



1947

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NATIONAL
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35TH CONGRESS

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35TH NATIONAL SAFETY CONGRESS

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VOLUME I

Annual Meeting, Banquet, Women's Activities,
Index to all Volumes and Exhibitors

NATIONAL SAFETY COUNCIL, INC.
20 NO. WACKER DRIVE, CHICAGO 6, ILL.

Foreword

THE Transactions of the 35th. National Safety Congress and Exposition of the National Safety Council are published in 29 volumes. Volume I includes the Annual Meeting, Banquet, Women's Activities, Index to all volumes and List of Exhibitors. Volume "II" contains the ASSE Session and the Industrial Subject Sessions. Volume XXIX contains the Early Morning Sessions, "Psychology You Can Use." Each of the other volumes is devoted to the sessions of a single section or division of the Council.

The transactions are a record of the proceedings of the Congress, condensed and edited for reference purposes. The complete original manuscripts, many of which contain charts and illustrations which could not be reproduced here, are available in the files of the National Safety Council.

The National Safety Council seeks to eliminate from discussion matters not pertinent to the aims of the Council. However, it cannot accept responsibility for the views expressed at the Congress or in this record.

It is expected that the new format of these Transactions will permit wider and more effective use of the material relating to various fields of safety. At the same time, the whole set provides a complete and indexed reference work on all phases of accident prevention.

THE NATIONAL SAFETY COUNCIL
20 North Wacker Drive
Chicago 6, Ill.

35th National Safety Congress Transactions

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Annual Meeting of Members

MONDAY MORNING SESSION
October 6, 1947

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DE WITT SMITH, Vice Chairman in Charge of Domestic Services, The American National Red Cross, Washington, D. C.
R. T. SOLENSTEN, Vice-President, Elliott Service Company, Mount Vernon, N. Y.
LESLIE J. SORENSON, City Traffic Engineer, City of Chicago, Chicago, Ill.
R. C. STRATTON, Supervising Chemical Engineer, Travelers Insurance Companies, Hartford, Conn.
PAUL F. STRICKER, Executive Vice-President, Greater New York Safety Council, New York, N. Y.
C. E. WOOLLEVER, Director of Personnel, A. O. Smith Corporation, Milwaukee, Wis.
DR. WILLIAM P. YANT, Director of Research & Development, Mine Safety Appliances Company Research Laboratory, Pittsburgh, Pa.
J. W. YOUNG, Safety Director, International Harvester Company, Chicago, Ill.

Presiding: NED H. DEARBORN, President, National Safety Council, Inc.

The 1947 Annual Council Meeting of the National Safety Council was held in the Grand Ballroom of the Stevens Hotel, Chicago, on October 6, with Mr. Ned H. Dearborn, President, presiding.

Following the singing of the national anthem, President Dearborn announced a quorum present, in person or by proxy. It was voted to dispense with the calling of the roll; also to dispense with the reading of the minutes of the previous Annual Meeting.

Mr. Dearborn read a letter from President Harry S. Truman in which he asked that Mr. Dearborn "convey to all those attending the National Safety Congress my earnest hope they will leave this great meeting determined to wage the most successful nation-wide attack on accidents this country has ever seen."

"Records prove again and again," said Mr. Truman, "that a factory, a community or a state can achieve amazing reductions in accident rates by united and persistent effort."

President Dearborn called for the report of the General Nominating Committee, which consisted of the following members: G. A. Heuser, Chairman, Ray Carr, Mrs. LaFell Dickinson, C. E. Pettibone, and Theodore F. Smith.

Mr. Heuser reported in behalf of the General Nominating Committee, pointing out that the Constitution authorizes the Committee to name candidates for election to the Trustees, to the Board of Directors, to the Executive Board, and to all offices except the office of Executive Vice-President. The selections of the Committee, Mr. Heuser stated, were reported to the Secretary of the Council seventy-five days before this meeting and were properly announced to all members of the Council on August 7, 1947.

Mr. Heuser then presented as the nominees for Trustees of the Council, to be elected for a three-year term: Winthrop W. Aldrich, James B. Black, S. Bruce Black Morgan II.

Bainard, Kenneth B. Colman, Walter J. Cummings, Francis J. Gavin, William M. Jeffers, William A. Simpson, Herbert I. Smith, Juan T. Trippie, C. E. Wilson, and Robert W. Woodruff. Of the above nominees, all but Mr. Woodruff were named in the Nominating Committee's report circulated to the Membership. Mr. Heuser said that Mr. Woodruff's name had been added following consideration by his Committee after the original announcement. (Secretary's Note: A complete list of the Trustees, including those elected at this meeting, as well as those continuing in office from previous elections is given on pages 6 and 7 of this volume.)

Mr. Heuser presented the nominations for Directors. In doing so he omitted the name of Mr. Ralph Hough who, along with the other nominees, had been announced to members of the Council on August 7, 1947. He explained that Mr. Hough had advised with regret that he would not be able to accept the office. Mr. Craig proposed the name of Mr. O. Gressens, of Chicago, to take Mr. Hough's place.

Mr. Heuser presented the nominees for the Executive Board, stating that the recommendations of the Executive Board Nominating Committee had been accepted in full and that the list had been published to members of the Council on August 7, 1947.

Mr. Heuser presented nominees for Officers of the Council. He pointed out that in his Committee's report to the Membership, dated August 7, 1947, no nomination was made for the office of Vice-President for Finance and Treasurer and that, to fill this position, his Committee now desired to present the name of Mr. O. Gressens of Chicago.

There were no nominations except those presented by Mr. Heuser, and the Secretary announced that the entire proxy vote, numbering 5,119, was cast in favor of the nominees proposed by the General Nominating Com-

Safety Exposition Exhibitors

EXHIBITION HALL—STEVENS HOTEL
MEZZANINE FLOOR—SHERMAN HOTEL

Alphabetical List of Exhibitors of Industrial and Public Safety Equipment

Acme Protection Equipment Co., Chicago, Ill.

Gas Masks.

All-American Safety Equipment Co., Chicago, Ill.

Power and Kick Press Guards.

American Abrasive Metals Co., Irvington, N. J.

Safety Treads, Abrasive Paints.

American Cord & Webbing Co., New York, N. Y.

Acro-lyte Products, Reflectors and Fluorescent Webbing.

American-LaFrance-Foamite Corp., Elmira, N. Y.

Fire Protection Equipment.

American Mat Corp., Toledo, O.

Safety Matings.

American Optical Co., Southbridge, Mass.

Industrial Safety Goggles, Respiratory Devices and Protective Clothing.

Ampco Metal, Inc., Milwaukee, Wis.

Beryllium-Copper Non-Sparking Safety Tools.

Ansul Chemical Co., Marinette, Wis.

Fire Protection Equipment.

Audio Development Co., Minneapolis, Minn.

Hearing Testing Equipment.

Batterton Distributing Co., Houston, Tex.

Plastic Traffic Markers for Streets, Highways and Industry.

Bausch & Lomb Optical Co., Rochester, N. Y.

Safety Lenses and Goggles.

Bear Manufacturing Co., Rock Island, Ill.

Motor Vehicle Inspection and Correction Equipment; Static and

Dynamic Balancing Machines.

Behr-Manning Corp., Troy, N. Y.

Coated Abrasives.

Benson and Associates, Inc., Chicago, Ill.

General Safety Equipment.

Bradley Washfountain Co., Milwaukee, Wis.

Group Washfountains and Multi-Stall Showers.

John H. Breck, Inc., Springfield, Mass.

Protective Creams and Hand Cleaners.

Stewart E. Browne Mfg. Co., Inc., New York, N. Y.

Flashlights and Extension Lights.

Buckingham Mfg. Co., Inc., Binghamton, N. Y.

Linemen's Accessories.

Buffalo Fire Appliance Corp., Dayton, Ohio

Fire Extinguishing Equipment.

R. H. Buhrke Co., Chicago, Ill.

Safety Equipment and Allied Products for Construction and Maintenance Work.

E. D. Bullard Co., San Francisco, Cal.

Everything in Safety.

Gandall Oil Co., Cleveland, Ohio

Oil-Spurl Absorbents.

