

22

TRANSACTIONS

29th
NATIONAL SAFETY CONGRESS



GENERAL AND INDUSTRIAL
SESSIONS

CHICAGO
OCTOBER 7-11, 1940

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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

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Council Purposes and Program

The National Safety Council is a non-profit, cooperative association whose objective is the elimination of accidents. To achieve this objective the Council advocates the following program of safety activities:

1. **Creating Interest in Safety.** People will try to prevent accidents only when they are convinced of three things: (a) that accidents are really a serious problem, threatening personal happiness, industrial efficiency and economic security; (b) that accidents don't "just happen," but that each one has definite, ascertainable causes; (c) that accidents can be prevented. The basic requirement in a national safety program, therefore, is a dramatic and effective presentation of these facts to more and more people.

2. **Finding Accident Causes.** Accident causes are not the same in any two plants, in any two cities, in any two schools. They are not the same from one time to another. Every industrial plant, every city, every school and every other public or private organization, therefore, must study the causes of accidents in its own group, so that prevention efforts always will be directed at the things really responsible for accidents.

3. **Maintaining Interest in Safety.** People retain interest in very few things of which they are not continuously reminded. Therefore, it is the task of the newspaper, the radio, the magazine, the school, the public speaker and every other educational influence to keep reminding the worker, the driver, the pedestrian, the housewife and the school child that freedom from accidents depends on personal caution, and that the safe way is the right way and the best way—from the standpoint not only of human satisfaction, but of social efficiency and economy.

4. **Engineering Improvement.** Many accidents occur because equipment is faulty. The punch press is unguarded, the auto-

mobile brakes are worn, the stairway is crudely built, the propeller is defective, the stop sign is obscured. The avoidance of accidents, therefore, requires that safety be built into every piece of machinery, every house, every school building, every highway. We must insist that the things we buy—whether a stapler or a stop sign, a band-saw or a blast furnace—be safe things. And we must be willing if necessary to pay a higher price because of this built-in safety factor, realizing that it is true economy to do so.

5. **Training for Safety.** Many accidents occur because the injured person or some other person acts in an unsafe manner. This unsafe act often is committed because the person involved never has been taught how to do the job in the safe way. Therefore, boys and girls, men and women, must be taught how to work, how to drive, how to cross the street, how to live safely. This teaching and training is a joint responsibility of industry, of schools and colleges, of governmental groups and of parents in the home.

6. **Supervision for Safety.** Many who know well the safe method of performing an act nevertheless are involved in accidents because, due to hurry, fatigue, thoughtlessness or some other reason, they do not perform the act in what they know is the safe way. Therefore, we need good foremen in industry, alert patrol boys in our schools, diligent police officers on our streets, thoughtful parents in our homes. These, through wise guidance of those under their supervision, can greatly minimize the chances of accident.

7. **Legislation for Safety.** Avoidance of accidents requires the adoption and scientific enforcement of sound legislation—legislation on traffic, on industrial matters, on public transportation, on home construction and maintenance, and on many items of per-

MR. HIERONYMOUS: I don't think Mr. Cooper's remarks are all incompatible with what you had in mind, Mr. Chairman. I therefore would like to make a motion that this group assembled here this morning adopt the suggestion you made, and that you, as Chairman of this meeting, communicate our action to these various groups you mention. In other words, the motion would be that the associations and

various groups that operate public buildings cooperate with the National Safety Council and take some actual steps to further safety work in the buildings they represent. I make that a motion.

CHAIRMAN WHISTON: Is there a second?

(The motion was regularly seconded, put to a vote, and carried.)

ADJOURNMENT

Eye Protection

FRIDAY MORNING SESSION

October 11, 1940

The meeting for the discussion of problems of eye protection, which was sponsored by the National Society for the Prevention of Blindness in cooperation with the National Safety Council, was called to order by the Chairman, Dr. Leonard Greenburg, Executive Director, Division of Industrial Hygiene, New York State Department of Labor, New York City, who presided.

CHAIRMAN GREENBURG: The meeting this morning is intended to be a very informal one. We have a chief speaker, but in addition we have a panel discussion which is completely and totally unprepared, the idea being that many of you gentlemen in the audience have had a great deal of experience with eye protection in industry. Some of our experts who have been invited here will discuss various aspects and phases of this problem, based chiefly on questions which have come in to us from

time to time, but it must be clearly understood that anybody in the audience can participate in the discussions as he may wish.

Finally, I want to say that the problem of eye protection in industry does not consist of the gathering of data and doing nothing about it. I am very much reminded of the remark of our dear departed friend, Will Rogers, when he said that data are like garbage: after you collect them you have to find something to do with them, and that is our problem this morning, to find just what we are going to do with these interesting figures.

The first speaker of the morning is Dr. M. Davidson, who happens to be a conferee of mine in New York State and who for many years has been in charge of the eye work for the State of New York Department of Labor.

Industry's Obligation to More Adequately Protect the Worker's Eyesight

By M. DAVIDSON, M.D.

Ophthalmologist, New York State Department of Labor, New York City

There are two aspects to this obligation of industry to safeguard its workers' eyes. One is to make the environment safe for the worker by eliminating hazards causing accidents, and the dusts, fumes, intoxications and poor illumination, responsible for occupational diseases. Safety measures have accomplished much since the turn of the century.

The other aspect, that of making the worker safe for himself, his co-worker and industry, has as yet not received the recognition it deserves. It involves proper vocational guidance and advice for the applicant for employment with irremediable defective eyesight and for the worker who has ac-

quired it in the course of his employment. To reject him as an applicant when found with such a defect or to discharge him after employment, is obviously an inadequate social solution of the problem.

It should be emphasized that errors of refraction are not considered here as constituting true defective eyesight, as long as normal visual acuity can be secured by correcting the errors with glasses. Such errors prevail in more than one-half of the population. When uncorrected, they are of course a handicap and a source of eye strain, particularly under poor illumination.

The true defectives are those with irremediable defective eyesight, either in vis-

ual acuity or otherwise, who constitute the "human" as distinguished from the "environmental" factor in accident prevention and industrial efficiency and who need appropriate attention.

Their handicap may be merely a low visual acuity incompatible with their tasks. It may be, however, a lack of depth perception; defective color vision, congenital or acquired; defective light sense, or defective indirect vision, and accompanied perhaps by a normal visual acuity. They are unable to perform certain tasks effectively and become unsafe in those operations particularly which require speed. Thus, lack of depth perception makes flying and driving any motor vehicle extremely hazardous, and the finer mechanical work and artistic and drafting work difficult. Defective color vision is also a hazard in flyers and drivers and a handicap for signalmen, embroiderers, and in the chemical industry. Flyers, drivers of motor vehicles, sailors, miners and night watchmen need especially good light sense and indirect vision, and photographers and x-ray technicians find their absence crippling.

This group also offers a problem in Workmen's Compensation administration. When they meet with an accident damaging their eyes, they are, in the absence of knowledge of their antedating condition, perforce given the benefit of doubt. We must not, however, exaggerate the extent of their overcompensation. It is balanced moreover by the undercompensation of a considerable element endowed originally with a visual acuity of 20/15 or even of 20/10 for whose loss, when they meet with an accident reducing their vision to 20/20, there is rarely provision under the law. This is obviously not the best kind of justice.

It is clearly the duty of Labor, Industry, State Departments of Labor and other State Agencies to take cognizance of this group of defectives and, for medicolegal justice, of the supernormals, and to come to their relief. Our knowledge of the real size of the two groups, and of the frequency distribution of the causes of defective eyesight in the industrial population, is incomplete. The National Safety Council is at present "unwilling to estimate eye injuries in occupational accidents without further study." Such knowledge, necessary for proper vocational guidance and advice, can be secured, without great expense, by the routine examination of the industrial population by ophthalmologists to screen out the defectives and classify them as to cause. Merely determining the visual acuity and the mechanical application of eyesight testing methods by non-ophthalmologists are not adequate for the purpose.

A survey of the examinations of eyes for compensation in New York City in 1939, from the vantage point of a rather large material and a uniform method of examination, is presented here. As an introduction to it, let us examine the available data as to the eye capital which the worker brings into industry and the inroads which industry makes on it. Both differ widely between countries and regions, as to whether they are industrial or agricultural, from the presence of endemic diseases such as trachoma. The data also vary with age, due to progress in the art of refraction and correction of its errors, in diagnostic methods, and to better nutrition, all unequal in different localities. It is to be noted that the data are in terms of visual acuity only.

Eye Capital of the Worker

In 1925 Collins' figures for New York, Delaware, North Carolina and Maryland, when analyzed, show among male school children of 16 (less defective than younger boys and girls), with only 10 per cent fully corrected for errors, as follows:

20/20 in either eye, 70.8 per cent.

Less than 20/20 in one eye, 10.7 per cent.

Less than 20/20 in either eye, 18.5 per cent.

Serious defects in the last two groups combined, 8 per cent.

In 1939 an analysis by Blankstein of 920 visual acuity determinations of school children in Chicago, 7-19, to screen out defectives, shows the following:

20/20 in either eye, 68 per cent.

Less than 20/20 in one eye, 22 per cent.

Less than 20/20 in either eye, 10 per cent.

Allowing for a large proportion of defective eyesight correctable to normal by glasses; of other defectives not entering industry of their own choice; and of still others rejected by industry, the eye capital which the worker brings into industry must be considerably better than 70 per cent good eyesight.

New York State Figures

Averages For	Blind	Permanent Partial*	Temporary Disability	Permanent Eye Disabilities % of All Permanent Disability
1925-30.....	8	766	2189	3%
1930-34.....	9	574	1930	2.56%
1934-39.....	8	520	1265	2.74%
In 1939.....	11	467	1190	2.24%

The Present Situation

	Blind	Permanent Partial*	Temporary Disability	Total in Round Figures
Past Annual.....	240	15,600	37,950	54,000
Present.....	80	5,700	12,650	18,000
Annual or on Basis of 20,000,000 workers.....	4	260	632	900
	Per Million	Per Million	Per Million	Per Million

*Includes unilateral industrial blindness.

In 1928 McAuliffe reports defects, some correctable, among 5000, 20.5 per cent.

In 1929 a New York Central Lines survey finds defective, 20 per cent.

In 1933 Murray among miners finds defects, some correctable, 28.3 per cent.

In 1937 Rainey among 15,000, in Chicago found defects, 14 per cent.

Illiteracy among the miners is stated to account for the higher figure, and a rigorous selection by industry since the depression probably accounts for the lower figure. Rainey moreover succeeded in correcting to normal more than half of the defectives and in improving some of the others. True defective eyesight for Chicago today among workers should be accordingly not over 6 per cent.

With due allowance for both the depression and increase of population, the eye toll has been reduced to 1/4 in 15 years. Available fragmentary figures for the rest of the country indicate a reduction to about one-third for the past three decades. Multiplying the New York State Figures by 10, one can visualize the past and present situation. See table, "The Present Situation."

The following summary of New York City Eye Examinations for 1939 includes

examinations for accidents occurring in 1938 as well as in earlier part of 1939, hence does not cover the same material necessarily shown in the New York State table.

Number of examinations (1 and 1/2 per person).....3414

Number of persons (7% females; 495 old cases reexamined).....2663

Persons examined for first time (509 subject to reexamination).....2168

A. Persons with normal visual acuity in either eye.....1340

B. Persons with subnormal visual acuity in one or either.....828

C. Persons with permanent partial or total compensable defects.....440

(Non-compensable defectives among uninjured eyes.....17 per cent

D. Persons with non-compensable pre-existing defects.....388

(Constitutes in relation to group "A," defective group of.....22 1/2 per cent

The distribution in Rainey's study is upon analysis somewhat as follows: Development, 49%; Injuries, 8%; and Systemic, 43%.

From the data available for the country as a whole it appears that the potential in-

Analysis of New York State Closed Cases for 1939

(On basis of unpublished survey by Dr. Patton, Director of New York State Dept. of Labor Division of Statistics.)

	Number	Total Cost	Average Per Case
Total Cases.....	1,669	\$ 1,074,705	\$ 644 (One death included)
Temporary Disability.....	1,190	49,287	41
All Permanent Eye Disability.....	437	851,613	1,824 (Head injuries included)
Permanent Total Blind.....	11	164,660	14,971
All Other Permanent Disability Cases for Comparison.....	21,381	14,280,252	688

Summary of Distribution of Defects of Group "C"

Less than 20/40 in one or either eye	20/40 to 20/100 in one or either eye	20/100 and less in one eye	Blind
41.6%	23.5%	33.5%	1.4%

industrial worker may bring with him into industry an eye capital about 30 per cent defective. A large proportion of these defectives are remediable by glasses. Among the industrial population the incidence of true defectives is somewhere between 14 per cent and 22.5 per cent, or approximately 18 per cent. About 1/12 of this group is defective because of industrial injuries in the past.

On the basis of a vision of 20/100 or less, and of lack of binocular depth perception as constituting the group of serious defectives, there are 6 per cent of serious defectives in the industrial population requiring special attention in view of the National Industrial Defense Program, for the sake of efficiency and of accident prevention. Over one-third of this serious defective group is a hazard because of lack of binocular depth perception, and possibly a hazard out of proportion to the numerical strength of the group. In any survey of the industrial population it is therefore extremely desirable to make a complete eye examination, to include the other elements of normal eyesight and not merely to measure visual acuity, as is commonly done.

Eye Examination Program

A survey of the incidence of true defective eyesight among the industrial population in terms of its most important element,

visual acuity, indicates about 14 per cent to 18 per cent, with most probably less than one half serious, defectives. The problem appears therefore smaller than it is usually envisaged, but it nevertheless calls for better knowledge of it, and, above all, for attention.

As part of the Defense Program, now acute, and for the sake of a more just administration of Workmen's Compensation, a complete study of the problem with a view to meeting it is in order. Neither industry nor labor can be expected to carry it out with satisfaction to all concerned.

Considering that some 10 per cent of workers of New York, and presumably elsewhere, are annually examined or have a hearing at a Department of Labor for compensation for all kinds of accidents, entailing loss of time by the worker and expenses by the State, utilization of the occasion and the facilities of the Department for the examination of the eyes of these 10 per cent, already there for other purposes, suggests itself as practicable and economical.

These eye examinations, not for glasses, but to screen out the defectives for vocational guidance and advice, would entail for the country no more than adding or attaching to State Departments of Labor some 150 ophthalmologists to perform the service, and a certain number of medical social workers

Summary of Causes and Distribution of Defects of Group "D"
(An Attempt at a Classification of a Sample of 55%)

	Better than 20/100	20/100-20/200	Stereopsis Loss	Blind
Developmental—47%				
Errors of Refraction.....	28.2%	7.5%	3.2%	0.5%
Strabismus.....	2%	1%	3.1%	
Miscellaneous.....	1%		0.5%	
Injuries—21%				
Old Industrial.....	4%	2.5%	1%	0.5%
Non-Industrial.....	6%	3.5%	2%	1.5%
Systemic and Unknown—32%				
(includes senility, infections, glaucoma and simulation).....	25%	4%	3%	
Total 100%.....	66.2%	18.5%	12.8%	2.5%

to be furnished by cooperating State agencies, such as the State Departments of Health, of Social Welfare, and of Education. The execution of the program could be lodged either with a Workmen's Compensation Division or with an Industrial Hygiene Division.

The program could be expanded, should the need arise, to examine a larger sector of the population by increasing the staff. It

can also be adapted for the general physical examination of workers. It should be borne in mind that the mere determination of visual acuity, forming part of physical examinations in general, is of no use, since low acuity may be due to errors of refraction only, and normal acuity accompanied by defects of disease.

The cost involved might be one-tenth of what it would otherwise be.

The Panel Discussion

CHAIRMAN GREENBURG: It is interesting that in a state such as the State of New York—and I use that just by way of example—we have a total of approximately 3,000 eye accidents a year, that at least one or two of these each year result in death, that about ten or fifteen result in permanent total blindness, permanent total industrial blindness, that about 500 result in permanent partial disability, and that there are a large number of temporary disability cases. This must be characteristic of practically all manufacturing states in the union, and a very recent, most interesting and valuable report which has come in from the state of Wisconsin, proves this to be essentially the fact.

