

TRANSACTIONS

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32nd NATIONAL SAFETY CONGRESS



**General Subject and
Industrial Sessions**

CHICAGO

October 5-7, 1943

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Foreword

VOLUME I

THE Transactions of the 32nd National Safety Congress and Exposition of the National Safety Council are published in two volumes. Volume I contains the General Subject and Industrial Section sessions. Volume II contains the Public Safety, Child Education, Home Safety and Farm Safety sessions.

Volume I is distributed to all members of the Council. Volume II is sent to those members who are believed to be interested chiefly in the sessions it contains.

The Transactions are a record of the proceedings of the Congress, condensed and edited for reference purposes. They are therefore an abridged version of the papers and discussions. The original manuscripts, some of which have drawings and charts too expensive to reproduce here, are available 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 views expressed, either in the discussions of the Congress itself or in this record of them.

Extra copies of Volume I may be obtained by Council members at the following rates: 1 to 10 copies at \$2.00 each; 11 or more copies at \$1.75 each. Extra copies of Volume II are 75 cents each.

THE NATIONAL SAFETY COUNCIL, INC.

20 North Wacker Drive

Chicago, Illinois

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Safety Takes

The 1943 National Safety Congress—the second in World War II—was a larger and more significant gathering than any of the preceding thirty-one Congresses. It was the culmination of a year's activity in all fields of safety that exceeded the achievements of any previous twelve months.

The year's achievements and the success of the Congress were possible only through the increased safety activities of scores of organizations and the new interest thus aroused among thousands of individual citizens. In the words of President John Stilwell of the National Safety Council, when he welcomed delegates to the Congress, the nation generally had come to realize that accident prevention is "more than a great humanitarian obligation and an important aspect of good business; it is an indispensable means to survival."

The identification of the safety movement with the war program is well demonstrated in the successive slogans of the last three Congresses: 1941—Safety for Defense; 1942—Save Manpower for Warpower; 1943—Stop Accidents—Speed Victory.

Congress delegates in every field of safety came to the 1943 convention to learn how accidents could be stopped and victory achieved sooner. They came from the Armed Forces, from war plants in every section of the country, from public agencies charged with traffic and industrial safety responsibilities, and from many other types of organizations.

Men from the Armed Forces could be found in numbers at practically every session. A special Army Session brought together hundreds of Army men having direct or supervisory responsibility for safety. Top-ranking Army and Navy offi-

cers were honored at the Congress Banquet.

To the 1943 Congress also came men and women in non-industrial fields, to find out what their organizations could do to help meet the nation's accident problem. The attendance of these people reflected what had been going on throughout the year—a carefully planned program of securing the interest and cooperation of every organization in a position to influence its members in accident prevention.

This attendance was a most favorable sign. It reflected the National Safety Council's policy that safety can succeed only by the cooperation of everyone—that no one organization can do the safety job alone.

The Council's program during the year reflected expansion in many directions, three of which are outstanding: First, the establishment of regional offices in New York, Chicago, and San Francisco; second, closer cooperation with chartered community safety councils; third, a definite policy of encouraging every organization to its own safety job.

Two structural changes in the Council during the year were of considerable importance: the staff reorganization of June, 1943, and the adoption of a new Constitution and By-Laws at the 1943 Congress.

The staff reorganization provided, under the supervision of the Executive Vice-President, for a General Manager, a General Secretary, Department Managers, and Division and Regional Directors. Five major staff departments were created: Program, Public Information, Sales, Service, Field Organization.

In replacing the old By-Laws of the Council, the members voted at the Annual Meeting to adopt a Constitution, dealing

The Offensive

with the objects of the organization, the methods of its control, and the privileges of its members, and By-Laws, which cover essential operative details. To insure stability, the former can be altered only by direct vote of the members; to insure flexibility, the latter can be amended by action of the Executive Board after due consideration.

The year ending with the 1943 Congress also saw the successful completion of the Council's campaign for contributive money, carried on through the War Production Fund, and sponsored by the Council's Trustees.

Throughout its history, the Council has recognized the need for safety activity on a national scale, beyond membership services. In other words, a great many organizations and individuals that need assistance and stimulation in carrying on safety work are not, at least in the first instance, willing or able to pay for such assistance.

Such work by the Council has, in the past, been limited by financial resources. Industry's contributions to the War Production Fund for the first time provided substantial amounts of money for carrying on the Council's public service program.

While the War Production Fund was discontinued as a separate entity on June 30, 1943, a campaign for public service financing will continue, under the direction of the Council's Trustees. The vital public service program inaugurated in 1942 and 1943 must be continued during the war and on into the post-war period, if maximum results in accident prevention are to be secured.

In evaluating the 1943 Congress, and the year which it climaxed, the existing accident situation must be taken into ac-

count. Comparing the first six months of 1943 with the same period of 1941, the accident situation was as follows:

1. All accidental deaths—down 7 per cent.
2. Deaths of workers on the job—no change, despite a 17 per cent increase in man-hours worked.
3. Traffic deaths—down 41 per cent.
4. Public deaths, other than traffic—down 9 per cent.
5. Home deaths—increase of 4 per cent.

These comparisons show that definite progress has been made in the battle to reduce accidents, but much remains to be done. The 1943 accident death toll in the United States is still likely to exceed 90,000.

The expanded safety movement, described at greater length in the addresses by President Stilwell and Vice-President Dearborn gives promise of greater reductions in accidents because more people and more organizations will be working at the job. The promise, however, will be fulfilled only with the continued and enthusiastic efforts of the men and women now pledged to safety leadership, and the added support of thousands of other individuals who will accept safety responsibility for themselves and for groups and organizations whose activities they are in a position to influence.

Safety, indeed, took the offensive during the year which culminated in the 1943 National Safety Congress. In the words of President Stilwell, addressing the delegates, "so long as we follow the pattern of progress we now have established, the Safety Council and the safety movement will continue to grow in stature, strength and effectiveness."

Using The Transactions

Each edition of these Transactions is a library of safety experience. Hundreds of men and women—leaders in industry, transportation, insurance, and governmental agencies—give the best of their knowledge and background to the cause of accident prevention at the Annual Safety Congress.

This knowledge and experience, accumulating year after year, is of great value to progressive industrialists and businessmen.

Plan of Arrangement

Safety ideas, topics, and problems, as well as personalities important in the field of safety, can be found by reference either to the *Table of Contents* or to the *Index* at the end of the volume.

The *Table of Contents* lists (a) General Sessions, (b) Subject Sessions dealing with problems common to many industries, (c) Industrial Section meetings.

Subject Sessions and Industrial Sections are arranged alphabetically. In the body of the book the several meetings of each Industrial Section are printed as they appeared in the daily time schedule of the original program.

The detailed alphabetical *Index* makes it easy to find specific safety material. It lists hundreds of items in three ways: (a) subjects discussed, i.e., absenteeism, dusts, safety shoes, welding; (b) speakers, in the case of formal papers. Speakers' names are printed in italics; (c) Industrial Sections, i.e., Chemical, Construction, Food, Marine, etc. Under each Industrial Section are listed the subjects of its complete program.

Ways to Use the Transactions

Solve accident problems of foremanship, protective clothing, dermatitis, welding operations, ventilation, substitute materials and many others.