A. B. Chance Co., Centerville, Mo.

Line Construction and Live Line Maintenance Equipment.

Chello, Inc., New York, N. Y.
 Polaroid Color and Contrast Vectograph Displays.
 Chicago Eye Shield Co., Chicago, Ill.
 Head and Eye Protective Equipment.
 Columbia First Aid, Chicago, Ill.
 First Aid Supplies.
 Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
 Chain and Chain Hoists.
 O-O-Two Fire Equip. Co., Newark, N. J.
 Carbon Dioxide Fire Extinguishers, Hose Units, Manual-Automatic Systems,
 Smoke Detecting Systems.
 M. E. Cunningham Co., Pittsburgh, Pa.
 Safety Marking Tools.
 Davis Emergency Equipment Co., Newark, N. J.
 Respiratory Protection; Combustible Gas Indicators; General Safety and First Aid
 Equipment.
 The Diversy Corp., Chicago, Ill.
 Oil and Grease Absorbents, Cleaning Compounds, Hand Cleaners.
 Dobbins Mfg. Co., Elkhart, Ind.
 Portable Drinking Fountains and Accessories.
 Dockson Corp., Detroit, Mich.
 Industrial Head and Eye Protection.
 C. B. Doige Co., Westport, Conn.
 Fungicides, Protective Creams, Skin Cleaner, Cutting Oil Germicides.
 Dunn Products, Chicago, Ill.
 Industrial Protective Clothing Made from Rubber, Asbestos Cloth and Leather.
 Duo-Safety Ladder Corp., Oshkosh, Wis.
 Safety and Fire Ladders, Ladder Shoes.
 E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
 Hand Protective Creams, Industrial Hand Creams, Neoprene Products, Rayon Yarn
 E. & J. Manufacturing Co., Glendale, Calif.
 Resuscitator Inhalator and Aspirator
 Elliott Service Co., New York, N. Y.
 Foremanship Training Material, Bulletin Board Displays on Safety,
 Quality and Waste; Suggestion Systems.
 J. H. Emerson Co., Cambridge, Mass.
 Automatic Resuscitation and Respiration Equipment.
 Flibnell System, Inc., Elkhart, Ind.
 Floor-Care Machines and Floor Treatments.
 Fry-Fyter Co., Dayton, Ohio.
 Fire Extinguishing Equipment.
 General Detroit Corp., Detroit, Mich.
 Fire Extinguishers, Motor Fire Apparatus and Allied Products.
 Graubard's, Inc., Newark, N. J.
 Gro-Cord Rubber Co., Lima, Ohio.
 Gro-Cord, Raw-Cord and Neo-Cord Soles, Heels and Taps.
 Haas Corporation, Mendon, Mich.
 Optical Magnifiers.
 Harley-Davidson Motor Co., Milwaukee, Wis.
 Hild Floor Machine Co., Chicago, Ill.
 Electrically Operated Floor Scrubbing & Polishing Machines—
 Portable Industrial Vacuum Machines.
 Hilliard Sales Companies, St. Joseph, Mo.
 Floor Treatments, Building Maintenance, Sanitation Products, Equipment
 and materials.
 Holcomb Safety Garment Co., Chicago, Ill.
 Protective Clothing Made of Asbestos, Leather and Fire-Proofed Duck.
 Hospital Specialty Co., Cleveland, Ohio.
 Manufacturers and Distributors—GARDS, FEMS, TAMPAX—Sanitary Pads
 and Dispensers.

Huntington Laboratories, Inc., Huntington, Ind.
 Sanitary Supplies, Liquid Soaps, Disinfectants, Floor Finishes and
 Machines, Insecticides.
 Hydro-Tex Corp., Chicago, Ill.
 Industrial Aprons.
 Hyson Westcott & Dunning, Inc., Baltimore, Md.
 Micachrome and Thantis Lozenges.
 Indian Motorcycle Co., Springfield, Mass.
 Industrial Gloves Co., Danville, Ill.
 Protective Clothing, Gloves, Mittens, Headguards, Loggings, Flame-Proof Suits.
 Industrial Products Co., Philadelphia, Pa.
 Safety Equipment for All Industries.
 Industrial Safety Equipment Assn., New York, N. Y.
 Into-Gas Corp., Detroit, Mich.
 Underwriters Approved Torches and Furnaces.
 International Business Machine Corp., Chicago, Ill.
 International Shoe Co., High-Test Div., St. Louis, Mo.
 Hy-Test Safety Shoes.
 Iron Age Div., H. Childs & Co., Inc., Pittsburgh, Pa.
 Safety Shoes.
 Jackson Products, Warren, Mich.
 Insulated Electrode Holders, Cable Connectors, Face Shields and Goggles.
 Junkin Safety Appliance Co., Inc., Louisville, Ky.
 Interlocking Barrier Gate and Swinging Die Closure Guards.
 Justite Manufacturing Co., Chicago, Ill.
 Safety Cans, Safety Flashlights, Electric Lanterns.
 Karel First Aid Supply Co., Chicago, Ill.
 Industrial First-Aid Supplies and Equipment.
 Kex National Service, New York, N. Y.
 Safe Wiping Materials.
 Keystone View Co., Meadville, Pa.
 Industrial Visual Testing Equipment.
 Walter Kilde & Co., Inc., Belleville, N. J.
 Fire Extinguishing Equipment.
 Kimball Safety Products Co., Cleveland, O.
 Protective Clothing, Gloves and Goggles.
 Walter G. Legge Co., Inc., New York, N. Y.
 Non-Slip Floor Polishes and Treatments, Non-Sparking Floor Treatment.
 Lehigh Safety Shoe Co., Inc., Allentown, Pa.
 Safety Shoes and Rubber Boots.
 Lightfoot Schultz Co., New York, N. Y.
 Industrial Soaps—Powdered, Bar, Paste and Hand Lotion.
 Macwhyrte Company, Kenosha, Wis.
 Wire Rope and Wire Slings.
 Magnesium Co. of America, Chicago, Ill.
 Magcon Light Weight Magnesium Dockboards, Pallets, Barrel Skids,
 General Fabrication.
 Marsh & McLennan, Inc., Chicago, Ill.
 Insurance Brokers and Agents.
 Martindale Electric Co., Lakewood, Ohio.
 Respirator for Non-Toxic Dusts, Electrical Testing Instruments.
 Thom McAn Safety Shoe Co., New York, N. Y.
 Safety Shoes.
 Julian A. McDermott Corp., Corona, New York.
 Warning and Safety Lights for Municipal, Industrial and Utility Use.
 E. F. McDonald Co., Los Angeles, Cal.
 Mining and Industrial Safety Appliances.
 Medical Supply Co., Chicago, Ill.
 First Aid Kits—All Purposes.

Melfox Products Co., Akron, Ohio.
 Flooring Materials, Treads and Standing Mats.
 Metropolitan Life Insurance Co., New York, N. Y.
 Accident Prevention Educational Materials for Industry, Home and Traffic Safety.
 Milburn Company, Detroit, Mich.
 Protective Skin Creams and Plastic Coated Safety Clothing.
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 Mine Safety Appliances Co., Pittsburgh, Pa.
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 Reflective Sign Material and Non-Skid Floor Surfacing.
 Motorola, Inc., Chicago, Ill.
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 National Safety Council, Inc., Chicago, Ill.
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 National Society for the Prevention of Blindness, New York, N. Y.
 Conservation and Utilization of Eyesight in Industry.
 Occupational Hazards, Inc., Cleveland, Ohio
 Publishers.
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National Safety Council Inc.

Annual Meeting of Members

MONDAY MORNING SESSION

October 6, 1947

Presiding: NED H. DEARBORN, President, National Safety Council, Inc.

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LESLIE J. SORENSON, City Traffic Engineer, City of Chicago, Chicago, Ill.
R. C. STRATTON, Supervising Chemical Engineer, Travelers Insurance Companies, Hartford, Conn.
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C. E. WOOLVEVER, Director of Personnel, A. O. Smith Corporation, Milwaukee, Wis.
DR. WILLIAM P. YANT, Director of Research & Development, Mine Safety Appliances Company Research Laboratory, Pittsburgh, Pa.
J. W. YOUNG, Safety Director, International Harvester Company, Chicago, Ill.