These cases in New York cost about \$1,200,000 a year in round numbers, a fairly sizeable sum, and the average per case is approximately \$650. When we looked into the cost of some of these accidents we found

that in general handtools were associated with higher costs than some of the flying objects. In other words, in many cases of small flying objects the disability is not great and not serious, but as soon as a tool begins to come into the picture, usually the flying object presents a more serious hazard. The average cost per case is just about as Dr. Davidson presented to you, about \$650 for an eye accident and about \$350 for other types of accidents.

The Problem

The problem then boils itself down to a real economic and social problem because of the economic factors involved—to industry and the workman in the case of the injury, and to society in general in the case of those persons who are permanently and totally disabled or who are partially disabled on a total basis.

That means that a broad-gage plan must be set up, both with reference to protection of workers and compensation for eye injuries and more particularly for standards of employment rejection. Now some companies have a very broad-gage policy along these lines and they do not refuse employment to a man because he has no vision in one eye, but unfortunately some companies do refuse employment to such a man and it brings about therefore a most serious problem.

These and other problems which you may have in mind, and which some of our friends have had in mind, can be discussed very freely and frankly before this panel. I will now present to you Mr. W. T. Cameron, Chief Safety Advisor, Division of Labor Standards, U. S. Department of Labor, Washington, D. C., who will be the leader in our panel discussion of eye protection problems.

(Mr. W. T. Cameron assumed the chair.)

The Panel Members

Chairman Cameron introduced the members of the panel as follows:

Mrs. Eleanor Brown Merrill, Executive Director, National Society for the Prevention of Blindness, New York City.

Harry Guilbert, Director, Bureau of Safety and Compensation, The Pullman Company, Chicago.

Dr. T. Lyle Hazlett, Medical Director, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

R. McA. Keown, Engineer, Industrial Commission of Wisconsin, Madison, Wis.

M. A. Kroger, Director of Safety, Chevrolet-Gear, Axle and Forge Division, General Motors Corporation, Detroit.

H. S. Simpson, Safety Director, Caterpillar Tractor Company, Peoria, Ill.

CHAIRMAN CAMERON: As I see it, we have before us two problems. One is protecting the good eyes of industry, and there are a lot of them still left despite some of the figures that do turn up on lack of depth perception and lack of visual acuity

and color blindness and so on. We have the job of keeping the eyes for our great defense program, and so on. The second problem is: How are we going to make the best use of these workers who now have some uncorrectible defect? Where can they be placed? Where can they be used? How shall we provide them with opportunities to earn a livelihood?

I think Mr. Knudsen said the other day that our first bottleneck in national defense is going to be the lack of skilled and trained workers, so we are going to have fewer of the labor supply waiting outside the gates, clamoring to get in, and we are going to have to use some of these people who have previously been screened out of industry or neglected because of some defect, in many cases a visual defect.

We are going to follow the questions as listed in the program, although we probably will do some skipping around.

First, in what operations and occupations do eye injuries occur most frequently? I shall call first on Mr. Keown to give us some information on that subject.

Where Eye Injuries Occur

R. McA. KEOWN: Mr. Chairman, I have a few figures. I am not going to give very many of them because they have been covered pretty well already, but some of the most important.

In our Wisconsin eye injury cases we find that the industries that cause the greatest number of injuries are the clay, glass and stone industries, and another important group is the metal and metal products. The paper and paper products contribute only about 2.4 per cent of all the eye injuries. Another group, a rather serious one, is the commercial and mechanical services like garage work, which account for 4 per cent of all of the eye injuries. As to mechanics, carpenters suffer more eye injuries perhaps than any other group, and hammers contribute the greatest number of injuries as a tool. Dr. Greenburg mentioned the fact that in Wisconsin 23 per cent of all of the eye injuries are caused by handtools; yet only about 4 per cent of the benefits are paid on account of handtool injuries.

Eighty per cent of all of our injuries are of a temporary nature, and manufacturing contributes only about 50 to 55 per cent of

the eye injuries. Eighty-three out of every 100 compensable eye injuries are temporary. As stated by the New York figures, our number of eye injuries as compared with all injuries runs from 29 per cent to nearly 4 per cent. That figure has varied between those two limits for quite a number of years, and the amount of benefits paid, however, runs from 8 to 10 per cent and that checks very closely. The cost of eye injuries in total benefits is about two and one-half times as serious as for all injury cases.

CHAIRMAN CAMERON: I think we might have an actual example or two. I know that the usual procedure in industry is to go through the shop and make a list of all the jobs where eye protection of one kind or another should be furnished. I should like to call on Mr. Simpson, of the Caterpillar Tractor Company, to give us some examples of where eye cases turn up in heavy manufacturing.

H. S. SIMPSON: It is our experience, and that of all industry, that accidents happen where you do not expect them. If you do not expect to have an eye injury, you do not wear goggles, and you end up in the hospital with an injury and then the compensation. We have considered adopting the compulsory goggles rule but we get up there and then we back away. We have tried to evaluate hazards. We say that the operator on this machine must wear goggles, but what are we going to do about the timekeeper who stops by for an instant to get the man's time and also one of his chips?

Our serious eye accidents have been cases, for instance, where a lock-washer exploded when the nut was being backed off with an air wrench. A piece of the lock-washer tore a hole in a man's eyeball. Normally, you have a devil of a hard time selling the man in the shop that there is any particular hazard there, but he believes it now. Incidentally, he is in our employ and we do not feel that we should discriminate against his lack of binocular vision. The intelligence level there takes care of many things. He has learned an awfully good lesson and he sees twice as fast with one eye.

FRANK K. BOYLE (Brown-Lipe-Chapin Division, General Motors Corp., Syracuse, New York): In the doctor's statistics, how many cases involved syphilis and do accidents aggravate the condition?

CHAIRMAN CAMERON: Dr. Davidson, will you take that question?

DR. DAVIDSON: A very insignificant proportion. I haven't the exact figure.

MR. BOYLE: Is it true, doctor, in the state of New York that if a person has syphilis and an accident aggravates the condition he gets compensation for total blindness?

DR. DAVIDSON: According to our laws, if syphilis preexists an accident, he gets paid for the loss regardless of the pre-existing condition. Aggravation is a ground for compensation.

Getting Employee Cooperation

CHAIRMAN CAMERON: I think this very logically leads us up to "The pro and con of the compulsory goggle rule." We have had several questions turned in. The first one is, "Any eye protection campaign depends on the worker. How do you gain his cooperation? What is the supervisor's place in the program?"

Dr. Hazlett, I should like to have you tell us a little about how you gain the worker's cooperation in wearing goggles. Now we have two things here. We have one the matter of making the wearing of goggles a condition of employment, just like punching a time clock or anything else. We have the other problem of a selling campaign to get the workers to wear goggles voluntarily with perhaps a little pressure now and then from the supervisor. Will you take that first, Dr. Hazlett?

DR. T. LYLE HAZLETT: In regard to the employee, I think that we can educate him by means of example. It has a very telling effect. We all feel that a great majority of the eye accidents can be eliminated if we do have proper protection. We still, of course, have the timekeeper or the engineer who may have an accident when walking down an aisle, but eye accidents can be eliminated by making the employees more conscious of the effects of simple eye injuries.

Often if the employees are shown a break-down of minor accidents occurring in different divisions, it will make them realize the size of this whole problem. I think we can sell this to employees by gradual education, making them more conscious of the number of cases occurring during a

period of time. This must be continuous. By keeping after it all the time we feel that we can create a great deal of additional interest in the conservation of eyes in industry.

Goggle Difficulties

S. WARZALA (Calco Chemical Division, American Cyanide Co., Bound Brook, N. J.): In our experience, there is no difficulty with the worker about the wearing of goggles. The worker will wear goggles whenever we can furnish him a satisfactory goggle, but I do not know of any goggle manufactured today that you can call a satisfactory goggle for our purpose.

Where you can wear a spectacle type of goggle and where you can wear a cup type goggle, perforated to provide ventilation, you may use that goggle very well; but where you must have a goggle that covers your eyes completely and have it practically hermetically tight, then we do not have a goggle on the market that will satisfy that condition.

We have eye accidents in industry largely because men cannot wear goggles all the time, and they cannot see in connection with their work the different places where they are required to wear goggles; therefore, they get into trouble.

In one case we had a drum standing on end, covered with a removable top. In the top was a hole about two inches in diameter. Liquid caustic was kept in this drum. The rod with which they mixed this liquid caustic was not available. An employee, wearing glasses like my own and having only one good eye, found a piece of pipe a half-inch in diameter. The pipe was about 45 to 46 inches long. The drum was about 40 inches high. He stuck the pipe into the drum. On the bottom was about two inches of this caustic. A crust had formed on top. As the pipe struck the bottom a drop of acid, believe it or not, flew through the pipe and under his glasses and into the good eye—mind you, into the good eye.

I will give you another example. A man again was handling caustic wearing rubber goggles. They were rubber goggles that covered the eyes. Under one of the eyes there was an opening of about one-eighth of an inch. A drop of acid found that opening, lodged in the eye and produced an injury.

We communicated with the manufacturers of the goggles. They showed great interest and as a result they are trying a new experiment; they have sent us four goggles of different designs. We have tried them on 100 men. Seventy-five men were able to use one of those goggles so that they covered the eye completely. The others required other fits.

Now even in the fitting of goggles there hasn't been much progress; all of the goggles seem to be poured out of one mould, and if they do not fit, well, it is just too bad. The reason the workmen do not wear goggles is because there are no goggles that they can wear eight hours a day and do any work and under the circumstances we certainly cannot require it.

I should like to see a goggle produced that a man will be able to wear all day long and have complete protection, not only against flying objects but also against corrosive liquids and materials.

CHAIRMAN CAMERON: Has anyone had any experience in relation to eye protection for the man who is handling acids and caustics?

MR. BOYLE: I think that problem also involves the Interstate Commerce law. When empties are shipped, if there is anything in those empties and the truckman suffers an eye injury, the concern that is shipping them back is involved.

CHAIRMAN CAMERON: That is a very good point, the legal responsibility of the company shipping the containers.

EDGAR N. GOLDSTEIN (Consulting Safety Engineer, San Francisco): I think that the idea of having one type of goggle that is going to do for every industrial condition is expecting just a little too much. You cannot do that any more than you can give a carpenter one tool and have him do all the carpenter work that is necessary. However, some of the manufacturers make goggles with different nose bridge widths and if they are properly adjusted a man can wear a pair of those spectacles all day, just as easily as he can wear a pair of ordinary spectacles that he may require on account of his eye condition.

I want to ask if the present trend is toward 47 millimeter instead of 50 millimeter in order to afford better fit?

47 or 50 Millimeters

CHAIRMAN CAMERON: The question is whether in the use of industrial spectacles the 47 millimeter, which is the smaller size, the more or less standard size, is better from an optical standpoint, although perhaps not so good from a safety standpoint? Mr. Guilbert, will you answer that question?

HARRY GUILBERT: Your question is a very good one. I am going to ask an expert to answer it, if I may. Dr. Davidson, of the Pullman Car Works, will you come here for a moment and answer the gentleman's question?

DR. H. P. DAVIDSON (Pullman Standard Car Manufacturing Co., Chicago): It depends entirely upon the size of the man's face. Of course, you can decenter any lens, but you have to take into consideration the build of the man. For instance, when you have a very small, wizened man, if you put a 50 millimeter goggle on him, his goggle would stand out like wings, so in that case you would have to put on the 47. If you have a man with a large face, then you would put 50 or even larger on him.

MR. GUILBERT: I think that Dr. Goldstein made a very good point there about a carpenter doing a job with one tool. I think that most of us realize that there are hundreds of thousands of men in America today wearing goggles all day long. In our particular organization there are 25,000 men and women wearing goggles eight hours a day. That is the answer. Of course, it is impossible to make one goggle to suit every occasion. I think that Walter King will bear me out on that, and he has had a great deal more experience along those lines than I have. We worked together on the problem over twenty years ago. But today, let me repeat, that in our particular case every man and every woman wears goggles while they are working.

If a visitor comes to the plant he protects his eyes or he doesn't get into the plant, and I mean superintendents, vice presidents, foremen and everybody else. There is a sign at the entrance to each plant, signed by the president of The Pullman Company, that eliminates all arguments from some of these wise guys who come along and want to get into the plant without glasses. Personally, I have had more trouble with the

so-called executives than I have had with workmen.

I am not an expert, but you can put any subject in a nutshell. It is preventing eye accidents. And the only way to do it, in my opinion, is to get every man in the shop to protect his sight, because there is not a man in this room or anywhere else who can lay down a set of rules and say that accidents are going to happen here or they are going to happen there or they were unexpected. Well, management, of course, is supposed to be intelligent enough to take care of the unexpected situations.

I want to bring out one very important point if I may. It is this: To get men to take care of their sight we must render a service to them. When you take an automobile to a service station the attendant does everything but brush your teeth. Now in the average plant in America there is a tool room where men turn in their tools, but in this average plant where men are given eye protection the management leaves it to the men to take care of their eye protection and the men do not do it. That is what I call "individual control." You must substitute central control.

Let me illustrate briefly. I took a tour through one of our shops the other day where there are 1,700 men and I scrutinized very carefully every man whom I passed. I was in every department. I did not see one of the 1,700 men without goggles. Every pair of goggles that I looked at fitted the man and were clean. Why? Because those men have the privilege of going to what we call the goggle and respiratory dispensary, any time of the day and night, to get what in my opinion is the crux of the whole thing, and that is a proper adjustment. When you buy a pair of glasses—and lots of the men here are wearing glasses—what is the first thing that is done for you? They are adjusted, aren't they, and they are continually getting out of adjustment. Even the fellow's in the office. Now what chance do you think the man in the shop has of keeping his goggles in such condition that they fit him properly all day long? He hasn't.

MR. BOYLE: Mr. Guilbert, who adjusts the goggles in your organization?

MR. GUILBERT: A full-time man, and he is doing a very excellent job. I could prove that to you better if you could talk to some of the men and find out how they feel

about it. It is very unfair, I think, to expect 5,000 men in a plant to be very happy about wearing goggles all day long and do a good job if you do not render this service that I am talking about.

"Cafeteria" Service

CHAIRMAN CAMERON: I think maybe we have another answer here to that same question while we are on it. Mr. Simpson, of the Caterpillar Tractor Company, I think has a cafeteria wagon that goes around and fits goggles. Will you tell them about that, Mr. Simpson?

H. S. SIMPSON: We have the problem of some 160 or 170 acres of property, of which 70 acres are covered with buildings. There is a lot of walking involved. We pay people to work, and if they are in the back end of the shop, we figured that we could save money by using a push cart. One of those ice cream carts, with a lot of compartments, etc. That cart is in circulation in each division continually on each shift. The operator of a cart goes right down an aisle and stops and talks to the machine operator, or whoever the person might be. One of those service men will cover from 100 to 150 employees per shift. There are five people doing that. It means that I continually have my hands on the focal point of that many conversations with that many employees. There are a lot of duplications, but it gives one a very good opportunity to know what the feeling is on certain things. It gives you a rather rapid return on the fittings.

On this fitting proposition and on prescription glasses, our safety glasses do fit very definitely into the program, but they themselves are not the total answer. The goggle manufacturer cannot make brains for your men.

Wednesday night five of our executives flew in here, and the top man of the group had his safety glasses on. He had gotten 155 miles away from the plant and had not thought of them yet—so they must have hurt his eyes very much. In decentering, we have an overall geometric sign through the center of the lens and quite often we can decenter two millimeters each way. We like to go a little to the outside, but if we go too far, on the second shift where we have artificial illumination we get back lighting

which gives you more trouble than anything else.

CHAIRMAN CAMERON: We haven't answered your question yet; we are still hoping that we may get the answer.

MR. WARZALA: I know that, Mr. Chairman. I think that in any intelligent discussion of the goggle question, we ought to make some distinction between goggles that are used in plants where corrosive liquids are handled and plants that do not handle them. On the train coming to Chicago I heard about an interesting accident. An office girl was sitting down doing her work, and another girl standing in back of her was handing her a piece of paper. In taking it, somehow the sheet of paper hit her eye. It came right across the ball of the eye. The girl naturally blinked her eye and continued working and did not report to the medical department that day. She reported the following day and by that time infection had set in, and I understand that the girl right now is in the Eye and Ear Hospital in New York City.