Special war problems receive emphasis in the sessions on Off-the-Job Accidents, War Conservation of Personal Protective Equipment, Wartime Fire Protection, and Women in War Industry. The Early Morning Classes (Package Training for Safety) stress the proper approach to employee training problems faced by all recently expanded industries.

Speech-making materials are abundant for the safety director or business executive who is scheduled to speak on accident prevention, either in his own organization or in the community. He will find excellent examples of safety talks in these pages, as well as authorities and quotations for use in plant publications, releases for local publicity, and poster and bulletin board materials.

Outstanding safety leaders are powerful influences in the promotion of the national safety movement. As officers or members of the Council's Industrial Sections or as public officials, they can be helpful in organizing safety programs. Their points of view on many questions are in the Transactions.

The National Safety Council's services and the national safety program will be better understood through frequent use of the Transactions. A survey of the material contained in this volume will give a better comprehension of the growing power of the safety movement and of the means by which that power is expressed.

Annual Meeting of Members

MONDAY MORNING SESSION

October 5, 1943

The Annual Meeting of Members of the National Safety Council, at the 32nd National Safety Congress and Exposition, was called to order in the Grand Ballroom of the Sherman Hotel, Chicago, with Colonel John Stilwell, President, presiding.

Following the singing of the Star Spangled Banner by the assembled delegates, Colonel Stilwell announced a quorum present, in person or by proxy. It was voted to dispense with the calling of the roll; also to dispense with the reading of the minutes of the previous Annual Meeting.

President Stilwell announced that he had appointed three Inspectors of Election for the meeting: G. M. Burns, chairman; Harry H. Ezainerd, and Walter L. Fox. He then called upon Judge Harry H. Porter, chairman of the Nominating Committee for Directors, to make his report, which was as follows:

"The Nominating Committee for Directors consisted of: Judge Harry H. Porter, chairman; J. Fred Berry, P. N. Bushnell, H. G. Hensel, and Dwight M. McCracken.

"It was the agreement of the committee that the Directors whose terms expire this year should be re-elected for the three-year term. In accordance with the By-Laws, their names were published to the entire membership through printing in the August issue of the NATIONAL SAFETY NEWS.

"No other nominations for Directors were received by the Secretary of the Council. Mr. President, I therefore propose the following persons for election to the Board of Directors for a three-year term:

W. H. Cameron	Harry Guilbert
D. B. Chant	Frank H. Harrison
Ned H. Dearborn	G. T. Helfmuth
C. W. Dempsey	C. L. LaFontaine

James B. Douglas	Thos. H. MacDonald
Harold F. Enlows	R. B. Morley
Howard B. Fonda	G. H. Pfeif
W. A. Griffin	A. V. Rohweder
H. J. Griffith	Frank T. Sheets

President Stilwell stated that, under the provisions of the By-Laws, no additional nominations could be made. It was voted that the Secretary be directed to cast one ballot for the candidates named.

President Stilwell stated that C. W. Bergquist, Walter S. Paine, and Leslie J. Sorenson had been appointed as proxies. He asked G. M. Burns, chairman of the Inspectors of Election, to report the vote of the proxies. Mr. Burns reported as follows:

"On behalf of the Inspectors of Election, I wish to report that 3,799 proxy votes have been cast in favor of the Directors as nominated, and none against."

At this point, President Stilwell gave his annual report to the members, which is printed below. Following his address, the President called upon Ned H. Dearborn, Executive Vice-President, for his annual report, which is also printed below.

President Stilwell then stated that immediately after the 1942 Congress, he had appointed a By-Laws Revision Committee, consisting of C. W. Bergquist, chairman; Julien H. Harvey, John E. Long, Walter S. Paine, and C. E. Pettibone. After referring to the committee's careful studies and extensive discussions during the year, President Stilwell called upon Mr. Long to report in behalf of the committee, Chairman Bergquist being absent on account of illness.

Mr. Long assured the members that his committee had worked conscientiously at the job of improving and clarifying the structure of the Council, through the new Constitution and By-Laws. He expressed

his belief that the new instruments were a considerable improvement over the old ones, and that if further changes were considered desirable they could be made at the will of the members.

He referred to the fact that a statement covering the most important features of the new Constitution and By-Laws had been sent to all Council members on September 1, 1943, and that the complete documents had been given to all those attending this meeting. Mr. Long then offered the following resolution:

"I move that the present By-Laws of the National Safety Council be repealed upon adjournment of the meeting of the Board of Directors on October 5, 1943, and that in their place there be adopted the Constitution and By-Laws prepared by the Committee on Revision of By-Laws of the Executive Committee, which were approved by the Executive Committee on August 9, 1943 and published, in outline form, to the membership of the Council on September 1, 1943, with the following provisions:

1. The elected members of the Executive Committee, as constituted when the new Constitution takes effect, shall become the Executive Board under the new Constitution.
2. The Executive Board shall hold its first meeting at 3:00 p.m., October 6, 1943, in the Sherman Hotel, Chicago, Illinois, and at that meeting shall elect six additional members who shall be Past Presidents of the Council. At its first meeting, the Executive Board shall also elect Trustees within the limits of the Constitution, one-third to serve until the first election under the Constitution, one-third until the second, and the remainder until the third such election.
3. The Council shall continue to be governed in accordance with such provisions of the old By-Laws, Special Administrative Regulations and other policies established in the past by the Executive Committee as are not in

conflict with the new Constitution and By-Laws, until different By-Laws, Special Administrative Regulations or policies are adopted by the Executive Board."

The motion was seconded, and there was no discussion. President Stilwell pointed out that the adoption of the new Constitution and By-Laws would constitute, in effect, a revision of the present By-Laws, as provided for in Article XIII, Section 1, and that such a revision required affirmative vote of at least two-thirds of the quorum of members present.

President Stilwell stated that members of the Council had been asked to indicate whether their proxies should be voted for or against the adoption of the new Constitution and By-Laws, and had been told that if they did not cast a specific vote on this point, the proxy would be voted in favor of its adoption. He thereupon asked G. M. Burns, the chairman of the Inspectors of Election, to report the vote, which he did, as follows:

"On behalf of the Inspectors of Election, I wish to report that 3,799 proxy votes have been cast in favor of adopting the New Constitution and By-Laws, and in favor of Mr. Long's resolution establishing the time and manner in which they shall become effective."

The President asked for any negative votes, of which there were none, and thereupon declared the motion adopted. He then thanked the members for their acceptance of the new documents prepared by the By-Laws Revision Committee, stating his opinion that the revised Constitution and By-Laws would enable the Council to function more efficiently. He thereupon introduced the principal speaker of the morning, C. C. Carlton, whose address "Stop Accidents—Speed Victory," is printed below.

R. L. FORNEY,
Assistant Secretary.

(Any member of the Council may secure, upon request, a copy of the new Constitution and By-Laws.)

What Price 100,000 Lives?

By JOHN STILWELL

President of the National Safety Council

In August, 1941, the President of the United States called upon the National Safety Council to organize and lead an all-out attack on accidents that were seriously and increasingly impeding war production. The nation-wide expansion of accident-prevention activities that has followed has been, perhaps, the most significant development in the history of the safety movement.

How this expansion has been made possible and some salient activities it has involved are described in the following reports by the President and the Executive Vice President of the National Safety Council for the year ended October, 1943, presented to the members of the National Safety Council at the Congress, October 5, 1943.

I believe all of us who have been actively interested in the safety movement have been aware for a good many years that the importance of this movement was not adequately recognized or appreciated throughout the country as a whole.

