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BUREAU OF LABOR STATISTICS
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Fatal Work Injuries in Shipyards 1943 and 1944

Bulletin No. 839

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Washington 25, D. C. Price 10 cents

Letter of Transmittal

UNITED STATES DEPARTMENT OF LABOR,
BUREAU OF LABOR STATISTICS,
Washington, D. C., July 16, 1945.

The SECRETARY OF LABOR:

I have the honor to submit herewith a report on fatal work injuries in shipyards in 1943 and 1944. The information contained herein is based on information submitted by shipyards as a part of the Program of Safety and Industrial Health in Contract Shipyards, sponsored by the U. S. Maritime Commission and the U. S. Navy Department. This report was prepared in the Bureau's Industrial Hazards Division by Frank S. McElroy and George R. McCormack.

A. F. HINRICHS, *Acting Commissioner.*

HON. L. B. SCHWELLENBACH,
Secretary of Labor.

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Bulletin No. 839 of the
United States Bureau of Labor Statistics
[Reprinted from the MONTHLY LABOR REVIEW, July 1945, with additional data]

Fatal Work Injuries in Shipyards, 1943 and 1944

Summary

On the basis of shipyard accident reports submitted as a part of the Program of Safety and Industrial Health in Contract Shipyards, sponsored by the U. S. Maritime Commission and the U. S. Navy Department, it is estimated that about 700 employees of private shipyards died as a result of injuries experienced in the course of their work during the years of 1943 and 1944.

In comparison with the estimated volume of 173,000 nonfatal disabling injuries experienced by shipyard workers in the same period, the number of fatalities is small. Because of their seriousness, however, fatal accidents are significant to a degree far exceeding their numbers, and for this reason are deserving of particular study for the purpose of determining what specific measures can be taken to prevent the recurrence of similar accidents.

For many of the fatal accidents full details are lacking, but reports have been submitted describing in some detail the circumstances connected with 655 occupational deaths. It is immediately apparent in reviewing these case histories that fatal and nonfatal accidents fall into very similar patterns, and that the differences in the severity of the injuries incurred are due largely to chance. This observation supports the basic theory of all scientific accident prevention, that the proper approach to safety is to attempt to prevent *all* accidents regardless of their probable consequences. There are, however, some significant differences in the patterns formed by the fatal and nonfatal accidents, which should be of importance in planning shipyard safety programs.

It seems particularly important that falls from one level to another were responsible for more shipyard fatalities than were ascribed to any other single accident type. Fully 39 percent of all the reported fatalities resulted from such falls, and more than half of these falls were from scaffolds, stagings, and other working surfaces.

"Struck-by" accidents were the second most prolific producers of fatalities. Nearly a fourth of the reported fatal accidents were of this type. In almost half of these accidents the specific agency involved was a crane or a crane load. Motor vehicles, including straddle-trucks, were the agencies next most commonly involved. Material defects within the agencies caused many of these accidents, particularly those involving cranes. In the greater number of cases, however, the unsafe conditions which contributed to the accidents were created through misuse of the agencies, such as rigging loads improperly,

overloading, operating at unsafe speed, or standing, walking, or working within range of the moving cranes or vehicles.

Contact with electric current has not been one of the outstanding sources of shipyard injuries indicated in any previous studies based upon an analysis of all disabling injuries. It ranked third, however, among the types of accidents which resulted in fatalities. Seventy-two of the reported fatalities were the result of contact with electricity. Sixty-nine of these were electrocutions and the other three were cases of burns produced by electric flashes. Defective grounds or broken wiring in machines, powered hand tools, and other electric equipment were responsible for many of these accidents. The failure to understand or to respect the hazard involved in the seemingly simple act of replacing broken light bulbs while standing upon a grounded steel hull led to 10 of the 72 reported fatalities.

In the broad analysis of the fundamental causes of the accidents which resulted in fatalities, the most striking fact is that extremely few of the accidents were attributed to the lack of or the failure to use proper personal safety equipment. In view of the relatively large volume of nonfatal injuries attributed to these causes, this is rather surprising. In other respects, however, the cause pattern of the fatalities was quite similar to that of the nonfatal accidents.

Among the various categories of unsafe working conditions which led to the occurrence of fatal accidents, the most prominent was that of defective agencies. These defective agencies included a very wide variety of materials and equipment. Most important from the standpoint of the volume of fatalities for which they were responsible, however, were improperly rigged crane loads, defective hand tools, defective scaffolds or staging, defective machines, and defective electrical apparatus.

Hazardous arrangements and procedures, primarily in respect to the operation of hoisting apparatus and vehicles, were the second most important group of unsafe working conditions directly connected with the occurrence of fatal accidents, while improperly guarded agencies held third place. The great majority of the improperly guarded agencies were scaffolds, stagings, and other elevated working surfaces, and most of the accidents attributed to these conditions were falls.

