



TRANSACTIONS

29th

NATIONAL SAFETY CONGRESS



GENERAL AND INDUSTRIAL
SESSIONS.

CHICAGO
OCTOBER 7-11, 1940

NATIONAL SAFETY COUNCIL, INC.
20 North Wacker Drive, Chicago

Copyright, 1940, National Safety Council, Inc.
Printed in the U. S. A.

Foreword

THE Transactions of the 29th National Safety Congress and Exposition of the National Safety Council, October 7-11, 1940, are published in two volumes. Volume I contains the General Sessions and the meetings of the various Industrial Sections of the Council. Volume II contains the Street and Highway Traffic; the Commercial Vehicle, the Transit, the Child Education and the Home Safety Sessions. Volume I is distributed automatically to all industrial members of the Council. Volume II is sent to members who are believed to be interested chiefly in the sessions it contains. However, other members of the Council may obtain Volume II upon request.

Many Council members have found it advantageous to distribute copies of the Transactions Volumes to the individual executives, foremen and supervisors of their organizations, who make use of the practical safety information the volumes contain to organize accident prevention programs. The volumes contain a vast amount of standard reference material. Extra copies of the Transactions may be obtained as follows: Volume I, one to 10 copies at \$2 each; 11 or more copies \$1.75 each. Extra copies of Volume II may be had at 75 cents each.

THE Transactions are a condensed record of the proceedings of the Congress. The papers and addresses and many of the discussions have been edited to delete extraneous matter, abbreviate the less important portions, and emphasize those parts of particular usefulness in promoting effective safety organization and other accident prevention measures. The volumes are, therefore, a somewhat abridged version, compact, practical, and of particular value to the student, the supervisor and the executive in achieving more thorough accident prevention success. The original manuscripts are available for additional reference, if desired, in the files of the National Safety Council.

THE National Safety Council, at its Congresses, seeks to eliminate from discussion matters which are not pertinent to the aims of the Congress or which may be contrary to the Council's policies. However, it cannot accept responsibility for all the views expressed either in the papers presented or in the discussions based upon these papers.

NATIONAL SAFETY COUNCIL, Inc.
20 North Wacker Drive
Chicago, Illinois

Contents

Council Officers and Directors.....	4
Council Purposes and Program.....	9
Annual Meeting of Members.....	11
Annual Banquet.....	27
General Subject Sessions—	
Agricultural Safety.....	29
Building Maintenance.....	47
Eye Protection.....	63
Fire Control and Prevention.....	79
Fundamental Causes of Accidents.....	91
Governmental Safety Service in Industry.....	107
Health Service in Industry.....	119
Industrial Nursing.....	129
Maintaining Interest in Safety.....	151
Occupational Disease.....	165
Off-the-Job Accidents.....	183
Plant Transportation.....	197
Psychology and Safety (Early Morning Classes).....	209
Safety Belts.....	245
Safety Supervisors.....	253
Safety Training.....	261
Visual Education.....	277
Acronautical Section.....	285
A.S.E.—Engineering Section.....	301
Automotive and Machine Shop Section.....	305
Cement and Quarry Section.....	319
Chemical Section.....	327
Construction Section.....	353
Food Section.....	375
Marine Section.....	397
Meat Packing, Tanning and Leather Industries Section.....	427
Metals Section.....	445
Mining Section.....	497
Paper and Pulp Section.....	549
Petroleum Section.....	591
Power Press Section.....	625
Public Utilities Section.....	635
Refrigeration Section.....	659
Rubber Section.....	671
Steam Railroad Section.....	697
Textile Section.....	723
Wood Products Section.....	739
Safety Exposition Exhibitors.....	743
Index.....	749

National Safety Council, Inc.

OFFICERS AND DIRECTORS, Continued

HONORARY MEMBERS

ASSOCIATION OF IRON AND STEEL ENGINEERS
ROBERT W. CAMPBELL
LEW R. PALMER

OFFICERS (1940-1941)

COL. JOHN STILWELL, President
NED H. DEARBORN, Vice-President for Education
J. W. MILLARD, Vice-President for Finance and Treasurer
G. T. HELLMUTH, Asst. Vice-President for Finance and Asst. Treasurer
WALTER S. PAINE, Vice-President for Industrial Safety
LEW R. PALMER, Vice-President for Community Councils and Public Relations
A. V. ROHWEDER, Vice-President for Home Safety
R. T. SOLENSSEN, Vice-President for Membership
LESLIE J. SORENSON, Vice-President for Public Safety
W. H. CAMERON, Managing Director and Secretary

EXECUTIVE COMMITTEE (1940-1941)

H. J. ALDRICH, Spencer Kellogg & Sons, Inc.
J. I. BANASH, Past President
H. K. BENNETT, Safety Dept., Automobile Club of Rhode Island
C. W. BERGQUIST, Past President
H. W. BURGESS, Sinclair Prairie Oil Company
H. E. DORT, South Bend Civic Safety Council
CHAS. S. BOWMAN, Public Utilities Section
F. W. BRACK, ASSE-Engineering Section
W. H. CAMERON, National Safety Council, Inc.
J. C. CAMPBELL, The Koppers Coal Company
ROBERT W. CAMPBELL, Past President
D. B. CHANT, Ontario Pulp & Paper Makers' Safety Association
NED H. DEARBORN, New York University
LEWIS A. DI BONA, Past President
MARCEL A. DOW, Past President
HAROLD F. ENLOW, The American National Red Cross
CARWILLIAM EVANS, JR., Mining Section
D. D. FENNEL, Past President
H. J. GRUYTH, Jones & Laughlin Steel Corp.
E. E. GROVER, Columbus & Southern Ohio Electric Company
HARRY GUILBERT, The Pullman Company
JULIAN H. HARVEY, Greater New York Safety Council
G. T. HELLMUTH, Chicago Rapid Transit Company

HAROLD G. HOFFMAN, New Jersey Unemployment Compensation Commission

WALTER G. KING, Past President
WIL. C. KNOELK, Milwaukee Safety Commission
JOHN E. LONG, Past President
THOS. H. MACDONALD, U. S. Public Roads Administration
ROBERT A. McARTHUR, Public Service Coordinated Transport
DR. MILLER MCCLINTOCK, Yale University
I. W. MILLARD, Industrial Gloves Company
CHAS. A. MILLER, Petroleum Section
HAROLD L. MINER, E. I. du Pont de Nemours & Co.
HON. ELIOT NESS, Director of Public Safety, Cleveland
E. J. O'BRIEN, JR., Louisville Safety Council
WALTER S. PAINE, Aetna Life & Affiliated Companies
LEW R. PALMER, Past President
C. E. PETTIBONE, Past President
G. H. PFEIF, General Electric Company
ALBERT S. REGULA, Industrial Relations Counselors, Inc.
R. J. REIGELUTH, Construction Section
LT. COL. HENRY A. RENINGER, Past President
A. V. ROHWEDER, Duluth, Missabe & Iron Range Railway Company
CHARLES B. SCOTT, Past President
FRANK T. SHEETS, Portland Cement Association
CARL L. SMITH, Greater Cleveland Safety Council
C. R. SMITH, American Air Lines, Inc.
R. T. SOLENSSEN, Elliott Service Company
LESLIE J. SORENSON, Traffic Engineer, Chicago
COL. JOHN STILWELL, Consolidated Edison Company of New York, Inc.
JOHN M. SYLVESTER, Lehigh Valley Safety Council
J. R. TENNEY, Steam Railroad Section
C. P. TOLMAN, Past President
GEORGE G. TRAVER, Greater Chicago Safety Council
V. I. TROTTER, Automotive & Machine Shop Section
DR. C. H. WATSON, Past President
A. W. WHITNEY, National Conservation Bureau
R. V. WRIGHT, Railway Age Magazine
ARTHUR H. YOUNG, Past President

DIRECTORS (1940-1941)

H. J. ALDRICH, Spencer Kellogg & Sons, Inc.
FRANK E. AMES, Marine Section
A. L. ARNSTROM, Rochester, N. Y.
VIRN W. AUCHI, Safety Div., Syracuse Chamber of Commerce
J. I. BANASH, Past President
D. A. BARRETT, Carnegie-Illinois Steel Corporation
ERNEST W. DECK, United States Rubber Company