The 1947 Annual Council Meeting of the National Safety Council was held in the Grand Ballroom of the Stevens Hotel, Chicago, on October 6, with Mr. Ned H. Dearborn, President, presiding.
Following the singing of the national anthem, President Dearborn announced a quorum present, in person or by proxy. It was voted to dispense with the calling of the roll; also to dispense with the reading of the minutes of the previous Annual Meeting.

Mr. Dearborn read a letter from President Harry S. Truman in which he asked that Mr. Dearborn "convey to all those attending the National Safety Congress my earnest hope they will leave this great meeting determined to wage the most successful nation-wide attack on accidents this country has ever seen." "Records prove again and again," said Mr. Truman, "that a factory, a community or a state can achieve amazing reductions in accident rates by united and persistent effort." President Dearborn called for the report of the General Nominating Committee, which consisted of the following members: G. A. Heuser, Chairman, Ray Carr, Mrs. LaFell Dickinson, C. E. Pettibone, and Theodore F. Smith.

Mr. Heuser reported in behalf of the General Nominating Committee, pointing out that the Constitution authorizes the Committee to name candidates for election to the Trustees, to the Board of Directors, to the Executive Board, and to all offices except the office of Executive Vice-President. The selections of the Committee, Mr. Heuser stated, were reported to the Secretary of the Council seventy-five days before this meeting and were properly announced to all members of the Council on August 7, 1947.

Mr. Heuser then presented as the nominees for Trustees of the Council, to be elected for a three-year term: Winthrop W. Aldrich, James B. Black, S. Bruce Blace Morgan B.

Brainard, Kenneth B. Colman, Walter J. Cummings, Francis J. Gavin, William A. Jeffers, William A. Simpson, Herbert I. Smith, Juan T. Trippie, C. E. Wilson, and Robert W. Woodruff. Of the above nominees, all but Mr. Woodruff were named in the Nominating Committee's report circulated to the Membership. Mr. Heuser said that Mr. Woodruff's name had been added following consideration by his Committee after the original announcement. (Secretary's Note: A complete list of the Trustees, including those elected at this meeting, as well as those continuing in office from previous elections is given on pages 6 and 7 of this volume.)

Mr. Heuser presented the nominations to Directors. In doing so he omitted the name of Mr. Ralph Hough who, along with the other nominees, had been announced to members of the Council on August 7, 1947. He explained that Mr. Hough had advised with regret that he would not be able to accept the office. Mr. Craig proposed the name of Mr. O. Gressens, of Chicago, to take Mr. Hough's place.

Mr. Heuser presented the nominees for the Executive Board, stating that the recommendations of the Executive Board Nominating Committee had been accepted in full and that the list had been published to members of the Council on August 7, 1947.

Mr. Heuser presented nominees for Officers of the Council. He pointed out that in his Committee's report to the Membership, dated August 7, 1947, no nomination was made for the office of Vice-President for Finance and Treasurer and that, to fill this position, his Committee now desired to present the name of Mr. O. Gressens of Chicago.

There were no nominations except those presented by Mr. Heuser, and the Secretary announced that the entire proxy vote, numbering 5,149, was cast in favor of the nominee proposed by the General Nominating Com-

Chello, Inc., New York, N. Y.
 Polaroid Color and Contrast Vectograph Displays.
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 Head and Eye Protective Equipment.
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 First Aid Supplies.
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 Chain and Chain Hooks.
 C-O-Two Fire Equip. Co., Newark, N. J.
 Carbon Dioxide Fire Extinguishers, Hose Units, Manual-Automatic Systems,
 Smoke Detecting Systems.
 M. E. Cunningham Co., Pittsburgh, Pa.
 Safety Marking Tools.
 Davis Emergency Equipment Co., Newark, N. J.
 Respiratory Protection; Combustible Gas Indicators; General Safety and First Aid
 Equipment.
 The Diversify Corp., Chicago, Ill.
 Oil and Grease Absorbents, Cleaning Compounds, Hand Cleaners.
 Dobbins Mfg. Co., Elkhart, Ind.
 Portable Drinking Fountains and Accessories.
 Dockson Corp., Detroit, Mich.
 Industrial Head and Eye Protection.
 C. E. Dodge Co., Westport, Conn.
 Fungicides, Protective Creams, Skin Cleaner, Cutting Oil Germicides.
 Dunn Products, Chicago, Ill.
 Industrial Protective Clothing Made from Rubber, Asbestos Cloth and Leather.
 Duo-Safety Ladder Corp., Oshkosh, Wis.
 Safety and Fire Ladders, Ladder Shoes.
 E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
 Hand Protective Creams, Industrial Hand Creams, Neoprene Products, Rayon Yarn
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TUESDAY AFTERNOON SESSION

October 7, 1947

Reading: LLOYD A. BLANCHARD, Chief, Safety Div., Corps of Engineers, Washington, D. C.

The Chapter of Accidents

By N. B. O'CONNELL

General Superintendent, Turner Construction Company

Those who build buildings can testify that the chapter of accidents in our business is a large and expensive one.

Billy Muldoon was born and raised in a small New England mill town. He finished high school and had hopes of going to college, but he had to help out at home so he got a job at the local mill. By the time the construction of the big new addition to the factory got underway a few years later, Billy Muldoon was already happily married and the father of two fine children. Attracted by the high construction wages and the stories of big take-home pay, he quit his factory job, got himself a laborer's card and went to work for the contractor. He was strong and quick to learn and it didn't long before he was a pusher in the building gang.

January 16, 1945 was a gray winter day with snow in the air and a brisk west wind blowing through the bleak skeleton structure. Billy Muldoon stood on the fifth floor, a gang of hoisting large form panels and about to hook one on when a gust of wind blew the cable hook beyond his reach. He leaned out; the panel, unbalanced by the weight, toppled against him and pushed him forward to the frozen ground sixty feet below.

For days he was on the critical list. Then came the word that his rugged Irish constitution, aided by fervent prayer and constant medical attention, was going to permit a list of injuries which included fractured ribs, a fractured pelvis, fracture of three transverse processes and a comminuted fracture of a lumbar vertebra, to permit a walking with the aid of a cane and walking with the aid of a cane. On July 1, he was back on the job doing his work.

But he had to give up his job with the contractor; could not keep his end up at

the mill, and, finally, his parish rector had to make a place for him working around the church. Billy Muldoon is still in his thirtieth year. His fall has had a tragic effect not only on his life but on the lives of his wife and children.

Hjalmar Frederickson was 56 years old when his useful days as a journeyman carpenter came to an abrupt end. When he first came to this country, he worked on building construction because all his friends were in that line. He was a good mechanic, loved the trade but hated intensely working as a "wood butcher" on concrete forms.

Not long after he married, he put his family savings into a little carpenter shop. But the war came on with its restrictions on lumber. Hjalmar had to go back to working on buildings. He hated the work, but those war plant construction jobs paid well.

It was while placing the forms for a fill on top of a new type of sound absorbent insulating roof tile that Hjalmar met his misfortune. One of the tiles broke under his weight and he fell 22 feet to the concrete floor below. The doctor called it "a comminuted fracture of the right humerus" and stated that there was some indication of injury to the spine. There was not much the doctors could do and, as time went on, Hjalmar suffered almost constant pain in the ulnar nerve, which I understand is the one which gives the "funny bone" sensation. Hjalmar's wife got herself a job soon after the accident, for they had obligations which could not be met by compensation checks. Hjalmar catches odd jobs when he can, but he is not good for much, and the doctors deem him totally disabled. It is just a sort of slow, living death.

