted to answer the following questions.

Do our supervisors realize the responsibility that safety must be considered a thread in the textile of the operation, and that like the whole cloth, if a thread of that cloth is broken or omitted, we jeopardize and threaten our entire operation?

Do our supervisors realize the importance of accident investigation and have they ever been educated concerning the American Standard Method of recording and measuring work injury experience and why it was developed? We know it was developed to use as a yardstick and measure of their own progress comparing safety. Do they? Maybe a little pride would be helpful in motivational activities.

A prompt and thorough investigation of any accident will provide a two-fold obvious benefit. It will minimize fraudulent claims and more important, it will affort, in many instances, the opportunity to remedy a situation that could have occasioned the incident.

Do our supervisors realize that safety starts with their leadership? When accidents are investigated and corrective action is taken, it shows their concern to find the cause and remedy it. The success of their leadership can be reflected in the safe working attitude in the men for whom they are responsible. This is management's visible evidence of a positive attitude toward the men's safety and welfare.

Setting an example is concrete evidence of a sincere philosophy. How many of your supervisors wear safety shoes for example? Do your supervisors realize the benefits that are derived from good housekeeping practices? . . . the differences between a trip and a fall or a major and minor injury?

You know the minimal efforts to make a clean, clear, safe place to work are so economically worthwhile. Do they? Have they been made aware that they pay the price for every accident, even to the stamp that is needed to mail the accident report—not the insurance company?

These are but a few of the many questions that were answered by this course of instruction to our supervisory personnel. It is our conclusion that with this knowledge our supervisors are better qualified to train their subordinates.

Furthermore, do not act like the grocer that made a practice of putting eggs in the bottom of the bag of groceries to be certain that they would not effect the other groceries when they broke. Move your safety program and planning from the bottom of the order of sound business practices, and you will realize that the time spent will not dampen your production nor rupture the receptacle containing your economic success.

I would like to leave you with this thought —especially those who have the obligation to promote safety:

It is sound business practice to delegate your *authority* to subordinates, however, you are the *masters* of the vessels of Sound Safety Programs and therefore, you *can not delegate responsibility.*

RADIO AND VESSEL SAFETY

By R. B. McCULLOCH
Port Captain, The Ohio River Co., Huntington, W. Va.

Radio or wireless, as it was first called to distinguish between the wire-linked telegraph system and the wireless system of Marconi and others, came into being around the turn of the century. Although Marconi transmitted the first trans-Atlantic wireless signal on December 13, 1901, it wasn't until January 3, 1906, that the first practical two-way wireless code transmission was made possible by Professor Reginald Aubrey Fessenden's invention. Fessenden also transmitted the first wireless telephone message Christmas Eve 1906. The trials and tribulations of the early inventors and business people, their court battles, and so forth, would fill a book. Out of it emerged a few strong communication companies and the Radio Corp. of America, a patent holding corp. that served as a clearing house for the parts manufacturers.

The most important use of wireless in the early days, and still of paramount importance, is ship reporting. The multitude of communication companies and the lack of co-operation between the communication companies made this a hopeless task. The chit-chat between the ship operators added to the confusion also.

In 1910 the Congress of the United States enacted a law requiring all passenger ships leaving United States ports and carrying fifty or more persons and plying between ports 200 miles or more apart, to be equipped with radio apparatus capable of transmitting and receiving messages over distances of at least 100 miles. This was amended by the Communication Act of 1912 to give Congress more power over wireless or radio communications. Also in 1912, the leading maritime nations held an international convention to formulate regulations concerning the installation of radio apparatus aboard ship. The sinking of the steamer Titanic, April 15, 1912, with the loss of 1,500 lives, provided added impetus toward establishing standards that would provide greater safety at sea. The 700 lives saved by the steamer Carpathia would have been lost if the operator on the Carpathia had not been listening in past his usual time to go off watch.

The safety aspect of radio, as it applies to ships, was carried forward by international and domestic law to the present time, where all United States passenger ships and cargo ships of 500 tons or more making international voyages are subject to the International Safety of Life at Sea Convention and the Communications Act, which requires all cargo vessels of 500 tons or more and all passenger vessels navigating in the open seas to carry radio. Cargo vessels of less than 1600 tons may use radio telephone in place of radio telegraph.

Practically every country in the world operates coastal radio telegraph stations. These may be government or commercial stations. Almost all of them transmit weather reports to the ships at sea and all will assist in the handling of distress, safety, or urgency traffic. The frequency 500 KC has been set aside for distress use only. All coast stations and ships observe a silent period twice hourly to better hear a distress signal.