OFFICERS AND DIRECTORS, Continued

H. K. BENNETT, Safety Dept., Automobile Club of Rhode Island
 C. W. BERGQUIST, Past President
 E. F. BLANK, Jones & Laughlin Steel Corporation
 H. W. BOGGS, Sinclair Prairie Oil Company
 O. C. BOURGAG, Wood Products Section
 H. E. BOLT, South Bend Civic Safety Council
 C. B. BOULT, Wisconsin Public Service Corporation
 CHAS. S. BOWDEN, Public Utilities Section
 F. W. BRAUN, ASSE-Engineering Section
 IRVIN A. BRINKMAN, Metals Section
 JOSEPH A. BURNETT, Elizabeth Safety Council
 F. S. BROWN, Standard Accident Insurance Company
 W. H. CAMERON, National Safety Council, Inc.
 L. C. CAMPBELL, The Koppers Coal Company
 ROBERT W. CAMPBELL, Past President
 RAYMOND A. CARLY, Evanston Safety Council
 RAY CARNEY, Kenosha Safety Council
 ROBERT I. CATTIN, Aetna Casualty & Surety Company
 D. B. CHANT, Paper & Pulp Section
 DEAN M. CLARK, Food Section
 WM. M. CLARK, St. Joseph Safety Council
 EDWARD L. COOK, Rochester Safety Council
 J. E. CULINEV, Bethlehem Steel Company
 NED H. DEARMON, New York University
 LEWIS A. DUBOIS, Past President
 C. W. DEMPSEY, The Liquid Carbonic Corporation
 R. A. DITMAR, Cement & Quarry Section
 MILTON W. DUBZENSKY, East Bay Safety Council
 C. R. DOOLY, Socony Vacuum Oil Company, Inc.
 JAMES B. DOUGLAS, The Philadelphia Gas Works Company
 MARCUS A. DOW, Past President
 RALPH W. ELLIS, Jr., Springfield Safety Council & Hampden County Safety Council
 HAROLD F. ENLOWS, The American National Red Cross
 CADWALLADER EVANS, JR., Mining Section
 D. D. FENNELL, Past President
 DR. HART E. FISHER, Chicago Rapid Transit Company
 EDMUND FITZGERALD, Safety Div., Milwaukee Association of Commerce
 VICTOR B. FITZGERALD, Richmond Safety Council
 HOWARD B. FUNDY, Burroughs Wellcome & Co. (U.S.A.) Inc.
 ARTHUR C. FRY, Worcester Safety Council
 LYLE H. GIFT, Peoria Association of Commerce Safety Council
 RANDOLPH L. GILMAN, Railway Safety Council
 HENRY J. GORMAN, Black-tone Valley Safety Council
 W. A. GRIFFIN, American Telephone & Telegraph Company
 H. J. GRIFFITH, Jones & Laughlin Steel Corporation
 E. E. GROVER, Columbus & Southern Ohio Electric Company
 HARRY GUILBERT, The Pullman Company
 D. T. HARRINGTON, U. S. Bureau of Mines

OFFICERS AND DIRECTORS, Continued

FRANK H. HARRISON, International Harvester Company
 JULIEN H. HARVEY, Greater New York Safety Council
 G. T. HELLMUTH, Chicago Rapid Transit Company
 J. C. HERBERT, Greater Los Angeles Safety Council
 HAROLD G. HOFFMAN, New Jersey Unemployment Compensation Commission
 J. ANDREW HOLLEY, Child Education Section
 OLIVER HOPKINS, Rubber Section
 S. B. HORRELL, The Carey Salt Company
 MURDER JACKSON, Employees' Publication Section
 W. FLOYD JACKSON, Delaware Safety Council
 WM. F. JAMES, Philadelphia Safety Council
 JASPER B. JOHNSON, Madison County Safety Council
 THOMAS P. KEARNS, Industrial Commission of Ohio
 H. H. KELLY, U. S. Interstate Commerce Commission
 WALTER G. KING, Past President
 WM. C. KNOELK, Milwaukee Safety Commission
 WM. S. KNUDSEN, Detroit Industrial Safety Council
 C. L. LAFOUNTAIN, Great Northern Railway Company
 ROY LEE, Contra Costa County Safety Council
 ARNOLD LOCKERBY, Grand Rapids Safety Council
 JOHN E. LONG, Past President
 J. W. LORD, Commercial Vehicle Section
 THOS. H. MACDONALD, U. S. Public Roads Administration
 HON. ARTHUR W. MAGEE, Commissioner of Motor Vehicles, New Jersey
 ROY S. MARSHALL, Seattle Traffic & Safety Council
 R. A. McARTHUR, Public Service Coordinated Transport
 H. N. MCCLELLAN, Berkeley Traffic Safety Commission, Ltd.
 DR. MILLER MCCLESTON, Yale University
 DAVID L. MILLAR, St. Louis Safety Council
 I. W. MILLARD, Industrial Gloves Company
 CHAS. A. MILLER, Petroleum Section
 HAROLD L. MINER, E. I. du Pont de Nemours & Company
 R. B. MOBLEY, Industrial Accident Prevention Associations
 C. L. MURRAY, Mason City-Cerro Gordo County Safety Council
 GEN. DANIEL NEEHAW, Massachusetts Safety Council
 M. C. NELSON, Des Moines Safety Council
 HON. ELIOT NESS, Director of Public Safety, Cleveland
 FRANK S. NEWELL, Toledo Safety Council
 E. J. O'BRIEN, JR., Louisville Safety Council
 GEORGE C. A. OPP, The Detroit Edison Company
 WALTER S. PAINE, Aetna Life & Affiliated Companies
 LEW. R. PALMER, Past President
 DAVID A. PATTON, Newark Safety Council
 V. G. PENDLETON, Power Press Section
 C. E. PETTIBONE, Past President
 G. H. PFEIF, General Electric Company
 JUDGE HARRY H. PORTER, Street & Highway Traffic Section
 A. A. RAIL, Refrigeration Section

OFFICERS AND DIRECTORS, Continued

ALBERT S. REGULA, Industrial Relations Counselors, Inc.
 R. J. REIGELUTH, Construction Section
 LT. COL. HENRY A. RENINGER, Past President
 A. V. ROHWEDER, Duluth, Missabe & Iron Range Railway Company
 HENRY G. SCHAFFNER, Meat Packing, Tanning & Leather Industries
 Section
 CHARLES B. SCOTT, Past President
 EARL S. SHARTZER, Utica Safety Council
 FRANK T. SHEETS, Portland Cement Association
 JOHN R. SHERWOOD, Baltimore Safety Council
 DR. L. A. SHODDY, Bethlehem Steel Company
 ERNEST L. SIMONDS, New Haven Safety Council
 ADOLPH SKINNER, Safety Dept., Nashville Chamber of Commerce
 CARL L. SMITH, Greater Cleveland Safety Council
 C. R. SMITH, American Air Lines, Inc.
 ARTHUR V. SNELL, Chattanooga Safety Council
 R. T. SOLENSTEN, Elliott Service Company
 LESLIE J. SORENSON, Traffic Engineer, Chicago
 JOHN B. SPENCE, Kansas City Safety Council
 E. C. SPRING, Philadelphia, Pa.
 COL. JOHN STILWELL, Consolidated Edison Company of N. Y., Inc.
 EDMUND C. STONE, Western Pennsylvania Safety Council
 JOHN M. SYLVESTER, Lehigh Valley Safety Council
 J. R. TENNEY, Steam Railroad Section
 ARTHUR M. TODD, Consulting Engineer
 C. P. TOLMAN, Past President
 GEORGE G. TRAYER, Greater Chicago Safety Council
 V. I. TROTTER, Automotive & Machine Shop Section
 WILFRED E. VOGLER, Albany Safety Council
 DR. B. L. VOSBURGH, General Electric Company
 J. C. WARD, Superior & Douglas County Safety Council
 STANLEY WARZALA, Chemical Section
 DR. C. H. WATSON, Past President
 W. B. WEAVER, Textile Section
 T. ANGLIN WHITE, Safety Div., Birmingham Chamber of Commerce
 S. E. WHITING, Liberty Mutual Insurance Company
 A. W. WHITNEY, National Conservation Bureau
 R. V. WRIGHT, Railway Age Magazine
 ARTHUR H. YOUNG, Past President
 E. J. ZAUFT, Safety Bureau, Duluth Chamber of Commerce

The
 profit,
 tive i
 achiev
 the fo

1. C
 will tr
 are cor
 dents a
 ing pe
 and ec
 don't
 definite
 dents c
 ment
 fore, is
 of these

2. F
 causes
 in any
 are not
 Every
 school
 organizat
 of acci
 ventio
 the th

3. M
 ple re
 which
 Therefo
 the ra
 public
 influen
 driver,
 school
 pends o
 way is
 from t
 isfactic
 omy.

4. E
 accident
 The p

Occupational Disease

WEDNESDAY MORNING SESSION

October 9, 1940

The meeting on Occupational Disease, planned as a Panel Discussion, was called to order by the Chairman, Walter S. Paine,

Manager, Engineering Department, Aetna Casualty & Surety Company, Hartford, Conn., who presided.

Panel Discussion

CHAIRMAN PAINE: At every meeting that I have attended in this Congress someone has raised the question of industrial disease. This is a subject which has been maligned in some cases and has been a fantasy on the part of others. This, however, should not in any way destroy the realities that are back of the industrial disease problem.

In the discussion of this broad problem, we have asked the medical profession and the law to help us this morning. Each phase of the problem will be discussed on an orderly basis. We have assigned as the first speaker for each of these subjects one of the men on this platform. After he has finished his preamble, we will ask the members on the floor to present any question they may have on the subject.

We have the following subjects to be discussed: "Health Hazards in Spray Painting." Dr. Eugene Walsh, Associate Supervisor of Medical Service, International Harvester Company, Chicago, will open this subject.

"Fatigue and Its Relation to Occupational Disease." This subject will be taken up by Dr. Norbert Enzer, Director of Laboratories, Mount Sinai Hospital, Milwaukee.