Among the various categories of unsafe acts which contributed to the occurrence of fatal accidents, that of unnecessarily assuming an unsafe position was outstanding. Specifically, the most common of the unsafe acts in this general group were standing or working in the way of moving cranes, crane loads, or vehicles; approaching too close to deck openings or to the edge of elevated surfaces; and misusing scaffolds or stagings, particularly, jumping from one surface to another or climbing on the supporting framework.

Some fatalities occurred in practically every occupational group of shipyard workers. In proportion to the number of workers in the craft and in actual numbers, however, there were more fatalities among riggers than in any other occupational group. About 15 percent of the workers reported killed were riggers, 12 percent were welders, and 10 percent were shipwrights.

Kind of Injuries Sustained

Over 45 percent of the injuries reported as resulting in fatalities were fractures. Another 12 percent were simply described as "crushing" injuries. Many of the injuries reported as crushed heads, chests, and pelvic regions were, no doubt, also fracture cases. Electrocutions accounted for 13 percent of the fatal injuries, burns and scalds for 9 percent, and drowning for 7 percent.

Almost 38 percent of the reported fatalities resulted from head injuries. Three-fourths of these were skull fractures. In addition, there were 14 fatalities which were described as "crushed head."

About one-fourth of the fatalities resulted from trunk injuries. Fractured vertebrae, ribs, hips, or pelvic bones were most common, although crushing injuries were numerous. Death resulted more frequently from injuries to the abdomen than from injuries to any other part of the trunk. Contusions or bruises led to 8 fatalities; 6 of these were abdominal injuries. All of the 7 cases described as strains or sprains of the trunk were abdominal cases; in 3 of these death occurred in the course of surgery to correct a hernia.

Fatal injuries involving the upper or lower extremities were comparatively infrequent; injuries to legs, feet, or toes accounted for approximately 4 percent of the fatalities and injuries to arms, hands, or fingers for a little more than 1 percent.

Some injuries were not confined to particular members of the body but were more or less general in extent; these have been classified as "body general." About one-third of the fatal work injuries fell in this group. These included electrocutions, which caused 69 fatalities; drownings, 38 fatalities; and 42 cases of death as a result of extensive burns or scalds.

Accident Type

More fatal injuries resulted from falls than from any other type of accident and practically all of these falls were from one level to another. Although falls to a lower level produced only 12 percent of all disabling injuries reported by shipyards during 1943 and 13 percent in 1944, 39 percent of the fatalities reported during the 2-year period 1943–44 were due to this type of accident, indicating that, although falls are not so common as some other accident types, they are much more likely to result in serious injury.

Fatalities from falls.—Over half of the fatal falls were falls from working surfaces. Of the 251 deaths resulting from falls to a lower level, 129 were falls from working surfaces and, of this group, 86 were falls from stagings or platforms. Twelve additional workers were killed when they fell from stagings or platforms upon which they were walking or climbing.

Falls from cranes or crane loads were responsible for 16 fatalities. In 4 of these cases, the injured employee was riding the crane load and in 2 others the worker stood on the load as it was being moved from, or to, its resting place. Ten men were killed when they fell from crane ladders, cabs, or platforms.

Sixteen employees sustained fatal injuries when they fell from ladders and 20 lost their lives as a result of falls from vehicles. Of this latter group, 13 were falls from water craft, 4 were falls from

trucks, 2 were falls from trailers, and 1 was a fall from a railroad car. Falls from stairs caused 4 fatalities.

Although not the direct cause of death, falls on the same level contributed to 10 fatal work injuries. Two men fell into the water and drowned. A third injury in this group occurred to a chipper who fell on his lunch bucket and suffered a contused chest and a ruptured spleen. A female pipefitter's helper sustained a similar injury when she fell on a wet deck. In another case an electrician's helper fell to the pavement when a pipe, which he was using as a lever, broke. He died as a result of a cerebral hemorrhage. Three other workers died from tumors or other complications resulting from this type of fall. In still another case, the trousers of a shipfitter caught on a projecting stud bolt. In an attempt to keep himself from falling the worker grabbed and pulled a fellow employee on top of him as he fell. The weight of the second man caused a brain concussion to the first, resulting in his death.

"Struck by" accidents.—The second largest group of fatal accidents involved employees' being struck by moving objects. Accidents of this type caused 157, or about one-fourth of the reported fatal injuries. Fifty-one employees were killed when they were struck by moving crane loads. Secure and proper fastening of the load, regular inspection of cranes, and sufficient clearance for the movement of the load would have prevented practically all of these injuries. Another 27 employees were killed when they were struck by other moving parts of cranes. Moving vehicles struck and killed 24 employees. Trucks, busses, or automobiles were involved in 16 of these deaths, straddle-trucks in 5, and locomotives in 3. Five men were killed when they were struck by kick-backs from saws, and 2 others were struck by parts of exploding grinding wheels.