When you are handling corrosive materials the plain eye glass kind of a goggle will not do. Neither will the cup goggle with ventilation, that is, with screens, baffles or other things. We have used the nod-and-shake goggles, but there is a complaint against them. It is a small goggle that fits tightly over the eye. The frame is filled with water. When the goggle fogs up and you cannot see, you just shake your head and the water in the goggle washes it off. There is distortion of vision, headaches, and a lot of other things. Now these rubber cup goggles cover the eyes completely, but they are not satisfactory. So in any discussion of goggles that anybody makes, I should like to see a distinction drawn. Let us talk about goggles for non-corrosive materials and goggles for corrosive materials.

Suggested Committee Study

CHAIRMAN CAMERON: Let me ask Mrs. Merrill a question. Would it be possible to set up a technical subcommittee within the National Society that could study this problem during the year and report back to the Congress next year, or if there is a report in the meantime, could it be made available to the National Safety Council?

MRS. MERRILL: I think, if we can have the cooperation of our Industrial Advisory Committee and of the Safety Directors, that it would be possible through the National Society to carry a clearing of that information and to assemble material.

CHAIRMAN CAMERON: How does that sound to you folks in the audience?

MR. BOYLE: I was in the Willis Morrell plant at Elmira to get the result of an eye survey. This was prior to the time they made physical examinations of employees. A number of accidents had occurred and they found that two employees were totally blind in one eye and did not know it. I will ask the lady if she has ever had that experience.

MRS. MERRILL: I think for that particular question, the leader of the discussion might want to ask someone else for an answer.

CHAIRMAN CAMERON: Yes, I have quite a few questions just on physical examinations and how much stress should be laid on the eyes. Let's try to settle this equipment problem if we can. Is there anybody in the audience who has made a homemade goggle or something else that answers this drastic and corrosive problem?

Mining Experience

A. AMRAM (Hamlin & Co., New York City): We have been discussing eye protection for various industries, and I dare say the industry in which they have more accidents than anywhere else is the mining industry. According to Dr. Davidson, 28 per cent have defective vision, a larger percentage than in any other industry.

I should like to go on record as saying that I do not quite agree with the comment that this is perhaps due to inferior intelligence. In my work, which takes me to a few mines—I am not a mine inspector but nevertheless it is one of my duties and I am referring to southeastern Missouri, to Utah, and Nevada—I find that the miner is just as intelligent as any industrial worker.

We have the greatest difficulty, especially out in the western mines, to get the proper type of protection. I might perhaps illustrate that by a letter I have just received from a mine superintendent who is out in California. He says:

"Referring to our conversation in regard

to making our men wear goggles, we wish to speed this matter all possible. We just had another very bitter experience; one of our men had a little dust in his eye and the local doctor treated it for about ten days."

I might say that we are eighty miles away from any doctor, or at least from any eye specialist. The letter continues:

"As he did not improve, we sent him to a specialist and he reports that the man will have permanent impaired vision; probably due to improper treatment. As we told you, 60 per cent of our accidents are eye trouble caused by dust and if we can find goggles that can be worn underground without fogging we want to start using them at once."

Well, I thought of a friend of mine, a superintendent of a mine, who had had a great deal of trouble getting the men to wear the right type of goggles, but he finally thought that he had solved the problem; so I wrote to him so that I could inform our mutual friend in California what he had done. This is what he says:

"At one time we thought we had solved the problem with a certain type of glass goggle, but it turned out that due to certain air currents and conditions these goggles only worked satisfactorily in one place. With the same men wearing the same goggles and being transferred to another part of the mine, the glass fogged up immediately and it was impossible to use them successfully.

"These glass goggles are much more satisfactory where there is a perceptible movement of air, as it seems to take care of the fogging.

"We still use in most cases a very crude wire goggle, which you are perfectly familiar with and we all consider very crude."

DR. M. DAVIDSON: Mr. Chairman, may I say that I did not mean to reflect on the intelligence of miners. I used that word because Mr. Murray, who reported his findings, explained the eye incidence among miners on that basis and I was just quoting him.

A. H. TRESTRAIL (Pickands, Mather & Co., Caspian, Mich.): I have been in mining about twenty-one years. When we first started out we had the goggle question. We still have it somewhat. At first we tried to get men in certain occupations to wear goggles, and while we saved some eyes that

way, we found out that we lost eyes in other occupations. We finally came to the conclusion that it would be necessary to have every man on the job, whether underground or on the surface, wear goggles.

At first we experimented with the screen goggles, but they were not satisfactory. The argument against the glass goggle was that it fogged. We got away from fogging largely by having proper ventilation in our mining places. The wearing of goggles is the hardest on the supervisor who has to travel from one place in the mine to another. If a fellow is working in a warm place his goggles become adjusted to that temperature and he does not have a great deal of trouble, but the supervisor, the man who goes from one temperature to another, does have trouble. We aim to have our temperature in the mine uniform all the way through, but that is impossible in certain types of mining, especially where you have heavy timber formation or bodies of ore adjacent to sulphur-bearing rock.

We came to the conclusion that a half a loaf is better than none. We do not claim that we are going to prevent anybody from becoming blind; we are not guaranteeing that; but if we can save 90 or 95 per cent of our eye accidents, we are going to do that.

In case of eye injuries, we take our men by automobile seventy-six miles; we just simply put the man in an automobile and take him to an eye specialist. In a group of 600 men, we have had within the last two years two eye injuries where there was a short period of disability. One of them ran as much as fourteen days. We have had compulsory goggle use in our mines now for two years, and in that time the maximum disability has been fourteen days. We haven't had any lost eyes.

In the company's experience in the entire Lake Superior district, where we have approximately 1,200 to 1,500 men employed and our records are interchangeable, I know of only one case that a man had a severe eye injury while wearing goggles.

I have also observed that the man who has to wear goggles with prescription lenses, somehow or other overcomes all the difficulties that these other fellows complain about.

C. A. De MONGE (Kelsey Hayes Wheel Co., Detroit, Mich.): I want to ask Mr.

Guilbert what type of goggle he uses and whether the company pays the cost of furnishing the goggles?

CHAIRMAN CAMERON: The question is whether or not you furnish prescription goggles to your men, and if so, do you charge them for the prescription or do you furnish them free of charge, and what control do you have over them?

MR. GUILBERT: We furnish everything free of charge.

MR. TRESTRAIL: So do we.

MR. De MONGE: Do you use one type of goggle all the way through?

MR. GUILBERT: No, the fewer types the better, in my opinion. We use practically one type throughout the whole organization with very few exceptions.

MR. BOYLE: Mr. Chairman, have you ever heard of a glass eye exploding?

CHAIRMAN CAMERON: Yes, I have. I think that perhaps a number of people who have worked closely with this subject have heard of experiences of that kind. Does anyone want to say a word about glass eyes exploding?

Goggles to Fit

H. B. BENJAMIN: I happen to have had that experience. I can also contribute something about the man who wears glasses and has to wear goggles over them. For eleven years I have worked with goggles over my glasses. I found that the average goggle is not made to fit the average eye glass. You will notice that those in the audience who are wearing glasses all have different style glasses. If every man wore the same style of glasses it would be easy enough for any goggle manufacturer to manufacture a goggle that would fit over those glasses, but that is not the case. So I took a pair of goggles that looked to me as though they were right, took them apart and I ground out and cut those protective sides to fit the glasses that I had. Now when I go to the doctor to have my glasses changed I take the glasses that I wear at the factory, also the glasses that I expect to wear on the street, and I have him make lenses for each pair of glasses. Then I put my sides back on those glasses.

You have noticed that some of them have high nose pieces and others do not. I happened to be foolish enough to buy a pair of those with a high nose piece one time. So I

took a pair of regular goggles and made a leather nose piece. I cut it out so that it fit properly. I do not use those any more because I like the pair that I made out of the other goggles the best; but I loan those goggles to men who want to visit the department.

As to glass eyes exploding, a glass eye is hollow, like an egg shell. There is a certain amount of air in there that gets hot. In fact, if one is in a very hot place, it almost turns to steam. If you step out into cold air immediately where a cold breeze hits that suddenly, it is likely to explode. I have had it happen three times.

CHAIRMAN CAMERON: That is just the kind of practical experience we need. Thank you.

MR. TRESTRAIL: That is a good argument to convince any man that he should wear goggles.

A Study Resolution

ROY S. BONSBIB (Standard Oil Co., New Jersey): The suggestion was made that this question of the development of proper eye protection should be studied by the National Society. In order to focus the thing, I think it would be well if we could state that it is the consensus of this session that this thing should be studied, possibly through the National Society in cooperation with the National Safety Council, through the Goggle Manufacturers Association, through the Bureau of Standards, and other agencies that are in a position to contribute to the details. I think that should be done because talking is never going to get us anywhere. In order to bring it to a head, I suggest that that action be taken.

CHAIRMAN CAMERON: All right. All in favor of requesting that this group go on record as requesting that the National Society for the Prevention of Blindness, in cooperation with the National Safety Council and the Bureau of Standards and the Safety Equipment Manufacturers Association, set up a technical committee to study types and kinds of goggles for various jobs and that their recommendations be presented before this group at the next Congress, raise your hands. Opposed? It is carried.

MRS. MERRILL: I am glad to have that request.

Job Placement

CHAIRMAN CAMERON: I think that the matter of being seventy or eighty miles away from an eye specialist may be covered somewhat in this next phase of our discussion. "What are the bare essentials that we must know about a man's eyes before job placement?" Dr. Hazlett, would you care to comment on that question?

DR. T. LYLE HAZLETT: I think that most of us are interested in the basic principle of visual acuity, which has more to do with job placement than any other factor. There are a few occupations, of course, where color tests are necessary and also depth perception, but, as a rule, if we have visual acuity we should be able to place a man on such a job that he can carry on without any injury to himself or injury to other workers beside him.

CHAIRMAN CAMERON: There is another question on that same subject here: "To what extent does industry refuse employment to one-eyed men?" Does anyone have anything on that subject? Suppose that a good machinist comes in but he has only one eye? Do you turn him down?

E. F. TINGLEY (United Gas Pipe Line Co., Houston, Texas): We do not hire machinists. We turn anybody down who hasn't good vision to begin with. If they lose their vision while they are working with us, we take care of them from that time on out. We find some job to put them on where they won't hurt anybody, but when you are handling natural gas under high pressures you want the man to see where he is going so that he can take care of the rest of them. We do not have them all under one roof where we can say, "You do this and you do that." We may have a man twenty miles from any other fellow and he has a job to take care of and he must do it.

CHAIRMAN CAMERON: I will ask Mr. Kroger if he will make a contribution on this subject. What do you do with men who come in with defective eyes?

MR. KROGER: The gentleman has stated that we need physically fit men, but I should like to remind you that industry is doing things for a reason, and if they will take a one-eyed man on a certain job or they won't take a one-eyed man, surely something must have taken place in the past to justify such a rule or restriction.

You cannot expect the boss to open a bag and let you dip your hand in as regards every one-eyed man who comes to the gate and asks for a job. We exponents of safety realize that we have a rehabilitation program in our large plants. Ten or fifteen years ago our eye losses were terrific. Coming to our employment office now and asking for a new job is like asking for three-quarters of the stock in our company. We do not have such a thing as a new employee. The labor legislation took care of that, but we do this: We do not expect our doctor in examining anyone's eyes to tell us where the man should work. We feel that we know what kind of eyes are required on a job. I think it is one of the greatest evils to expect any doctor to know all about what is going on in your shop and what kind of glasses are needed for each job. He is out of order when he attempts that.

If a man coming in happens to be a clerk, we have no restriction against his doing clerical work, or if he happens to be a draftsman. We feel that we are able to take care of such one-eyed men. Our experience in the shop is very much like the gentleman mentioned. Those who have lost an eye while employed by us we will take care of, but we will not take any others. But in my opinion, sooner or later we are going to have to take them, and I hope that we do not get into the national defense program to the extent that we have to take too many until our brethren, the manufacturers, really find something that will take care of the one-eyed man as well as the two-eyed man.

Depth Perception and Color Blindness

CHAIRMAN CAMERON: I have another question in this same field: "Defective eyesight has been named as one of the contributing causes of accidents. Give actual cases where lack of depth perception or color blindness or other defects caused accidents." I understand that Dr. Kuhn is in the audience, who has made quite a study of this subject and I am going to call on her.

DR. HEDWIG S. KUHN (Hammond, Ind.): In direct answer to the question as to whether depth perception has caused accidents, we have so many illustrations in our recent survey of 16,000 individuals and their defects in industry that I could quote them

indefinitely. There was the crane operator who said, after he had had his depth perception and muscle imbalance corrected after six months of training orthoptically, "The fellows under me can now work with safety. When I first came in I could not tell within 20 feet where I was dropping my load. Now I can put it on a dime."

An ingenious safety director in a large corporation who had a man with no depth perception wanted to prove to himself that there was a hazard. So he took away all of the stationary machinery that he could possibly move away, destroying the landmarks with which this man had been working, and he said to him: "Go about your business." But he couldn't drop his load within 15 feet of where he was supposed to after the removal of the permanent fixtures which had guided him in his job.

Now with a crane operator who works with permanent fixtures, that is one thing; with somebody who works with changing conditions, like tractor drivers and automobile drivers, etc., it is another thing; we have never dug out the accident records on depth perception alone. But our charts show how many more people with lost-time accidents did have depth perception defects.

I am going to interject here one or two statements that are, I hope, a contribution to this discussion.

Our obligation to protect the worker's eyesight we feel is greater than realized, and includes, as Dr. Davidson indicated, additional factors besides goggles and the study of accidents and data on acuity. His basis of 8 per cent of serious visual defects was on a compensation basis, whereas 20/20 is taken as normal. Our figure of 15 per cent of serious eye defects is on the basis of what we designate a practically normal vision from industry's standpoint and, therefore, includes also serious eye muscle imbalances which interfere directly from a safety standpoint with that person's job. I think that ophthalmologists can learn and cooperate with management on what an individual's eye should do, because when we are all done figuring it out with management, we have to help them correct them, don't we?

The concept is that visual performance, as Dr. Davidson indicated, is a varying function arising from varying demands of the job. We designate eyes for the job and

I have just two thoughts to contribute to this discussion. The first is that there is a direct correlation between visual performance and accuracy, and accuracy is the same thing as efficiency. The second is a reference to Mr. Cameron's statement of the shortage of skilled labor. I take this figure out of our project:

According to statistics, if the efficiency of the present employed force of skilled labor could be increased three to five per cent, it would cancel out the present lack of skilled labor or the likelihood of such a shortage occurring. Job training inside of industry, plus the proper type of physical examination which includes visual performance as an aptitude test, which means more than acuity, could accomplish this three to five per cent increase in efficiency, and it would do this without any of the personnel problems, dislocations and moving of jobs, strikes, grievance committees, etc. While machine power has been geared up to 40 per cent of its efficiency, human power or efficiency has as yet been geared only to 40 or 60 per cent of its efficiency.

MR. TINGLEY: I do not want you to misinterpret me about not taking people

into industry just because they have one eye. We take clerical workers and people like that with very poor vision if they are corrected with glasses, but it happens that our particular industry is very dangerous.

MR. KROGER: I meant no slam at doctors when I made mention as I did. I will say this to Dr. Kuhn or to any other ophthalmologist, optometrist, or any other man who attempts to make fittings commensurate with the classification of work, give him to me for six months and let him walk daily with me through the plant and after he gets his mechanical knowledge and education as to what is required of the worker, I will bet my shirt he can fit glasses 100 per cent better than he did.

CHAIRMAN CAMERON: I think that you and Dr. Kuhn should get together, because I think that she also has had a great deal of practical experience. I understand that the National Society for the Prevention of Blindness is going to make available the paper covering the results of a long series of studies performed by Dr. Kuhn to members of the National Safety Council and of the National Society.

Thank you very much for your splendid cooperation this morning.

ADJOURNMENT

found that these 80 men had an average debt of \$450, they had come to us with that debt. Men with families, working on a laborer's job, naturally went into the lowest paid jobs in our organization, and a \$450 debt was pretty big for them.

We worked it out this way: After they had been with us a short time and we determined that they were the type of men we would want to keep, we got the men and said: Now, let us see what your bills are: \$50 to the doctor; \$35 to the grocer; so much for rent, one thing and another. So we got hold of those various creditors who had hoped on them as soon as they went to work and wanted their money and said, "Here is the situation. This man owes \$450, and he probably is not going to live long enough to pay it off. If you force him too hard, he is going into bankruptcy. Can't we compromise these debts and get you something for your money and get the worry off this man's mind?"