"The Toxic Limits of Common Solvents." This subject will be opened up by Dr. Elston L. Belknap, of Milwaukee.

"Lead in Industrial Processes." Dr. Belknap will also handle this subject.

"Skin Affections." This will be handled by Dr. M. J. Reuter, Dermatologist and Syphilologist, of Milwaukee, Wis.

The last, but one of the most important, will be "Should Occupational Diseases Be

Considered as Industrial Injuries?" This will be handled by H. A. Nelson, Director of Workmen's Compensation Department, Wisconsin Industrial Commission of Madison.

We all regret that severe illness keeps Dr. Paul Brehm, Supervisor of Industrial Hygiene Unit of Wisconsin State Board of Health at Madison, from being present.

The panel will be opened on "Health Hazards in Spray Painting." Dr. Walsh.

Spray Painting

DR. EUGENE WALSH: Painting is a topic that has received considerable attention. There has been an increasing number of hazards imported into the trade. Most of these have received wide attention, particularly in the past few years. It has been incident to the wide use of the spray gun and of the lacquers, particularly. Many of the solvents and products used in the paint industry have known toxicities. Others are in the experimental stage, so far as use and so far as their hazards to health are concerned.

In the old days of brush or dip or flow painting, still widely used, solvents of rather low volatility were employed, and the hazards associated therewith were not as great. However, when we come to the spray gun, particularly in its use in the recently developed lacquers, we come into a host of new solvents.

The quantities used per year in lacquers and solvents in the paint industry in the United States reach astronomical proportions. Many, many tons are used.

the paints we have the following hazards: first, the pigments. There has been a strong trend definitely away from lead-containing pigments toward non-lead pigments. Many of the non-lead pigments have their own hazards. Many of them are relatively innocuous and can be used with relative immunity.

As far as the fluid constituents of paints are concerned, in the order of volatility in the paint, we have, first, the solvents which are largely, for paints, the paraffins, oils, turpentine, varnish with some turpentine, some spirits of various and sundry types. The product, of course, if it is a solvent, the greater the toxicity.

Ordinary paints and lacquers can be sold together because the problem of solvent is largely, is what we wish to avoid. The solvents used are relatively benign products which volatilize readily, such as acetone, ethyl acetate, butyl acetate, amyl acetate, and so forth.

Next, the paint must have a diluent. In ordinary paints—oils, turpentine or spirits are used. In the lacquers—alcohol, ethyl alcohol, mineral spirits have been used. The fact, benzol was used. We are glad that there is a growing trend away from the use of benzol, which has accumulations in the human individual, resulting in the low grade chronic toxicities due to the depression of the blood-forming organs. There is a definite trend toward less toxic paints.

Next essential part of the lacquers is the driers, such as ethyl lactate or olive, monomethyl ethers and various chemical products of known and unknown toxicities. Also, there must be a hardener or a substance giving flow to the paint. These are relatively high-boiling low-boiling products, triphenylphosphate, calcium phosphate and others, again of known toxicity.

Toxicities of the various individual ingredients are often known. It is not the toxicity of the pure product, however, that is often concerned with. It is the product as it is used commercially. It is often in minute quantities that add up to toxicity. For example, we may say that in the case of xylol, some question is inherent toxicity. However, since it is so frequently a contaminant, we must consider some benzol toxicity to be considered.

ered when xylol is used. Also, when we have two substances which are used to make a paint or lacquer fluid, its toxicity, resulting from the combination of the two substances is not usually that of a summation of the individual toxicities of the two. That is, if we have two products (A and B), A of one-plus toxicity, and B of one-plus toxicity, we may get a resulting toxicity of three-plus, or something of that nature—just to use an arbitrary form.

The methods of control are: First, the substitution of non-toxic products such as we mentioned in getting away from lead-bearing pigments in paints. We are fortunate to have alert chemists in the paint industry who are alive to this problem. They are constantly striving and working with the industrial hygienists and the physicians in developing non-toxic products, so far as both pigments and solvents are concerned.

Another factor that has been considered and is of importance today in reducing toxicity is the mechanical development of the spray gun. Many years ago, in its infancy, no precautions were taken. The engineers weren't particularly interested in it. A man would spray with one or another, spreading the toxic substances about. Today, however, with the development of lower pressure spray guns, with the development of engineering methods of control of vapors and fumes and dusts incident to the process, we have less toxicity.

If an individual corporation is alert in observing and controlling the hazards present, very little toxicity need be encountered in most processes. This includes, of course, the precautionary methods for the individual, when I speak of the industrial hygienist and the engineer's phase of the problem. If an individual is working in a place where engineering methods are not feasible to control the vapors and toxic products, then the individual must have his respiratory protection to prevent inhalation. Most of the solvents which are used have a narcotic action, and their action is by way of absorption through the respiratory tract. Taking away the fumes is the way of control.

I have very briefly outlined some of the major points. Do you choose to pursue this question?

CHAIRMAN PAINE: Discussion will be carried on from the floor and also from

the viewpoint of the panel. May we proceed on this subject, namely health hazards in spray painting?

EDWARD SMITH (Jewell Alloy & Malleable Co., Buffalo, N. Y.): No mention was made about spraying whitewash.

DR. WALSH: Spraying with whitewash is a common procedure. As whitewash is largely calcium, it is a relatively innocuous substance. It is irritating to the respiratory tract and may be followed by a chronic cough. Not infrequently there are contaminants in whitewash which may have toxic products in them but, ordinarily, whitewashing is a matter that is done today, next week, and perhaps a month hence. It isn't done in most industries day after day. The exposure is relatively infrequent and the hazards are not great.

Likewise, most of the whitewashing procedures are done in large, open, airy rooms. That isn't true of some tunnels, of course. If it is done in closed rooms, tunnels and places with poor aeration, it is advisable, if the process is to consume any length of time, to have the individual protected in some manner. Just a simple draft of air or a mechanical dust type respirator probably would be usable if the exposure is to be of any length of time.

X-Ray Examinations

DR. ROBERT M. BURNS (Minnesota State Medical Assn., St. Paul, Minn.): Are there methods by x-ray examination from time to time or from year to year that will show progress of bronchial trouble as a result of these paint inhalations?

DR. WALSH: There are those that would answer your question in the affirmative. Most roentgenologists, however, rather scoff at the idea of making a diagnosis of bronchiectasis by x-ray. The shadows which we see in the x-ray are largely those of the blood vessels and fibrous structures of the lung. It is true, however, if an individual is using some paints which bear silica—and one paint that I did not mention is that used in the porcelain industry, silica-bearing paint—that is another problem. If you are using a silica-bearing paint, you will get the characteristic changes of silicosis.

However, for the ordinary pigment, so little is absorbed, so few of them produce progressive changes in the lung, they rarely

show on the x-ray. Most of them are stopped by the mechanical aids in the nose and upper respiratory tract, that is the hairs, the cilia on the lining of the respiratory tract and, as such, are coughed up, rather than persisting in the respiratory tract.

However, if one is using paints over a long period of time, it is conceivable that a chronic bronchitis might result. However, here one is on thin ice. There are many other factors incident to the causation of chronic bronchitis that are equally as, or more, important than the products used in the paints, either the pigments or the solvents.

MR. CARR (Eastman-Kodak Company): In spray painting in rooms, using lead-free gasoline as a solvent, we have noticed as much as 450 parts per million of aromatics, and we find that many lead-free gasolines now sold contain a large proportion of benzol, xylol and toluol. I wonder if much attention has been given to that fact?

DR. WALSH: That is a problem, it is true. Certain fields of oil, particularly those bearing the naphthionic acid oils do, in their cracking processes, result in benzol in considerable portions, in some instances, in the gasoline. The straight paraffin oils may result in some benzol but not so much. It is a factor to be considered. It depends largely upon the amount of benzol present. In some instances it has been said to run as high as 10 per cent in certain gasolines. That is not usually true.

There is one factor to be considered in gasolines, and that is the difference between benzol, which is the ring-structure and benzene, which is a straight hydrocarbon, and relatively innocuous. It has some toxic properties, but they are transitory, largely.

Benzol has developed a chronic toxicity. This particular subject is receiving attention now, but very little has been produced to indicate that benzol is a definite toxic agent in the gasolines produced. But if the aromatics were up to about 450 parts per million, you certainly are on the borderline of toxicity. I think it should be reduced, if it is at all possible, by ordinary methods. At least the men should be watched very carefully for blood changes, so far as benzol exposure is concerned.

MR. CARR: In that connection, it has been necessary for us to go to a respira-

Occupational Disease

protection of the supplied air type, supplied also with a charcoal canister at the waist, so that when he breaks the connection temporarily to go back in the room, he still has the protection of the charcoal canister. The connection, when broken, automatically shuts off both the air supply and also the air connection, so that he can breathe the room air.

Q. WALSH: That certainly is a fine comment.

A. ALICE HAMILTON (Division of Standards, U. S. Department of Labor, Washington, D. C.): In the Division of Labor Standards in Washington some two or three years ago, when I was visiting automobile plants, I was told they were making a change in their coatings. I wonder whether that has proved to be true? They told me they were substituting synthetic resins for nitrocellulose and as a solvent using hydrogenated petroleum products which had very low volatility. It is as if that were going to be a revolution in coating in automobile factories. I like very much to know whether that has been made.