We have known that the accident problem with which we were concerned was clearly and demonstrably of major importance. We have known that it necessarily affected the interests of both the public and the average individual to a far greater extent than did the problems with which many other great national movements were designed to deal.

We have known, moreover, that we possessed the technical knowledge and the skills to deal effectively with the accident problem—that, given the facilities and resources with which to attack the job, we had the "know-how" to cut accidents almost to the point of elimination. We have known, too, that, in terms of professional competence, the safety men and women of this country perhaps excelled any other group engaged in any comparable undertaking. With the resources and support they have had available, they have done a job of accident

prevention that merits the entire nation's commendation and gratitude.

Nevertheless, we have seen other movements dealing with problems of one-tenth the social and economic importance of the accident problem receiving many times the support and recognition of the safety movement. And, while seeing this, we have also seen accidents continuing to kill upward of 100,000 persons, injure some 9 million others, and cause an economic loss of about 4 billion dollars a year.

I daresay that every one of us who has ever been associated with the safety movement has repeatedly thought that if he could bring others to see the seriousness of the accident problem as he sees it, if he could only bring them to realize the importance of practicing safety measures—if, in short, he only had the kind of support and co-operation that is enjoyed by many other movements—there would be no question about cutting these losses to the vanishing point. To bring about such conditions is, as I believe everyone interested in the matter will agree, the ultimate goal of the safety movement.

There are many indications that the recent progress made toward this goal is, perhaps, the most significant development in the history of the safety movement. To understand the basic pattern of this progress and its significance with respect to the future of the movement, it is necessary to consider the various steps involved as related parts of a coherent whole.

For this reason, it seems desirable to review in this report the essential developments through which this progress has been achieved. These developments have followed a clearly logical pattern.

First, in 1940, was the organization of the National Safety Council's Board of Trustees, through whose sponsorship the prestige of the Council was distinctly enhanced, particularly among others in high positions in business and industry, and

through whose influence it was established to the country's principal sources of leadership and financial support.

Second, was the Proclamation by the President of the United States in 1941, calling upon the Council to mobilize the safety forces of the country in a concerted campaign against accidents, and publicly preparing the way for the Council to seek the necessary co-operation and financial support on a national scale.

Then came a new administration in the Council through the appointment of an Executive Vice President with a broad vision of the place of safety in our national life, with sound administrative ability, and with exceptional qualifications for formulating policies consistent with the Council's enlarged responsibilities and for interpreting the safety movement to the country's leadership as well as to the general public.

Next was the nation-wide public relations and fund-raising effort conducted by the War Production Fund to Conserve Manpower, through which the controlling officials of thousands of the most important business and industrial concerns throughout the country were acquainted with the need for an expanded safety movement, wide recognition of the importance of the movement was gained, and substantial financial support for enlarging our program of action was obtained.

Then there has been the Council's organic growth of recent years—the increase in its membership, the enlargement of its staff, the establishment of regional offices, the inclusion of community safety organizations as integral, though autonomous, parts of its national structure under a unification plan.

Then the expansion of the program of safety activities, the extensive co-operation with other groups and agencies, the increasing volume of services and materials, the constantly widening coverage of all parts of the field.

Next are the rapidly accumulating evidences of the efforts of this expansion of safety activity upon the accident situation, indicating that the results are beginning to be felt widely throughout the nation.

And finally there is the growing evidence that the safety movement, through the powerful influences and forces being mobilized behind it, is definitely on its way to attaining the strength, the stature, and the recognition that its importance deserves.

Let us now review these developments in their logical order:

Four years ago, it was apparent that the greatest need of the safety movement generally was closer contact with the top leadership in the social and economic life of the country. The movement had within its own ranks plenty of technical skill, abundant enthusiasm, a high degree of technical competence. But it had been trying single-handedly, so to speak, to perform a task that required outside co-operation on a gigantic scale.

It was obvious that, to develop a movement of sufficient size and strength to deal effectively with our high accident problem, the most powerful influences available had to be enlisted in the task. This was necessary for gaining anything like an adequate degree of public recognition and acceptance. It was necessary for gaining financial support. It was necessary for gaining the co-operation of the press, the radio, the magazines, the motion pictures, and of volunteer groups and agencies on an adequate scale.

The first step toward solving this problem clearly seemed to be the organization of a Board of Trustees, composed of men of national standing in the business and industrial fields; and, after amending the By-laws to permit such action, that step was taken. Today this Board consists of:

William A. Irvin, former president, United States Steel Corporation—Chairman

Winthrop W. Aldrich, chairman, The Chase National Bank of the City of New York

Sewell L. Avery, president, Montgomery, Ward & Company

Morgan B. Brainard, president, Aetna Life Insurance Company

William G. Chandler, War Production Board

Howard Coonley, chairman, Walworth Company

Benjamin F. Fairless, president, United States Steel Corporation

Walter S. Gifford, president, American Telephone & Telegraph Co.

E. Roland Harriman, of Brown Bros. Harriman & Company

Thomas I. Parkinson, president, The Equitable Life Assurance Society of the United States

Robert C. Stanley, president, The International Nickel Company of Canada, Ltd.

Thomas J. Watson, president, International Business Machines Corp.

Charles E. Wilson, vice-chairman, War Production Board and myself

Through these men, the National Safety Council—and, with it, the entire safety movement—now has access to any section of the business and industrial leadership of the country, as well as to the nation's most important sources of influence and wealth.

Doubtless many of you, aware of the great importance of the safety movement and seeing other movements enjoying many times its acceptance and support, have often asked yourselves what those movements have had that the safety movement has lacked.

Our Trustees, I think, are your answer. Although we have a long way to go before our movement attains a degree of recognition and support commensurate with its importance, these men are supplying, in ever-increasing measure, precisely what the safety movement has most lacked and most needed for many years. They provide the key to the kind of leadership necessary for enlisting the sort of forces and influences required to build a great national movement.

The first practical demonstration of this was in the enlistment of a leader for the War Production Fund to Conserve Manpower. There was a real and urgent need for a large-scale expansion of accident-prevention work throughout the country. The President's proclamation had prepared the way for seeking support for such

an expansion. But in order to seek such support with any hope of success, a spokesman capable of commanding the attention of business and industrial circles everywhere in the country was needed. Any man of such stature inevitably wants to know a good deal about a movement before he becomes associated with it. In particular, he wants to know who else is associated with the undertaking, with whom he will be allied in the effort; and he forms his judgment to a considerable extent upon his knowledge of the caliber and standing of the others who are sponsoring the cause.

The fact that such men as I have mentioned were officially identified with the Council, therefore, was an important factor in making possible the enlistment of an industrialist of the national stature of Mr. William A. Irvin, as the chairman and leader of our first major effort to obtain wide recognition and substantial financial support on a contributed basis.

What this meant to the Council and to the safety movement in general can hardly be over-emphasized. The War Production Fund to Conserve Manpower raised approximately \$2,500,000. It brought the importance of the safety movement, as a cause affecting the public interest, to the attention of about 41,000 company heads throughout the United States. It acquainted the senior executives and boards of directors of a great proportion of the country's largest corporations with the need for a broad-scale expansion of accident-prevention work, and with the reasons for giving support to such a program. It brought about the participation in the safety movement of 1,076 leading representatives of all fields of business and industry in all sections of the country who served on its committees. It was responsible, through the 9,000 mile nation-wide tour made last winter, by Mr. Irvin, Mr. Dearborn and myself, for stimulating community safety interest and activity in many important centers and for mobilizing the leading elements of these centers behind the national safety movement and behind their local safety programs. It brought about the co-operation of the country's leading newspapers, magazines, radio systems, trade publications and motion picture interests in

bringing the importance of safety to public attention on an unprecedented and nation-wide scale.