Contact with electric current.—Contact with electric current resulted in death for 72 shipyard workers. Ten workers were electrocuted when they accidentally touched the filaments in broken light bulbs, and 2 others were killed while using defective extension cords. Nine workers were electrocuted while working on or near live circuits, and 12 sustained similar injuries while working on control panels or switches. Hand tools were involved in 13 electrocutions; welding tools were the agencies in 8 of these cases, and drills were involved in 5. Defective grounds led to 9 of the 12 fatalities associated with the use of machines. Eight men were electrocuted while working on or standing near cranes. In 7 of these cases the crane came into contact with overhead power lines; in the other a maintenance man was electrocuted while repairing a crane on which the power had not been shut off.

"Caught in, on, or between" accidents.—About 10 percent of the reported fatalities were caused by employees' being caught in, on, or between objects. Crushing injuries were sustained by 34 shipyard workers when they were caught between cranes and other objects, the crane load being the crushing agency in 14 of these cases. Fourteen additional workers were killed when they were caught in, on, or between vehicles.

Miscellaneous types.—Thirty-seven employees lost their lives in explosions. Thirteen of these workers were killed in one accident when a gasoline barge exploded. Seven men were killed in explosions of acetylene equipment.

Fire or flames caused the deaths of 29 workers; live steam or hot water, 5; and heat exhaustion, 2.

Accidents involving inhalation, absorption, or ingestion caused the deaths of 10 workers. Welding or burning fumes were reported as responsible for 5 of these fatalities, and carbon tetrachloride fumes for 2. One man was drowned as he attempted to free debris from a propellor, another was suffocated when he failed to leave a ship which was being fumigated with hydrocyanic acid, and a third was asphyxiated when a bottle of carbon dioxide was broken.

Unsafe Working Conditions

Defective equipment, hazardous arrangement or procedure, and unguarded, or inadequately guarded equipment caused practically all of the 463 fatal accidents in which an unsafe working condition was known to exist. Defective equipment was responsible for over one-third of the accidents, hazardous arrangement or procedure for over one-fourth, and inadequately guarded agencies for about one-fifth.

Defective equipment.—Defective scaffolds, stagings, or catwalks were responsible for accidents resulting in 23 of the reported fatalities. Four of these deaths resulted when workers leaned against insecure backrails which parted under the pressure and allowed the workers to fall. Loose planks which tipped or turned when stepped upon dropped 5 workers to their deaths, and another employee was killed when he was struck by a plank dislodged from an overhead staging.

Accidents involving defective cranes or crane parts led to 42 fatalities, 32 of which were specifically associated with defective slings or sling loads. Fourteen men were killed when the loads, or part of the loads, dropped from the hooks or cables because of defective rigging, and 10 others were killed when the lifting chain or cable parted.

Accidents involving defective hand tools were responsible for 26 fatalities. Thirteen of these workers were killed by fires or explosions attributed to gas leaks in burners' torches. Three welders were electrocuted by coming into contact with defective welding tools, and 5 other electrocutions were ascribed to defective wiring in portable drills. One man was killed by parts from an exploding grinding wheel.

Twelve of the 18 fatalities associated with defective machines resulted because of electrical short circuits in the machines. Ten workers were killed in accidents involving defective electric extension cords.

Hazardous arrangement or procedure.—Accidents involving inadequate planning for the use of cranes led to 58 of the reported fatalities. Insufficient clearance in the operation caused 27 fatal injuries. Seventeen of these occurred when employees were caught between the crane cab and another object or were struck by the crane while they were working on the craneway. Ten workers were killed in accidents that occurred when the crane load struck some ob ect as the load was being raised or lowered. Twelve other fatalities occurred when the employees were struck by the load as it was being lowered, or were struck by objects falling from a suspended load when it was carried over their heads. Swinging slingloads which struck the injured employee caused an additional 8 fatalities, and 7 men were electrocuted when the crane on or near which they were working came in contact with high-tension wires.

Unsafely stored or piled materials caused 25 fatal accidents. In most of these cases the piles of materials were insufficiently braced or poorly placed. Loose materials lying on scaffolds or other working surfaces were specifically responsible for 9 of these deaths.

The need for better control of traffic in shipyards is emphasized by the fact that 18 workers lost their lives when they were struck by cars or trucks. Standard-type trucks were involved in 10 of these accidents; straddle-trucks in 5; and automobiles or busses in 3.

Unguarded or improperly guarded agencies.—Improperly guarded agencies were responsible for 106 fatalities. Unguarded or inadequately guarded scaffolds, stagings, or catwalks accounted for 48 of these, and open manholes, hatchways, and other unguarded openings in working surfaces caused 40 additional fatalities. The 5 fatalities associated with unguarded machines all resulted from kick-backs from power saws. Nine workers were electrocuted when they came in contact with unguarded or inadequately guarded electrical equipment such as switches and power lines.

Unsafe Acts

Of the 655 fatalities included in this study, 370 were known to have resulted from accidents involving an unsafe act. Of the remainder, there were 173 cases which apparently involved no unsafe acts, while 112 could not be classified because of insufficient data.