Patsy Moreno was an Italian immigrant many years ago. He came over with his father while he was still a young boy. They settled in a small New England town with his father's relatives who worked on the large estates in the neighborhood. As was generally the rule, Patsy was one of a large

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TUESDAY AFTERNOON SESSION

October 7, 1947

Ship Operators Day

Reading: VICE ADMIRAL LYNDON SPENCER, Vice Pres., Lake Carriers' Association

Prevention of Accidents Peculiar to the Operation of Tankers

By CHARLES L. BOYLE

Manager, Marine Dept., Sun Oil Company

It is a little difficult to interpret the meaning of "accidents peculiar to the operation of tankers," except in the broad sense that because tankers carry petroleum products they are susceptible to more violent hazards than regulars and other floating equipment. Some petroleum products are relatively safe to transport, but most are not, and accordingly think in terms of the dangerous products. Formulating rules for prevention of accidents. That the tanker industry has enjoyed a very reasonable degree of success in its campaign to prevent accidents can be readily attested to by the fact that personnel consider tankers as safe as freighters.

While the nation's railroads boast of their record of service without accidents and aviation companies boast of their hours in the flight without accidents, the tanker industry would prudently point to the billions of gallons of petroleum products transported without accidents. In the oil industry accidents are not only cause pain, suffering and unhappiness, but also mean lower morale of personnel, a depletion of higher management insisting on good safety records, breakdown of discipline through loss of time with consequent disruptions in other parts of the industry, monetary losses, and an insult to the industry's pride.

It is difficult to differentiate in tanker operations between materiel and personnel in causing an accident. Prevention programs for the simple reason that accidents are preventable present a high degree of exposure to personnel and, vice versa, personnel can result in serious accidents and, however, we do differentiate, and we should find ourselves devoting the bulk of our attention to prevention of accidents among personnel. In addition to the fact that all seagoing personnel are engaged in their daily routine, tanker

personnel must be fully aware of hazards peculiar to their trade, some of which are mentioned below.

Asphyxiation is probably the most serious hazard, when one considers the high volatility and attendant toxicity of most cargoes carried. As the old saying goes—"familiarity breeds contempt" and you find many tankermen indifferent to the deadly nature of fumes and they often take chances when entering compartments and tanks. Experience figures indicate that this hazard is among the top in fatalities to tanker personnel. Pumprooms, cofferdams and cargo spaces present the greatest amount of exposure for asphyxiation. This is particularly true of the main cargo pumproom. Leakage from cargo pump glands, pipelines and valves should receive prompt attention. The bilges should be kept free of oil at all times. It is good practice to hook up a bilge pump discharge to the shore stop while discharging cargo and while loading cargo, because many cargo pipelines have valve glands begin leaking as a result of high cargo loading rates now employed.

A hard and fast rule should be enforced that no man, for any reason whatsoever, be permitted to enter a cargo tank, pumpcofferdam or any closed space until a thorough test of the space has been made. Various instruments and devices are available for the detection of gas vapors and oxygen, and even if the space to be entered is found safe, continued vigilance is required until definite assurance is obtained that static condition exists. Spaces which contain petroleum products, unless thoroughly cleaned and ventilated, have a habit of becoming gassy again due to temperature changes, dislodgment of scale, agitation of sludge, etc. Effective ventilation of a compartment to be entered is an important

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MONDAY AFTERNOON SESSION

October 6, 1947

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How the Front Line Supervisor Should Carry Out His Safety Responsibility

By H. H. FEIT

Superintendent of Industrial Relations, Homestead District Works, Carnegie-Illinois Steel Corporation

I shall not burden you with a discussion of the history of the safety movement and progress we have seen within our life-time because as has been said before, "there is no need to continually examine the past to fully understand how much a part of it is."

Nothing, however, we should fully recognize that the progress we have thus far made is largely within the field of facilities. Also frequently the case, scientific development of material things is much more rapid than the scientific development of men and actions. Briefly, we have seen much accomplished in the way of safeguards on machinery, the use of colors and signs to designate dangerous areas, governors placed on machinery to hold it within safe speed limits, and a host of other improvements too numerous to mention here.

Obviously, then, it is the individual toward whom we must direct our attention from the point of safety. We must increasingly turn ourselves with what he does if we are to determine why it is that accidents still occur. Such a problem cannot be solved unless there is a definite and conscious effort on the part of all management through the front line supervisor to get at the source of the trouble.

In the field of equipment everyone recognizes that the best performance is obtained when that equipment is attuned to a sensitivity that makes for smoothness and freedom from trouble. It follows, then, that the supervisor, too, must have that sensitivity—we can otherwise state—an awareness of the conditions which are necessary for continued safety of all concerned. Awareness, is being alive; the intuition to know when something is out of the ordinary, though to all outward appearances there

has been no appreciable change from the normal. The ability to be aware of these changes spells the difference between success and failure for the modern front line supervisor. We cannot be content with such answers as prevailed in the past: "I didn't see anything wrong in the way they were doing it," or "They surely know better, but they've been told often enough." Our responsibility is to be aware of why individuals continue to be involved in accidents and develop a solution of this problem. In connection with this increased awareness there must also be an increased sense of responsibility as a necessity on the part of all supervision.

"Passing the buck" is an indication of the proper degree of responsibility has been accepted, or has not been delegated to the proper degree. Ideally, everyone should assume the responsibility for the safety of himself and others to the degree that a change of any kind would be only history. This is idealism of the highest order, but will occur only when man has reached millennium. Until then, we will continue to recognize that the front line supervisor has definite responsibility for the safety of those for whom he has assumed the position of supervisor. He cannot, if he is to be the kind of supervisor we must have in industry today, assume part of the responsibility without assuming the whole.

Before entering into the detailed discussion of how the front line supervisor exercises his responsibility in connection with safety, I feel it would be well to deplore momentarily and consider the responsibility of management as a whole. I do this because we all realize that the front line supervisor is a member of the management team. It is therefore necessary that each element in man-

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Petroleum Section

TUESDAY AFTERNOON SESSION

October 7, 1947

J. HOWARD MEYERS, Director of Safety and Fire Prevention, The Atlantic Refining Co.

The Safety Program, a Unique Tool of Management

By H. H. ANDERSON

Vice President and General Manager, Shell Pipe Line Corp.

cannot replace that other effort, but well-planned safety promotion will create a propitious atmosphere for that effort and supplement it to unique advantage for workers as well as management.

The experts say that good industrial relations require effective two-way channels of communication between workers and management. Such are imperative if a manager expects to sell the company and its policies to his workers, and if he is to be honestly appraised of—and in a position to respond to—their attitudes, problems and needs. To illustrate how safety promotion can create such two-way channels, I will describe the experience of our own company with 1,500 employees operating 4,500 miles of oil pipe lines.

The best channels are provided by our Safety Chapters. Twenty-nine of these have been organized by the safety engineers to include all rank-and-file workers and their direct supervisors. Formed by a conveniently adjacent group of about 50 employees, each chapter elects officers who conduct formal quarterly meetings. These are held on employees' time, but company transportation may be used. More than 80 per cent of the workers attend them regularly, and full attendance at a good program is common. Division, Area and Head Office supervisors are always invited. Working funds are obtained when desired by dues or collections.

The meeting programs vary. One each year includes a dinner or picnic for the families, largely financed by the company. But all of them usually feature two or three items such as a short talk by a local citizen, a description or discussion of a company policy, the showing of a selected motion picture, or the presentation of service and safety awards, plus a brief talk on safety. The last is followed by a general and frank discussion of any unsafe local conditions. Minutes are written and mailed to all concerned.

Supervisors join in the safety discussions

safety program merits a key place in management plan because, adroitly handled, it is an exceptional tool for improvement of profits. It affords the manager a ready way among his workers to promote many millions beneficial to the business. It is so because the workers respond through a sense of reciprocal benefits.

Just such business conditions or factors are improved through a well-planned and efficiently-administered safety program. Efficiency of supervision, employee relations, worker acceptance, public relations, productivity, service continuity, reduction of absenteeism and reduction of accidents are open to improvement in our own companies.

Statistics have shown that an average lost accident, including expenses of all kinds, costs the company about \$975 plus the legal cost of any industrial deaths. Thus we may see without discussion the value of a safety program for reducing accident costs to the company and anguish and wage losses to employees, but some industrialists who recognize obvious benefits seem unaware of the gains to be derived from applying the program to other phases of the business.