The significance of the financial support obtained in this campaign extends far beyond the immediate dollars-and-cents value.

Derived exclusively from business and industry, this support represents the recognition of responsibility for supporting the safety movement on the part of some thousands of the country's most important companies to which the matter had never before been presented in a similar light. This means that a new understanding of the significance of the safety movement, and of the necessity of broad-scale, coordinated efforts has been developed among a considerable section of business and industry. It means established access to and closer relations with many of the most important elements in the nation's economic life. It means a tangible start toward gaining the type of recognition and support and influential backing that is required to make the safety movement genuinely great. It means that the way for developing a truly strong and effective safety movement in this country has been prepared.

The man primarily responsible for these accomplishments, and the man to whom the Council and the entire safety movement owe the greatest debt of gratitude, is William A. Irwin, who served as national chairman of the War Production Fund and is a tower of strength to the entire movement.

To meet the vastly enlarged responsibilities entailed by the developments of recent years, the Council has, naturally, made a number of important changes affecting administration, organization and policy. Most important, of course, has been the appointment of Ned H. Dearborn as Executive Vice President. A few months more than a year ago, we entrusted to Mr. Dearborn the responsibility of seeing that a nation-wide program of accident prevention, on a scale unprecedented in the history of the safety movement, was developed and set into motion—and practically at once. In short, we gave him something like a five-year job to do in about as many months.

The results soon showed that we gave this job to the right man. Not only has Mr. Dearborn shown himself to be an administrator with exceptional ability, with a broad understanding of the problems involved, but he has also, as a spokesman or an interpreter of the safety movement, shown a rare ability to win confidence and friends for the Council among people in all walks of life from coast to coast.

In conformity with the larger responsibilities involved, the policy of the Council has undergone a fundamental change under the new administration. The Council is no longer primarily a membership-service organization, concerned mainly with supplying materials and aids to its own members. It is today a public service agency, devoted to advancing every phase of safety in every part of the national life.

Perhaps the most dramatic reflection of the effects of the various developments and changes I have mentioned is found in the growth of the Council during the past four years. Here are the facts:

Four years ago, the Council had 5,160 memberships. Today it has 6,013.

The annual dues from members were \$340,125. Today they are \$502,241.

The membership cancellation rate was 6.7%. Today it is 4.9%.

In 1939, the Council's total annual expenditures were \$840,684. This year they are estimated at \$2,008,600.

The Council's total income then was \$892,899. This year it is estimated at \$2,062,640.

Four years ago, the Council's unexpended membership fees and membership guarantee funds totaled \$160,000. Today they total \$600,000.

With the increased strength it has gained and the additional funds that have been made available to it, the Council has set in motion activities affecting the safety of millions of people.

And we are finding constantly accumulating evidence that the effects of continually expanding safety activities are being felt throughout the social and economic life of the country. For example:

A comparison of the first six months of this year with the corresponding period of 1941, when the President asked the Council to undertake its expanded program, showed:

The all-accident death toll down 7 per cent.

The rising tide of deaths to workers through on-the-job accidents entirely halted, in spite of new personnel, and a 17 per cent increase in man-hours worked.

Traffic deaths down 41 per cent, largely due to wartime traffic restrictions, but also in part to public cooperation.

Public deaths, other than traffic, down 9 per cent.

Home deaths from accidents up 4 per cent.

The experience of many of the Federal groups and agencies with which the National Safety Council has been actively cooperating in training safety personnel and planning and organizing accident-prevention programs has shown a pronounced downward trend.

Explosives plans, under regular inspection by the Chief of Ordnance, cut their accident frequency rate 42 per cent and their severity rate 74 per cent in the first five months of 1943, as compared with the same period last year.

The joint accident prevention program of the United States Navy and the United States Maritime Commission cut the injury frequency rate in private shipyards almost 20 per cent in the first four months of 1943.

The accident rate among students and pilots of the United States Army Air Force has been brought down to the point where 95 out of every 100 pilots are being trained without injury of any kind. And the Air Service Command's safety program for ground personnel cut injury rates at control depots 21 per cent in the first half of 1943.

Following the organization by the Provost Marshal General and the service commands of a safety program designed to reach every plant producing war material for the army, injury rates in these thousands of plants were held constant, despite

increasing employment and replacement of experienced by inexperienced workers in the first five months of 1943.

From industry have come records of hundreds of companies showing accident rate reductions of from 10 to 60 per cent and more, in 1942, as compared with 1941.

In the field of traffic and transportation, 43 states and 200 cities cut their accident tolls by at least 25 per cent in the first half of this year, and in 29 important centers, cuts of 39 per cent were accomplished. These reductions cannot be attributed entirely to wartime traffic restrictions, since many communities cut their tolls in the face of unusual traffic congestion caused by war activity.

In the relatively few sections in which well organized programs of home and farm safety have been in operation for a sufficient length of time to provide indications of results, the signs are distinctly favorable.

In the light of all the foregoing evidence, I think it is obvious that we are on the right road toward building a safety movement of sufficient size and strength to cut to a fraction of their size our enormous accident losses. And in the light of the developments through which our movement has attained the growth and progress shown of recent years, I think the sources from which we must continue drawing strength and support are obvious. There is too much at stake for us to turn back now. Within the next decade, the lives of nearly a million Americans may depend upon our procedure.

We must not go back to trying to do this country's whole safety job practically alone. In a very real sense our national accident toll of about 100,000 lives a year represents the price we have been paying for trying to do this job without adequate aid. We need all the help we can get. We need the press, the radio, the magazines behind us. We need public acceptance. We need money. We need the support of the country's most important men. We need business and industrial management actively on our side. We need the cooperation of all national organizations.

So long as we continue to retain and strengthen the relations that we have thus far developed with the leadership of the country's social and economic life, we need have no concern about post-war problems.

So long as we follow the pattern of progress we now have established, the Safety Council and the safety movement will continue to grow in stature, strength, and effectiveness.

The Attack on Accidents

By NED H. DEARBORN
Executive Vice President, National Safety Council

Slightly more than two years ago, the President of the United States called upon the National Safety Council to mobilize the safety forces of this country in a concerted attack on accidents that were impeding the war effort. The resultant expansion of accident-prevention work, organized, activated and guided by the Council, has become the most significant development in the history of the safety movement. The purpose of this report is to summarize some of the highlights of this development for the past year.

Over-All Growth

During the year ending August 31, 1943, the staff of the National Safety Council increased from 165 to 225 members. The total expenditures for the same period amounted to \$1,950,000, which was about double the budget of the preceding year. Other indications of the extent of the institutional growth necessitated by the expansion of program activities during the past year have been:

- Council memberships up 10 percent—to a total of 6,013.
- Membership dues up 11 percent—to a total of \$592,000.
- Distribution of posters up 10 percent—to a total of 6,000,000.
- Distribution of Safe Practices Pamphlets up 69 percent—to a total of 305,000.
- Monthly circulations of Council publications up from 15 percent to 56 percent.
- Distribution of slide films and records up 380 percent—to a total of 12,230.
- Distribution of new-activity materials, covering home and farm safety, off-

the-job safety, and special promotional efforts conducted by the War Production Fund—5,449,000 pieces.