CHAIRMAN PAINE: Can anyone answer the question of Dr. Hamilton?

WALSH: I would like to say to Dr. Hamilton concerning the substitution of synthetic resins for nitrocellulose products in the automotive industry particularly, if we receive all of our information concerning the newer development of hazardous materials from other than Alice Hamilton, I am sure that she can answer the question. I am sure that she can. She has reviewed the entire literature in a publication that she produced in 1936 called "Changes in the Painter's Trade" Bulletin No. 7 of the U. S. Department of Labor. It is a beautiful presentation and it is worth while for any of you who are in the paint industry to read it.

Turning the question at hand, I know particular changes at the moment that have been instituted in the industries that I am acquainted with. I do know that changes are in progress. As Dr. Hamilton suggests, I think that they are changes in the right direction, in many instances.

A. L. BROOKS (Fisher Body Division, General Motors Corp.): We do quite a bit of painting. I believe there has been a radical change in the solvents and

diluents used in the lacquers which we are now employing. The process is very much the same.

There has been some change in the length of time required to dry these lacquers, but the constituents are the same as they were.

W. H. KRAUSE (Allis-Chalmers Mfg. Company, West Allis, Wis.): There have been recent changes in regard to the diluents used in paint. Quite a few of the larger oil companies are now producing hydrogenated naphtha. These do contain considerable quantities of benzol and toluol. I wonder if there had been any experiments made with regard to the toxicities?

Benzol Frowned Upon

DR. WALSH: I should have mentioned, when we were speaking of toxicities of solvents, that the medical profession frowns upon the use of benzol as a solvent or diluent in any proportion. We just don't like benzol, regardless of its percentage, because it is so easy to get out of hand, and the chronic effects of its poisoning come on so slowly and so innocuously, they creep upon you before you know it. It requires rather close observation wherever there is any benzol or toluol.

So far as the hydrogenated naphtha is concerned, it has been said that the hydrogenation does not change the chemical structure of the naphtha, and it does not increase, particularly, its toxicity. If it is in relatively large quantities, 400 to 500 parts per million, then there is the problem of the toxicities inherent to the hydrogenated naphtha itself. But we would much prefer not to see benzol at all.

CHAIRMAN PAINE: Dr. Hamilton, did you wish to say anything else on the subject?

DR. HAMILTON: I think not. My study of the subject is four years old. I thought perhaps very important things had come to light since then. Apparently benzol is still a lurking danger which arises in all sorts of unexpected ways, especially as we use more cracked gasoline than we did before. I quite agree that it is something that should be avoided.

We always advise the substitution of toluol, when possible, for benzol, but I don't think any industrial physician would be willing to give a clean bill of health to toluol.

We are beginning to look upon it with more suspicion. Dr. Cannon of the du Pont Company believes it is much more harmful than we have thought hitherto. I hope he will, as the years go on, accumulate more accurate knowledge about it so that we may perhaps encourage its disuse, also. I think that probably would be in the right direction.

MR. GUMMAR (Barrett Company): I would like to offer one minor observation. Commercial toluol, as sold in this country, does not contain any measurable amount of benzol.

CHAIRMAN PAINE: We will have to pass on to the next subject: "Fatigue and Its Relation to Occupational Disease." This subject will be opened by Dr. Norbert Enzer, Director of Laboratories, Mount Sinai Hospital, Milwaukee.

Fatigue and Occupational Disease

DR. NORBERT ENZER: At ten-thirty in the morning I generally have a very low level of activity and suffer from fatigue. Fatigue is a state of bodily ill health, of transient character. It is evanescent, as we understand it and as the term is commonly used but, so far as industry is concerned, fatigue is that state of the individual at work which makes it impossible for him to perform what may be considered an average good output.

It is characterized by certain symptoms. It is characterized under ideal conditions of investigation by certain objective findings which I will elaborate in a moment.

In the strictest sense of the term, I suppose an occupational disease is that condition which can be directly traced to some agent or circumstance in employment which can be labeled as the causative factor of the disease. But as our horizon widens and our concept of disease becomes broader, and as we interpret the word "disease" as it was originally used in the Greek sense, a state of variation from health, or disease, then we must regard an occupational disease as any state of ill health which has been contributed to by circumstances of employment.

Under that definition there is hardly a disease which, under some imaginable state of affairs, couldn't be related to what the man is doing. Those are the two extreme

definitions of the term "occupational disease."

Now, any disease will produce fatigue. It is almost synonymous that disease limits the output or the capacity for work of the individual who has been affected. What we must recognize today is that fatigue may also constitute a state of disease. In other words, that we recognize fatigue as a functional disorder which must be treated, which must be recognized and corrected, and its causes eliminated.

The mechanism of fatigue is grounded in a very complex explanation which is not yet clear, and probably won't be clarified until a great deal of investigative work has been done. But in the past few years a considerable amount of investigation has been done, most notably at the Harvard School of Industrial Hygiene under Dr. Dill; and in Europe, up to recent times, a great deal of work has been done, particularly in Germany and latterly in Russia; the object being, in the European investigations, to find out what circumstances of employment contributed to fatigue, to correct those circumstances of employment to prevent fatigue and, hence, to increase the output of the individual in terms of his occupation, without sacrificing any quality of his health.

Now, the thing that we lack at present, so far as its applicability to the practice of industrial medicine is concerned, is a yardstick of fatigue. A number of investigations are going on in that direction, and I think before long something will come of it.

Broadly speaking, two main channels of investigation are being carried on. One is a state of fatigue relative to the muscular capacity of the individual. In other words, we relate muscle strength to the load. The other is a form of fatigue which I think is going to be more important as time goes on, and is related to the nervous system. That arises out of the fact that fatigue is produced by agencies which impair the ability of the brain to send impulses to the peripheral muscles so that work may be performed.

Now, monotony of work may be the greatest contributor to fatigue. I use that as an illustration. For example, we found out, in one small investigation, that individuals employed at work which called for dexterity and nimbleness and a high degree of mental alertness fatigued in less than a twenty-

hour period. In other words, if a certain standard of measurement was applied in the morning before work began, the same standard applied at the end of the day, we demonstrate in almost all individuals that they had experienced fatigue, and that experience was definitely related to the ability of their nervous system to regulate their muscular activity in co-ordination.

Now, in jobs which call for a stationary position, manipulation of instruments, or toning of exercise, that kind of fatigue is recognized by the industrial physi-

cian as occupational disease, conversely, may be a fatigue which may not be recognized unless the individuals are subjected to an examination. For example, we have found that individuals with a mild type of tension increased blood pressure, have individuals whose blood pressure threshold is raised. Or an enlarged heart, due to valve disease, a leaky valve, will produce the phenomenon; or individuals with diabetes or individuals that have a low basal metabolic rate, because of a thyroid gland disease, or individuals who are abnormally obese will all show variations in fatigue thresholds.

Only way that aspect of the subject properly be investigated is to approach in the medical point of view first. Examination of the individual becomes the important thing. It is important to apply critical standards of evaluation, then to attempt correct them by medical program.

Industrial factor of fatigue, which I need first, calls for a recognition that a kind of work can produce fatigue, then to apply methods which will relieve and to illustrate just two:

We recognize that a certain occupation produces fatigue, we have discovered things which will relieve the fatigue. A man whose job is one position, doing the same job and over again, will have fatigue which is relieved if he can periodically sit in a position in which his oxygen consumption is greatly reduced over his standing position, and he performs virtually less work within himself. Consequently he has available greater reserves of energy for his performance.

It has been pointed out, and we have been able to show in some small investigations, that if it could be arranged that this job could be done in the sitting position, the output would be increased and the individual would suffer less fatigue.

It has been shown that, in jobs which call for a to-and-fro movement between more or less fixed positions, without much opportunity to rest, if the period is broken hourly or at hour and one-half intervals, and simple freedom of motion allowed to get out of the range of what he was doing, rest is instituted and fatigue is relieved.

We have been able to show that the application of bathing, in certain kinds of industries, will produce a diminution of fatigue and raise the capacity of the individual to resist his industry or his job. Those are some of the features of the occupational aspects of disease, or the industrial aspect of fatigue, rather. With that casual introduction we can go on and attempt to answer some questions.

Tests of Fatigue

CHAIRMAN PAINE: Are there any questions from the floor? This is an interesting subject.

DR. WALSH: I should like to ask a question in relation to various tests of fatigue. The psychologists have all had people putting round pegs in square holes and all that sort of thing, rapidity of processes. That is one method that is not my concept of the way to measure fatigue, but it brings up one point; namely, the relation of fatigue to the mental status of the individual. Again, the psychological yardstick may be applied. What is the relationship of the intelligence quotient of the individual to fatigue? Does the person using his mind in his work fatigue more readily than one doing physical activity in which no mental effort is required?

DR. ENZER: If I may restate the question, I think Dr. Walsh really wants to find out whether individuals of low I.Q., so to speak, experience the same phenomenon of fatigue under the same circumstances as an individual of high I.Q.

DR. WALSH: That is right.

DR. ENZER: I would say he does, although that is not generally recognized.