In addition to the radio telegraph and telephone stations that serve ships at sea, radio direction finder beacons are world wide. By the use of special receivers, the ship can home-in on several beacons and plot its position. Since World War II, the use of LORAN or long range navigation has come into use by ships and aircraft. Synchronously emitted short pulses of radio frequency are transmitted by the shore stations and received by the ship or aircraft. The relative time of arrival of the pulses is measured by the LORAN equipment. From special charts or tables prepared for the pair of LORAN stations involved, the line of position of the ship or aircraft is determined. Similar observations made on a second pair of LORAN stations yields a second line of position. The intersection of the two lines establishes the fix.

Weather information from stations ashore and ships at sea is plotted by the maritime countries and broadcast to the ships on special equipment that produces a facsimile map of the high and low pressure areas to be found almost all over the world.

The U. S. Coast Guard operates on both coasts of the United States a system called AMVER, meaning automated merchant vessel reporting. Practically every ship at sea participates in this. Their daily position, course and speed is put into an electronic brain. When a distress call is received, the electronic brain reveals the nearest ship. This saves precious time in case of distress. The nearest ship is advised of the situation and others are relieved of the burden of speeding to the scene of distress.

RADAR, developed during World War II, has been a great safety boon to all shipping, especially those ships or towboats that operate in close waters. The success of RADAR depends on the knowledge and ability of the master, or pilot, or navigating officer to recognize and understand the picture presented by the RADAR scope. At sea the positions of ships on the RADAR scope is plotted to determine course and speed. On the rivers there is not time to plot and the navigator depends on bridge to bridge radio for this information.

Oddly enough, with all the complex electronic gear aboard ocean liners and cargo ships, they lack a direct bridge to bridge radio that would establish instant communication between two or more ships approaching one another in the fog. There is a move afoot in the United States to establish a single-channel VHF radio for navigation use only. The captive effect of high frequency VHF-FM lends itself very well to this type of communication. If three ships were in an area, the two closest together would be able to override the signal from the third ship farther away. Since you are more concerned with the ship near-by, this would make an ideal navigation radio.

The maritime radio telephone system in use on the Great Lakes was developed through the co-ordinated efforts of the United States and Canadian shipping interests shore station operating companies and the government agencies of both countries. It serves the vessels of both nations through an integrated system. Any vessel can contact any shore station or be contacted by any shore station at any time.

An "agreement between the United States and Canada for promotion of safety on the Great Lakes by means of radio" requires that all vessels of 500 tons or more, together with certain other smaller vessels, be equipped for and use radio telephone for safety purposes while navigating the Great Lakes. This agreement establishes 2182 KC as the safety, distress, and calling channel and requires that all compulsorily equipped vessels be equipped for monitoring and operating on 2182 KC and for inter-communication on the ship to ship channel of 2003 KC.

The present integrated safety, navigational, commercial ship-to-ship and ship-to-shore radio system utilizing 2182 KC as a common meeting ground is the result of studies made in 1937 by all concerned. This program also brought into the system about 80 Coast Guard stations, all of which monitor the safety and distress channel 2182 KC. The Great Lakes system has been very successful.

Radio on the western rivers or Mississippi river system is not compulsory and just grew like "Topsy." In general, the system follows the Great Lakes pattern with 2182 KC being the safety, distress, and calling channel. Due to the long-range characteristics of 2 MC radio, the one channel for boat-to-boat operation is very overloaded. The use of VHF will relieve this condition.

Although not compulsory, the use of radio on the western rivers system has been a major factor in safe operation on the narrow waterways, especially during fog and RADAR operation. Practically every towboat and many yachts are equipped with two-way radio. I am very familiar with the use of radio on the rivers and could spend a good deal of time recounting messages inquiring about various ailments such as sunburn, snakebite, mouth-to-mouth artificial respiration, and how to make time with the red headed girl that lives around the next bend.

Seriously, radio has been a great help to the river pilot. Information about sunken barges in the channel and so forth are quickly relayed from one end of the river to the other. Pilots that have been on other runs are quickly posted when they start down a river that may have changed completely in some places since their last trip. The pleasure boater making his first trip on the Mississippi river is quickly appraised of the hazards he will encounter during his day's run.

The spirit of co-operation and helpfulness is widespread. The unlucky pilot that has run aground soon hears inquiries from passing towboats wanting to know what they can do to help. Radio is indeed the greatest aid to safe navigation the river pilot has.

Although not compelled by law to do so, the U. S. Coast Guard has long recognized the importance of keeping watch on the distress frequencies. Coast Guard stations and vessels along the coastal waters constantly monitor the high seas radio telegraph frequency, the radio telephone distress frequency plus the military and airways distress frequencies. It is not hard to understand the difficult job of monitoring so many distress frequencies. However, due to this constant surveillance and the efficiency of their AMVER system, many lives have been saved.