Safety and the General Public

The reduction of accidents among the American public involves modifying the attitudes and habits of thought of some 130 million individuals. Since the attitudes and thoughts of the average individual are influenced to a considerable extent by what he reads in his newspaper and what he hears over his radio, the Council has greatly increased its use of these media for influencing individual and collective opinions. During the past year, for example, the Council has carried on the most extensive newspaper publicity campaign in its history. There were 203 releases of news stories, 67 on features and editorials, 212 cartoons, and more than 200 news photos. The mailing lists on these ranged from 2,000 to 10,000 newspapers; 21 syndicates and press services also were covered.

Indicating the wide acceptance of Council material, a test run on our Grade Crossing Campaign showed that more than 5,000 newspapers were using an average of more than three stories each on this campaign alone.

Radio time devoted to safety was several times greater in 1942-43 than in the previous year. The Council and its work were featured on 62 network presentations, including such programs as "Army Hour," "Fibber McGee and Molly," "Breakfast Club," "Club Matinee," "Vic and Sade," and many others. One hundred eighty-hour safety features are known to have been used in local broadcasts, and it is estimated that more than 40,000 spot radio announcements on safety were used.

Altogether, radio safety time during the year is estimated at 702 hours.

Safety has been featured more than ever before in magazines of national circulations, such as "Collier's," "Saturday Evening Post," "Good Housekeeping," "Ladies' Home Journal," "Cosmopolitan," and others. During the year, more than 500 feature articles and 200 technical articles to magazines and trade journals were released.

In addition to this use of Council material by others, the circulation and influence of the Council's own publications have greatly increased. These include seven monthly magazines (total circulation, 725,000); 312 posters yearly (circulation more than six million); the Annual Safety Calendar (circulation, 430,000); and more than 100 separate brochures, folders and pamphlets.

Wartime Industrial Safety

Many of the major industrial concerns now in war production have utilized the Council's facilities for years in carrying out extensive safety activities. New war production industries, also, have found in the Council's services the technical and educational materials they needed to organize and maintain effective safety programs.

While maintaining and improving services to all industries, the Council has given special attention to certain key industries where the need for extra assistance has been most urgent. A few examples will serve to illustrate:

Early in 1942, the United States Maritime Commission called upon the Council to investigate the accident experience of the shipyards and to supervise the organization of a safety program. One of the Council's engineers was made Chief Safety Consultant for the Commission, an efficient safety organization was developed, and most of the country's shipyards now have the benefit of the Council's technical and educational materials.

The Air Service Command of the United States Army Air Forces has been given similar cooperation. In each of eleven control area depots, and in the majority of the 250 sub-depots, there is a

well organized safety program and the Council's technical and educational materials have been made available throughout the organization.

In cooperation with the United States Department of Labor, the Council produced a series of "Safety in Foremanship" sound slide films, for use in training safety personnel in industry and elsewhere; and more than 700 sets of these films are now in use by industries and in safety training programs at the high school and college level.

Among the various other agencies with which the Council has collaborated in providing materials and staff assistance in safety training courses are the United States Department of Labor, the United States Office of Education, a number of officers of the War Department, and the War Production Board.

Cooperating with the War Department, the War Production Board, and safety equipment manufacturers, the Council developed a program for the conservation of personal protective equipment used in industry, which included a series of posters and instruction cards for distribution to war production employees throughout the nation.

Demands for safety engineers and safety inspectors in industry have been heavy throughout the year, both from government agencies and from industries operating war plants, and the Council's complete personnel files have enabled it to help many companies maintain a high quality of industrial safety supervision.

Off-The-Job Safety

Since records of recent years have shown that approximately three out of five accidental deaths and injuries to workers have occurred off the job, the Council has made a major effort to develop materials and to promote activities that would enable employers and others to protect industrial employees while they are on the streets, in other public places, and at home.

More than a million and a half pieces of literature on off-the-job safety have been distributed to industrial concerns during the year. More than 1,000 plant

publications have cooperated in using a series of cartoons and feature articles on off-the-job safety.

Fifty thousand copies of a 16-page cartoon-illustrated booklet on off-duty accident hazards to soldiers have been prepared for distribution in the Sixth Service Command.

Some 28 community councils, using materials provided through the home office, have cooperated with the National Safety Council in conducting local off-the-job safety campaigns.

Traffic and Transportation

Despite the fact that traffic accidents have declined for the nation as a whole, 6,500 workers were killed in traffic in the first seven months of the year, and 230,000 injured. Moreover, the national trend toward fewer traffic accidents was reversed in certain war industry centers, where increased traffic brought more accidents, serious traffic congestion and consequent production delays. To combat this situation, members of the Council's Traffic Engineering Bureau have spent much of their time in the field, giving "on the ground" advisory service.

This service has helped traffic authorities and industrial management in these localities to obtain maximum use of existing traffic facilities and to keep accidents at a minimum. Thirty-four war centers have received this service, among the larger being Rock Island, Salt Lake City, Memphis, Mobile, Peoria, Kansas City and San Antonio.

Special assistance has been given to the National Highway Traffic Advisory Committee to the War Department, and its state committees, and to the Division of Local Transport of the Office of Defense Transportation. Typical of the Council's collaboration with other agencies in wartime traffic projects have been:

1. A study of traffic accidents during demounts undertaken at the request of the Office of Civilian Defense. Supervision and financial support of a co-operative project with the American Bar Association, which will result in the adoption of standard procedures in the handling of military and war work-

er traffic violators, without disruption of production schedules or military requirements.

2. Collaboration with the American Association of Motor Vehicle Administrators and the International Association of Chiefs of Police on a state enforcement manual covering the organization and operation of state police departments.
3. Aid to police departments in maintaining high standards of law enforcement and administration, through a co-operative project with the International Association of Chiefs of Police, that makes available the free services of trained police personnel to police departments in cities with concentrations of war industry or military personnel.
4. A special one-week course in commercial vehicle safety was developed at the request of the United States Engineers, and conducted for that organization's civilian personnel who are charged with safety supervision and training of drivers.

Other highlights of the traffic and transportation work were the National Traffic Safety Contest and the development of a railroad grade crossing safety program. Forty states and 1,296 cities participated in the 1942 National Traffic Safety Contest, in which major emphasis was placed on wartime traffic measures.

Under the direction of a committee representing all interests—transportation, the driving public, and public officials—a balanced program of safety activities was promoted in all states having a serious railroad grade crossing accident problem. In each state the campaign was sponsored and carried on by the State Safety Council or other representative safety organization, or, in the absence of such a group, by the various governmental departments. Stories and illustrations of typical grade crossing accidents were carried by several thousand newspapers and other publications. The success of the campaign is indicated by the enthusiastic support of state officials and unofficial agencies, and by substantial reductions in grade crossing accidents in several states.

Home and Farm Safety

Because more fatal work accidents occur in agriculture than in any other industry, and one third of all fatal accidents occur in homes, the Council has greatly expanded its efforts to combat home and farm accidents.

From only one employee in July 1942, the staff personnel assigned to home and farm safety have been increased to eleven, about half of whom now work out of the regional offices. This has enabled the Council to establish relationships with scores of national, state and community organizations whose assistance and interest are necessary to bring about national interest in home and farm safety.