Business large or small can succeed only if it serves its public, and the larger it is, more it is dependent on its employees to carry out its objectives. To win their best, the employees must be brought to realize their mutuality of interest with employer. Only then will they prefer to work on the job; to work harmoniously, to work carefully; and to carry the burden of good report to customers and the public at large.

The conditions or factors mentioned are not the others are responsive to the effective supervision, and its corollary, employee relations. However, the improvement of each factor requires special effort if not a separate program in the management plan. Of course the safety program

exists, H. W.: "Industrial Accident Prevention"

TUESDAY AFTERNOON SESSION

October 7, 1947

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Memorial to Ben Grainger

By GEORGE H. BERRY
 Safety Engineer, Western Electric Co., Inc.

Ben Grainger is gone. Gone these many years. We who but a short while ago, were working at his assignment as staff representative for the Power Press Section as well as other sections, still can scarcely believe he is gone. It seems but yesterday that he stood at the door, counting the attendance for sessions with a view toward obtaining a room for us at this present Congress. It does not seem possible that we shall ever again see his genial sunny smile—that can never again pick up the telephone or call to Ben asking for advice—nor lean upon him for guidance in the formulation of programs or for some idea from his vast reservoir of experience.

There was nothing selfish about Ben. He had no flare for self publicity. He was modest and humble. He asked nothing more for himself than he'd like to give to others. He talked in a language we all could understand and liked him right from the start.

Ben Grainger was born April 4th, 1888, in St. Louis, Missouri and died February 12th, 1947. His service to safety was of a kind and quality duplicated by few men. It runs through a period of 34 years—almost exactly parallel to the history of the National Safety Council itself.

In addition to his sectional activities, Ben was a staunch supporter of the American Society of Safety Engineers. His fellowship and wealth of experience in human relationships and safety work will be missed by countless men in industrial safety fields.

Ben Grainger's first industrial job was that of a plant engineer with the Stromberg-Carlson Motor Devices Company of Chicago in 1914.

In 1935 he took charge of safety work for Bendix Aviation Corporation of South Bend, Indiana for whom he established an admirable program of accident prevention.

In addition to his safety work at Bend he also served for four years as chairman of South Bend's Safety Council's Industrial Division.

In the early days of the last World War he went with the Newport Shipbuilding Company at Newport, Fla.

Later he became safety director for Ingalls Shipbuilding Corporation at Ingalls, Miss.

Having filled various offices in the Press and Automotive and Machine Shop sections down through the years, he was a "usual" for staff representative of these sections when he joined the National Safety Council staff in 1913.

A practical man rather than a theoretician he was more interested in the means and devices for preventing accidents than delving into the theories of programming alone.

As a master of personal relationships (which he preferred to call "getting along with the boys") he was highly successful as a shop safety man as well as a staff representative. His colleagues at National Headquarters tell me they found him to be a "caustic critic of 'fancy' ideas and an inhaustible source of workable ones."

In human relationship Ben Grainger has an example which will be difficult for many of us who remain here to follow.

As Admiral Gregory so aptly said at the grave of General Harbord in Arlington Cemetery on the 21st of last August:

"Half of our troubles we make ourselves by rebelling against our misfortunes. As so we can accept them, can say and believe they are for the best, their sting is gone. Trusting in God, we shall not fancy should be happy were we only somewhat else, had we only that something else which seems to us wanting in our lives. We shall feel that God put us exactly where we need it or withheld whatever was right; "

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TUESDAY AFTERNOON SESSION

October 7, 1948

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An Ex-President Reviews a Twenty Year Safety Program

By W. E. MITCHELL

Ex-President, Georgia Power Company

Recent issue of the Saturday Evening Post carried the striking headline—"License to Kill." Of course it had reference to the terrible toll of lives lost in highway accidents. However we have a 3-day week-end holiday. We are warned that 300 or 400 people will be killed, and they are. The number of accidents in and around the home are appalling. And this great convention indicates the interest of every line of business here in preventing in doing a better job of accident prevention. With that thought in mind I want to say to you that it might be helpful if I were to look back over the electric light and power business, with which I have been connected for nearly 45 years, and see if we have any real progress there. These things that have been tried and proved helpful in one industry should be helpful in others. Of course there are some hazards that, like the ones I am coming in contact with live in the electric utility business.

There is one thing that I know as well as anyone here—a thing that we all ought to have is the recognition that we can't let things go. On the contrary, we must work harder than ever to make safety pay bigger dividends than it ever has paid before in terms of human life and happiness, of industrial productivity and economic well-being. Here, as perhaps nowhere else, eternal peace is the price of continued success.

Why have a safety program? What makes it successful one? How do you measure its accomplishments? Much has been written and spoken on this subject. I can't tell you any more new, but old lessons, like sound old words, will bear repeating. Men at work will much like overgrown children, prone to forget and prone to slip backward.

Why have a safety program—because it will bring big dividends in cash, and in a clearer conscience. Accidents cost money and are an economic waste, aside from causing needless

human suffering. The training of men in practices and the avoidance of accidents is justly having a safety program.

What will make a successful one—the harder to say but certainly it will take a full planning, thorough training, and continued follow-up as part of the duties of regular employees.

How shall we measure its accomplishment—that is not difficult. A steadily decreasing number of accidents per 100 man-hours worked and a continued reduction in permanently disabling accidents are a true proof that your program is working.

How to develop a successful plan—well, say that the first and most important factor is that top management be completely and enthusiastically sold on the importance of safety.

Management must take the leading in a program of accident prevention amounts to anything. Management has initiated it, see that it permeates the whole organization, give it emotional appeal, keep it alive and going after the first interest has died down. You can employ safety directors to advise with the management, with the men about good techniques. Safety directors can help to carry out the policies of the management, but they can't do the job alone, without the assistance of management.

The wages paid must be fair and adequate and there must be reasonable permanency in the job, if we expect the workman to become interested in accident prevention.

It is the duty and obligation of a company to take the leadership in activities of a kind from which the employees benefit. The president or general manager cannot delegate the organization of the safety program to some minor subordinate. This is not a way management gets results in production or in purchasing, or in selling. Management must realize that the functioning of a

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Textile Section

TUESDAY AFTERNOON SESSION

October 7, 1947

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Safety Factors Involved in Mechanical and Manual Materials Handling

By C. S. LINK, JR.
Avondale Mills

This entire paper is based on the experience gained in connection with the safety programs and materials handling projects as being carried on in Avondale Mills' eleven plants in Alabama.

In Avondale Mills, the matter of safety is on an equal footing with such items as production, quality and deliveries, and, most importantly, is the fact that this interest in safety is spearheaded by top management.

It was top management's idea to set up the program and each plant were asked to serve as a month on a committee whose interests would lie in one of four directions—one group in safety, another group on good-housekeeping, another on thrift and still another on saving. These groups are selected in alphabetical order from the payrolls and at the end of the program, half of them served for one month, the other for one month; thus now have the half of the group with experience in the subject, breaking in the new half. Over a period of time, therefore, all employees will have served, at some time or other, one or all of these groups.

These groups hold monthly inspections of the entire plant, then sit down and talk over their findings; a written report is made to general office. All suggestions are acted upon, or rejected if not feasible, and prizes are given for worthwhile suggestions.

When a lost time accident occurs, the full report is reported to all superintendents as well as the main office; statements are taken from the injured as to how it occurred and the best possible safe-guard suggested as to how to prevent a re-occurrence. Each such incident and report is then taken up at the monthly meeting of the safety group and thoroughly discussed, and notes made of suggestions and criticisms.

When a minor accident occurs that does not involve lost-time, but which does involve

medical attention or first aid, the name of the injured, his explanation, the nature of the accident and the causes are carefully recorded and a monthly report filed with the main office. Here they are consolidated, a frequency rate established and results reported to the committee and occasionally published in our house organ, the Avondale Sun.

We own and operate our own hospital at Sylacauga, and thus the statistics presented will be a result of actual hospital cases as well as results obtained from the monthly reports.

Materials handling equipment must fill certain basic requirements: safety to operators and to other employees; prevention of increase productivity per employee; promote good-housekeeping and make a reasonable return on the investment. All of these are basic and fundamental.