BEN JOHANEK (Connor Lumber Co., Wakefield, Mich.): Do you not think a lot of this is caused through improper food?

DR. ENZER: We are now recognizing that nutrition plays an important part in nervous fatigue because we know there are certain elements in food that are important for the integrity of the central nervous system. But we have been able to show in some preliminary experiments and from some surveys that, in a general way, food intake, except in an extreme instance, is not important, but in acute instances it is. What do I mean by that? An individual who has been deprived of food for longer than he is normally accustomed, in other words, if his meals are separated by too long a period of time, fatigue will be produced. We showed that on ourselves. We took no food from early morning until late at night and were able to show increasing fatigue.

We were also able to show—and this is well known, of course—that there are certain kinds of food which give some temporary relief from fatigue, most notably the sugars, carbohydrates, and a good deal has been done on the proteins of diet. But in the sense that I have tried to lay the subject this morning, diet is a factor in fatigue because it becomes a disease state, and a disease state induces fatigue. Diet will produce a state of fatigue if we have some acute disturbance in the habits of diet.

Factor of Noise

MISS MARY LOU SCOTT (Jos. E. Seagram & Son, Louisville, Ky.): I would like to know the effect of factory noise in regard to fatigue.

DR. ENZER: Noise is a factor in fatigue. We demonstrated that objectively in a scientific way in a laboratory, in this manner: We tested individuals for the flicker phenomenon rate which, as I said, constitutes our base line. Afterwards, we stimulated their ear with a sound of a regular intensity, rhythm and rate, the object being to see whether we could fatigue one center of the brain and in that way effect fatigue in another center of the brain, or whether we could distract one center from the other.

We found that this investigation brought to light two rather interesting things, or I would say three, perhaps. One is that there are, constitutionally, individuals who are

sensitive to sound, because we could pick out from a group of individuals people whose flicker phenomenon was greatly depressed when their ears were stimulated; which suggests, perhaps, that such individuals work best in a quiet atmosphere. That is a speculation.

Another type of individual constitutionally wasn't affected at all. His flicker phenomenon was exactly the same rate.

The third individual had his flicker phenomenon raised; in other words, he was stimulated by sound. I think casual examination amongst yourselves will probably bring to light illustrations of the individual who can concentrate on reading a book while the radio is going on and understand both of them perfectly satisfactorily.

Now, when we fatigued these individuals by their routine work—in other words, we conducted the same test in the morning and got a certain base line value; then they did their day's work, and we tested them at the end of the day—we found that fatigue accentuated the direction of their natural constitutional tendency. In other words, the individual to whom stimulation of the ear depressed the flicker phenomenon found that depression increased at the end of a day's work.

PAUL M. HARRIS (Western Austin Co., Aurora, Ill.): Does the human system have the ability in any way to build resistance to this monotony, so it doesn't affect fatigue other than the infusion of glucose or the increasing of the oxygenation?

DR. ENZER: That is a phenomenon known as adaptation in a physiological sense and, in the social sense, it is a question of getting used to your job; but the important part about getting used to your job is you are not the same today as you were five years ago. In other words, the individual today can't get used to the things he was used to five years ago. Age is an important factor in that direction. The longer the individual is at a fatigue-producing job, sooner or later there will come a time when his fatigue becomes manifest.

We have found that our so-called fatigue testing standards showed no important factors, so far as age was concerned; but the older individuals had a lower threshold to the thing that produced the fatigue than the younger individuals. In other words, it is

a cold once or twice. Every time he developed jaundice. Then, of course, of liver function tests and found reduction of that. We found he had a weakening of heart muscle. We found a definite reflex in one ankle-joint, showing the involvement of the central nervous

system. We were able to get all the physicians to agree that this man was considerably disabled; that it was due to his occupation. You understand, I was seeing him not for himself but for the company. I think a good deal of them thought I had been a little out to this malingering. This man went on to this malingering. I don't know anything further about the case except I did hear that the man died and that the death certificate said "cirrhosis of the liver and heart failure." Unfortunately, we have an autopsy to confirm it.

In my opinion, the toxic solvent is one of the most dangerous substances and it may be disabling and kill.

Lead in Industry

I am a practitioner to the subject of lead in industry. I would like to say that I am not practicing entirely in industrial medicine. One of the great increasing groups who feel that industrial medicine is not a specialty in itself is merely a division of internal medicine or diagnosis, the large field of medicine which in private practice correlates to or is correlated with the field of surgery. I am glad that a large proportion of my practice is still private practice. I am also consulting medical director of our industrial concerns in Milwaukee, with branches over the country, so I have an opportunity to see lead and toxic materials.

If you see a man who has said, "I am lead poisoning," do not forget he may have other disabilities and diseases, such as acute appendicitis, gallbladder, kidney and so forth. In my private practice interest has been sharpened so that we make an effort to take a very careful occupational history on a patient, even if he may come to me purely as a heart or lung case or what-have-you.

My particular plant in Milwaukee began by having and still has, as a reputation of its work, storage battery

plants, when I came there about ten years ago we were having an incidence of about 21 lead cases per 100 employees per year, which corresponds pretty well with the percentage of 15 to 16 reported by the Public Health Service in work about that time.

In five years, by cooperation with the medical department, the engineering department and management, we dropped that to an incidence of 2 per 100, and for the past five years we have had no cases of lead poisoning at all. We are still handling lead, and we are still handling it in large amounts.

I think that in the storage battery industry, probably, men are exposed potentially, at least, to the greatest concentration of lead for absorption directly into their bodies than in any other industry. I am glad to report that, having followed this particular group of workers of about 80 for this period, at the end of ten years they are certainly just as healthy and, in many respects, I think healthier than the general run of the population. Of course, we have reduced their lead absorption, but at times it will break down the physical resistance and respiratory protection. They occasionally have large doses of lead. Many of these workers were persons who had had lead poisoning or serious lead absorption in the period of observation.

Lead is one of the most widely used so-called poisons in well over 200 industries. I think there is no doubt but in the large industry the hazard is well controlled. First of all, it is recognized and then every effort is given. No expense is spared to study the men and to reduce the continuance of any exposure. However, in the small industry, which is the major portion of industry in this country, lead is continually cropping up, and even silicosis, which got the center of the stage in recent years, certainly in Wisconsin, has now taken a back step, and lead has come back into its own, together with the ever increasing use of solvents.

I would like to stress again the danger here is one of non-recognition, that we have our trouble in the small plant, not in the large plant. I will rapidly run through the types of industry where I have seen lead poisoning occur and in which it is an important factor.

The most important is the storage battery industry. Then the streamlining of our automobiles and trucks where, after welding, of

course, as many of you know, they were at first smoothed off by lead paste which, after it cooled, was then ground by machine grinder and produced a great amount of finely divided, inhalable dust. This brings up the fact that the most important hazard in any lead industry is the point of inhalation. Remember that lead dust inhaled is much more dangerous than swallowed, and that very rarely are lead compounds absorbed through the skin, perhaps with the one exception of tetraethyl lead which is an organic and fat soluble substance.

It is rather amusing that many plants, smaller plants, particularly, have had to give up machine grinding of welded joints. Here is a return of modern industry to the horse-and-buggy stage. They are going back to hand filing where, of course, the particles are heavy and are too large to be inhaled. The problem can be licked, however, even by machine grinding, if one uses respirators.

It has always been said that lead poisoning was very common in painting. My experience in ordinary painting nowadays is it is very rare, particularly on inside painting where lead has been substituted by other substances, such as titanium, zinc and so forth, which are harmless. On the outside, however, lead is still used, in many instances, because it is the one substance that will stand the weather.

Here we come again to the question of finely divided, inhalable dust where men burn off old paint in private homes; not in the large installations, of course, or sand, either by machine sanding or by hand sanding. There we have the question of finely divided dust which is inhaled. You must remember that dust when inhaled passes directly into the system and immediately circulates throughout the entire body.

I make a recommendation, therefore, that any worker that has gotten his lead by burning off or sanding, be given a respirator for that purpose, even though he is an outside worker.

In the wrecking of old buildings and old ships, of course, there is the constant presence of lead absorption when the steel has been coated with several coats. It ideally forms a fume which is so fine as to be almost invisible and is absorbed directly into the system. The only way that a worker doing that can really protect himself, in my opinion, is to use an air-line respirator. I

have seen a great many men in one particular type of ship industry, cutting up old ships outdoors in mid-winter, and I have never seen men leaked up so rapidly. Of course, this is an old story. The Navy found this out twenty years ago when they scrapped many of the old ships. Unfortunately, some people in industry, as well as doctors, are not very good on keeping up on their own work, by reading, and experiments have to be made again.

In the smelting of lead or zinc ore and scrap metal, lead poisoning occurs. In pottery making where a glazed mixer is used, one most usually is exposed to lead. In the printing industry we have heard a great deal of lead poisoning.

I had an opportunity recently to make a survey of a group of printers with the Wisconsin Industrial Hygiene Unit. They went into an analysis of the air, and I examined the men. To be sure, our list was not large; some 30 men in fourteen different printing establishments, but it was striking that all of these men were in excellent health and, as far as I could see, there had been no great deal of turnover.