In many cases we were able to do that successfully; say, we compromised the \$450 worth of debts for something like \$300 total. We gave that man a \$300 loan from our credit union. I have had the experience of filling out some of those loan applications, sitting there and figuring with the man who is going to get how much money. You get all the compromises arranged, and when the deal is finally completed and you put through the loan and these bills are paid off, he gets up from the desk and stands off, he gets up from the desk and stands off, and you can see trouble slide off his shoulder, and he says, "Thanks." Well, you have done that man a favor but, certainly, you have done yourself just as great a favor because you have taken something off his mind that was bound to handicap him at his work. He is worrying all day about the debts he owes, and he is worrying about what will happen if his check is garnished and what is going to happen to his family. He is worrying about what is going to happen about his job. Will his employer get tired of this business and fire him rather than fool with the bills? But you aid him

to pay off those bills, you have taken a big load of worry off that man's mind.

I don't think it is necessary for me to argue with you that worry certainly plays a very important part in accidents. I am not able to tell you how many accidents those men would have had if we had not taken care of their financial difficulties. But I think we not only did a job for them but a very big job for our safety program at the same time, by getting rid of their financial worries.

I feel that the credit union is almost an integral part of our safety program.

This business of hospitalization and sickness benefits works out in about the same way. If you have a man working in your plant on a fairly low rate job, he is not making a great deal of money and has a number of family responsibilities. His doctor says, "John, you are going to have to have your tonsils taken out." The doctor's bill for that is going to be \$25, \$50 or possibly more. Maybe he is going to have to be off work for two weeks, and there will be a hospital bill to pay there. That is a pretty tough load.

If John knows that during the time he is off he is going to receive a definite sickness benefit, if he knows he is going to receive hospitalization benefit, he is a lot more apt to be willing to go ahead and have the tonsils taken out; and, again, he has done both himself a favor and you a favor by correcting his physical condition.

So, I believe both of them do play a part and help out the safety program.

CHAIRMAN BIXLER: Ladies and Gentlemen: Your continued interest this morning, I know, is of sufficient satisfaction to the members of this panel that the Chairman need do no more than to turn to them and say "thanks" on behalf of the Program Committee. We are glad that there has been as much, if not more discussion from the floor as from this panel.

Please remember that a good part of the discussion this morning will be published in the Congress report.

ADJOURNMENT

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

Panel Discussion

CHAIRMAN PAYNE: 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 Enner, Director of Laboratories, Mount Sinai Hospital, Milwaukee.

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

"Lead in Industrial Processes." Dr. Bellup 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 Bruhn, 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 we 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.

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

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

The ordinary paints and lacquers can be considered together because the problem of the solvents, largely, is what we wish to deal with. The solvents used are relatively low boiling products which volatilize readily, such as acetone, ethyl acetate, butyl acetate, amyl acetate, and so forth.

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

The next essential part of the lacquers includes the driers, such as ethyl lactate or cadmate, monomethyl ethers and various other chemical products of known and unknown toxicities. Also, there must be a filler or a substance giving flow to the plastic. These are relatively high-boiling low-volatility products, triphenylphosphine, castor oil, camphor and others, again of known and unknown toxicity.

The toxicities of the various individual products are often known. It is not the toxicity of the pure product, however, that we are often concerned with. It is the product which is used commercially. It is often the impurities in minute quantities that add to the toxicity. For example, we may say there is, in the case of xylol, some question as to its inherent toxicity. However, since benzol is so frequently a contaminant, we do have some benzol toxicity to be consid-

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, if we wish to use that terminology, 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 term.

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 caustic 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 (Jewel 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 ventilation, 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 respiratory probably would be suitable 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 cephalonic 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 gasoline, 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 gasoline 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 user should be watched very carefully for blood changes, so far as benzol exposure is concerned.

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

every protection of the supplied air type, supplied also with a charcoal canister at the man's 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 cannot breathe the room air.

MR. WALSH: That certainly is a fine arrangement.

DR. ALICE HAMILTON (Division of Labor 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 were using hydrogenated petroleum products which had very low volatility. It seemed as if that were going to be a revolution in coating in automobile factories. I should like very much to know whether that change has been made.

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

DR. WALSH: I would like to say to Dr. Hamilton concerning the substitution of synthetic resins for nitrocellulose products in the automotive industry particularly, most of us receive all of our information concerning the newer developments of hazards from no person other than Alice Hamilton. If anyone in the room can answer the question, I am sure that she can. She beautifully reviewed the entire literature in a publication that she produced in 1936 called "Recent Changes in the Painter's Trade" which is Bulletin No. 7 of the U. S. Department of Labor. It is a beautiful presentation, and it is worth while for any of you interested in the paint industry to read it.

Concerning the question at hand, I know of no particular changes at the moment that have been instituted in the industries that I have been acquainted with. I do know that such things are in progress. As Dr. Hamilton suggests, I think that they are changes in the right direction, in many instances.

DR. A. L. BROOKS (Fisher Body Division, General Motors Corp.): We do quite a lot of spray painting. I believe there has been no radical change in the solvents and

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

Benzene Prolonged Upon

DR. WALSH: I should have mentioned, when we were speaking of varieties of solvents, that the medical profession focuses upon the use of benzene as a solvent or diluent in any proportion. We just don't like benzene, 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 innocently, they creep up on you before you know it. It requires rather close observation wherever there is any benzene or toluene.

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 benzene 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 benzene 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 toluene, when possible, for benzene, but I don't think any industrial physician would be willing to give a clean bill of health to toluene.

We are beginning to look upon it with more suspicion. Dr. Gammon 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 use, also. I think that probably would be in the right direction.

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

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 Entzer, Director of Laboratories, Mount Sinai Hospital, Milwaukee.

Fatigue and Occupational Disease

DR. NORBERT ENTZER: As one thing is 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 more intangible state of affairs, couldn't be related to what the man is doing. There 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. Hill; and in Europe, up to recent times, a great deal of work has been done, particularly in Germany and lately in Russia; the object being, in the European investigation, 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-

four-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 could demonstrate in almost all individuals so tested that they had experienced fatigue, and that that experience was definitely related to the ability of their nervous system to regulate their muscular activity in coordination.

Now, in jobs which call for a stationary position, manipulation of instruments, or monotony of exercise, that kind of fatigue must be recognized by the industrial physician.

The occupational disease, conversely, may produce a fatigue which may not be recognized unless the individuals are subjected to critical examination. For example, we have noted that individuals with a mild type of hypertension, increased blood pressure, have in many instances a lower fatigue threshold than individuals whose blood pressures are normal. Or an enlarged heart, due to valvular disease, a leaky valve, will produce the same phenomenon; or individuals with diabetes or individuals that have a low basal metabolic rate, because of a thyroid gland disturbance, or individuals who are abnormally obese will all show variations in their fatigue thresholds.

The only way that aspect of the subject can properly be investigated is to approach it from 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 to correct them by medical program.

The industrial factor of fatigue, which I mentioned first, calls for a recognition that certain kinds of work can produce fatigue, and then to apply methods which will relieve it. I want to illustrate just two:

If we recognize that a certain occupation produces fatigue, we have discovered things which will relieve the fatigue. A man whose job calls for standing at a bench, in more or less one position, doing the same job over and over again, will have fatigue which can be relieved if he can periodically sit down, because his oxygen consumption in the sitting position is greatly reduced over the 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. These are some of the features of the occupational aspect of disease, or the industrial aspect of fatigue, rather. With that causal 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 rained pegs in square holes and all that sort of thing, rapidly of process. 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 (Cassier Lumber Co., Walsford, 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 state disturbance in the habits of diet.

Factor of Noise

MISS MARY LOU SCOTT (Joa. 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 Ansin 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 unfortunate 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

not entirely true that experience with a job is a guarantee against fatigue.

CHAIRMAN PAINE: In order that you may not be fatigued, I am going to change the subject. I am asking Dr. Boffump to take the two next subjects, 3 and 4: "The Toxic Limits of Common Solvents" and "Lead in Industrial Processes," and dwell on those subjects as one.

Toxic Limits of Solvents

DR. ELSTON L. BELKNAP: Mr. Chairman, I know there may be several distinguished guests but I am sure that we in the medical profession always feel peculiarly honored when Dr. Hamilton is in the audience. If there has been anyone who has been responsible for bringing to the attention of American industry and the medical profession the importance of toxicology in industry, I think it is Dr. Hamilton.

I will emphasize a few of the toxic limits of the common solvents, so-called thresholds. While these limits have been more or less agreed upon by authorities in this field, particularly such as Doctors Drinker, Haggard and Hamilton, there is no threshold that is arbitrarily perfect, and the actual decision of whether or not the solvent has been toxic is the observation of the patient who has been exposed to that solvent, by a physician who must determine whether or not there has been a temporary intoxication and whether or not there has been a residual.

Dr. Walsh has really very ably covered the subject of the hazards of spray painting, and solvents which are the chief hazards of spray painting, but I will mention a few which I have grouped in increasing order of toxicity.

As an example of probably the least toxic solvent—I say least toxic because no solvent is not potentially toxic; in fact, come go so far as to say that all good solvents are toxic—there is gasoline. It has been stated that 1,000 parts per million is a safe limit for continued exposure. The matter of contamination by other substances such as benzol in 5 to 10 per cent in certain gasoline, certainly would alter that safe threshold.

The next group of solvents which are slightly more toxic, are the xylol and heavy acetates and ether which are allowable in 400 parts per million. Some authorities still state that they belong in the 1,000-part-per-

million class. The most recent report classes them as 400.

The third group of 200 parts per million, include the following: Methanol or wood alcohol which, as you know, may have a serious effect on vision and cause blindness; toluol and xylol, tetrachlorethylene, trichlorethylene and turpentine.

The fourth group, which has dropped to 100 parts per million, include carbon tetrachloride and ethylene dichloride.

Then the fifth group of 75 parts per million, benzene and dichlorobenzene; and finally nitrobenzene, which we, fortunately, actually use very rarely as a solvent, is 5 parts per million.

I think it is important to remember that these solvents, if in sufficient concentration, may kill. This is in contradiction to the other subjects that I have been given, which is lead, which very rarely kills. These solvents kill, first of all, by simple suffocation, if they are used in an enclosed space, such as in a vat. But the sinister element of the solvent, of the toxic solvent, is the fact that it affects the central nervous system because, as you know, these solvents are fat solvents, and our nervous system is largely made up of fatty tissue or lipid tissue, so the nervous system is very easily affected. We have involvement, therefore, of the eye, one of the most highly developed nervous structures. Then we have central nervous system involvement, paralysis, inability to walk. Also, we must realize that some of these solvents actually damage the liver and the kidney, causing an acute Bright's disease. It is thought that some of them may cause cirrhosis of the liver.

Fortunately, one of the best solvents and one of the most dangerous is not included in the list at all now, the tetrachlorethylene group used in the airplane industry in the past. That had the peculiar ability to attack every part in the body, including the heart muscle. That, too, is said to be a contaminant of some of our other solvents. It has been mentioned that possibly the former contamination in trichlorethylene was really the reason why trichlorethylene had originally had a rather bad name.

I think one of the most important things to remember in dealing with the control of a good solvent is that we are dealing with a potentially dangerous substance and not make any effort to conceal that fact from

anyone in the factory. We of the medical profession have always felt that we like to put our cards on the table. We know that it is a great deal simpler to follow the ancient axioms and tell the truth. So that I admire, for instance, the benzol company which puts on its barrels, the word "Poison." I am not in a position to know whether they were or less did that because they were told to, but I know they do it.

I think there are many other companies that should put the same label on their products. In this connection I would like to tell of a case that I was asked to see, where a young boy, in the middle of the summer, working in a shop which made motors, suddenly became very sick, had severe headache, was dizzy, and had to stop work. He was working with a substance which he regarded as harmless.

When I first heard of the case I insisted I would want to see the process and see the plans and get my information firsthand rather than attempt to talk to some foreman by telephone. (The medical profession as a whole is learning that it can only fulfill its responsibility by demanding the right to know all about the exposure of the patients that come into their hands.)

When I went into the shop I found that this worker was using a large paint brush, dipping it into a large bowl of liquid, which he then stepped on the motor to get the grease off. On this particular hot day he evolved the idea of using a fan, which ordinarily, perhaps, blew the fumes away from him, directly opposite the bowl of material and blew the fumes directly in his face. He got cooked, and then he got sick.

I asked the foreman what was in that material, and he said he didn't know exactly; it was stock material, perfectly safe, as far as he knew. I said, "Well, I would like to know what it is." So there was considerable opening of routine. We finally went out into a shed in the yard, completely dark; we finally got a flashlight, and we found a barrel of benzol marked "Poison."

Now, no one in that shop knew what they were doing. There were a dozen other workers each doing the same thing but who, fortunately, had not gotten this brilliant idea of the fan.

The curious thing about this particular shop was that in another department, not

more than thirty feet away, they were doing spray painting, and they were doing it properly. Instead of exhausting the spray overhead and bringing it right back in the worker's nose, they had their suction underneath the objects to be sprayed and took advantage of draft as well as suction. They had good engineering equipment and staff, but they simply didn't know what they were using in this particular instance.

I had another experience with a man who was a so-called neurotic. I think most of you can spot the neurotic, if you have had my shop experience. This man certainly was. He had been to half a dozen doctors. One told him he was going to die, and another one said there was nothing the matter with him.

Again I demanded to see the shop. We found he was spraying an aluminum paint with a harmless solvent, a diluent, with good suction and a good spray gun. However, on further talking with him and confirmation from the foreman, I found he was the one man in the shop who was delegated to clean the spray guns at the end of the working day. He would sit down and squirt material, which he called chloride, in and out of the spray guns, and lean over the vat he was working with. Finally, he noticed he began to get happy and whistle and sing, and he began to look forward to the experience at the end of every day. However, finally he noticed he was getting weak, he was dragging one leg, and his heart was going very fast.

Well, this illustrates one other sample. This was a large corporation. Yes, they were using chloride. Finally, after great difficulty and having to go to the treasurer of the organization and going into the files we found that this was a material which they had bought from a supply house in another city, and they did not know what was in it. We finally found out it was ethylene dichloride.

The course of that individual is interesting, in that we put him in the hospital. It eventually cost that company quite a lot of money. I was in this to find out all I could learn about the action of that particular substance. I put the man in the hospital three or four weeks and did a number of delicate tests on him.

Well, he came through, and interestingly we found that he had an opportunity to do

velop a cold once or twice. Every time he did, he developed jaundice. Then, of course, we did liver function tests and found reduction of that. We found he had a weakening of the heart muscle. We found a definite loss of the reflex in one ankle-joint, showing a definite 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 will understand, I was seeing him not for himself but for the company. I think a good many of them thought I had been a little generous to this malingerer. This man went ahead and got a large pension. I don't know anything further about the case except that I did hear that the man died and that the death certificate said "cirrhosis of the liver and heart failure." Unfortunately, we didn't have an autopsy to confirm it.

In my opinion, the toxic solvent is one of the most dangerous substances and is may seriously disable and kill.

Lead in Industry

As a preface to the subject of lead in industry I would like to say that I am not specializing entirely in industrial medicine. I am one of that increasing group who feel that industrial medicine is not a specialty in itself but is merely a division of internal medicine or diagnosis, the large field of medicine which in private practice corresponds to or is correlated with the field of general surgery. I am glad that a large portion of my practice is still private practice. I am also consulting medical director to one of our industrial concerns in Milwaukee, with branches over the country, so that I have an opportunity to see lead and other toxic materials.

When you see a man who has said, "I have lead poisoning," do not forget he may have some other disabilities and diseases, such as acute appendicitis, gallbladder, kidney colic and so forth. In my private practice my interest has been sharpened so that I always make no effort to take a very careful occupational history on a patient, even though he may come to me purely as a heart case, lung case or what-have-you.

In this particular plant in Milwaukee, which began by having and still has, as a large proportion of its work, storage battery

plants, when I came there about ten years ago we were having an incidence of about 24 lead cases per 100 employees per year, which corresponds pretty well with the percentage of 15 to 26 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 creeping 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 type 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 fixed, 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 frame 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 cold-weather, and I have never seen men leaded 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 sets 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 forgotten man, worked down in the basement on a hotle, 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 15 milligrams, I don't think you will have a case of

lead poisoning. However, as a matter of practical interest, I think it is very difficult to get there in ordinary industry, and I would more or less forbear as a safe level. I think it has also been found by other workers. However, if you get over 3 you certainly have the possibility of serious lead absorption.