Two top advisory committees have been established on home safety and on farm occupational safety. State-wide committees on home and farm safety have been set up in twelve states and are being organized in eight others. At least forty national organizations have developed home or farm safety programs, or both, with the cooperation and assistance of the Council. Some of the more prominent examples of which are: The National Grange, National Congress of Parents and Teachers, American Society of Agricultural Engineers, National Council of Women, American Federation of Women's Clubs, American Women's Voluntary Services, American Public Health Association.

Through field visits and other assistance, home safety activities have been established or considerably expanded in thirty cities, among the larger of which are New York, Milwaukee, Louisville, Pittsburgh, Minneapolis, Los Angeles and Cleveland. In New York 700,000 home safety inspection check lists were distributed. In Cleveland adult home safety classes were organized in seventy schools, with an enrollment of more than twenty-five hundred.

Of special interest is the setting up of an experimental laboratory type home safety program in Milwaukee. This is being conducted under the supervision of the Council's Home and Farm Safety Division and is expected to provide valuable information on the effectiveness of various methods of promoting home safety. A

similar experimental program on a state-wide rural basis is being undertaken in the state of Indiana.

In the field of farm safety, all possible assistance has been given to U. S. Department of Agriculture. Special emphasis has been placed on plans for the safety training of new farm workers. The Department was assisted in drafting two leaflets and an instructor's manual which have been distributed to the recruited farm workers and instructors, and to farmers employing emergency help. 500,000 copies of each of the leaflets and 15,000 of the instructors manual were printed and used.

Other farm safety developments of importance have been: (1) the appointment of a safety committee by the American Society of Agricultural Engineers; (2) the inclusion of safety in a study of farm job simplification, an important national undertaking financed by the Rockefeller Foundation; (3) the trend of state home and farm safety committees to employ full-time safety men.

To give cooperating organizations the necessary "safety ammunition," the Council has produced a variety of educational material on home and farm safety. Two bi-monthly magazines were started, one on home safety and one on farm safety. The home safety magazine now reaches some 2,000 key persons in cooperating organizations and the farm magazine approximately 3,000. Both magazines are designed to keep these key persons informed of new developments and to stimulate their continued interest.

Women and Safety

Recognizing the potential influence of women in the safety movement, a special staff representative in charge of women's activities has been appointed to contact leading women's organizations with a view to encouraging them to organize safety committees and to feature safety in their programs and publications, and at their meetings.

Contacts have been established with 17 leading women's organizations, representing a total membership of approximately 16,000,000. Arrangements are made to provide these groups with publicity and articles on safety for their official publications,

and assistance is given them in starting home accident reporting surveys, in providing exhibits and consultation service for their conventions, and in developing plans for safety programs to be carried on by member units on the local level.

Fact Finding

Since safety work can be effective only if directed against fundamental causes of accidents, the Council's statistical staff has turned its attention to the development of information immediately valuable in the war safety program.

An example of this is the assistance given to the Air Service Command, to the U. S. Engineers, and to a number of outstanding industrial concerns, in establishing a reporting procedure by which accident reports can be analyzed rapidly and accurately for cause, location, and other factors.

Twenty-two "Accident Facts Memos," analyzing the fundamental causes of accidents on specific types of equipment in industry, have been issued by this Department during the past year. And out of these studies has come the development of "Diagnosis Sheets," by which industrial safety directors can quickly determine what is wrong with their own plants' accident experience, and what can be done to correct it. Through using these sheets, accident records no longer become merely tabulations of figures, but working tools in the accident prevention program.

This basic cause information has also been put to work in the selection of safety posters, and in many other ways.

"Accident Facts," the Council's annual statistical handbook, continues in its position as the recognized authority on the national accident situation. Twenty-four thousand copies of the 1943 edition (published in July) have already been distributed.

Safety in Schools

Acting on the belief that carefully developed and continuous cooperation with a selected number of educational organizations is more effective than a limited amount of work with a larger number of groups, the Council has worked closely

with such organizations as The U. S. Office of Education, American Association of Teachers Colleges, American Vocational Association, American Home Economics Association and the National Education Association.

The most helpful Council materials were combined into packets, and information on the availability of these packets was sent from the Office of Education to all state directors of war worker training and vocational education. Following this, personal conferences were held by a Council staff member with state directors of war worker training in forty-one states. In addition, the Office of Education and the Council cooperatively arranged fifteen regional conferences of state school officials responsible for the transportation of pupils by bus.

The Council is working with the American Vocational Association on the promotion of safety training of vocational school teachers, and with the American Home Economics Association on a similar project. Twelve states have already been visited in this effort.

With the National Education Association, the Council has cooperated in promoting school bus safety, pre-induction driver training, and in many other ways.

In cooperation with the American Association of Teachers Colleges a two-way program has been set up for the purpose of assisting teachers college faculties in meeting the safety education problems brought on by the war, and in conducting a long-term study of safety education in the teacher education institutions so that standards for such education may be developed. Fifty institutions have been visited in connection with this program.

The Council has also cooperated closely with organizations active in the field of safety education such as the Automotive Safety Foundation and National Conservation Bureau; rendered extensive technical field service to state and local safety organizations in reviewing, evaluating, and improving their programs; conducted a comprehensive survey of the safety education program of the Detroit Public Schools; and produced and distributed a wide variety of educational materials.

Community and State Safety Program

In developing its expanded program to meet the war emergency, the Council has recognized that, to assure an effective safety program for the nation, there must be increasingly effective community and state safety organization. Accordingly, vigorous steps have been taken to strengthen existing organizations and to build new ones. These steps have included:

1. Organization of a field staff to assist existing councils and help organize new ones. These representatives are now working out of the various regional offices of the Council, making possible a close and continuous contact with cities and states in their regions.
2. Establishment of cooperative arrangements with chartered councils whereby the national organization will be able to "steer" local Council activities in the most effective directions. Most of the 37 Class A Councils have already accepted this closer relationship.
3. Extensive assistance to state and community safety organizations through field service. Thirty-eight states and more than 50 cities were visited during the year, on matters of organization, financing and program.
4. Approval by the Executive Committee last August of a plan in principle, whereby a community safety organization would operate as an integral part of the National Safety Council, participating in both national and local services to be secured through one membership. Definite arrangements for putting this principle into operation are now being worked out.
5. Cooperation with state and community councils in promoting forty-six regional and local safety conferences were conducted throughout the nation last year.
5. Cooperation with the United States Army Engineers in developing complete community safety programs for two new and very large war plant communities in widely separated parts of the country. These programs cover all phases of traffic safety, school safety, and home safety, including engineering design, safeguarding of equip-

ment, and thorough programs of safety training and public education. This is the first time in the history of the safety movement that it has been possible to incorporate safety standards and a safety program into the life of a community, from the "blueprint" stage. While military considerations do not permit the identification of these communities and specific discussion of the activities at this time, the procedures followed and the results obtained should be extremely valuable after the termination of the war.

Recognizing that the success of a state or community council depends to a large extent on the competence of the manager, a national Institute of Safety Organization Management was again held in July, 1943. The Institute comprised one week's training in the fundamentals of safety council organization and management. Instruction was given by local council managers and headquarters staff personnel.

Regional Offices

To make the services of the Council more directly available throughout the country as a whole, regional offices have been established in San Francisco, New York, and in Chicago. An office has also been established in Washington, D. C., where a representative maintains regular contact with various governmental agencies with which the Council is co-operating.