However, there are one or two spots in the printing industry that are danger spots; that is, of course, the man who remelts the old type metal or who saws it, if he uses a machine saw. I think it is interesting, going through our records of printers in the State of Wisconsin, for a great number of years past, we have had only three cases, one of which was really a serious case, and that man was one who remelted—he was the foreman, worked down in the basement on a kettle, where nobody paid any attention to him, and there was no protection.

In passing, I will simply name soldering, and that occurs very frequently even in the evaporated milk industry out in the country; tempering of metals, brass foundries, ink making, insecticides. This potentially may occur in leaded steel when it is scrapped. Then I would class as the final one, the risk which says they have no lead hazard. That is the place you should look particularly.

As I said, the important portal of entry is through the nose. If we bear that in mind, the problem of control of lead poisoning is really not difficult. If, of course, your engineers reduce the exposure to 1.5 milligrams, I don't think you will have a case of

ally acids or alkalis producing simple inflammation of the skin.

As a subject for discussion, I might say probably cleansing agents used by the workers are one of the most potent factors in the causation of occupational dermatitis.

HAIRMAN PAINE: This is a subject which there are a number of men interested in. Will you expedite your questions?

DR. ENZER: I would like to ask Dr. Reuter to say a word about skin cancer in occupational exposures.

Skin Cancer

DR. REUTER: Ewing has set forth five states which must be fulfilled before traumatic trauma as the cause of given cancering states: "First, the authenticity adequacy of injury must be established. That is, the patient's statement regarding injury must be substantiated, and must be actual tissue damage.

Second, the previous integrity of the lesion part before the injury must be established.

Third, the cancer or tumor must arise at the site of injury.

Fourth, there must be a reasonable time between injury and the development of tumor." That is, if the tumor develops two or three days after the injury, reasonable that in that short a time it could have developed.

Fifth, the positive diagnosis must establish that there is an actual tumor present of the nature of the particular tumor."

HAIRMAN PAINE: Dr. Enzer, do you want to speak to the point?

DR. ENZER: I thought Dr. Reuter might say a word about the increasing attention being given to highly complex chemical agents which have the property of inducing cancer in the experimental animal. We know in agents which have that property in man. The commonly known one is aflatoxin. We know also of certain anilines which would produce cancer of the urinary bladder, and so on.

It is a subject which is highly complex, but I should like to bring to your attention the dermatology of today we deal with dermatitis but also deal with

DR. REUTER: I have had very little occasion to pass on a question of cancer of the skin arising from alleged contact with some carcinogenic agent.

C. T. DENSMORE (Koppers Co., St. Paul, Minn.): I would like to hear a little about the effects of coal tar and creosote oils in relation to cancer and what-not, and also the inhalation of the creosote vapors.

DR. REUTER: Regarding the development of cancer from coal tar and creosote, I have had no experience. We do know that coal tar is the worst to the skin and does produce an inflammation about the hair follicles called folliculitis. It is undoubtedly due to the plugging of the follicles with the tar and perhaps some stimulation of the epidermal layers of the skin from the tar, which sets up this inflammatory reaction around the hair follicles. I think the same is true with creosote. But, regarding the actual development of hypertrophic lesions of the skin, particularly cancer, I have had no experience.

DR. BELKNAP: As for creosote, I have had no actual cases brought to my attention. As far as I know, the fumes would be no more irritating, possibly, than causing an irritative cough. I know of no cases, really, of acute chronic bronchitis or other carcinogenic results.

CHAIRMAN PAINE: We will leave any other questions to the end of the session and hear Mr. H. A. Nelson, Industrial Commission of Wisconsin, on the question: "Should occupational diseases be considered as industrial injuries?"

Disease Vs. Injury

H. A. NELSON: Mr. Chairman: The question which I have been assigned is susceptible of treatment in several ways. We can treat it in a highly technical way and quibble about the exact construction of the word "injury" or we can treat it in a general way and ask whether occupational diseases should be compensated. That is the real crux of the question today.

It sometimes astonishes me that thirty years after the passage of compensation acts we are still disputing this question of whether we shall compensate a condition which may cause disability and which arises

out of industry just as clearly as does an accidental injury. There are various ways of meeting the problem. One, of course, is to do nothing about it and that is what about eighteen states in the Union are doing. They are not compensating occupational diseases at all. Out of the other states there are a few which are compensating all occupational diseases, and some of them are compensating by schedule.

Now, schedules are usually designed so that there are a great many diseases which are named, but very generally you will find that they leave out the one occupational disease which causes the most disability. For example, silicosis is left out of a great many of the state laws, which have schedules. Therefore, silicosis, which is a serious occupational disease, is not compensated.

When we go back to the prime principles of workmen's compensation, we wonder why the compensation fathers didn't face the question at the time the compensation acts were passed. That was the time to do it. Either through inadvertence or, in some cases, through design, occupational diseases were left out of the laws pretty generally, but accidental injuries were to be compensated. I think that was largely because of the rather violent split from the old common law system and leaving out of consideration the question of negligence. It was a rather violent split, but it is surprising that in all of these years occupational diseases still remain uncompensated in so many states.

When we consider the nature of an occupational disease, which is usually a slow insidious process, over which the man himself, the employee, has no control, but over which the employer, as these physicians have told you this morning, has the entire power of control, there seems to be one hundred times more reason why the employee who cannot protect himself in any possible way should be compensated for occupational disease rather than for accidental injury.

I suppose there is no question but that the real crux of the matter is that of expense to the employer, and that comes because of the so stated accrued liability. Here has been an accrual of dosage which finally eventuates in disease, and this, accrual is such that the disease may come at a given moment.

If the employer has a large number of

employees who have this accrual of dosage, it may be that in periods of depression the expense to him will be rather great for the time being, and that must be met in various ways. Employers are humanitarian. Most of them would like to do these things but they are also in competition with each other, and that means there must be laws and regulations for the compensating of occupational disease if the job is to be done in a satisfactory way.

Another reason that is often given is that industrial commissions and accident boards are unable to decide the question of occupational disease, as to causation, between the process and the final condition which results in disability. I think that is a rather fatuous objection, in view of the development which has been made in medical science within the last few years.

I think those questions are no more difficult to decide than the questions of aggravation of pre-existing conditions which are clearly under the law, if we may ascribe them to accidents, and also to the obscure conditions which are ascribed to accidents and as to which compensation boards and commissions have to make decisions every day.

Can Stamp Out Disease

But the most glorious thing that has been accomplished by occupational disease laws is the fact that employers have become conscious of the fact that they can stamp out occupational disease. I am glad to say that in Wisconsin we have practically stamped out silicosis, that in a few years more it is going to be practically a negligible thing. Dr. Belknap has shown you how lead poisoning can be almost entirely eradicated. That is the glorious thing which we have achieved through the passage of occupational disease laws. I want to give a few figures showing the drop in silicosis in the State of Wisconsin since 1933 to 1939. These figures are the percentages of compensation which were paid in silicosis cases as compared with the total. In 1933 the figure was 9.4; 1934, 8.8; 1935, 7.9; then 5 and 2 and .9 per cent, and, in the year 1939, 1.0 per cent which we figure is getting about on a level.

I think there is no question but that the public is demanding that occupational dis-

compensated. The trend is coming to believe that industry and society will be satisfied when the problem has been solved by whatever methods may be adopted to the different states.

IRMAN PAINE: Are there any as you want to ask Mr. Nelson before we go into the general discussion?

LEF AMRAM (Hamlin & Co., New York): We passed a compensation law in New York State some two or three years ago. I recall that first we passed an illegal law, the all-inclusive act included most disastrously not only to industry but to the workmen. You are right with the history and the recall of it. I dare say in a number of states it is likely right and proper the compensation should include silicosis, but it includes silicosis on a schedule basis. It is the case in Illinois.

NELSON: All states are not as yet as some other states. I think we are doing generally throughout all of the but the problem can be solved.

Protection for Welders

IRMAN PAINE: We have a few of asking this panel of doctors any they want to raise on these main

GREEN (Edgewater Steel Co., Pa.): I would like to ask to what an ordinary welder in a small plant is protected? Once in a while there is a hardening material which has results. Other times there will be a hardening of paint on a product which is some noxious poison. To what extent a welder or a cutter have to be

IRMAN PAINE: The question is, we are going to protect, and what is sure to welders on new material material that has been painted? Ask Dr. Walsh to answer that ques-

WALSH: Within the past couple of years we have had occasion to go over a list of about 1,000 welders. Of that group we have been welding for ten or more years. They were gone over from the clinical view. X-rays of the chest were

taken. Disability due to sickness over the ten-year period was calculated and seen for each individual man. There certainly was no marked difference in sickness rates and in disability rates in the welders as compared to the general run of employees working at their side in the same plant and in the same economic situation.

When you are considering welders who are cutting painted materials, lead-bearing paints, or who are welding in confined spaces, you have a different problem; but for the ordinary welding group, working in a large, airy room, with ordinary precautions and ventilation, their health is just as good as any other group of workers. If they are cutting paint or toxic coatings of any kind or lead-bearing steel, or if they are working in a confined space, then additional respiratory protection is necessary.