In two plants we have installed low-level dump chutes for doffers, so that when a frame is doffed there is no need to lift 150 pounds four feet to dump the yarn into a larger bin. The yarn is dumped into the proper bin which leads to a large hopper which holds from 1500 to 1700 bobbins—six or seven doffers.

In one of these plants, before this installation, we had a hospital record of four to six cases a day of lost-time due to strained backs. Since this installation has been in use the hasn't been a single case.

In another plant a system was installed to return empty bobbins to a conveniently located station, near the center of the spinning room, as fast as they were emptied at the winders. This eliminated a large part of running with doff boxes, kept large supply boxes off the floor, utilized space under the mill and along the ceiling with savings on all these points.

In the weaving mill the cloth doffers too their rolls of cloth great distances, leaving

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MONDAY AFTERNOON SESSION

October 6, 1947

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Recognition and Control of Fume and Dust Exposure

By V. J. CASTROP

Research Laboratories Division, General Motors Corporation

Illness which can be attributed to the occupational environment may occur in the automotive and machine shop industries. While occupational disease is not as prevalent as in some other industries, there are many fewer in number than those who are exposed to occupational hazards. The need for vigilance in maintaining a safe working environment. The responsibility for employee health is delegated to management to the medical director with the safety director charged with matters pertaining to safety. For the smooth functioning of the department it is necessary that these individuals work in close harmony with each other.

A safety engineer who is capable of recognizing conditions which may be detrimental to the health of the employee is an excellent asset to the department. The safety engineer should not be capable of actually sampling air in the environment or designing a ventilation system for the control of toxic materials. He should, however, have knowledge of the materials which have been proved harmful should be fairly well informed of the hazards of these materials may be used safely, have a good understanding of basic control measures which are normally recommended when such materials are used.

The intention is not to present a highly technical discussion of fume and dust exposure, or detailed information regarding ventilation systems, as such matters are of interest to the professional industrial hygienist and of comparatively little value to safety engineers. This discussion will be limited to more basic principles of industrial hygiene as they relate to fume and dust exposure to indicate what control measures are available or used to protect the employee's health, and, to call to your attention operations and materials which are commonly encountered in the automotive and allied industries, at the same time indicating the generally

accepted opinion as to their effect on health. Many conditions are corrected or improved because of reasons other than their effect upon the health of the employees. Better products, better employee relationship, reduction in maintenance of equipment may be cited as justification for management's decisions for such correction or improvement.

Generally speaking there are two means of entrance of toxic compounds into the human body under industrial conditions, namely, by ingestion or via the respiratory tract through the inhalation of fumes, dusts, mists or gases. Ingestion is of importance if toxic materials which have a systemic effect are used and adequate washing facilities are not provided, or, where the employees are slovenly in their personal habits. Inhalation is considered the most important portal of entry of fumes or dusts and the particle size, therefore, becomes significant in evaluating an exposure. The particles which cause the physiological changes are those which are small enough to remain suspended in the air and not those which immediately fall to the floor. Flying particles, which are of concern to a safety man and for which he advocates the use of goggles, are not of hygienic significance since they are not of respirable size. To judge the seriousness of an exposure by the quantity of detritus adjacent to an operation is often misleading. This is especially true where mechanical ventilation has been provided which will remove the fine material but is inadequate to trap or convey the larger particles.

In evaluating an exposure it is necessary to consider the toxicity of the material, the duration of the exposure, the average concentration of the contaminant with special attention being paid to those operations which produce high concentrations at some phase of an operating cycle, and the measures which have been provided to control the exposure.

Medical records of the individuals subjected to the exposure may be of value if the examinations are thorough and frequent and not of a cursory type. It must be remembered that occupational diseases are slow in development and in some instances lasting in effect. Slow changes may not be detected and the mere fact that cases have not occurred is no definite assurance that exposures to known toxic materials may be ignored.

The determination of the concentration of the toxic material in the air is important in evaluating the exposure. Tests of this type are not only indicative of the degree of contamination but in some instances which operation is the major offender.

The apparatus used in collecting the contaminant and the method used in estimating the amount present in the atmosphere vary with the type of material. Tests of this type are specialized in nature and are beset with many pitfalls which can lead to very erroneous results and conclusions if done by other than experienced personnel.

In a discussion pertaining to toxic materials it is generally necessary to quote permissible concentrations or as it is sometimes expressed—maximum allowable concentrations—permissible limits, or threshold limits. These terms are used extensively by industrial hygienists to indicate concentrations of a substance in the air which are considered compatible with good health. The limit usually applies to exposures of eight hours duration for a prolonged period.

The limits are, for the most part, advisory standards or bench marks which are practical to meet. In general, these limits are derived from three types of evidence all of which have value and limitations.

1. Animals have been exposed at different concentrations and the effects noted.
2. A few experiments have been made on human subjects for short periods of time.
3. Safe limits have been arrived at by measuring the concentrations of substance in the workroom air and correlating this information with results of medical examinations of workmen.

There is no magic connected with these limits and the mere fact that they are exceeded does not necessarily mean that someone will definitely become ill, but there is a good probability that someone will suffer ill effects if the limit is greatly exceeded for a

considerable period. There remains much to be learned regarding the toxicity of many substances used in industry, and it is hoped that with more research and study that answers will be found.

So much for the general picture. Now let us take a look at some specific operations. *Welding*—Welding processes most commonly used can be divided into three types, arc, gas, and resistance. The safety measures pertaining to clothing, goggles, and helmets are of common knowledge and therefore will not be considered in this discussion.

Arc welding when performed on uncoated steel does not produce a condition which is considered harmful to the welder provided it is accomplished in a comparatively large open area. The fumes which result from welding consist essentially of the oxides of iron and oxides of metals which may comprise the steel or coating of the welding rod. Some investigators have found characteristic markings on chest x-rays of men who have welded under severe conditions for long periods of time. These markings are presumably due to the deposition of iron fumes within the lungs, but it has not been demonstrated that such fumes have caused physical impairment.

A frequently suggested limit for welder fume is 15 milligrams of iron oxide per cubic meter of air. Concentrations of this magnitude existing in the workroom would materially reduce visibility and thereby become a source or an unsafe condition requiring correction.

Welding within confined areas and tanks, inside machinery or equipment in small rooms presents a condition which is of concern. The concentration of iron materially higher under these conditions is natural air currents normally present in a large shop. Nitrogen oxides formed by electric arc when inhaled in sufficient quantities causes fluids to form in the lung system. While welding in large open areas these toxic gases are normally not present in sufficient quantities to cause harmful effects. However, when welding is done in confined areas, the nitrogen oxides may reach a concentration which will be harmful.

Gas welding generally is not producing harmful fumes. There are, however, involving two potentially harmful exposures, boric acid or borates generally are

brazing fluxes, some metals require fluxes containing significant quantities of fluoride compounds and fumes from these fluxes have been known to produce significant nasal irritation. Fluorides in general are looked upon with suspicion since they may produce harmful effects upon the bone structure. A limit of 45 mg. per cubic meter has been suggested for fluorides, but no standard has been agreed upon. Most industrial hygienists attempt to keep them as low as practicable in order to be absolutely certain that bone damage does not occur among the workers.

Silver solder is one of the more common alloys used in brazing. Solders of this type vary in composition and may in some instances contain cadmium which if volatilized in sufficient quantities is considered to be harmful. At present the suggested limit for cadmium fume in air is 1 milligram per 10 cubic meters of air.

Resistance, spot, or butt welding of plain steel is of no concern from the physiological standpoint. The fumes arising from such operations generally are caused by the volatilized oil which has come upon the metal stick during previous operations or which has been placed upon the metal as a rust preventive.

The preceding discussion of welding operations has been based upon the assumption that the metals being welded are of plain steel. The performance of welding operations, whether arc, gas, or resistance, upon metals which have been coated with such toxic materials as lead, cadmium, or mercury may cause harmful exposures. The heat of the flame or of the arc causes volatilization of these metals. Welding or cutting ofterne plates or other metals containing significant quantities of lead can result in the volatilization of lead fume, which if inhaled for a sufficient period of time, may result in lead absorption and ultimate poisoning. The cutting or welding of surfaces which have been coated with paint containing lead has caused lead poisoning in the past and will continue to do so unless adequately controlled.