I want to emphasize that mere lead absorption does not mean the man has lead poisoning. He may have a lead line, may have lead in the urine, 0.5 milligrams per liter, but that does not make lead poisoning. That is merely evidence of absorption. He must have, in addition, clinical symptoms of one of the three types of lead absorption.

As a final word in regard to the role of the medical profession in its cooperation in industry, it seems to me that the medical man should first of all be responsible to the highest man in authority in the plant, so that he can go direct to him with any problem that arises, and before any new procedure is used or any new chemical, have a conference with the physician to see whether there is any possible danger, whether there are volatile solvents or lead, so that the danger to the men may be prevented before it happens.

I am not making a plea for absolute substitution for and avoidance of the use of lead. I think industry cannot get along without the use of lead, cannot get along without the use of a number of these solvents; but if industry is forewarned, and if the worker is informed correctly so he will cooperate in the use of protective devices and, finally, the medical profession is allowed to see the patient as often as they see fit, perhaps every two or three weeks, then there need occur no occupational disease in industry.

CHAIRMAN PAINE: Are there any questions on either one of these subjects that you would like to ask?

MR. HUTTER: What is the effect of the small amount of benzene on the worker? Is that a permanent effect or just temporary?

DR. BELKNAP: As far as I know, there is no ill effect from the inhalation of benzene.

R. S. SKYRM (Employers Liability Assurance Corporation, Boston): Would Dr. Belknap recommend the direct venting of lead pots on Enotype machines where the pots are electrically heated and thermos-

tatically controlled so the temperature of the lead does not exceed 500 degrees?

DR. BELKNAP: That is a good practical question. As we know, lead melts at a much lower temperature when volatilized. In my experience, lead does not really volatilize until around 1,000 or 1,100 degrees.

In this group of workers that I am following, some years ago, large lead pots, two or three feet in diameter, were unhooded because of certain changes in technical procedure, and the plant never got around to the hood. I disapproved of that and repeatedly said they would have cases of lead poisoning there if they didn't hood. They said they would just as soon as it was practical. It has never been practicable, and I am here to say we have had no lead cases develop to the point of disability, and we have had very little lead absorption result from that. The same men have worked there for ten years, dipping lead out of the pot, incidentally, at temperatures ranging usually from 550 to 650 degrees. In this group of Enotype workers we found no evidence of lead absorption in spite of the danger where they had no protection. I would not say in my own experience that hooding is necessary at 500 degrees.

MR. CARR: I wonder if there is any evidence to indicate the toxic limit for butyl alcohol could be raised above that given? We had experience over some twenty years with the same group of men, working in concentrations from 200 to 400 parts per million, and under careful examination they have shown no indication of trouble.

One other question is whether much work has been done on toxic limits of benzene?

DR. BELKNAP: I think Dr. Hamilton will have to state if the results whether we have toxic limits established for benzene.

DR. HAMILTON: Benzene is the trade name for diethylene chloride. No toxic limit has been established for that. We considered it a fairly safe solvent until some very disastrous cases occurred in England from over-exposure, causing five deaths. Since then we have looked upon it with a good deal more suspicion. There has not been enough work done on it to establish any maximum allowable concentration.

DR. BELKNAP: In regard to butyl alcohol, the butyl radical acetate is much less toxic than ethyl or methyl, particularly. So I would be interested in your point of view.

I think probably it could be made at safe limits.

MR. GUMMAR: I want to endorse completely the principle of maximum clearances of safety standards in engineering, but they should be based on factual data. As regards solvent, there have been enormous quantities used in the lacquer industry since spray painting came into use. It is sprayed into the air as fine mist, and even though it evaporates at a slower rate than benzol, if you inhale the mist, you get severe effects, if it is toxic.

I have employers in four states, New York State, New Jersey, Ohio and Connecticut, who for the past sixteen years have not had any reported cases of chronic solvent poisoning; yet Ohio in the past sixteen years has had over 69 cases of poisoning from gasoline in the petroleum industry.

As to the experimental results, I can find no experimental data indicating the toxicity should be such a low value. Some of the confusion arises from the failure to distinguish between chronic and acute poisoning. It is a fact that in extremely high concentrations, toluene and xylene are more toxic than benzol; that is, if you go into a chamber where there are 20,000 parts per million, you would be unconscious quicker from toluene and xylene than you would with benzene, but that is an entirely separate phenomenon from the slow chronic poisoning.

CHAIRMAN PAINE: The next topic will be "Skin Affections" and that will be handled by Dr. M. J. Reuter.

Skin Affections

DR. M. J. REUTER: When we consider to what extent the skin of the worker is exposed to injuries, the action of chemical irritants and the various infectious agents, it is not surprising that occupational skin diseases are a major problem in industry. The United States Public Health Service estimates 69 per cent of occupational diseases are skin diseases. They carried out a study in 100,000 workers and found, in the course of a year, that one per cent of these workers were affected with some skin disease as a result of their work. This did not include burns, splashes of acids and alkalis, and the ordinary pus infections of scratches or abrasions.

The problem confronting the physician is to determine the relationship between the skin disease and the occupational environment, to discover the nature of the offending agent and to adopt measures designed to cure the condition and prevent its occurrence.

There are many predisposing causes of occupational dermatosis, such as uncleanliness of workrooms, of clothes and of person. Previous skin diseases as, for example, eczema, are potent factors, because individuals with eczema react seven times more frequently to external irritants than non-eczematous individuals. The skin of the young and old is more susceptible to irritation and infection than the skin of persons in middle life. Dry skin is more vulnerable to irritants than oily skin.

The skin of certain parts of the body is especially sensitive, for instance, that of the eyelids and genitalia. Anything which lowers the normal threshold of resistance of the skin may act as a predisposing factor in the production of dermatitis and of infectious lesions. These factors include bruises, sunburn, sweating, and maceration, prolonged exposure of the skin to water and especially to alkalis and repeated scrubbing of the skin. These agents tend to remove the natural protective coats of the skin, that is the outer horny layer, and thus expose the sensitive epidermal cells directly to irritating material. A point fairly recently emphasized is that individuals with common athlete's foot are much more prone to occupational dermatitis of the hands. Apparently this infection of the feet acts as a sensitizing factor.

The actual causes of occupational dermatoses are mechanical, physical and biologic agents and chemical irritants. Mechanical agents produce bruises and lacerations, as well as friction and pressure resulting in various inflammations and thickenings of the skin.

The physical agents which may produce an occupational dermatosis are heat and cold, either dry or wet, electricity, ultraviolet rays, either from the sun or artificial, and x-rays or radium.

The biologic agents are the common bacteria, fungi and parasites.

For the most part, however, occupational affections of the skin are the result of contact with irritants of a chemical nature,

usually acids or alkalis producing simple inflammation of the skin.

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

CHAIRMAN PAINE: This is a subject in which there are a number of men interested. Will you expound 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 postulates which must be fulfilled before something known as the cause of given cancer. Ewing states: "First, the authenticity and adjuvancy of injury must be established." That is, the patient's statement regarding injury must be substantiated, and there must be actual tissue damage.

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

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

"Fourth, there must be a reasonable time limit between injury and the development of the tumor." That is, if the tumor develops within two or three days after the injury, it isn't reasonable that in that short a time a tumor could have developed.

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

CHAIRMAN 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 now being given to highly complex chemical agents which have the property of inducing cancer in the experimental animal. We know of certain agents which have that property in the human. The commonly known one is tar cancer. We know also of certain sulfone products which would produce cancer of the skin of the urinary bladder, and so on. I think that subject is highly complex, but I think it should be brought to your attention that in the dermatology of today we deal not only with dermatitis but also deal with tumors.

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 inhibition 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 nearest 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 hyperplastic lesions of the skin, particularly cancer, I have had no experience.

DR. BELKNAP: As for creosote, I have had no actual cancer brought to my attention. As far as I know, the fumes would be no more irritating, possibly, than coming 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 astounds 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 earlier 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 damage which finally crystallizes 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 damage, it may be that to 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 humanitarians. 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 diseases 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 fituous 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.

Coal 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 very few figures showing the drop in silicosis in the State of Wisconsin since 1913 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 9.6; 1934, 8.8; 1935, 7.9; then 5 and 2 and 9 per cent, and, in the year 1939, 1.5 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-

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

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

ADOLF AMRAM (Hamlin & Co., New York City): We passed a compensation law in New York State some two or three years ago. Perhaps you recall that law we passed a most illogical law, the all-inclusive act which acted most disadvantageously not only to industry itself but to the workman. You are familiar with the history and the recall of that act. I dare say is a number of states it is absolutely right and proper the compensation act should include silicosis, but it should include silicosis on a schedule basis, as I think is the case in Illinois.

MR. NELSON: All states are not as fortunate as some other states. I think we are showing generally throughout all of the states that the problem can be solved.

Protection for Welders

CHAIRMAN PAINE: We have a few minutes. Anyone in the audience has the privilege of asking this panel of doctors any questions they want to raise on these main subjects.

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

CHAIRMAN PAINE: The question is, how are we going to protect, and what is the exposure to welders on new material or on old material that has been painted? I will ask Dr. Walsh to answer that question.

DR. WALSH: Within the past couple of years we have had occasion to go over a group of about 1,000 welders. Of that group some 300 have been welding for ten or more years. They were gone over from the clinical point of 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 protections and ventilation, their health is just as good as any other group of workers. If they are cutting point or toxic coatings of any kind or lead-bearing stock, 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. Sender 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 chipping 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 raise 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 con-

man who might lose of a 99 1/4 per cent recovery rate from a specific operation, the individual who happened to belong to that 1/4 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 nitrogen 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 \$11,000. 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 it itself 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 exact 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 contracts 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. Conner, will you repeat your question?

P. W. GUMAER: 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 poisonings?

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

MR. GUMMER: 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 tetol 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 tetol 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 guess-work.

The quantity of 1,000 parts per million for gasoline is guess, and so is 200 parts of tetol. 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 anodizing; but the rest of the substances still are more or less in the realm of guess-work.

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

Off-the-Job Accidents

WEDNESDAY MORNING SESSION

October 9, 1940

The Panel Discussion on Off-the-Job Accidents was called to order by the Chairman, Julien H. Harvey, Managing Director, The National Conservation Bureau, New York City, who presided.

CHAIRMAN HARVEY: It is a pleasure to welcome you here this morning. By way of introduction, I simply want to state clearly just what the National Safety Council has in mind by the phrase "Off-the-Job Accidents." All too frequently in previous sessions of this kind there has been a feeling that we were thinking in terms of "community" safety work. In one sense we are thinking of safety work on a community basis, but in another definite sense we are thinking of a program whereby an individual industry or company will consider the problem of accidents which occur to its employees during the hours when they are away from work. This movement had its inception some seven or eight years ago, following several surveys which showed that a very great preponderance of accidents occurred to employees after they had left the job, as compared to those which occurred while they were at work.

I recall one illustration in the East, where a well known national organization with many thousands of employees was doing a good job of safety work in its plants. Despite that fact, during a five-year period, 17 of their employees had been killed while at work, but during the same period 204 of their employees had been killed "after the whistle blew."

We found that situation repeated in many instances. Proceeding on the theory that industry is closer to its workers than other organizations can be, and that industry has been able to do a good job of accident prevention within the walls of its own plants, we felt that it might be possible for it, through a special program, to emerge its employees and do something to extend the hours of safety beyond the plant.

In our program this morning, we intend to take up certain problems, which will

appear as they are developed by our Panel of Safety and Industrial leaders before you. This will, however, be an open meeting, and we expect to have many candid suggestions presented by persons in the audience, who will also ask the panel questions. The panel members are as follows:

Mrs. James E. Sims, Past State Chairman, American Home Department, Illinois Federation of Women's Clubs, Joliet, Ill.

Leslie J. Swenson, City Traffic Engineer, City of Chicago.

Harry E. Bell, District Commercial Superintendent, Indiana Bell Telephone Company, South Bend, Ind., and President of the South Bend Civic Safety Council.

Ralph W. Pendleton, Assistant General Manager, Massachusetts Safety Council, Boston.

Edward P. Dorfee, Assistant Manager, Insurance Department, Consolidated Edison Company of New York, Inc., New York City.

A. G. Bungenstock, Director of Safety, Western Electric Company, Kenosha, W. J.

R. H. Baleniefer, Safety Engineering Manager, Hardware Mutual Casualty Company, Stevens Point, Wis.

We will now proceed with the discussions. The first of the specific problems to be discussed will be: "The Value of 'Off-Duty Safety Programs.'" I will ask Mr. Dorfee to give us his ideas on that subject.

Value of the Program

E. P. DORFEE: Mr. Chairman, I don't know how the title "off-the-job accidents" originated, but I do know that our present company program has what we consider real value. It dates back about four or five years when our general surgeon, one day, was laying his troubles on my shoulder. He told me that the chairman of the board was after him because our sickness payroll was approximately 3 per cent of our total annual payroll, which is \$30,000,000. The thought

the subjects in which courses are given are: shop mathematics, physics, materials and methods of aircraft inspection, C.A.A. rules and regulations, aircraft radio, internal combustion engines, etc.

Each apprentice is at the same time carrying on his regular work schedule in the shops; is assigned to assist a qualified licensed mechanic, and his classroom work does not interfere except to the extent that he is excused from the shops if a class in which he is enrolled is conducted during his work shift.

An apprentice's work assignments are arranged so that the work he is doing at any given time is closely related to the subjects he is studying in class; likewise, the entire training program is set up to provide for an apprentice spending a given number of months in each department of maintenance.

As the program has developed, the problem of selecting capable and dependable persons to place in the apprentice training school has itself become somewhat difficult, because the persons selected must possess the intelligence and mechanical aptitude necessary to master a highly technical craft, as well as the stability, energy, and perseverance to complete a four-year training program. Persons placed in this school who do not have the tenacity to see it through, represent a rather substantial loss in time and money.

Experience has indicated that those applicants who perform best are those who have had at least a high school education with some mechanical training and experience. Further, it is found that those applicants from families mechanically inclined generally prove more satisfactory.

Keeping these things in mind, Braniff Airways carefully selects from the rather large group of young men who apply, those

who seem to possess most completely these qualifications. In a further effort to place only the best in the school, arrangements are made to administer dexterity and manipulatory tests to each of these men in an effort to secure some indication of his true mechanical aptitude and intelligence. These tests are so inclusive and broad in scope that they require eight hours to administer, and were chosen upon the recommendation of experts in vocational guidance and employee selection.

The applicants finally selected are employed as stockroomers or cleaners, where they have the opportunity to familiarize themselves with the various airplane and engine parts. They serve in that capacity generally for 10 or 12 months, at which time they are placed in the apprentice mechanics' training school.

All shop supervisors who have apprentice mechanics working under them, make a periodic report to the supervisor of apprentices and the Apprentice Committee concerning the apprentice's rating on appearance, cooperation, conduct, health, initiative, quality of work, ability, and desire to learn and actual performance.

Throughout the entire four-year training program, the apprentice is taught theory and principle in the classroom and has practical instruction and experience in the shops. Though Braniff Airways has found that this method of selecting and training potential mechanics requires a considerable amount of time and some expense at the outset, it has likewise found that the persons so selected possess the necessary qualifications to capitalize on this extensive training program and that in the long run, a considerable amount of time and money is saved and a more highly capable airplane mechanic is generally produced.

ADJOURNMENT

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TUESDAY EVENING SESSION

October 8, 1940

The Annual Meeting of the A.S.S.E.—Engineering Section of the National Safety Council convened with F. W. Braun, Employers Mutuals, Wausau, Wisconsin, Gen-

eral Chairman, presiding. All reports had been mimeographed and copies were available at the meeting.

Mr. Braun gave a brief resume of the section's activities during the past year, following which he called up Mr. C. B. Boulet for the report of the Nominating Committee. Mr. Boulet presented the report on behalf of other members of the committee, including R. E. Donovan, Chairman; D. L. Royer, C. W. Smith, and A. S. Regula. The committee's list of officers, as elected, is presented elsewhere in these pages.

The General Chairman then presented the speaker of the evening, Dr. Phillips Thomas, Research Engineer, Westinghouse Electric & Manufacturing Co., who spoke on "New Horizons of Science," demonstrating and illustrating his address most effectively. The resume given below is a summary of his points, provided for this record by the publicity department of the Westinghouse organization.