Few people realize the importance of the Federal Communications Commission created in 1934. This dedicated and foresighted group of commissioners and their assistants have allocated space and worked with other nations to reserve space for present and future safety radio systems. This has taken a good deal of tact, understanding and hard work preparing papers that would stand up against the world when presented at the international radio meetings.

In spite of the world wide use and increasing demand for radio frequency space by private and government interests, we have a workable and adequate system of safety radio communications on the high seas, the lakes, and the rivers. Technical changes and the use of VHF will alleviate the overcrowding of telephone frequencies on the coast and on the rivers. The future looks good. Safe boating starts with an adequate radio system.

THE MARINE CHEMIST—HIS DUTIES AND OBLIGATIONS

By GEORGE A. HALE
Marine Inspection Engineer

The marine chemist is often looked upon as a necessary evil and somewhat of a bottleneck by a number of the traffic managers and port engineers of the barge lines. However, the repair yards and their personnel, especially the barge cleaners, burners and welders, hold us in somewhat higher esteem.

The need for the services of a gas chemist in the marine industry appeared in about 1922 when the Standards for the Control of

Gas Hazards on Vessels to be Repaired was developed by the National Fire Protection Association. The original standards, known as NFPA No. 306, were primarily developed for application to deep water vessels. However, in the early 1930's, following several explosions and fires aboard tank barges on the rivers, the provisions of the Standards were applied to inland tank barges.

The rules for the certification of marine chemists were originally supervised by the National Fire Protection Association. In the late 1920's the certification was placed under the jurisdiction of a joint committee of the American Bureau of Shipping and the American Petroleum Institute.

In 1962, at the request of the API and with the consent of the ABS, the supervision of the marine chemist was returned to the National Fire Protection Association who also agreed to administer the certification of gas chemists and the activities of the marine industries' Gas Hazards Committee and to employ a full time staff man to service this committee and the industry in the field of gas and toxic hazards control.

This office, which the NFPA established, serves as the focal point for information and activities related to the promotion of safety in the repair of vessels which have carried petroleum and chemicals and which present a hazard from the standpoint of fire or toxicity. The establishment of this office has afforded some of the smaller shipyards on the rivers a convenient source of information on the subject of gas hazards and on the growing problem of toxic hazards. The Marine Representative of the NFPA also acts as a clearing house for information and data with respect to the activities of the marine chemists and furnishes the chemist with information on fires, explosions and other accidents of interest to the certificated chemist.

The requirements for qualification as a certificated chemist are:

1. The applicant must be at least 25 years of age and physically able to perform the duties of a marine chemist.

2. The applicant must be a citizen of the United States if the work is to be within the territorial limits of the United States.

3. The applicant shall have an adequate education in chemistry, a thorough knowledge of and familiarity with the Standards for the Control of Gas Hazards on Vessels to be Repaired and shall give evidence of a sufficient knowledge of ship construction.

4. The applicant shall have completed at least three years' experience in chemistry or chemical engineering work subsequent to the completion of the educational requirements.

5. In addition to the qualifications set forth in the preceding sections, the applicant shall have completed at least six months (including not less than 300 hours actual experience under proper supervision) in shipboard work involving the testing and inspection of tank and other vessels, in the application of the standards for the control of gas hazards on vessels to be repaired.

The specific duties of the Certified Gas Chemist are to enter a barge, or other vessel, when it is submitted for testing and by means of testing instruments, knowledge and visual inspection determine if, in the chemist's opinion and judgment, the contemplated repairs and alterations can be undertaken with safety.

The chemist shall determine that all heating coils shall have been steamed or aired and blown, that all cargo pumps, cargo lines, cargo smothering and vent lines shall have been flushed with water or blown with steam or air. He shall also determine that the gas content by volume of the atmosphere in all cargo compartments and other spaces subject to gas accumulation shall be within a permissible concentration. Further, he shall determine that the residues in all cargo compartments and other spaces shall not be capable, in his opinion, of releasing gas which will raise the concentration in any such space above a permissible limit.

Where inserting materials are used in lieu of cleaning, the chemist shall be present continuously and shall actually supervise the control of the inerting medium and the hazards from the time the inerting medium is first taken aboard until the repairs have been finished and the safe disposal or securing of the inerting medium are completed.

When the marine chemist has found, in his judgement, that the vessel is in safe condition for repair work, he will issue a written certificate which will include his findings together with any special instructions, recommendations or restrictions he may deem necessary.