Welding of cadmium plated material was reported as the cause of illness and even death to a number of individuals during the recent war activity. The reported cases indicated that death occurred in a comparatively short time after the exposure.

Welding of galvanized metal causes the volatilization of the zinc coating. Temporary

discomfort associated with metal fume may result from such an exposure.

Where warranted the control of weld fumes is generally accomplished by providing a mechanical ventilation system. The type of ventilation used is dependent upon the nature of the welding. When the object to be welded is positioned in a fixture or jig it is possible to obtain effective control of fumes by the use of a grift side hood, flexible duct near the source of fume. If the parts are large and it is necessary to weld more than a foot from a fixed point it is difficult to obtain good control of the fume with reasonable air volumes through a tent using flexible ducts. Since the effective range of most flexible ducts is approximately 8 inches from the duct opening, it is necessary for the welder to move the duct whenever the arc is outside this range. The practical result is that most ducts are normal not moved and the ventilation system does not remove the fumes when liberated. According to reports this type of system has been effectively used in shipyards, for the control of welding fumes in confined areas. In view of this experience it should therefore be a satisfactory means of control in welding fumes in tanks. However, excellent supervision and education is necessary to make such systems effective.

Where the room volume per welder is large the natural ventilation within the plant is usually sufficient to prevent the accumulation of excessive concentration of fumes from plain steel welding. Circulating fans directed from the side help to dilute the fume which may be concentrated in the breathing zone of the welder.

Another means of control is the use of personal respiratory equipment. Air line respirators and fume respirators have been developed which will provide adequate protection. Some manufacturers of this type of equipment have on the market welders' helmets with facilities for providing fresh air to the wearer. The use of this type of equipment has been limited. Since the welder is already burdened with helmet, goggles, and protective clothing he probably will not be receptive to a respirator. It is usually sufficient in most welding for the employee to wear an ordinary helmet and to arrange the position of the work so as to prevent the concentrated fume from flowing under the helmet.

Dry Grinding—The dust resulting from the

grinding of nontoxic metals which are free of sand is generally considered a nuisance and is not harmful per se. Despite this fact some state laws require grinding operations to be ventilated. This requirement has probably been a hold over from the days when sandstone wheels were prevalent and also to prevent the creation of a nuisance condition. Grinding wheels in use in industry have artificial abrasives such as aluminum oxide or silicon carbide. Emery, which is a natural product composed of essentially aluminum and the magnetic oxide of iron, may also be used. A permissible limit of 50 million particles per cubic foot of air for aluminum oxide and silicon carbide was recently accepted by the members of the American Conference of Governmental Industrial Hygienists. Such a limit is liberal and concentrations of such magnitude are normally not encountered.

When lead, silica, or some similar toxic material comes in contact with the grinding wheel the exposure to the abrasive matter may be ignored and the exposure evaluated on the basis of the toxic material. If this latter material is controlled the nuisance will also be eliminated.

Ventilation systems for grinding wheels have been fairly well standardized and generally are satisfactory to prevent a nuisance. Hoods should enclose the wheel as completely as is practicable. Air volumes should be provided which are sufficient to cause an inward flow into the hood when using the smallest wheel. This is especially true where toxic materials are involved.

Wet Grinding—Baffles, hoods, and guards are generally located near wet grinding wheels to prevent dispersion of the liquid used as a coolant. These devices are usually sufficient to control the dust if it is nontoxic in nature. If the dust liberated is toxic, mechanical exhaust ventilation may be required.

Buffing and polishing—The buffing compound applied to wheels used for buffing and polishing vary in composition. Waxes and various types of abrasive are the major components. These materials plus lint and fibers from the wheel are the essential ingredients of the airborne dust. The toxicity is dependent upon the type of abrasive. Generally ventilation is provided so as to improve housekeeping and reduce the number of complaints and not because of the hazard to health.

Machining—Smoke from oily parts is the prevailing source of air contamination at machining operations. Illness has not been attributed to this type of exposure. As is the case with most fumes and dusts of the nature variety little is known as to what effect such materials have on already existing physical abnormalities.

Machining operations on steel produce large chips or turnings; consequently, dust is not a problem. Operations involving the machining of high lead alloys have been studied, and significant quantities of airborne lead have not been demonstrated.

Graphite which becomes airborne during the machining of cast iron is not considered to be physiologically significant, and therefore is classified as a nuisance dust. Frequently management considers it advisable to provide ventilation for the machines which are productive of the most dust, as graphite on the clothing and person and surrounding machinery is conducive to many complaints. Ventilation systems for the machining, drilling, and so forth, of cast iron should include hoods located as near the cutters or drills as is practicable. Many of these hoods are in use on production machinery and are doing an excellent job of dust control.

Abrasive Cleaning—Since silica is recognized as the most harmful of mineral dusts, an adequate ventilation system is normally provided at the time of installation of commercially built sand blast equipment. Continuous usage and lack of maintenance result in a breakdown of adequate control. Visible escape of dust is the best evidence that this has occurred and it is advisable to correct such a condition without undue delay.

Employees who are stationed in blast rooms are dependent upon personal respiratory equipment. It is of utmost importance that such devices are of a type which will provide the necessary protection. Devices of this type are of the supplied-air variety, and it is necessary that the air provided be free of harmful contaminants. The air compressors should be located in an area free of contamination; otherwise the contaminant will be transmitted to the helmet and the breathing zone of the worker.

Normally, ventilation within the room is provided so as to improve visibility and to help prevent the escape of dust to the surrounding areas not to reduce the concentration of silica dust to a safe level.

Practically all industrial plants have operations which involve the use of leading base bearing metal or solder. Babbitt bearing metal containing approximately 75 per cent lead has been encountered. The composition of solder metal is variable and dependent upon the purpose for which it is used, with ordinary soft solder containing a comparatively high percentage of lead.

Assuming that the babbitt or solder in use is one containing a significant amount of lead, the question then arises as to whether or not the employees working with this material will become ill. The answer to such a question could be given by a qualified industrial hygienist after he had seen the operation and considered such factors as the temperature to which the metal is heated, the method of removing excess solder, the length of exposure, and the effectiveness of the control measures provided.

It is a well known fact that lead causes illness if absorbed in excessive amounts, and therefore operations wherein lead is used have received considerable attention and study. Out of this experience certain practices are known to produce excessive exposure whereas other practices have been proved not to be harmful. It is generally conceded that excessive concentrations do not result from operations where solder is applied by means of an electric soldering iron. This is probably due to the small amounts of solder used and the comparatively low heat of the metal. When an iron is used which is heated in a small gas fired furnace, the exposure may be of greater consequence. Solder which remains on the iron coming into contact with the flame or heat is vulnerable for volatilization. Small amounts of solder drop from the iron onto the hot floor of the furnace where it is readily volatilized or oxidized. The oxidized material may become airborne due to disturbances created by the flame or by removing or placing the soldering iron in the furnace. Frequently industrial hygienists recommend that ventilation be provided for heating units of this type thereby removing lead fumes and dust from the environment. This is particularly true in small rooms or where many units are in use.

The atmospheric contamination occasioned by the use of either gas or electrically heated pots containing solder is dependent on a number of factors. With higher temperatures more volatilization will occur and the greater

rumblast or rotating table type of sand blast units should be provided with sufficient ventilation to prevent the escape of silica dust. Leakage due to excessive wear should be remedied.

Small sand blast cabinets, where the operator controls the blast nozzles from outside the cabinet, frequently have faulty seals around the doors or the rubber gauntlets are loose or torn. The dust which escapes from the cabinet through these openings is in close proximity to the breathing zone of the employee and in many instances exceeds the permissible limit for silica. This leakage should be corrected and the men should not be required to use respirators.

If the articles being blasted are free of silica or other toxic material, the dust resulting from grit or shot blasting is classified in the nuisance category. It follows that the maintenance of ventilating systems for grit blasting, although desirable, is not always so necessary as for sand blasting.