Among the accidents in which an unsafe act was known to have been committed, over 65 percent were caused by the injured employee's taking an unsafe position or posture. Exposure to the crane or its load caused 84 of the 242 fatalities in this group of unsafe acts. Unnecessary exposure to the slingload alone caused 41 of these fatal work injuries, and 43 other workers were killed when they exposed themselves to other parts of the crane. In most of the latter group of cases the employees were caught between the crane cab and some other object or were struck by the crane as it was being moved.

Thirty-three workers lost their lives after taking an unsafe position on stagings or platforms on which they were working; 4 others died as a result of accidents on stagings on which they were climbing or walking. Seven employees were killed when they fell from the staging as they attempted to climb from one level to another, and 3 others fell as they attempted to jump from one staging to another. Falls from other working surfaces caused 24 additional injuries in this group.

Unnecessary exposure in connection with the operation of vehicles resulted in death to 17 shipyard workers. Nine men were killed when they fell from vehicles on which they were riding or were caught between the vehicles and other objects. Three men drowned when they fell from ships on trial runs. Another employee was killed when he attempted to grease the mechanism of a dump truck as the body was being lowered; he sustained a spine fracture.

Using unsafe equipment or equipment unsafely constituted the second highest number of unsafe acts. Most of these cases involved misuse of stagings or scaffolds, hand tools, hoisting apparatus, or electrical equipment.

Fatalities, by Occupation of Injured Worker

Practically every regular shipyard occupation was represented in the fatality list of 1943 and 1944. There were, however, certain highly significant occupational groupings among the reported cases, which emphasize the variations in the hazards faced by workers of the different crafts. Fully 37 percent of the workers who were killed were employed as shipwrights, riggers, or welders, or as helpers to one of these crafts. An additional 27 percent of the fatally injured workers were classified as electricians, laborers, pipefitters, or shipfitters, or as helpers to these crafts. Over 64 percent of the fatalities, therefore, fell within seven occupational groups which together include less than half the total employment of shipyards.

The greatest variation between the fatality record and the general occupational distribution in shipyards was in respect to the riggers. This occupation generally constitutes about 2 percent of the total employment in shipyards. In the fatality record, however, riggers accounted for no less than 15 percent.

This extreme disproportion was not apparent in respect to any other craft, but the proportions of fatalities to shipwrights, crane operators, electricians, and erectors were each at least double the relative numerical importance of these crafts in the total shipyard population. Similarly, the proportion of all fatalities which befell pipefitters, shipfitters, and welders substantially exceeded the proportion of all shipyard employment represented by those crafts.

Riggers.—Although there were a few fatal accidents to riggers which resulted from unsafe conditions or operations not directly connected with the movement of materials by means of cranes, most of the cases involving riggers or their helpers were closely associated with hazards arising directly from the operations of their craft.

Safe practice dictates that workers should remain clear of moving sling loads. Failure to obey this rule led to at least 34 of the fatal injuries to riggers. Nine riggers were killed when they were struck by swinging sling loads. In 7 of these cases, the injured was caught between the swinging load and a fixed object. Three of these accidents occurred when the load was being picked up and 3 occurred when the load was being lowered into place. Another rigger was killed, when, after giving the signal to the crane operator to swing a roof section into place, he turned his back to the moving crane load and was knocked into an opening on the deck.

Defective hoisting apparatus, which permitted the load or part of the apparatus to drop on the worker, was responsible for 9 fatal accidents. Two riggers were killed in separate accidents when the cable "ran out" of the drum. In one of these accidents the cable was fastened to the drum, but pulled out of the fastening; in the other, the cable was not fastened. The recommendation of the safety inspector in the latter case was: "Recommended that superintendent and foreman place identification marks near end of cable." Crane booms, which fell because of mechanical defects, caused 3 riggers to lose their lives; and a defective cable caused a small crane to tip and fall on a fourth worker.

Poorly rigged loads which permitted objects to drop from the sling resulted in 9 fatal injuries. In 2 other accidents, riggers crawled

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under the loads after they had been landed and were killed when the loads shifted.

Four riggers were killed when they attempted to land or guide sling loads from an unsafe position. In one case the worker was standing on the rail of the ship. The swing of the crane threw him off balance and he fell 30 feet. In a similar accident, a rigger was standing on a stairway. He was thrown to the main deck 15 feet below.

Standing on material upon which loads were being placed resulted in the death of 6 riggers. Two of these men were standing on racks which became unbalanced when the load was placed. In the other 4 cases the slings struck and jarred the piled material on which the riggers were standing, throwing 3 men from the piles and causing the fourth to be crushed among the materials when the pile collapsed. One of these men experienced only a fractured ankle at the time, but died later as a result of a blood clot.

Four riggers were killed when they were standing near, or on, the load, as it was moved. In one of these instances the rigger was standing on a rack against which the crane load was resting. As the crane load was lifted the rack collapsed and the worker was caught in 10 tons of falling steel. Two other riggers were injured when the piles of materials on which they were working shifted and fell on them.