The regional offices are responsible for all field representation in their areas, except certain technical services maintained in the home office. Each office has supervision of community and state safety council contacts and development in its area. As the need develops, one or two additional offices may be established to keep the Council's services abreast of the national demand.

Staff Reorganization

As the Council's activities broadened during the year, it became apparent that some reorganization of staff would bring about improved service to members, as well as more effective joint activities with the Council's growing list of co-operating organizations.

The new plan, adopted in June, 1943, provides, under the supervision of the Executive Vice President, for a General Manager, a General Secretary, Department Managers, and Divisional and Regional Directors. There are five major staff departments: Program, Public Information, Sales, Service, Field Organization.

Under the Program Department are six divisions, through which contacts are maintained with all Council members, and technical services are produced. The units within this division are: Industry, Traffic and Transportation, Farm, Home, Schools and Colleges, and Statistics.

The Public Information Department retains the functions of the former Division of Public Information, including Publicity, Editorial, Art, and Films.

The Sales Department embraces four principal fields of operation: Council Membership, Magazine Circulation, Advertising and Exhibits, and Miscellaneous Publications. Establishment of this new department is a recognition of the fact that the Council's influence through magazines and other publications can be increased tremendously by wider distribution of these materials.

The Service Department includes the various office management and "manufacturing" operations in the headquarters office, such as Stenography and Filing, Shipping, Printing, Purchasing, Billing and Membership Records. Also in this department are placed the supervision of Membership Services and the Management of the Annual Congress.

The newly established Field Organization Department supervises the regional offices, and is responsible for the Council's relationships with community and state organizations, and with local and state officials in all fields of safety interest.

Statement of Major Policies

In developing the greatly enlarged program of the past year the officers and Executive Committee of the Council have operated in accordance with certain major policies and principles, which may be summarized briefly:

A Public Service Program. Prior to 1942, the Council had been primarily a

membership service organization. Its publications and services had been largely prepared for its own members, with only a slight margin for general public education and information.

The financial support contributed by business and industry through the War Production Fund to Conserve Manpower has enabled the Council to change that concept. The result is that the Council's purpose is now to meet the need for safety information and safety organization, wherever that need is found.

Safety Organization — National, Regional, Local. During the year, the Council has planned its activities on the principle that sharp lines of demarcation between national, regional, and local safety effort should be obliterated; that there should be one safety movement. The Executive Committee's approval of a plan for integrating local and National Safety Council membership arrangements was a practical expression of this policy.

Decentralization of National Safety Council Staff and Program. The establishment of three regional offices,—in New York, Chicago, and San Francisco—was a major step toward the realization of a genuinely nation-wide safety organization composed of regional offices, community and state safety councils, and other safety organizations with a central home office in Chicago. Through these regional offices, the Council's contacts throughout the country—with local safety councils, co-operating organizations, and public officials—have become more direct and personal and, consequently, more effective.

Community Safety Councils. All activities during the past year have been predicated on the fact that maximum results in accident prevention can be achieved only with a strong safety organization in every community. Accordingly, the provision of assistance through field representatives, the preparation and production of new program materials and the extension of financial assistance to community safety organizations have been important parts of the National Council's program.

Service to Industry. Major improvements have been made during the year in the Council's direct services to industry.

The industrial engineering staff has been enlarged and reorganized, making possible the specific assignment of a staff representative to one or more closely related sections.

A plan has also been developed whereby all Sections of the Council can discuss their joint problems and can bring joint recommendations to the Council's management. This is accomplished through four meetings annually of the General Chairmen of the Sections. One function of this General Chairmen's group is to recommend sectional representatives for election to the Executive Committee of the Council.

Membership in the Council. The membership of the Council has increased substantially during the year. Nevertheless, the officers and Executive Committee are keenly aware of the fact that many more organizations and individuals should identify themselves as "belonging to the Safety Council." This problem has numerous angles—how to reach the small plant, what our policy should be on individual memberships, the nature of membership services, and many others. All of these are being studied and plans are being worked out.

Reference has already been made to the Executive Committee's approval, in principle, of a "single membership" plan

whereby membership would automatically mean participation in both local and national programs and services. If industries, public groups, and individuals can be brought to understand the importance of activities which can be carried on in the community, in the state, in the region, and nationally, it is felt that there will no longer be any question about their willingness to support activities at all these levels.

Cooperation—the Key to Safety. A basic policy of the Council during the past year has been that safety will be achieved nationally, not through safety organizations alone, but by the interest in safety taken by all organizations, both public and private. In other words, a prime requirement for further advancement is to secure the right "multipliers" for the safety idea.

Experience has shown us what can be accomplished by a receptive attitude toward safety on a part of a newspaper press association, a state motor vehicle official, a trade association executive, or a national women's organization. It is our plan and purpose to cultivate the safety interest of every citizen, but we shall concentrate on those individuals and organizations whose influence is greatest. This effort must be a continuing one; it promises great results, because there is an almost universal acceptance of the safety idea, once it is properly interpreted.

Stop Accidents—Speed Victory

By C. C. CARLTON.

Vice President and Secretary,
Motor Wheel Corporation;

President,

Automotive Parts and Equipment Manufacturers' Association;

Vice President,

Automotive Council for War Production

and

Automotive Safety Foundation

I understand that there was some serious discussion about holding this Annual Meeting of the members of the National Safety Council, and I congratulate you upon your decision to hold this conference. A few said, "We are too busy with the war effort to bother with a Safety Congress." Recently I saw a slogan which said, "If you are too busy for safety, then you are too, too busy."

War is organized murder. What a strange anomaly that in the midst of the most terrible and terrific war in all history, we meet here to discuss and to plan for safety at home, on our highways and

Safety in industry, on the highway, in the home, is not a frill or a fad, but a vital part of war production. To say that we are too busy for safety is to say that we are too busy to build the vital munitions of war. The war plant that is too busy for safety—and as a result finds vital machines without operators because of crippling and fatal accidents—will wish that it had not been too busy to fight accidents.

The safety movement is national in scope. The men and women attending this conference represent a variety of interests. Many of you are from industry; others are primarily interested in traffic accident prevention; others represent groups promoting safety in the home and on the farm. But all of you join in the common cause, "Stop Accidents—Speed Victory!"

Industry Has Faced Many Problems

American business and industry have willingly accepted their responsibilities in

connection with the war effort. The arsenal of democracy is living up to its reputation in a magnificent way and American business has a right to be proud of its war production. At the same time, and in the face of a remarkable record, all of us want to be certain that we leave nothing undone so that, after the war, we may feel that our very best efforts helped bring victory to a successful and speedy conclusion.

Our war factories have had many aggravating problems. It was no small job to move from the production of peacetime goods to the tools of war. It was a job involving retooling, revamping, replanning; a job of new methods and new techniques and a job which had to be done with the utmost speed.

We are now faced with a new problem and one which, by the very nature of war, is one of the most serious and which will become increasingly critical as the fighting progresses and our fronts expand.

This is the problem of manpower, the problem of not only getting but keeping sufficient personnel to meet the demands of the war production program. Industry is aware of this problem, and knows it is up against the severest labor problem in its history; and industry knows that, somehow, it must contrive to produce materials in even greater quantity despite this shortage.