The use of steel grit or shot in blasting rooms produce excessively high concentrations of dust within the enclosure. It is therefore, necessary to protect the worker within the room. The remarks included in the section devoted to sand blasting rooms are therefore, pertinent when considering rooms in which steel grit or shot are used as the abrasive.

Vapor blasting, a variation of sand blasting, is of comparatively recent development. This procedure involves the use of fine silica and water under pressure. The silica used in vapor blast units varies in size and may even be as small as 1250 mesh (approximately 10 microns). It is generally believed that airborne silica particles below 5 microns are most significant in causing silicosis. It then follows that operations involving the use of silica abrasive whose initial particle size approaches that order of magnitude are more hazardous, and require continual vigilance in maintaining good control. It is, therefore, essential that the vapor blast cabinets be maintained so that leakage of mist does not occur. Good housekeeping is also essential as spillage of the sand and water sludge upon the floor will create a source for dust dissemination when the water evaporates. Likewise, containers of the dried sludge should not be allowed to stand in the factory where they can be influenced by air currents of high velocity.

des of dust in one cubic foot of air, as determined by actual count, using the standard light field technique.

The dust hazard in abrasive blasting may be controlled in several ways; however, most of the industries now use mechanically enclosed exhaust-ventilated machines where the operator observes and controls his work from the outside by looking through a protected glass window.

These machines are built in the form of a cabinet forming a sealed or enclosed area, so that little of the dusts escape into the general workroom area. If necessary, the workers are provided with personal protective devices, such as hoods with air-line respirators, and approved filter type respirators, and other equipment necessary to protect against dusts and rebounding abrasives.

Cleaning by polishing the base metals is usually carried out by the use of revolving wire brushes, which are used to remove rust and loose scale, adhering dust, dirt or materials which have to be removed before the metal can be electroplated. The principal hazard to health is dusts, and these wire brush buffing machines should be provided with adequate suction to remove the dusts from the working area; otherwise the worker should be provided with an approved respirator to protect against any toxic innocuous dusts which might be present.

Cleaning with the use of solvents is the principal method used to clean metal parts before electroplating. It is usually referred to as "solvent degreasing." Cleaning by this method involves the use of such chlorinated solvents as Permachlor (trichloroethylene), perchloroethylene and carbon tetrachloride. These solvents are all toxic and adequate protective measures must be employed for their safe use.

When used in a mechanically operated, properly designed and maintained degreaser, little health hazard is involved, if the manufacturers' rules and other safety regulations are followed. In manually operated degreasing operations, however, considerable solvent vapor can be released and inhaled if close and constant supervision is not exercised over the workers. In hand cleaning of small batches of materials to be plated, if speed in drying is not too important, perchloroethylene on account of its lower vapor pressure and higher boiling point is to be preferred over trichloroethylene or carbon tetrachlo-

ride. Exhaust ventilation of solvent degreasing operations is rarely recommended on account of solvent loss. In the great majority of cases, as we have already indicated—if the manufacturers' instructions are followed as to installation and maintenance and safety rules, and provided the degreaser is protected from drafts, little or no health hazard is involved in its use.

The M.A.C. of trichloroethylene or perchloroethylene for most states is 200 parts per million (p.p.m.). The M.A.C. for carbon tetrachloride is 100 p.p.m. Some health departments think this last solvent is of such toxic character that its M.A.C. should be reduced to 50 p.p.m. Tests should be made in the vicinity of solvent degreasers to see if these values are not exceeded for continuous eight hour exposures.

The health hazard in cleaning by caustic treatment results from exposure to caustic mists and vapors liberated from the hot caustic solutions in which the metal is dipped for treatment.

Local exhaust and other control measures may be needed. This will be the more needful if the solutions are strongly heated.

Some of the potential health hazards in pickling metals are the acid mists, acid gases, and gases liberated due to impurities either in the pickling acid or in the metal being cleaned, which is immersed in the sulphuric acid solution. Some of these products are hydrogen chloride, hydrogen sulphide, sulphur dioxide, arsine, phosphine and nitrogen oxides.

Pickling operations should be enclosed, isolated to prevent the liberated mists and gases from entering and contaminating the general workroom air. This enclosure should have sufficient exhaust ventilation so that air is admitted to it at all openings at a rate of at least 100 feet per minute. This should prevent exfiltration of the gases to work in adjoining areas.

If the pickling operation can not be isolated, then local exhaust ventilation should be provided at the tank by means of slot hoods located at the upper edge of the container which holds the acid. The exhaust ventilation rate should be a minimum of at least 120 cubic feet per minute for each square foot of tank area. The workers should be protected with acid proof clothing and should be instructed as to the corrosive char-

acter of the solutions used, as well as the necessary first-aid measures to be used should some of the acid solution accidentally come in contact with their skin.

For the removal of oxides, tarnish and scales from copper, bronze and some other materials, a solution known as "Bright Dip" is used. This solution consists of sulphuric, nitric and hydrochloric acids. It is very corrosive, and when used, good ventilation must be provided.

If sand is present in the surface grains of the metal, then hydrofluoric acid is used. This is also a very corrosive acid and care is needed in handling it. The M.A.C. is low.

The "Stripping" of defective plated coatings may be accomplished electrolytically, or in strong acid or alcoholic solutions. In these cases gases and sprays are involved which require good ventilation.

In operations using solutions of cyanides in a bath, care should be taken to avoid the introductions of acid into the bath since hydrogen cyanide is liberated under such conditions. This gas is very poisonous. All cyanide baths should be conspicuously marked "Poisonous."

Electroplating consists of the passage of an electric current through a solution of a metallic salt and the separation of a metal on one of the electrodes.

The potential health hazards associated with electroplating are chromic acid mists, metallic salts, cyanides and other toxic gases and compounds.

Electroplating protects against tarnish and corrosion and improves appearance.

The applications of electroplating are almost as extensive as the uses of metals. The largest industrial application is in the automobile industry, in which not only many visible parts are finished by plating, chiefly with nickel and chromium; but also many concealed parts are plated with zinc, cadmium or tin.

Most of the plating is done in several hundred large plants, that are supervised by technical persons and provided with modern equipment, including that for effective ventilation. In addition, there are at least 3,000 smaller plating plants, many engaged in "job plating," in which the facilities and staff are more limited, and for which more instruction and supervision are required.

Many of the plating operations involve the use of large volumes of solutions of poison-

ous materials, including strong acids and alkalis, cyanides, chromic acid, and salts of toxic metals, such as lead and cadmium. In addition to the danger of contact with the solutions, there is also the hazard of inhaling poisonous gases, and sprays that are carried into the air by evolved gases. One such gas that may be liberated is hydrocyanic acid by the action of the carbon dioxide of the air on cyanide solutions.

Chromic acid, the principal constituent of chromium plating baths has specific effects that are distinct from those of the common strong acids. Its high oxidizing properties cause it to attack membranes, especially of the nasal tissues, and to cause "ulcers" to form wherever the skin is abraded.

It is important to note that these effects are confined to hexavalent chromium (chromic acid and chromates). Trivalent chromium, as in chromic sulfate, has no such effects. It has been reported that large amounts can be ingested without injury. This distinction is important in considering the possible health hazards should any chromium be dissolved from cooking utensils, as then the trivalent compounds are formed, and not the hexavalent.

There is always a large evolution of gas during chromium plating. Oxygen is evolved at the insoluble anodes and considerable hydrogen is evolved at the cathodes. These gases tend to carry a fine mist or spray of the liquid present in the tank into the surrounding air. The injurious component is deemed to be chromic acid. For this reason effective ventilation must be provided. Early in the development of chromium plating a study was made of the hazards involved by Bloomfield and Blum (1).

The results of this early exploratory study appear to be confirmed by later observations and experience. They showed that nasal injuries were likely to occur on long exposure to air containing more than 1 milligram of chromic acid in 10 cubic meters of air. It was then concluded that, under favorable conditions of cross ventilation, the desired low concentration can be maintained by drawing air through a narrow slot on one or more sides of the tank with a slot velocity of about 2,000 linear feet per minute.

In the American Standard for "Safety in Electroplating Operations," approved August 19, 1941 by the American Standards Association, the degree of ventilation suggested for