Riding, or sitting, on the crane is usually forbidden. Violation of this rule, however, resulted in 8 fatal injuries to riggers. In 5 of these accidents the injured workers were sitting on the chassis of the crane and were crushed as the crane was swung around. Three other riggers fell under the wheels of cranes.

Four riggers were injured fatally as a result of riding the sling load. In 2 of these cases the load shifted, dropping the workers to the area below. A third injury was caused by a cable parting and dropping the worker; in the fourth case the crane operator dropped the load into the water, drowning the rigger.

Thirteen riggers lost their lives when they fell from walkways, ladders, or working surfaces. Unguarded or inadequately guarded working areas contributed to 4 of these accidents. In one case, the rigger was leaning against a weakened railing when it gave way, and he fell 50 feet to the main deck. In another accident, an inexperienced rigger became excited and backed away from a rising load. He fell 18 feet from the unguarded platform on which he was standing. A third rigger fell from the deck of a ship to a float and sustained a fractured skull. Another dislodged a safety bar across a doorway when he was throwing a rope upward to another level; later he fell through the unguarded doorway. Four riggers sustained fatal injuries while working on defective or inadequate working surfaces and 5 others lost their lives when they failed to use proper care in climbing or walking. Two of these men fell from ladders, another stepped over the side of the ship to the anchor and fell, and 2 others fell from objects on which they were walking instead of using the provided ladders or the designated walkways.

Four riggers were killed (2 in one accident) as a result of explosions, and 4 were electrocuted. In each of the latter four accidents, the boom of the crane came in contact with an overhead power line.

Two riggers were injured when they were struck by moving vehicles. Two others died as a result of surgical operations for correction of apparently nonfatal injuries. In one of these cases the worker

died during an operation for hernia, and in the second the worker died during an operation for the removal of a foreign body from his eye.

Welders.—Over 60 percent of the reported fatal injuries to welders were due either to contact with electric current or to falls to a lower level. The dangers of low-voltage current are emphasized by these electrocutions. Five of the 24 deaths in this group resulted from contact with the exposed filaments of broken electric-light bulbs, and 7 men were killed when the current from their welding torches passed through their bodies. Clothing, which had become wet with perspiration, contributed to at least 2 of the latter group of injuries.

Defective grounds on welding machines caused 6 fatal accidents to welders. Two of these occurred only 8 days apart on the same machine. Open switches accounted for 2 deaths, and 1 man was electrocuted while he was pulling a 440-volt feed line for a welding machine. The insulation was broken, permitting his hand to come into contact with the electric current.

Sixteen of the 24 fatal falls were from stagings or platforms. Most of these were due to lack of, or inadequate, guards. In 2 of these accidents, the welders fell between the guardrail and the working surface. Loose flooring on the stagings contributed to 3 fatalities.

Two welders were killed when they fell from the deck of a ship. Two others fell into open hatchways and 2 fell from ladders. Another was killed when he fell into an open, unguarded pit in the yard and still another fell from the boat rail on which he was standing.

Fifteen welders lost their lives when they were struck by moving objects. Seven of these were killed by crane loads. Four were crushed when the plates or brackets upon which they were working fell on them. One man was struck by a straddle-truck and another by a standard-type truck.

Burns were responsible for 5 fatalities. Two welders were fatally burned when they used an oxygen line for a cooling unit. When they lit their torches they were enveloped in flames. In a similar accident, a fire was started when a defective oxygen hose permitted the oxygen to escape into the working area. Two other welders were burned while welding overhead without wearing protective clothing. In one of these cases the worker neglected to report for first aid until an infection had developed.

Four welders were killed in explosions. Another developed pneumonia after breathing welding fumes, and a sixth became unconscious and died, presumably because of inadequate ventilation, while welding in a confined space.

Shipwrights or carpenters.—Slightly over half of the 63 reported fatalities to shipwrights were caused by falls from one level to another. Fourteen of these falls were from scaffolds. In 3 of these cases the worker fell over or under the guardrail. Three others were caused by defective scaffolds. In one case the surface was slippery because of rain, in another the scaffold planks were not bolted, and in the third a cable pulled loose from a swinging scaffold. Four men fell as they attempted to move planks on scaffolds and lost their balance. One carpenter lost his balance when he was struck by a blast of air from an air valve, and another fell as he was climbing down the outside of a staging.

Six carpenters were killed when they fell into deck openings, none of which were guarded, and 6 others fell overboard. Two of the latter group were killed in the same accident. In this case, the men were

working on a lifeboat which was swung over the side of the ship. The release gear of the lifeboat was made fast to the floor boards. As they removed the retaining pins from the floor boards, the release was automatically tripped and the lifeboat fell 42 feet to the pier. Both men were thrown clear of the boat and sustained fractured skulls.