So far as the question that was rampant a few years ago, that is the development of so-called fibrosis of the lungs due to welding, we have not found this to be the case. Dr. Enzer and Dr. Sauter at Milwaukee have had occasion to examine at postmortem a few of these individuals who have been welding for long periods of time in confined spaces, usually. They did find there was an increase of iron in the lung but no fibrosis causing harm.

Recently, we also have examined another group of welders, that is a variant of the welding trade, scarfers, in the continuous production of steel. These scarfers use a long torch and blow out the defects in the billets rather than chiseling them out. This group also, while it is an infant in the group of welders, apparently have no health hazards of any consequence in their trade. In other words, I think if ordinary precautions, so far as ventilation and so forth are concerned, we need not be concerned other than if we are using lead or chromium or some of the toxic materials.

CHAIRMAN PAINE: Dr. Enzer will speak for a minute on the subject and then Dr. Belknap will follow him right up.

DR. ENZER: I want to seize the opportunity to make some comments relative to the general attitude of this panel discussion. It is most important that in any approach to the problem of industrial health we remember that a statistical analysis of groups is not a true criterion of the health of the individual. In other words, just like the sur-

geon who might boast of a 99½ per cent recovery rate from a specific operation, the individual who happened to belong to that ½ per cent constitutes 100 per cent mortality for the individual. There is a very sharp contrast there.

Now, when we talk about safe limits of toxic solvents, safe limits of toxic agents, safe limits of an industry, we must remember that the problem is not going to be solved by a blanket generalization of a problem, but by a careful and meticulous analysis and study of the individuals exposed to the industry. I know of no other way that this can be done except that industry realize that the profession of medicine forms the keystone to the solution of these problems.

DR. BELKNAP: I simply wanted to amplify what has already been mentioned, and that is when a welder or cutter works on material that has been painted or coated with lead, he, of course, probably will acquire lead absorption in a serious fashion about as quickly as, if not quicker than, in any other way.

It is very simple now, with the respirators we have available, for a shop welder, whenever he is doing that type of work, to use such a respirator. In my own particular series of cases one of our cases of lead absorption was a welder who had been repairing some ovens containing a large amount of lead.

Also, I had occasion recently to see half a dozen cases of cutters who were cutting up tanks in a large chemical plant. These steel tanks had been lined with lead. They could not understand why the men were getting lead. They went through the lead with a torch 3000 or 4000 degrees and they absorbed lead exceedingly rapidly. It is not a difficult question to solve at all but it is a matter of having perfect confidence in what the work is for and preparing for it.

MR. CARR: In connection with welding, we have had instances of zinc chills from work on galvanized iron. We have also had nitrous fume poisoning from the use of coated electrodes.

I would also like to call attention to a relatively new development, that of the flame cleaning of metals before painting, by the use of a special oxy-acetylene torch. That includes previously painted metals as well

as those which simply have mill scale on them.

R. J. WOODHOUSE (Continental Casualty Company, New York City): I had, a case a short time ago that I was called upon to investigate. The man worked in a small printing plant where he was assumed to have contracted lead poisoning. After making impinger tests which proved negative, an award was given by the commission to the widow in the amount of \$13,000. The lead was melted around 650 to 700 degrees and the experts proved that toxic fumes were not liberated.

I wonder what yardstick the referees used to measure those cases, in the face of such expert testimony.

MR. SKYRM: I would like to know the relation of hemlock poisoning and poison ivy to skin disease.

DR. REUTER: Poison ivy, of course, is the most common plant that causes dermatitis. Hemlock is occasionally the cause. Poison ivy is an intense irritant to most people's skin. It is a question of whether in itself it is not an irritant to all people's skin.

We used to think we knew the cause of poison ivy dermatitis, but more recent work has tended rather to disprove that we do know the actual cause of what it is in the plant that produces dermatitis. Apparently it is a water-soluble fraction rather than an oil.

Its relation to occupational disease depends on what the individual is doing. If he is exposed to it in his occupation, for example, as a farmer, WPA worker, lumberman or any occupation that keeps an individual out-of-doors, and he contacts poison ivy, it certainly would be an occupational disease. Poison ivy dermatitis is apt to be a much more violent dermatitis than that from hemlock.

CHAIRMAN PAINE: Mr. Gunner, will you repeat your question?

P. W. GUNNER: The question was, what is the basis of the comparatively low maximum concentration of toluol in the absence of any reported occupational disease cases, and are there any experimental data to warrant such a low concentration where such experimental data deals with chronic poisoning and not with acute poisoning?

DR. BELKNAP: The question is, whether toluol is really as toxic as I intimated it might be, being permissible in only 200 parts per million. Is that right, Mr. Gumaer?

MR. GUMAER: Yes.

DR. BELKNAP: As far as the official authority of that is concerned, it is taken from the code for safe concentrations of certain toxic substances used in industries, whose authors are Bowditch, Drinker, Haggard and Alice Hamilton which appeared in the June 1940 issue of the Journal of Industrial Hygiene and Toxicology.

I do not know whether there is any practical experimental work backing that up, but inasmuch as toluol and xylol are very closely related to benzol, I assume that the authors felt that it as yet could not be given an entirely safe record, for instance, compared to gasoline.

I will say, among a group of workers who have been working with adequate protection for several years with toluol solvents, I have seen no general reaction.

DR. HAMILTON: May I speak to that for just a moment? That presentation to which Dr. Belknap refers was got out simply because a small group of us felt that we might as well let the public know what was our best guess at the present moment with regard to maximum allowable concentrations of the most commonly used solvents. It is founded very largely on guesswork.

The quantity of 1,000 parts per million for gasoline is guess, and so is 200 parts of toluene. We are hoping that we shall be able to give more accurate figures presently.

The American Standards Association has a committee at work in this field, with a small subcommittee. We have just finished dealing with two gases and two volatile solvents, carbon monoxide and benzol and carbon disulphide and hydrogen sulphide. There we have been able to get pretty accurate figures because we have data to go on.

We are now trying to deal with twelve others which are going to be increasingly important in the munitions industry. We hope to be able to give out more accurate figures then. But it is a very difficult problem. You see the only way we can get any accurate figure is by having a combined inquiry made by the physicians, the chemists and the ventilation engineers, because we have to know how many cases developed in a given workroom at a given concentration, and also at what concentration do no cases come.

We could do that with the four I have mentioned, but it means, as you see, a great deal of careful study in the factory and in the physicians' examining room. Bringing those two together, we can do it with regard to lead; we can do it pretty well with regard to mercury, and we have pretty good data with regard to zinc oxide fumes in galvanizing iron and brass foundries and zinc smelting; but the rest of the substances still are more or less in the realm of guesswork.

CHAIRMAN PAINE: May I, in your behalf and in behalf of the National Safety Council, thank the gentlemen on the platform who have so kindly led us in this discussion? Will you express that thanks by giving them a rising vote?

... The audience arose and applauded.

ADJOURNMENT

Steam Railroad Section

Officers 1939-1940

General Chairman—E. L. HENRY, Chicago & North Western Railway Co., Chicago, Ill.
Vice-Chairman—D. G. PHILLIPS, Wabash Railway Co., St. Louis, Mo.
Secretary and News Letter Editor—P. F. BUCKLE, Chicago, Burlington & Quincy Railroad Co., Chicago, Ill.
Program Committee—J. R. TENNEY (*Chairman*), Western Maryland Railway Co., Hagerstown, Md.
P. F. BUCKLE, Chicago, Burlington & Quincy Railroad Co., Chicago, Ill.
O. F. GNADINGER, Elgin, Joliet & Eastern Railway Co., Joliet, Ill.
Membership Committee—ROBERT SCOTT (*Chairman*), Atlantic Coast Line Railroad Co., Wilmington, N. C.
A. O. BECK, Canadian National Railways, Montreal, Que., Canada.
F. A. BOGUE, Chicago, Rock Island & Pacific Railway Co., Chicago, Ill.
Statistics Committee—T. H. CARROW (*Chairman*), The Pennsylvania Railroad, Philadelphia.
F. R. BRADFORD, Boston & Maine Railroad, Boston, Mass.
D. G. PHILLIPS, Wabash Railway Co., St. Louis, Mo.
Contest Committee—C. L. LAFONTAINE (*Chairman*), Great Northern Railway Co., St. Paul, Minn.
L. R. PALMER (*Secretary*), Equitable Life Assurance Society of U. S., New York City.
T. H. CARROW, The Pennsylvania Railroad, Philadelphia, Pa.
A. V. ROHWEDER, Duluth, Missabe & Iron Range Railway Co., Duluth, Minn.
ROBERT SCOTT, Atlantic Coast Line Railroad Co., Wilmington, N. C.
Poster Committee—L. J. BENSON (*Chairman*), Chicago, Milwaukee, St. Paul & Pacific Railroad Co., Chicago, Ill.
C. H. BLAKEMORE, Norfolk & Western Railway Co., Roanoke, Va.
W. F. LOUGREN, Chicago, St. Paul, Minneapolis & Omaha Railway Co., St. Paul, Minn.
Safe Practices Pamphlet Committee—T. K. GAGE (*Chairman*), Chicago, Burlington & Quincy Railroad Co., Chicago, Ill.
W. J. FLANNIGAN, Northern Pacific Railway Co., St. Paul, Minn.
F. A. BOGUE, Chicago, Rock Island & Pacific Railway Co., Chicago, Ill.
Nominations and Elections Committee—W. C. SHELVER (*Chairman*), Union Pacific Railroad Co., Omaha, Nebr.
M. T. FULTON, Kansas City Southern Railway Co., Kansas City, Mo.
H. A. DAAKE, Erie Railroad Co., Cleveland, Ohio.
Health Committee—DR. I. S. CUTTER (*Chairman*), Chicago & North Western Railway Co., Chicago, Ill.
DR. HARVEY BARTLE, The Pennsylvania Railroad, Philadelphia, Pa.
DR. A. W. WALKER, Southern Pacific Railway Co., San Francisco, Calif.