New Horizons of Science *Photo. pub. 11-21-40*

By DR. PHILLIPS THOMAS

Research Engineer, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Death rays that protect life and laboratory tools that guard against mechanical defects have demonstrated that industrial research is building a safer world on this side of the Atlantic and is helping defend our gains.

Dr. Thomas used a one-man traveling laboratory to buttress his assertion that peacetime research is a major defense line in the American pattern of life. "Many recent developments of the laboratories," he said, "are so closely related to military defense that they cannot be revealed, but it can be said that practically every important peacetime engineering achievement of the past 10 years will have an important, if indirect, bearing on our national defense, enabling this country to build stronger and better designed defense weapons."

Death Ray Guards Health

Dr. Thomas flashed upon a screen a magnified view of ultraviolet radiation in action killing teeming microscopic life in a drop of water. Striking faster than lightning, the radiation literally exploded its victims.

At one moment, onlookers saw swarms of tiny ovate organisms known as paramecia, scurrying across the lighted screen. Then, with a sharp report, a "Sterilamp" hurled ultraviolet radiation at the organisms. In less than a thousandth of the time required to blink an eye, they were dead.

"The Sterilamp," Dr. Thomas explained, "was developed by Westinghouse to produce ultraviolet radiation of a wavelength most

lethal to bacteria." In the demonstration apparatus, electrical energy is stored in a condenser until it jumps across a spark gap with a loud crack. At that instant, the stored up energy is released through a special Sterilamp, concentrating its radiation in one powerful shot.

Sterilamps are now used to reduce infection by killing air-borne bacteria in hospital operating rooms, to preserve the cleanliness of utensils and glasses in restaurants, and to retard mold growth on food. They have made possible a short-cut process in tenderizing beef by controlling mold growth and reducing the aging or ripening time from several weeks to a few days.

Using the rays from a flashlight to play a set of chimes, the lecturer demonstrated a possible means of secret communication over short distances in war maneuvers. In the demonstration, visible light energized photo-electric cells, but he said it would be possible to use invisible infra-red light. Infra-red rays can be made to vary in intensity with the sound waves of a spoken message, transferred invisibly over space, and then reconverted to sound waves at the receiving end, he pointed out.

Atom smashing is another field of research which is already producing peacetime benefits, and may prove to be important in future defense plans. "By constant experimenting," he said, "physicists are learning better to duplicate nature's work and change one element into another. Thus they are able to create new products and processes."

ent pointed out that comprehensive job analyses have often been made as a method of establishing equitable wage rates; but an even more important development of these studies is the study of job hazards. Job analysis had been found by many to be valuable in determining whether new methods or equipment would make jobs safer. Experienced employees should be freely consulted in preparing the job descriptions on which studies are based.

A. S. HETHERINGTON spoke highly of the PCA Foremen Conference training course in instructing foremen to be competent teachers and stated that it has been demonstrated that foremen who are experts

in the work performed in their departments may not have adequate teaching ability. It was felt that current emphasis on the responsibility of foremen seeks to develop greater competence in discharging duties and influencing employees rather than to overload supervisors.

Opinion was divided as to whether foremen's meetings should be held on company time. Those who hold them on company time reported no difficulties arising from this practice. Those companies holding safety meetings outside of working hours usually provide dinners and sponsor a brief social program in the course of the evening.

ADJOURNMENT

Chemical Section

Officers 1939-1940

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Officers 1940-1941

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- Membership Committee*—C. E. SEEVERS (Chairman), Monsanto Chemical Co., Boston, Mass.
 W. L. HANCOCK, Electric Storage Battery Co., Philadelphia, Pa.
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 JOHN CLEMENTS, Michigan Alkali Co., Wyandotte, Mich.
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 *H. L. MINER, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

*Past General Chairman

TUESDAY LUNCHEON SESSION

October 8, 1940

The opening session was a special luncheon meeting, attended by a large number of delegates. General Chairman Ralph O. Keefer, Purchasing Agent, Aluminum Company of America, Pittsburgh, Pa., presided.

Following the luncheon, the Chairman welcomed the delegates and guests, spoke briefly of the Section's activities during the past year, and then introduced the speaker of the occasion, Mr. O. S. True, whose address is given below.

The Use of Rubber and Rubber Compounds in the Chemical Industry

By O. S. TRUE

United States Rubber Company, New York, N. Y.

Strictly speaking, rubber as such would be of little value to the chemical industry. It owes its valuable properties to an ability

to combine chemically with certain substances such as sulphur, and to its ability to incorporate with and to hold in uniform

dispersion certain reinforcing materials such as carbon black. Also the quality and durability of modern compounds has been much improved by the addition of small quantities of accelerators and anti-oxidants, for the most part complex organic materials which improve the uniformity of the cure and increase the resistance to natural aging.

Rubber can be compounded so as to provide substantial resistance to corrosion and abrasion, as well as high dielectric, low co-efficient of heat transfer, and marked ability to absorb vibration and shock. These properties make rubber of value to the chemical industry.

With regard to corrosion, an ever-present problem in the chemical industry, rubber can be compounded to satisfactorily resist the following:

1. Most inorganic acids—including hydrochloric, phosphoric, dilute sulphuric, etc.
2. Most organic acids—such as acetic, formic, tartaric, etc.
3. Inorganic bases—caustic soda, etc.
4. Inorganic salts—chlorides, sulfates, etc.
5. Organic salts—acetates, tartrates, etc.
6. Bleach solutions—hypochlorites, chlorine solutions.

No one compound is satisfactory for use in connection with all of the above classifications but a suitable compound can be obtained for each individual requirement.

Rubber is not suitable for use with the following:

1. Strong oxidizing agents—such as nitric and chromic acids.
2. Aromatic hydrocarbons—such as benzol and toluol.
3. Aliphatic hydrocarbons—petroleum and its derivatives.

Rubber has one further limitation which should be borne in mind: namely, temperature. While compounds have improved the temperature resistance of rubber, 160 to 200 degrees F. must still be considered the practical maximum for industrial rubber goods, if long life is to be obtained.

For present purposes, some generalization may be made. There is the type abrasion caused by a material sliding over a surface, a shearing action, and there is the type caused by impinging of a material against a surface, abrasion due to impact. Between

the two extreme types is an infinite number of combinations. Different rubber compounds are necessary for different types of abrasion, but unless the impact is so severe as to cut the rubber to pieces, the proper compound has a very high degree of resistance to abrasion. Without qualitative tests it is not possible to say just how much more resistant rubber is than some other material, but such tests can be made if necessary. When corrosion and abrasion are both present, rubber is an ideal material although if the corrosive action is so severe as to make necessary a compound designed primarily to resist corrosion, it might be necessary to sacrifice some abrasion resistance.

With regard to dielectric for potentials up to 10,000 volts, rubber is generally considered the best available commercial insulation. Furthermore, rubber can be compounded to provide low water absorption, thus maintaining its high insulating factor, a characteristic not enjoyed by most other insulating materials. Rubber insulation finds its most common use with electric wires and cables, although it has also wide application in connection with electro chemical processes where resistance to corrosion and to stray current losses are both important.

The ability of rubber to absorb vibration and shock is due to a high degree of resilience. If displaced under load it immediately returns to its original position when the load is removed. The movement is accomplished with a minimum of internal friction. This characteristic enables engineers to design rubber springs and vibration dampeners, a recent application of rubber that is proving very beneficial in many of the process industries.

Rubber may be considered a good thermal insulator with coefficient of heat transfer corresponding approximately to that of asbestos. This permits transfer of solutions through rubber lined pipe with small loss of heat content, and evaporation in rubber lined vacuum crystallizers without excessive radiation. On the other hand, low heat transfer precludes the possibility of temperature control by indirect heating in rubber lined jacketed kettles or similar equipment, it being necessary to maintain temperature by heating coils or direct injection of steam.

Rubber compounds vary in tensile strength from 2,000 to 10,000 lbs. per sq. inch, in elongation or stretch from 600 per cent to

Dam, notwithstanding the fact that the scale of wages at Hiwassee was 10 per cent higher for the workmen engaged in handling forms.

Three cofferdams were used to divert the river during construction. Foundation excavation inside the second cofferdam was delayed due to an unexpected number of seams, and before concrete could be started in that cofferdam, the other blocks had been poured to a height of 125 feet. Three blocks in this area were poured to stream bed level and stopped, to be used for diversion of the river during the period required to raise the blocks in number three cofferdam. After all other blocks had been poured above the control gates, these three blocks were poured by using a steel gate upstream to block off one opening at a time. After concrete was placed in this opening to a depth of five feet, the gate was moved to the next opening, and the operation repeated, until the blocks had been raised to a point where the water flowed through the control gates. A foot bridge was used by the workmen to reach the low blocks and prepare them for concrete. No disabling injuries were recorded against this work.

One of the problems at Hiwassee was to sandblast and paint two penstocks, 18 feet in diameter and 300 feet in length. One-third of the length was level, and the balance inclined at 30 degrees. A scaffold was designed by one of the supervisors on the job. It was adjustable for either level or inclined sections. A considerable saving was effected by the use of this scaffold, and no disabling accidents were recorded for this work.

One of the necessities of safe operation on work which must be performed at night is good illumination. Accidents and low efficiency can be expected if extreme care is not exercised in planning the lighting needs.

Frankly, we copied every safety suggestion we thought we could use in our work. The point I want to bring out is that we cannot afford to require the men under our supervision to work without adequate safety protection. I am convinced that our safety program at Hiwassee Dam saved us many thousands of dollars above the cost of the

program. I am further convinced that a well planned safety program will save any construction organization far more than it costs if common sense is used in planning the program.

All T. V. A. projects have similar safety programs. At Hiwassee we held regular foremen's safety meetings, and at these meetings all supervisors attended and exchanged ideas to promote safety on the job. The construction superintendent, or his designated representative served as chairman of these meetings, and the project safety engineer pointed out various conditions on the job that could be improved. Supervisors were held responsible for the safety of all employees under their supervision, but it was pointed out that they could not shoulder this responsibility if they did not enlist the co-operation and interest of each employee under their supervision in safety.

The safety engineer, accompanied by one representative of each craft, patrolled the job weekly and corrected unsafe practices and conditions on the job. Following this patrol, the group met in the construction superintendent's office and discussed conditions on the job. All employees on the patrol were assured that management had a deep interest in safety and encouraged the interest of every employee in safety. If suggestions were made by members of the patrol, that could not be put in practice, a careful explanation was given to show why it could not be done.

Housekeeping was stressed in all meetings, and each craft was required to clean up and salvage all materials left over after completing any task and supervisors insisted that workmen maintain an orderly place to work.

Employees were instructed in the safe way to perform routine work and encouraged to participate in first aid training courses.

Weekly letters were prepared by the safety organization and mailed to all supervisors by the construction superintendent. These letters pointed out the conditions causing the majority of the accidents in that period, and made suggestions to eliminate similar accidents.

ADJOURNMENT

Food Section

Officers 1939-1940

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Vice-Chairman for Program—H. J. ALDRICH, Spencer Kellogg & Sons, Inc., Buffalo, N. Y.
Vice-Chairman (Confections)—D. R. GRANT, Beech-Nut Packing Co., Canajoharie, N. Y.
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 E. L. ANDERSON, Penn Fruit Co., Inc., Philadelphia, Pa.
 HUGO A. KLEMM, Industrial Commission of Wisconsin, Madison, Wis.
 ROBERT B. McDADE, Atlantic Sugar Refineries, Ltd., St. John, N. B., Canada.
 C. F. MOBERG, Kraft Cheese Co., Chicago, Ill.
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 C. G. BENDER, Kellogg Co., Battle Creek, Mich.
 *S. B. HORRELL, Carey Salt Co., Hutchinson, Kansas.
 ROGER A. GRANT, Asheville Baking Co., Inc., Asheville, N. C.
 D. E. PRICE, Midwest Dairies, Inc., El Paso, Texas.
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 IRVING BEALL, Channel Pie Shops, Sacramento, Calif.
 F. W. BRUCE, Southern Grocery Stores, Inc., Atlanta, Ga.
 *W. A. SULLIVAN, Loose-Wiles Biscuit Co., Kansas City, Mo.
Health Committee—DR. WILMER H. SCHULZE (*Chairman*), Bureau of Environmental Hygiene, Health Dept., Baltimore, Md.
 A. L. BROWN, Post Products Div. of General Foods Corp., Battle Creek, Mich.
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 E. W. CARROLL, Dr. Pepper Bottling Co., Memphis, Tenn.
 ARMAND HECHT, Hecht Bakery, Bristol, Tenn.
 B. NOVO, American Molasses Co., Brooklyn, N. Y.
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 J. M. DELMAR, Gulf Brewing Co., Houston, Texas.
 *F. A. HASSE, Corn Products Refining Co., Argo, Ill.
 LEON TUJAGUE, National Food Products Co., New Orleans, La.
Data Sheet Committee—G. L. GORE (*Chairman*), Bruce Dodson & Co., Kansas City, Mo.
 THOMAS CHANDLER, Bennett Hubbard Candy Co., Chattanooga, Tenn.
 DOUGLAS PEARL, Walgreen Drug Stores, Chicago, Ill.

*Past General Chairman
 **Deceased

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Dairy Products Committee Chairman—E. G. QUESNEL, The Borden Co., New York, N. Y.
Milling Committee Chairman—GEO. T. PECKHAM, JR., Clinton Co., Clinton, Iowa.
Beverage Bottlers, Brewers & Distillers Committee Chairman—RAY M. SEEKER, Anheuser-Busch, Inc., St. Louis, Mo.
Tobacco Products Committee Chairman—CHARLES F. FRANCKE, The Axton-Fisher Tobacco Co., Inc., Louisville, Ky.
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Canners & Grocers Committee Chairman—C. C. RUPPICK, H. J. Heinz Co., Pittsburgh, Pa.

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Vice-Chairman (Confections)—D. R. GRANT, Beech-Nut Packing Co., Canajoharie, N. Y.
Secretary—C. C. RUPPICK, H. J. Heinz Co., Pittsburgh, Pa.
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 C. A. LINDER, Booth Fisheries Corp., Chicago, Ill.
 C. F. MUEBERG, Kraft Cheese Co., Chicago, Ill.
 E. E. ROUNDS, Jewel Tea Co., Inc., Barrington, Ill.
 RAY M. SEEKER, Anheuser-Busch, Inc., St. Louis, Mo.
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 C. G. BENDER, Kellogg Co., Battle Creek, Mich.
 ROGER A. GRANT, Asheville Baking Co., Inc., Asheville, N. C.
 *N. B. HORRELL, Carey Salt Co., Hutchinson, Kan.
 D. E. PRICE, Price Creameries, Inc., El Paso, Texas.
 A. E. SUTCLIFF, Kingan & Co., Indianapolis, Ind.
Membership Committee—D. R. GRANT (*Chairman*), Beech-Nut Packing Co., Canajoharie, N. Y.
 *C. W. DENPESY, The Liquid Carbonic Corp., Chicago, Ill.
 JOHN H. REICH, C. D. Kenny Co., Baltimore, Md.
 H. G. SCHAFFNER, Schaffner Bros. Co., Erie, Pa.
 CLYDE T. STEPHENS, Interstate Cotton Oil Refining Co., Inc., Sherman, Texas.
 D. H. THOMAS, Utah-Idaho Sugar Co., Salt Lake City, Utah.
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 IRVING BEALL, Channell Bakers, Sacramento, Calif.
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 *W. A. SULLIVAN, Loose-Wiles Biscuit Co., Kansas City, Mo.
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 ROBERT B. McDADE, Atlantic Sugar Refineries, Inc., St. John, N. B., Canada.
Poster Committee—HUGO A. KLEMM (*Chairman*), Industrial Commission of Wisconsin, Madison, Wis.
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 J. M. DELMAR, Guli Brewing Co., Houston, Texas.
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Sugar Industries Committee Chairman—A. M. SMITH, Godchaux Sugars, Inc., Reserve, La.

*Past General Chairman

TUESDAY AFTERNOON SESSION

October 8, 1940

The opening session of the Food Section was called to order by S. B. Horrell, General Manager of Operations, Carey Salt Company, Hutchinson, Kans., and Past-General Chairman of the Food Section, who presided. Chairman Horrell briefly welcomed

the delegates, and expressed the deep sorrow of the Section Members over the passing of Fred A. Webb, late General Chairman of the Section. A formal resolution honoring the memory of Mr. Webb was passed.