Eighteen shipwrights were killed as a result of being struck by moving objects. Four of these sustained fatal injuries in one accident when a plate on which they had been working fell on them. In this accident, a padeye was welded to a bulkhead and another to a shell-plate assembly. The padeyes were connected by a turnbuckle which was being used to pull the plate into position. The padeye on the bulkhead pulled off during the operation, causing the shell-plate assembly to fall on the workers. Four other workers were killed by kick-backs from circular saws. None of the saws was guarded. Three men were killed when they were struck by cranes or crane loads and one was struck by a plank which slipped out of a hand line which was being used to lower the plank from overhead. Failure to use equipment safely caused two additional deaths to shipwrights.

Four shipwrights were caught between moving objects and crushed. One man was building a box between two railroad cars and was caught between them as they were moved. A second man started a boat in gear and with a full throttle, so that the boat lurched forward under the pier and crushed him. Another was caught between a moving overhead crane and a pillar as he was standing on the crane track. The fourth of these accidents occurred to a carpenter working in the hold of a ship. He was ordered to stand clear of a sling load which was being landed and he moved back 6 feet. The load, however, hit the deck and skidded in his direction, pinning him between the load and a stanchion.

Two shipwrights were electrocuted while working with short-circuited machines. Another was working on a temporary scaffold under the power rail of a gantry crane. As he straightened up he came into contact with the exposed rail.

Improper care in walking contributed to 2 fatal injuries. In one of these accidents a splinter entered a shipwright's leg as he brushed against a timber during a launching. He failed to report to the first-aid room as instructed by his foreman; infection developed, causing his death. In the other accident, the injured was 1 of 3 men carrying a heavy plank. The plank struck a skidway and the shipwright walked into the end of the plank, rupturing his intestine.

Shipfitters.—Falls accounted for more fatalities to shipfitters than any other type of accident. Of the 53 reported fatalities to shipfitters, 28 were caused by falls. Twenty-six of these were falls to a lower level; falls from stagings or scaffolds were responsible for 16 deaths, 3 men fell from ladders, 4 men fell into holds of ships, and 3 others fell over the sides of ships.

Injuries resulting from being struck by moving objects caused the deaths of 11 shipfitters. Four were killed when they were struck by moving vehicles. Straddle-trucks were involved in 2 of these accidents. Four other workers were fatally injured when they were struck by cranes or crane loads. Three of these men were struck by the load and the fourth was injured when he was struck by a crane as he was walking on the craneway. Another worker died during an operation made necessary as a result of an accident in which he struck himself on the leg with a 16-pound sledge hammer.

Four shipfitters were killed in explosions. Three of these were injured in the same accident when a barge on which they were working exploded.

Electricians.—Of the 42 reported fatalities to electricians, falls to lower levels accounted for 16, and contact with electric current for 13.

Falls from staging were responsible for 3 fatalities, and falls into deck openings for 3 more. The remaining fatalities from falls resulted from a variety of causes. One man, partially intoxicated, fell while climbing onto a crane. A second man was walking on a catwalk. As he stepped on welding lines on the walk, the welder pulled the lines, with the result that the electrician fell to the bottom of the hold and sustained a fractured skull. Another electrician stepped from the crane walkway to the crane, slipped on the wet walkway, and fell 80 feet to the ground. Still another employee leaned against a railing, the welding into place of which had been left uncompleted by the welders on the previous shift, and fell 60 feet. A leaderman sustained a fractured skull when he attempted to place a heavy plank from one bulkhead to another; the board pulled him off balance and he fell from the bulkhead. A marine electrician who tried to jump the 3 feet between hulls fell between them, striking the bumper logs 40 feet below.

Six electricians were electrocuted by coming into contact with high-voltage lines. Three of these deaths occurred while men were working on the lines, and 2 were caused by workers touching the lines accidentally while working near them. Electric current encountered while working on or near switchboards or control boxes caused the deaths of 5 workers. Two other workers were electrocuted while working on machinery, but complete details on how the accidents occurred are lacking.

Three electricians were caught in, on, or between, moving objects. Two of these deaths occurred in the course of making tests. In one of these cases the operator attempted to check the speed of a rapidly moving boat; this operation was done so quickly that the boat dipped and sank, causing the electrician to drown. In the other, the electrician was riding, during a test run, on an elevator loaded with a concrete beam and two anchors; he was crushed when one of the elevator cables broke, causing the test load to shift upon him.

Two electricians in different yards used carbon tetrachloride to clean electric motors. Both men died as a result of breathing the fumes. Three other men died in explosions; two of these died in one accident when a barge exploded.

Pipefitters or steamfitters.—Falls, contact with electric current, and being struck by moving objects were the three most common types of accidents among the cases involving pipefitters. Of the 37 reported fatalities, 12 were due to falls, 10 of which were to a lower level. Two men fell from ladders, 2 fell through unguarded deck openings, and 2 fell over the sides of the ships on which they were working. One man fell off a ship and was drowned when the wooden handrail, to which he was holding, pulled loose. One pipefitter fell while descending a stairway, one fell as he attempted to jump from the ship to a gangplank, another fell under the wheels of a trailer on which he had been riding, and another fell from a pile of pipe.