Officers 1940-1941

General Chairman—J. R. TENNEY, Western Maryland Railway Co., Hagerstown, Md.
Vice-Chairman—O. F. GNADINGER, Elgin, Joliet & Eastern Railway Co., Joliet, Ill.
Secretary and News Letter Editor—J. E. LONG, The Delaware & Hudson Railroad Corp., Albany, N. Y.
Program Committee—P. F. BUCKLE (*Chairman*), Chicago, Burlington & Quincy R. R. Co., Chicago, Ill.
F. A. BOGUE, Chicago, Rock Island & Pacific Co., Chicago, Ill.

J. M. GUILD, Union Pacific Railroad, Omaha, Nebr.
Membership Committee—ROBERT SCOTT (Chairman), Atlantic Coast Line R. R. Co., Wilmington, N. C.
 A. V. ROHWEDER, Duluth, Missabe & Iron Range Railway Co., Duluth, Minn.
Statistics Committee—T. H. CARROW (Chairman), The Pennsylvania Railroad, Philadelphia.
 F. R. BRADFORD, Boston & Maine Railroad, Boston, Mass.
 D. G. PHILLIPS, Wabash Railway Co., St. Louis, Mo.
Contest Committee—C. L. LAFONTAINE (Chairman), Great Northern Railway Co., St. Paul, Minn.
 L. G. BENTLEY, The Chesapeake & Ohio Railway Co., Richmond, Va.
 G. W. ELSTE, JR., Baltimore & Ohio R. R. Co., Baltimore, Md.
 L. R. PALMER (Secretary), Equitable Life Assurance Society of U. S., New York City.
 J. J. SNAVELY, New York, New Haven & Hartford Railway Co., New Haven, Conn.
Poster Committee—L. J. BENSON (Chairman), Chicago, Milwaukee, St. Paul & Pacific R. Co., Chicago, Ill.
 C. H. BLAKEMORE, Norfolk & Western Railway Co., Roanoke, Va.
 W. R. LOFGREN, Chicago, St. Paul, Minneapolis & Omaha Railway Co., St. Paul, Minn.
Safe Practices Pamphlet Committee—T. K. GAGE (Chairman), Chicago, Burlington & Quincy R. R. Co., Chicago, Ill.
 W. J. FLANNIGAN, Northern Pacific Railway Co., St. Paul, Minn.
 G. C. JEFFERIS, Atchison, Topeka & Santa Fe Railway System, Chicago, Ill.
Nominations and Elections Committee—H. A. DAAKE (Chairman), Erie R. R. Co., Cleveland, Ohio.
 M. T. FULTON, Kansas City Southern Railway Co., Kansas City, Mo.
 E. L. HENRY, Chicago & North Western Railway Co., Chicago, Ill.
Health Committee—Dr. I. S. CUTTER (Chairman), Chicago & North Western Railway Co., Chicago, Ill.
 Dr. HARVEY BARTLE, The Pennsylvania Railroad, Philadelphia, Pa.

TUESDAY AFTERNOON SESSION

October 8, 1940

The opening session of the Steam Railroad Section was called to order by the Chairman, E. L. Henry, Superintendent of Safety, Chicago & North Western Railway Company, Chicago, who presided.

He outlined briefly some of the activities of the Section during the past year, and took

the opportunity to mention the work of many Standing Committees. He then introduced J. R. Tenney, Supervisor of Safety, Western Maryland Railway Company, Hagerstown, Md., Chairman of the Program Committee, who assumed the Chair. Mr. Tenney introduced the speakers.

The Effectiveness of Grade Crossing Protective Devices from the Viewpoint of State Authorities

By WARREN HENRY

Assistant Chief Engineer, Illinois Commerce Commission, Springfield, Ill.

The art of grade crossing protection has made rapid advance in the past few years and I believe it is fair to say that the state of public opinion on this point has advanced fully as much. It was not long ago for instance that a major obstacle to progress in

this field seemed, to some of us at least, the prevalence of what was often called the claim agent point of view, that is an undue emphasis upon legal liability rather than on public safety.

Another very persistent mental attitude,

wh
is
big
dro
get
it
wh
war
bet
poir
V
(an
been
the
the
affai
Tl
dem
impe
into
on a
tresp
have
proce
liers

A
a fa-
cross
a cen
of pe
and t
the r
erasi
Can r
occup
dange
in the
tion o
the p
gered
And
sturn
curren
Memb
dange
inc.
in the
eident
criteri
the acc
togethe
mentai
emphas
tions d
upon r
certain

ing Safety

f Chiefs of Police.

programs, the railroads
time, money and effort

ement standpoint in this
ing grade crossing acci-
must be the theme—just
there in the general plan
ement.

ment in the country is
to have men patrolling
every hour of the day.
question of assigning men
of the city where the
accidents are occurring—
day that experience in-
re the most prevalent—
to the men to be on the
ulations that have been
idents.

the country have learned
ement pays—in lives
prevented. Police have
orts can be much more
ey concentrate on the
ad of scattering their

the grade crossing acci-
ective enforcement may
of motorcycle officers
rade crossings with bad
hours of the day; it may
educational program
driver faults that have
may mean the installa-
ive devices or a system
me distance back from

functions of the traffic
ment of the traffic rules
e police must see that
But the work of the
ty is much broader than
of the law.

a sterling citizens will
they think they can get
fore, one of the major
enforcement officers is
blic a sense of obedi-
lesome respect for the

traffic laws, as well as the other laws we
have that make this a civilized country. In
this sense, the work of the police is edu-
cational. The police would like, in every
case, to get obedience to the traffic laws
and to good driving practices without ap-
plying penalties. Unfortunately, this cannot
be done always.

We all know that in cases of disobedience
to signs and signals at grade crossings, the
results to non-conforming drivers are often
tragic. Enforcement is a definite factor in
grade crossing safety for this reason. Ob-
servance of stopping lights, crossing gates
and signs at grade crossings requires the
same sort of driver obedience that other
traffic regulations do.

We are particularly concerned about the
grade crossing accident problem in rural
areas, as most state police organizations,
which are responsible for rural traffic
safety, are so pitifully undermanned that
they are unable to cope with these and other
enforcement problems in the manner they
should.

I think I can speak for all traffic law en-
forcement bodies in saying that the police
are anxious to cooperate with the railroads
and other agencies in every way possible
to solve this joint problem of grade cross-
ing accidents—and it is indeed gratifying to
know that we have such outstanding leaders
in the field of safety as the railroad men
to work with in this project.

WEDNESDAY AFTERNOON SESSION

October 9, 1940

Trespasser Accidents—Panel Discussion

Presiding: P. F. BUCKLE

Superintendent of Safety, Chicago, Burlington & Quincy Railroad Co., Chicago

In this program we will deal principally
with one phase of the railroad safety prob-
lem which, over the years, has perplexed
railroad managements, railroad officers and
employees generally. We will attempt to
point out some of the difficulties in dealing
with this problem and hope to offer you some
ideas as to how it may, in some part at
least, be solved.

I shall not take time here to present de-
tailed statistics on the subject, but I should
like to read to you the opening paragraph
of that splendid Statement on Trespasser
Casualties in Steam Railway Accidents, pre-
pared by the Bureau of Statistics, Interstate
Commerce Commission, last April. This is
known as Statement 4018 and is available
to all railroads.

"The average annual number of trespasser
casualties (number killed plus number in-
jured) in railway accidents in the period
1920-1939 was 5,248 compared with 9,069
for a like number of years 1900-1919.
This represents noteworthy reduction; how-
ever, the number reported by the railways
in 1939 constituted 54.9 per cent of the fatali-

ties and 12.2 per cent of the injuries sus-
tained by all classes of persons in railway
accidents involving train operation in that
year, indicating that this particular field is
still an important one for accident preven-
tion work."

I would recommend that all railroad of-
ficers interested in abating the trespass evil
obtain a copy of this statement for it can
be used to excellent advantage in presenting
the subject to employees and outside groups.

Dr. M. O. Lorenz, Director of the Bureau
of Statistics, I. C. C., when at St. Paul last
June said: "It may be said of the trespasser
accident problem, as of the grade crossing
problem, that you (the railroads) are not
primarily responsible. It is the victim's own
fault if he is injured while making un-
authorized use of your property, but cer-
tainly the trespassers are not organized and
the public will concern itself with the prob-
lem only if stimulated to do so. THE
DRIVING FORCE MUST COME FROM
THE RAILROADS WHOSE PROPERTY
IS INVADED BY TRESPASSERS."