Safety Requirements of the Federal Food, Drug and Cosmetic Act

By J. O. CLARKE

Food and Drug Administration, Chicago

The Federal Food, Drug and Cosmetic Act endeavors to safeguard the supply of food, drugs and cosmetics consumed by the American public. It is intended to provide safety in three broad fields for all of these products—safety from the consumption of foods, drugs and cosmetics which might be harmful; safety from the consumption of those products which might have been produced under insanitary conditions or which might be filthy or decomposed, and finally, safety from an economic standpoint by establishing certain conditions which tend to prevent the public from being cheated.

In this discussion I am going to have to use some words such as "filthy," "decom-

posed," "putrid," "poisonous or deleterious substances," "dangerous to health," etc., which are quoted from the text of the Act. I would like it definitely understood, however, that these words are not descriptive of the output of the industries as a whole and it would be grossly unfair to even imply that all the products of the food, drug and cosmetic industries can be described by such terms. I know that manufacturers generally deplore practices which lead to a violation of the law just as much as do consumers or regulatory officials.

Since you are primarily interested in food, it will be my purpose to devote most of my time to the safety features of the Food,

simply created another hazard, because there was a temptation for youngsters to jump on the moving vehicle. They have evolved a new type of step so that the moment the truck starts up, one revolution of the wheel, the step drops out of position and remains that way until the truck comes to a standstill again.

MR. LEE: I was in one of the large plants here in Chicago where they use quite a few trucks that run around through the departments. At intersections of the aisles they had large mirrors at such an angle that the fellow coming up one aisle could see the fellow coming from another direction.

MR. HANAU: I would like to ask one of the leather men or tanning men whether they have ever seen a guard on a staking machine or roll jack as specified in, I think it is, A.S.A. standards, which says that a fence should be provided around the thing so that a man can't get his hand under that. I have seen pictures of them, but I don't recall seeing one that worked.

CHAIRMAN SCHAFFNER: Mr. Clover, can you answer that?

MR. CLOVER: As to the Stocum staker you have in mind, where a man puts the hide in on the side and has to work it through—

MR. HANAU: Either the side or front. There is an arm that comes down.

MR. CLOVER: I don't know of any guard that is put at the point of operation. They do bring the guard up to a certain point on the arm, and they cover the fly-wheel below. As to actually guarding the point of operation on this staker, I don't believe it has been done. With the exception of sole leather, the glazing jacks have been guarded. They are guarded at the point of operation by having a basket type guard around them, with provision made at the front point of operation, to slide the skin from the left to the right or the right to the left, whichever way it is. If their hand or the skin of the hide is jerked in, the hand is knocked loose before it goes into the roller. There are some very good guards that you can make up to suit your condition.

MR. HANAU: Can you tell me where I can see one of those in operation in this area?

MR. CLOVER: I can send you some pictures of them.

MR. HANAU: I will be glad to have them.

MR. TEFFT: Mr. Lee referred to visual education. I would like to tie that up with a discussion of aprons, if I may. Cuts from beel loring operations are rare, but when they happen they are horrifying. I know of one man who bled to death in ten minutes. He cut a big artery.

Do you think it would be of any value if pictures were taken of beel loring operations to show the men how many times a day that knife almost cuts them but doesn't, and use those in a slow motion picture? Then they might take to some of the aprons a little bit more readily than they do at the present time.

MR. LEE: I think so. My suggestion would be that you have the still picture or the stereopticon slide first, because it seems to me that is the best medium for detail information and round table discussion. Then, after that, show the movie. The movie, in the first place, would be too fast. If you have it first in the still picture and go through the fine points and what he did and what he should have done, and so forth, then show him actually doing it in the picture, I think that would be ideal.

MR. TEFFT: I had in mind that you would have to take a motion picture because those fellows work so fast you can't see where the knife is. If you took the motion picture, then you could pick out the proper stills and make the stills from your motion pictures.

MR. LEE: Yes.

MR. HANAU: I saw a demonstration of that yesterday, in the Metals Section. Somebody took some shots of a punch press operator. He caught a particular operation he was interested in and then he made a loop film; in other words, he connected the two ends and kept running in through his machine. It was very effective.

ADJOURNMENT

Metals Section

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Publicity Committee—H. H. HENRY (Chairman), Ohio Steel Co., Cleveland, Ohio.
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 H. L. ROGERS, Sheffield Steel Corp., Kansas City, Mo.
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- J. F. COLLINS, Youngstown Sheet & Tube Co., Youngstown, Ohio.
- Railway Car Builders Committee*—P. J. BRAND (Chairman), Pullman-Standard Car Manufacturing Co., Pullman, Chicago, Ill.
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- D. V. MEDALLE, Interlake Iron Corp., Chicago, Ill.
- H. L. REBRASSIER, Wheeling Steel Corp., Wheeling, W. Va.

*Past General Chairman

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- *F. G. BENNETT, The Buckeye Steel Castings Co., Columbus, Ohio.
- *E. F. BLANK, Jones & Laughlin Steel Corp., Pittsburgh, Pa.
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- H. M. CROGHAN, Inland Steel Co., East Chicago, Ind.
- *H. W. DARR, Bethlehem Steel Co., Johnstown, Pa.
- M. W. DUNDORZ, Beloit Iron Works, Beloit, Wis.
- *JOHN P. EIR, American Steel & Wire Co., Chicago, Ill.
- *GEORGE T. FONDA, Weirton Steel Co., Weirton, W. Va.
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- *J. A. NORTHWOOD, Bethlehem Steel Co., Sparrows Point, Md.
- *J. A. OARTEL, Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
- *ROBERT L. SCHMITT, Louisville Car Wheel & Railway Supply Co., Louisville, Ky.
- *MELL E. TRAMMELL, Republic Steel Corp., Alabama City, Ala.
- *J. A. VOSS, Republic Steel Corp., Cleveland, Ohio.
- FRED E. WARR, Carnegie-Illinois Steel Corp., Homestead Steel Works, Munhall, Pa.

*Past General Chairman

MONDAY AFTERNOON SESSION

October 7, 1940

The session was called to order by General Chairman H. J. Griffith, Manager of Safety and Welfare, Jones and Laughlin Steel Corporation, Pittsburgh, Pa., who presided. Chairman Griffith, in commenting on "Activities of the Metals Section" during

the past year, took the opportunity to praise the chairmen of many standing committees.

The Report of the Nominating Committee was called for, and officers for the Section were elected, as presented elsewhere in this record.

"True or False?"

The session had been planned as a Panel Discussion of a number of safety problems, called a "Quiz." These problems had been mimeographed and distributed to the delegates, who found below each problem the words "True or false?" The list complete is as follows:

1. When new machinery is installed, the Safety Engineer should have final say as to whether or not the machinery is safely guarded before it is put into production.

True _____ False _____

2. When an employee works on an operation which necessitates the wearing of

goggles, he should be allowed to pick the type of goggle which he is to use.

True _____ False _____

3. When a new employee is put to work, the foreman should give him instructions in accident prevention and not merely show him the operation and tell him to be careful.

True _____ False _____

4. Education in off-the-job accident prevention is an essential part of a plant safety program.

True _____ False _____

Mining Section

Officers 1939-1940

General Chairman—ANDER D. CAMPBELL, McIntyre Porcupine Mines, Ltd., Schumacher, Ont., Canada.

Vice-Chairman—CAWALLAHER EVANS, JR., The Hudson Coal Co., Scranton, Pa.

Vice-Chairman—W. D. HASTON, Pickands Mather & Co., Duluth, Minn.

Vice-Chairman—*N. P. RHINEHART, West Virginia State Dept. of Mines, Charleston, W. Va.

Secretary and News Letter Editor—DANIEL HARRINGTON, U. S. Bureau of Mines, Washington, D. C.

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Health Committee Chairman—P. M. ARTHUR, American Zinc Company of Tennessee, Mascot, Tenn.

Membership Committee Chairman—HEATH CLARK, Rochester & Pittsburgh Coal Co., Indiana, Pa.

Poster and Slide Committee Chairman—J. J. FORBES, U. S. Bureau of Mines, Pittsburgh, Pa.

Statistics Committee Chairman—W. W. ADAMS, U. S. Bureau of Mines, Washington, D. C.

Entertainment Committee Chairman—J. T. RYAN, Mine Safety Appliance Company, Pittsburgh, Pa.

Members at Large—

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*J. W. ALT, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.

*G. J. BARRETT, Oliver Iron Mining Co., Duluth, Minn.

FRED E. BEAN, Consolidation Coal Co., Inc., Fairmont, W. Va.

JOHN L. BOARDMAN, Anaconda Copper Mining Co., Butte, Mont.

*L. C. CAMPBELL, The Koppers Coal Co., Pittsburgh, Pa.

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M. L. COULTER, Clearfield Bituminous Coal Corp., Indiana, Pa.

C. M. FILLMAN, Montreal Mining Co., Montreal, Wis.

*C. W. GIBBS, Duquesne Light Company, Pittsburgh, Pa.

*R. DAWSON HALL, "Coal Age," McGraw-Hill Publishing Co., Inc., New York, N. Y.

H. T. HARPER, Tennessee Copper Co., Copperhill, Tenn.

*H. C. HENRIE, Phelps Dodge Corp., Bisbee, Ariz.

C. F. KERN, Jamison Coal & Coke Co., Latrobe, Pa.

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*WILLIAM G. METZGER, The Hudson Coal Co., Scranton, Pa.

D. D. MURRAY, Utah Copper Co., Salt Lake City, Utah.

V. O. MURRAY, The Union Pacific Coal Co., Rock Springs, Wyoming.

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L. T. SICKS, St. Joseph Lead Co., Bonne Terre, Mo.

O. V. SIMPSON, The Koppers Coal Co., Morgantown, W. Va.

*HOWARD I. YOUNG, American Zinc Lead & Smelting Co., St. Louis, Mo.

Past General Chairman

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Third Vice-Chairman—JOHN TREWEEK, Homestake Mining Co., Lead, S. D.
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 *G. J. BARETT, Oliver Iron Mining Co., Duluth, Minn.
 FRED E. BEDALE, Consolidation Coal Co., Inc., Fairmont, W. Va.
 JOHN L. BOARDMAN, Anaconda Copper Mining Co., Butte, Mont.
 *ANGUS D. CAMPBELL, McIntyre Porcupine Mines Ltd., Schumacher, Ont., Canada.
 *W. H. COMBS, Baroid Sales Div., National Lead Co., Tascarkana, Texas.
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 *C. W. GIBBS, Duquesne Light Co., Pittsburgh, Pa.
 *D. DAWSON HALL, "Coal Age," McGraw-Hill Publishing Co., Inc., New York, N. Y.
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 *H. C. HENRIZ, Phelps Dodge Corp., Bisbee, Ariz.
 THOMAS E. LIGHTFOOT, The Koppers Coal Co., Pittsburgh, Pa.
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 *WILLIAM G. METZGER, The Hudson Coal Co., Scranton, Pa.
 D. D. MOFFAT, Utah Copper Co., Salt Lake City, Utah.
 V. O. MURRAY, The Union Pacific Coal Co., Rock Springs, Wyoming.
 R. H. SEP, The New Jersey Zinc Co., Franklin, N. J.
 L. T. SIGLA, St. Joseph Lead Co., Bonne Terre, Mo.
 *HOWARD I. YOUNG, American Zinc Lead & Smelting Co., St. Louis, Mo.

*Past General Chairman

MONDAY AFTERNOON SESSION

October 7, 1940

The session was called to order by General Chairman Angus D. Campbell, Safety Engineer, McIntyre Porcupine Mines, Ltd., Schumacher, Ontario, Canada, who presided.

In his opening remarks the Chairman sketched activities of the Section and Standing Committees during the past year, and then introduced the first speaker.

A Course of Training Foremen for Safety Work

By F. E. BEDALE

Assistant to General Manager, in Charge of Safety, Consolidated Coal Co. Inc., Fairmont, W. Va.

Before one can even start the education of the foreman a great deal of ground work must be done—a price must be paid for safety.

A safety program must be decided upon and unless the executive officials realize that such a program is merely a sound and profitable operating program and are willing to cooperate and stand behind such a program, the desired results cannot be obtained.

A department of safety should be organized with a director or chief reporting directly to someone of the higher executive officials. This department should have sufficient mine inspectors, ventilation inspectors and other field men to properly cover the various operations of the company. There must be an office force sufficient to study and properly assemble the information turned in by the field force.

The first work of the safety department is to study the past record of the company. This study should cover the various accident causes. The official foreman organization should be studied; many of these men will or should be excellent material for the program that is to be carried out. The study of the foremen on the job is a difficult one and must not be hurried; it may take a year or more. You must have a report of the conditions found under each foreman, meet them personally and find out whether they are popular with their men; whether they are able to have orders carried out or whether they are considered "easy marks." The health, habits and thousand and one little things that go to make up personality should be ascertained for each foreman.

Arrangements must be made to have a report covering each and every accident that occurs and a method of classifying these injuries. This process, carefully carried out will automatically determine where and how injuries are occurring. A method of permanently classifying your foremen should be made. This is done by keeping a record of each individual foreman, charging to his ac-

count each personal injury occurring under his jurisdiction. The causes of these accidents will probably disclose just where each foreman needs training and education. This preliminary work will determine, to a large extent, just how the foremen on the job will fit into the new company policy.

Whether new foremen are employed or whether the old ones are retained, the maximum benefits cannot be realized unless careful consideration is given to fundamental qualifications. Intelligence and a magnetic personality, in addition to experience, must be weighed carefully. A well rounded high school education is desirable, its equivalent should be required. Each foreman underground should hold a first grade mine foreman's certificate, a first aid certificate and a mine rescue certificate. Ambition and a sense of loyalty to the company and its operating policy are essential qualities if the educational effort is to bear favorable results.

As the work progresses the first step toward the education of the foremen is the preparation of a set of safety standards and operating rules. This involves an enormous amount of study and work. The safety standards and operating rules must cover all phases of operation underground and on the surface. They should be gone over by the entire executive staff, criticized, corrected and revised; then sent in preliminary form to the superintendents, foremen and others for criticism and suggestions, until finally you have what is really a text book for your operations.

By the time the safety standards and operating rules are prepared you will have completed your preliminary study of the foremen and laid the ground work of making them receptive to a safety education. You have impressed upon them that safety is pure operation with care and common sense, that safety and good mining are synonymous and that safety and mining efficiency are usually found together.

The next fundamental step is to place a complete set of the operating rules in the

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Control of Dust From Blasting by a Spray of
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tion 3358, 1938, 13 pp.

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Mosier, McHenry. Stemming in Metal Mines.
Progress Report 1: Bureau of Mines Rept. of
Investigation 3500, 1940, 27 pp.

ADJOURNMENT

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- F. H. ROSEBUSH, Nekoosa-Edwards Paper Co., Port Edwards, Wis.
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- Statistics Committee Chairman*—FRED W. BRAUN, Employers Mutuals, Wausau, Wis.
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- ARTHUR E. WINSLOW, Hollingsworth & Whitney Co., Waterville, Me.
- Visual Education Committee*—JULIUS A. DRAPER (*Chairman*), Consolidated Paper Corp., Ltd., Grand Mere, P. Q., Canada.
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- D. S. GARBER, Hummel & Downing Co., Milwaukee, Wis.
- J. R. LATTER, Anglo-Canadian Pulp & Paper Mills, Ltd., Quebec, Canada.
- L. R. SIMPSON, The Brown Paper Mill Co., Inc., Monroe, La.
- K. G. UFFER, Hawley Pulp & Paper Co., Oregon City, Ore.
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- ROBERT M. ALTMAN, Marathon Paper Mills Co., Rothschild, Wis.
- KENNETH L. FAIST, The Champion Paper & Fibre Co., Hamilton, Ohio.

WALTER A. GLEASON, Hammermill Paper Co., Erie, Pa.
 E. E. GRANT, The Crystal Tissue Co., Middletown, Ohio.
 M. G. HOYMAN, Kimberly-Clark Corp., Neenah, Wis.
 G. W. PHILLIPS, The Champion Paper & Fibre Co., Canton, N. C.
 J. J. PLZAK, Consolidated Water Power & Paper Co., Wisconsin Rapids, Wis.
 SAMUEL PRUYN, Finch, Pruyn & Co., Inc., Glens Falls, N. Y.
 S. F. SHATTUCK, Kimberly-Clark Corp., Neenah, Wis.
 GEORGE E. WILLIAMSON, Strathmore Paper Co., West Springfield, Mass.