Seven pipefitters were killed when they came into contact with electric current. Defective equipment caused 6 of these accidents,

and the seventh occurred when the pipefitter raised his head under an electric switchboard and touched a live wire.

Three pipefitters were struck by moving vehicles, and one was struck by a crane load as it fell on the truck in which he was sitting. Hatch covers piled beside an open hatchway and not adequately secured fell, striking a helper working in the hold. Another worker was struck by the anchor when the brake failed.

Four pipefitters were killed in explosions involving acetylene gas.

Machinists.—Over half of the 30 machinists reported killed were injured when they fell to a lower level or were struck by a moving object. Three fell from stagings on which they were working, and 3 fell from walkways. In at least 3 of these cases, railings had been installed but the workers fell either under the railing or between the scaffold and the ship. Two men fell from cranes or from overhead crane rails, and one fell from a ladder.

Seven machinists sustained fatal injuries when they were struck by moving objects. Two of these men were killed when material fell through deck openings and struck them as they were working below deck. One man was killed by a kick-back from a power saw as he was walking through a shop. In another case, the contact pin on the governor of an unguarded portable grinding wheel was too short, allowing the wheel to operate at twice its normal speed. The wheel exploded and a fragment struck the machinist, causing injuries which resulted in his death.

Four men were caught between, or on, moving objects. In one of these cases the man's trousers caught in the wheel of a straddle-truck, pulling him to the ground.

Three machinists were fatally burned when they came into contact with steam or fire, and two were electrocuted. One of the electrocutions occurred when the worker attempted to replace a broken light bulb. Three men were killed (two of these in the same accident) by explosions. In both of these instances, fellow workers had previously opened oxygen lines and the explosions occurred when burning torches were lighted. Another machinist was overcome by hydrocyanic-acid fumes. The acid was being used as a fumigant and the machinist neglected to leave the ship after a signal had been given to do so.

Burners.—Nine, or nearly half, of the 19 burner fatalities resulted from falls. In only 3 of these, however, was the fall from a scaffold or platform. Most of the other falls occurred while the employees were working in dangerous positions. One man was pulling his burner lines while standing on a railing around the hold, a second attempted to lift a jack while "precariously perched" on the ribs of a forepeak section, and a third was kneeling near an open door on the side of the ship. One burner fell from the skids as he attempted to step down instead of using the stairs. Another burner stepped on a hatchboard lying across the hatchway, and dropped 25 feet to the bottom of the hold; the hatchboard was unsupported at one end.

Three burners were burned to death in separate accidents when gas which had accumulated in confined working spaces was ignited. One other burner was overcome by carbon-monoxide gas while working in an inner bottom.

One burner died as a result of a seemingly minor injury. While burning, he slipped and struck his shin against a beam. He was given first aid and hospitalized. About 2 months later he died of infection.

TABLE 1.—*Distribution of Fatal Work Injuries in Shipyards, by Part of Body Injured and Nature of Injury, 1943 and 1944*

Part of body injured	Total fatal work injuries		Amputations	Burns and scalds	Cuts, lacerations, punctures	Contusions, bruises	Strains, sprains	Hernia	Fractures	Concussion	Poisoning, industrial disease	Drowning	Electrocution, electrical shock	Crushing	Unclassified, insufficient data	Other
	Number	Percent [1]														
Total fatal work injuries:																
Number	655		5	48	8	17	5	3	239	11	9	38	69	65	126	12
Percent [1]		100.0	0.9	9.1	1.5	3.2	0.9	0.6	45.2	2.1	1.7	7.2	13.0	12.3		2.3
Head	222	37.8		2	4	4			169	11				14	18	
Brain or skull	216	36.8		1	3	3			166	11				14	18	
Other	6	1.0		1	1	1			3							
Trunk	136	23.2		2	3	8	4	3	47					42	21	6
Spinal cord, back	25	4.3		1		1			19					2	2	
Ribs, chest	30	5.1							10					20		
Abdomen	43	7.3			3	6	4	3						2	19	6
Hip or pelvis	22	3.8				1			18					3		
Other	16	2.7		1										15		
Upper extremities	7	1.2	1	1		1			3						1	
Lower extremities	21	3.6	.4	1	1	2	1		9					1	1	1
Body general	201	34.2		42		1			9		9	38	69	7	21	5
Unclassified, insufficient data	68					1			2					1	64	

[1] Percent based on known cases only.