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 F. H. ROSEBUSH, Nekoosa-Edwards Paper Co., Port Edwards, Wis.
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 W. B. PLACK, Kieckhefer Container Co., Delair, N. J.
 JAMES W. TOWSEN, West Virginia Pulp & Paper Co., New York, N. Y.
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 M. W. DUNDORF, Beloit Iron Works, Beloit, Wis.
 JAMES J. HANKE, American Paper & Pulp Assn., New York, N. Y.
 C. O. HOLMER, Minnesota & Ontario Paper Co., Minneapolis, Minn.
 D. A. McALARY, Fraser Companies, Ltd., Edmundston, N. B., Canada.
 E. A. PAGE, Kimberly-Clark Corp., Neenah, Wis.
 G. R. VAUGHAN-EVANS, Anglo-Newfoundland Development Co., Ltd., Grand Falls, Newfoundland.
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Statistics Committee Chairman—FRED W. BRAUN, Employers Mutuals, Wausau, Wis.
Publicity Committee—WALTER E. STRONG (Chairman), Menasha Products Div., Marathon Paper Mills Co., Menasha, Wis.
 R. P. ALMOUR, Fibreboard Products, Inc., Los Angeles, Calif.
 J. C. FITZGERALD, Bowater's Newfoundland Pulp & Paper, Ltd., Corner Brook, Newfoundland.
 O. R. HARTWIG, Crown Zellerbach Corp., Portland, Ore.
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 ERNEST AUGUSTUS, The Mead Corp., Chillicothe, Ohio.
 G. J. BIESSENU, Gaylord Container Corp., Bogalusa, La.
 H. P. HELBNER, The Flintkote Co., New York, N. Y.
 JOHN M. LAVIN, St. Croix Paper Co., Woodland, Maine.
 C. J. MUNK, Racquette River Paper Co., Potsdam, N. Y.
 ARTHUR E. WINSLOW, Hollingsworth & Whitney Co., Waterville, Maine.

Visual Education Committee—L. R. SIMPSON (Chairman), The Brown Paper Mill Co., Inc., Monroe, La.

A. S. COOK, Quebec Pulp & Paper Safety Assn., Quebec, Canada.
 D. S. GABLER, Hummel & Downing Co., Milwaukee, Wis.
 J. W. KUEBLER, Dixie-Vortex Co., Easton, Pa.
 J. R. LATTER, Anglo-Canadian Pulp & Paper Mills, Ltd., Quebec, Canada.
 DON E. McDOWELL, Kalamazoo Vegetable Parchment Co., Parchment, Kalamazoo County, Mich.

B. L. WOOD, American Coating Mills, Inc., Elkhart, Ind.

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 ROBERT M. ALTMAN, Marathon Paper Mills Co., Rothschild, Wis.
 KENNETH L. FAIST, The Champion Paper & Fibre Co., Hamilton, Ohio.
 WALTER A. GLEASON, Hammermill Paper Co., Erie, Pa.
 E. E. GRANT, The Crystal Tissue Co., Middletown, Ohio.
 M. G. HOYMAN, Kimberly-Clark Corp., Neenah, Wis.
 G. W. PHILLIPS, The Champion Paper & Fibre Co., Canton, N. C.
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 GEORGE E. WILLIAMSON, Strathmore Paper Co., West Springfield, Mass.

MONDAY AFTERNOON SESSION

October 7, 1940

The opening session of the Paper and Pulp Section convened with General Chairman D. B. Chant, Ontario Pulp & Paper Makers' Safety Association, Toronto, Ontario, Canada, presiding.

CHAIRMAN CHANT: We are very glad to see so many here at this first session. We have an old custom which we have followed for a number of years: that is, for each person attending this first session of our Congress to rise in turn and introduce himself, naming his company affiliation. Let us again follow the custom this year.

(The members arose individually and introduced themselves.)

CHAIRMAN CHANT: As your General Chairman, I look back over the past year with mingled feelings of satisfaction and regret: satisfaction because of progress made, and regret over lost opportunities and failure to accomplish some of the things we had hoped we might achieve.

The year has not been a normal one, either in our industry or the economic life of North America. There is no need for me

to detail to you the disturbing elements which have made themselves felt with growing force as the flames of war rose higher and higher with each month since the Atlantic City Congress. No doubt the months ahead will also bring many surprises and many new and difficult problems to each of us.

To me, however, there is something particularly encouraging in the way the work of the National Safety Council has been steadily pushed forward during these evil days. With so much of the world's area seemingly abandoned to the forces of destruction and violence, the knowledge that here in America thousands of men and women are voluntarily giving unselfishly of their time and efforts for the betterment of human welfare, safety and health, must constitute a sure guarantee that those great democratic ideals of liberty and justice, to which your nation and mine are dedicated, shall forever prevail, and, come what may, that "government of the people, by the people, and for the people shall not perish from the earth."

and the Universal Safety Emblem, which were given to winners of first place in the contest; and of Certificates of Merit, each a handsome lettered scroll, which were given to winners of second and third places.

In the lists below, winners of first place are indicated by the numeral (1), and winners of second and third places by the numeral (2) and (3) respectively.

Manufacturing Department Group A

1. Standard Oil Company of Louisiana, Baton Rouge, La. 7,571,365 hours, 6 injuries.

2. Standard Oil Company, Indiana, Chicago, Ill. 12,443,593 hours, 23 injuries.

3. Humble Oil & Refining Company, Houston, Texas, 8,941,060 hours, 24 injuries.

Manufacturing Department Group B

1. The Ohio Oil Company, Findlay, Ohio, 1,339,707 hours, 3 injuries.

2. Pan American Petroleum Corp., New York, N. Y., 400,023 hours, 1 injury.

3. Indian Refining Company, Lawrenceville, Ill., 1,194,977 hours, 3 injuries.

Wholesale Marketing Department Group A

1. Continental Oil Company, Ponca City, Okla., 4,680,606 hours, 8 injuries.

2. General Petroleum Corporation of California, Los Angeles, Cal. 2,632,418 hours, 4 injuries.

3. Standard Oil Company, Indiana, Chicago, Ill., 29,647,376 hours, 88 injuries.

Wholesale Marketing Department Group B

1. Texas Pacific Coal and Oil Co., Fort Worth, Texas, 227,365 hours, no injuries.

1. Globe Oil & Refining Co., Wichita, Kan., 154,750 hours, no injuries.

3. Panhandle Refining Company, Wichita Falls, Texas, 757,464 hours, 2 injuries.

Natural Gasoline Department

1. Shell Oil Co., Inc., Mid-Continent Territory, St. Louis, Mo., 335,645 hours, no injuries.

1. General Petroleum Corporation of California, Los Angeles, Cal., 267,335 hours, no injuries.

1. Hope Construction and Refining Company, Pittsburgh, Pa., 226,417 hours, no injuries.

Oil & Gas Pipe Line Department Group A

1. Seacoast Pipe Line Company, Tulsa, Okla., 3,547,300 hours, 13 injuries.

2. Humble Pipe Line Company, Houston, Texas, 4,348,990 hours, 32 injuries.

3. Magnolia Pipe Line Company, Dallas, Texas, 2,731,114 hours, 23 injuries.

Retail Marketing Department

1. Humble Oil & Refining Company, Houston, Texas, 336,718 hours, no injuries.

Oil & Gas Pipe Line Department Group B

1. Kew Pipe Line Company, Tulsa, Okla., 26,628 hours, no injuries.

1. Tide Water Pipe Line Co., Ltd., Bradford, Pa., 208,577 hours, no injuries.

1. Sinclair Wyoming Oil Co., Tulsa, Okla., 201,678 hours, no injuries.

1. Charleston Oil Company, Charleston, S. C., 108,120 hours, no injuries.

3. Union Oil Company of California, Los Angeles, Cal., 4,313,572 hours, 28 injuries.

Producing Department Group A

1. Continental Oil Company, Ponca City, Okla., 2,730,567 hours, 12 injuries.

2. Stanolind Oil and Gas Company, Tulsa, Okla., 3,777,851 hours, 23 injuries.

3. Gulf Oil Corp., Gulf Production Div., Houston, Texas, 3,736,734 hours, 25 injuries.

Producing Department Group B

1. The Atlantic Refining Company, Dallas, Texas, 1,140,704 hours, 4 injuries.

2. Hope Construction and Refining Co., Pittsburgh, Pa., 402,797 hours, 2 injuries.

3. Texas Pacific Coal and Oil Company, Fort Worth, Texas, 416,998 hours, 2 injuries.

Drilling Department

1. Standard Oil Company of Louisiana, Shreveport, La., 125,919 hours, 1 injury.

2. Cities Service Gas Company, Bartlesville, Okla., 121,692 hours, 2 injuries.

3. Gulf Oil Corporation, Gulf Production Div., Houston, Texas, 1,162,557 hours, 29 injuries.

Power Press Section

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TUESDAY AFTERNOON SESSION

October 8, 1940

The opening session of the Power Press Section was called to order by General Chairman M. R. Zeller, Personnel Manager, Edison General Electric Appliance Company, Inc., Chicago, who presided. In his opening remarks the Chairman took the

opportunity to review briefly some activities of the Section during the year, and mentioned the work of many Standing Committees. Officers of the Section to serve during the coming year were elected, as listed elsewhere in this record. The Chairman then introduced the first speaker.

The Safeguarding of Fast Punch Presses

By W. A. VOLLMER

Safety Engineer, Employers Mutuals, Wausau, Wis.

Before the most practical methods of punch press guarding can be applied, it is necessary to realize why and how accidents happen.

I understand that about 85 per cent of all accidents that occur are due to either human or mechanical failures. If this is true, then the supervisor and mechanical appliances can be relied upon only to a very limited degree. If methods of die construction and of guarding can be adapted that will reduce the need for supervision and the use of mechanical movements to a minimum, the operations will be more foolproof and there will be a minimum of potential hazards.

In order to accomplish this, it should be the duty of those responsible for designing dies to try and think of some method of die construction that will enable the operator to feed the die and have some method of automatic ejection to unload the finished piece without making it necessary to place the hands at the point of operation at any time during the cycle of the operation. This can be done a large percentage of the time.

After this has been done, a basket enclosure guard can be used. This guard,

when properly made and adjusted, is stationary and surrounds the die on two sides and the front and built high enough to enclose all of the potential hazards from the bolster plate up to above the clamping bolts on the ram. No moving parts being exposed, there is little chance of the operator being injured.

In most cases where basket guards are used on dies constructed as just mentioned, the operator is not only protected against being injured but the speed of the operation is increased.

There are different types of practical ejectors that can be used, such as air ejectors, pick-up ejectors, clearance ejectors and ejecting by bringing the finished piece to the top of the stroke and stripping it from the punch by aid of the knock-out bar in the ram or by stripping it with a plate stripper or stripping fingers.

One method of feeding is to use a gravity chute feed. An apron with side guides is extended to the front of the die. The die is then placed on an inclined press. The piece to be worked on is placed on the apron and slides under the basket guard that surrounds

Rubber Section

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 PAUL VAN CLEY, Van Cley Brothers, Chicago, Ill.

*Past General Chairman

MONDAY AFTERNOON SESSION

October 7, 1940

The opening session of the Rubber Section was called to order by the General Chairman, R. W. Moore, Director, Workmen's Compensation & Safety Department, The Firestone Tire and Rubber Company, Akron, O., who presided. The Chairman

first made a brief résumé of the activities of the Section during the past year, taking the opportunity to mention the good work of various Standing Committees. He then introduced the first speaker.

Getting Safety Off the Defensive

By A. C. HORROCKS

Public Relations Department, The Goodyear Tire & Rubber Co., Akron, O.

If you are in supervision, you were placed there because you possessed, first of all, craftsmanship; second, judgment; and third, because you were a skilled handler of men. Your most acute need then is to learn to use what you already know.

Up to the present time we haven't had a technique for men in supervision to use in handling other men. We have told them they were chosen because they had developed a fine craftsmanship. We also paid tribute to the fact that they had a keen judgment and knew how to render decisions. We also told them they were skilled handlers of men and promptly started to take away the personal contacts they had.

We decided it would be a fine thing to have a personnel director, and the hiring and the firing was taken away from the foreman. He wasn't to set any piece work prices or day rates. The time study man, the efficiency department did that. He no longer had anything to do with the purchasing of materials used in his department. The production control department estimated his needs and the purchasing department bought them. He didn't have anything to say about his monthly budget and the

breakdown of that was given to him by an accounting department. By and large, he found himself assuming the role of being responsible for his production-mindedness or, in other words, he was charged with the responsibility of getting the work out.

But of the three M's of industry—Man, Material and Money—Man is by far the most important. So I am asking those in supervision to get back again to the contacts that mean so much to them and to realize that your most acute need is to learn to use what you already know. What I mean by that is that you are a skilled handler of men. The success of a safety man revolves around his contacts with the individual workmen, and the success of a production foreman likewise revolves around that workman.

We recently made a survey in seventeen cities, large, small and medium size, in various industries, to find out what the foreman's job was as he contacted men, and of the hundred and five duties that were listed we found about sixty-six of them to be human contacts.

Therefore, I wonder in the promotion of danger consciousness if we have seriously

asked some of the following questions. They will get glorious results for as if we will follow a plan:

What makes this employer tick? If I am going to make him safe while he is in my employ, I must know him.

What is his education? What experience has he had prior to coming to me?

Then you should ask and be satisfied to know, what are his tendencies toward society; toward work and toward management?

What is his temperament? Is he the kind of a fellow when things get going a little his tough who will be the emotional type, who blows up, or is he the plodder type that you can count on and rely on in an emergency, like a fire, and know full well you have a level-headed man pinching for you who will do exactly what you told him to do?

What are his supervisory needs? If you have a hundred men working for you so you have the same needs when it comes to supervision.

How does he present his problems to me? That tells me a lot about how that man's mind works.

How must I approach him? What plan of progress have I made for him?

How important it is in this new day because there is a pattern or common procedure, which applies to all foreman-workmen contacts, and it is as fine and swift in the final conclusion as the steps to a sale, which are: Favorable attention, interest, appreciation of value, desire, decision, action, satisfaction, confidence.

My next statement is probably one that you would like to challenge until you hear the explanation. Listen carefully: Production-mindedness is at once an asset and a liability. An asset when service is cheerfully built into the product, and pride in what is turned out, because we know the consuming public is able to get out of the article the service we built into it. A liability when our drive is emphasized and men are considered as only a cog in the machine, when we ignore the human feelings and the human element.

So it seems to me the production-minded supervisor in this new technique, in order to make men conscious of what they owe society, in order to make it a sacred place, in order to make them conscious of danger,

has to step up to a man and give him a wholesome greeting with a smile. It doesn't cost much. That is the initial step. That corresponds with the salesman getting favorable attention from his prospect.

Then you are going to create the proper atmosphere before you start to talk to that man about the job. If you are in supervision, if you are up there because of your craftsmanship, your judgment and because you are a skilled handler of men, you must take a step down to that fellow's level when you step in to create atmosphere. He can't come up to you in your thinking, in your planning or in your conversation. You might be thankful he can't. If he could he would be competition for your job. It is necessary for you to come down to his level.

Then the next thing you can ask yourself is what are the dangers of the job; and that doesn't only mean physical dangers. It takes in mental dangers and you can watch that man's attitude and help to lift the worry from his mind.

A short time ago we had one of the general foremen notified that an employee of eleven years' service in his department had broken the machine for the third time. Now, Jack was a big raw-boned Pennsylvania Dutchman, who stood about six feet and weighed about 225 pounds, and there was no fat on him. He was the kind of a fellow who had come up from the ranks years ago. He knew his job, he thought he knew how to handle men.

Jack had listened to some of this development, and he remembered a chance statement made by the lecturer to the Goodyear supervisors. He had happened to say those words: "Remember, foreman, a good man doesn't go wrong in a few days' time without there being a sufficient reason."

So Jack said, "All right," to the inspector who had just brought the news to him, "I will fix him," and out of his office he went and came over toward the workman standing with his back up to the window, contemplating the destruction of the machine. Jack took in the picture and he walked a little more slowly, then this thought flashed into his mind: "A good man doesn't go to pieces in a short time without a good reason." He said, "Jim, it looks to me as though you had had a pretty rough night at sea last night. This is the third time this week that you have smashed this machine."