TABLE 2.—*Distribution of Fatal Work Injuries in Shipyards, by Accident Type and by Agency, 1943 and 1944*

Accident type	Total fatal work injuries		Machines	Elevators	Hoisting apparatus		Pressure vessels	Vehicles	Electric apparatus	Hand tools	Chemicals	Working surfaces		Miscellaneous	Unknown
	Number	Percent [1]			Load	Other parts						Scaffolds or stagings	Other		
Total fatal work injuries:															
Number	655		30	5	75	60	5	72	37	46	8	87	51	166	13
Percent [1]		100.0	4.7	0.8	11.7	9.3	0.8	11.2	5.8	7.2	1.2	13.6	7.9	25.8	
Striking against	6	.9						1						5	
Struck by	157	24.3	9	1	51	22		24		6			1	43	
Caught in, on, or between	62	9.6	2	3	14	20		14		1				8	
Fall—on same level	10	1.5								1			6	3	
Fall—to lower level	251	39.0		1	6	10		20		1		86	43	83	1
Slip (not fall)	2	.3											1	1	
Contact with extreme temperature	36	5.6	3		2		2			14	2			13	
Inhalation, absorption, ingestion	10	1.5								4	4			2	
Contact with electric current	72	11.1	12		1	7			36	13				1	2
Explosions	37	5.7	4				3	13	1	6	2			5	3
Overexertion	2	.3			1									1	
Other	1	.2													1
Unknown	9					1						1		1	6

[1] Percent based on known cases only.

TABLE 3.—*Distribution of Fatal Work Injuries in Shipyards, by Unsafe Working Condition and by Agency, 1943 and 1944*

Unsafe working condition	Total fatal work injuries		Machines	Elevators	Hoisting apparatus		Pressure vessels	Vehicles	Electric apparatus	Hand tools	Chemicals	Working surfaces		Miscellaneous	Unknown
	Number	Percent [1]			Load	Other parts						Scaffolds or stagings	Other		
Total fatal work injuries:															
Number	655		30	5	75	60	5	72	37	46	8	87	51	166	13
Percent [2]		100.0	4.7	0.8	11.7	9.3	0.8	11.2	5.8	7.2	1.2	13.6	7.9	25.8	
Improperly guarded	106	22.9	5	2				1	9			41	29	19	
Defective agency	190	41.0	18	2	32	10	5	6	14	26		20	4	53	
Hazardous arrangement or procedure	156	33.8	3	1	34	24		27	3	1	3	6	8	46	
Improper ventilation	6	1.3								3	3				
Lack of personal safety equipment	3	.6								3					
Other	2	.4						1					1		
No unsafe working condition	124		2		8	23		17	8	8	2	14	5	35	2
Unknown	68		2		1	3		20	3	5		6	4	13	11

[1] Percent based on number of cases for which an unsafe working condition was known to exist.
[2] Percent based on number of cases in which the agency was known.

TABLE 4.—*Distribution of Fatal Work Injuries in Shipyards, by Unsafe Act and by Agency, 1943 and 1944*

Unsafe act	Total fatal work injuries		Machines	Elevators	Hoisting apparatus		Pressure vessels	Vehicles	Electric apparatus	Hand tools	Chemicals	Working surfaces		Miscellaneous	Unknown
	Number	Percent [1]			Load	Other parts						Scaffolds or stagings	Other		
Total fatal work injuries:															
Number	655		30	5	75	60	5	72	37	46	8	87	51	166	13
Percent [2]		100.0	4.7	0.8	11.7	9.3	0.8	11.2	5.8	7.2	1.2	13.6	7.9	25.8	
Operating without authority, failure to secure or warn	19	5.1			4	1		4	6	1			1	2	
Operating or working at unsafe speed	17	4.6	1		1	1		9					2	3	
Making safety devices inoperative	2	.5							1			1			
Using unsafe equipment, or equipment unsafely	62	16.8	5		5	6		1	6	9		11	2	17	
Unsafe loading, mixing, etc	14	3.8		1	3		1			2	1			6	
Taking an unsafe position or posture	242	65.4	3	2	41	43	1	30	7	2	1	33	24	55	
Working on moving or dangerous equipment	11	3.0				1			9					1	
Failure to use provided personal safety equipment	3	.8											1	2	
No unsafe act	173		17	2	18	6	3	10	6	28	6	20	9	47	1
Unknown	112		4		3	2		18	2	4		22	12	33	12

[1] Percent based on number of cases for which an unsafe act was known to have been committed.
[2] Percent based on number of cases in which the agency was known.

TABLE 5.—*Distribution of Fatal Work Injuries in Shipyards, Classified by Occupation of Deceased, 1943 and 1944*

Occupation	Number	Percent [1]
All occupations	655	100.0
Boilermaker or helper	5	.8
Burner	19	3.0
Carpenter, shipwright, or helper	63	10.0
Chipper, scaler, or helper	16	2.5
Crane operator or helper	15	2.4
Electrician or helper	42	6.6
Erector, plate hanger, or helper	17	2.7
Laborer	43	6.8
Machinist or helper	30	4.7
Painter or helper	12	1.9
Pipe fitter or helper	37	5.8
Rigger or helper	95	15.0
Sheet-metal worker or helper	10	1.6
Ship fitter or helper	53	8.4
Stagerigger	13	2.1
Stock or storeroom worker	8	1.3
Watchman or guard	8	1.3
Welder or helper	77	12.2
Not elsewhere classified	69	10.9
Occupation not specified	23	

[1] Percent based on known cases only.

U. S. GOVERNMENT PRINTING OFFICE: 1945