Method of Attack is Conservation

From the business point of view, one of the soundest attacks against any shortage is conservation; getting the ultimate out of what we have and protecting our

resources. And as wartime economies and new methods have resulted in almost unbelievable savings of time and materials.

Industry has also made great strides in conserving manpower through reducing the rate of injury due to on-the-job accidents. In spite of the employment of millions of men and women who never before worked in factories or business, in spite of an increase from 46 million employed in 1940 to a total of 64 million employed in our country today, occupational deaths in the first seven months of 1943 decreased by 400—from 10,800 in 1942 to 10,400 in 1943.

That's a record of which to be very proud. It's a tribute to the industrial and business safety workers of America. That's good business! That's speeding victory by modern safety methods.

But while the losses to industry as a result of on-the-job accidents have been reduced, over a period of years, too many employees have been lost to the war effort while outside the factory through off-the-job accidents—accidents in the home, on the farm, while at play and, most serious of all, traffic accidents. Here is the next big problem which industry must attack.

Manpower Losses

How big does this problem loom in comparison with the problem of industrial accidents?

Last year 45,000 working men and women lost their lives accidentally in the United States. 18,500 died as a result of work accidents, accidents which occurred in the plant. The other 26,500 workers died from accidents which took place off the job—at home and on the streets and highways.

But that is only part of the story. In addition, 90,000 other workers were lost to production just as definitely, just as surely as though they had been killed. These are the permanently disabled, and they were permanently disabled in off-the-job accidents.

137,500 American boys lost as casualties would be terrible, but how easily we seem to forget that last year America suffered 137,500 casualties in our industrial force.

There is another chapter. Add 2,200,000 workers who were temporarily away from their jobs, for varying lengths of time, because of off-the-job accidents.

This brings our total industrial casualties to 2,437,500 workers, and we hope and pray that the armed forces of the Allies will not suffer as greatly as that in this global war.

The total is astounding. It is 270 million man days of productive effort, a figure representing enough time to produce 12,600 large bombers, or 63,000 fighter planes, or 171,000 light tanks, or 324 destroyers or 39 battleships.

In the first seven months of 1942, 16,950 traffic deaths occurred. In the same period of this year, there were 11,780 traffic deaths. That's a reduction of 31 per cent, but there was a reduction in miles travelled of something over 40 per cent, and a considerable reduction in speed at which vehicles moved on the highways. So the record is not as good as I, for one, expected.

Deaths in the home for the first seven months of this year were 18,600; an increase, in spite of all our efforts, of seven per cent over the same period of last year. That is definitely not good business!

Off-the-Job Accidents Must Be Controlled

The off-the-job accident story is dramatically costly. It is double sabotage: We commit it ourselves and it costs the enemy nothing. These accidents which hurt war production perhaps more than do accidents within the factories, at least in greater volume, must be stopped.

From the point of view of factory management, and of the effect on production, it helps not a bit that a valuable worker was killed outside the factory rather than inside the factory. The loss is identical. Since the loss cannot be afforded, then it must be prevented.

Any general attack is not, by itself, sufficient and the time has now come, under pressure of war, when it is necessary for each individual factory to take specific steps to help its workers to stay alive, stay well and to keep their existing transportation.

Plant Activities

What can the factory do to minimize traffic accidents to its workers? There are three basic methods of preventing traffic accidents: Education, engineering and enforcement. The factory naturally should not assume the role of a police officer or a representative of the motor vehicle department, but it can do a lot about education and something about engineering.

The following are specific practical accident prevention steps which, I believe, each factory should take:

1. Establish a transportation department to take care of all transportation activities, including safety, ride-sharing and rationing.
2. Provide an adequate budget, suitable office and equipment and obtain an adequate staff.
3. Run a traffic safety contest between shifts, units or plants.
4. Use safety posters on plant bulletin boards.
5. Inspect the tires of workers' cars and insist upon their repair before they become dangerous.
6. Carry out a preventive vehicle maintenance program, to encourage workers to keep their vehicles in a safe operating condition.
7. Publish safety stories in all company publications.

All of these are fairly simple specific things that should be done. If they are done by every factory, the workers can be preserved so that they can make a maximum contribution to the war effort.

If the off-the-job accidents can be stopped, then management is certainly justified in spending as much money to

prevent them as it is now spending to prevent industrial accidents. Certainly it is justified in spending as much money to save the worker himself as to save the worker's tires and his car.

Responsibility is Clear

The responsibility of management is clear. These steps are parallel to the work of management in the fields of industrial safety, health, welfare, etc. With the manpower situation growing ever more serious, the job must be started at once.

I am told that representatives of the Army and Navy will play a prominent part in this Safety Congress. That is most encouraging because of the realization on the part of our military leaders that safety is a part of the efficient functioning of the nation's war production plants. Military insistence on accident prevention programs, in every war plant has no doubt succeeded in conserving manpower in some plants that have failed to realize even the economic significance of safety.

But, 9,200,000 accidental injuries! 93,000 accidental deaths! \$5,200,000,000 lost because of accidents! That from America in 1942 was good news to no one except Hitler and his gang of murderers. That's definitely *not good business!* That's definitely *not helping to speed victory.* That's why we are here today.

Now, we must think about safety after the war. Now, our plans must be formulated not only to speed victory, but to save the peace by stopping accidents. When many present restrictions are lifted, our accident curve must not be allowed to rise so rapidly that, while we are celebrating the victory which shall be ours, we kill and maim our own people in greater numbers, either in the home or in public places, in our factories or on our highways.

Congress Banquet

WEDNESDAY EVENING SESSION

October 6, 1943

Presiding:—Col. JOHN STILLWELL, President, National Safety Council, Inc., Chicago.

The annual banquet for members and guests at the 32nd National Safety Congress and Exposition was held in the Grand Ballroom, the West Room and the Crystal Room of the Sherman Hotel. Following the dinner, President John Stillwell announced the official list of newly elected officers of the National Safety Council. Colonel Stillwell then introduced the Honorable Robert A. Lovett, Assistant Secretary of War for Air, whose address was broadcast to the nation over a coast-to-coast network.

Safety Builds War Power

The Honorable ROBERT A. LOVETT, Assistant Secretary of War for Air

During the past three years it has been my privilege to work closely with the Army. Coming into the War Department direct from civilian life and joining the group which has, with the Army's usual wry wit, been labelled the Chairborne Infantry, I have been deeply impressed by many things about the Army which seem to be taken more or less for granted.

One of the major concerns of the Army which the public knows little about has to do with safety. It may seem to some people to be incongruous to talk about safety in a service dedicated to the deadly business of war. But I assure you it is not. Safety is a basic and underlying consideration of every operation of your Army.

It is, therefore, a very real pleasure for me to talk with you tonight as safety leaders attending this national convention of the National Safety Council. For the Army is fully aware of the importance of the nationwide campaign the Council is conducting at the request of the President of the United States to reduce the wartime accident toll that is delaying victory. The Army is grateful for the active and effective cooperation of the Council in helping it set up and carry out the safety program that is making possible its splendid record in preventing accidents.

In the interest of clarity let me over-simplify the subject a little bit by saying that the Army's objective is to make war as safe as possible for our soldiers and as unsafe as possible for the enemy's.

Preparation For Unexpected

To me the greatest advance in safety procedure in this war is preparation for the unexpected. This is accomplished by systems of training both for ground troops and air forces which attempt to duplicate, under rigid control, the actual conditions which a man will face in combat with the enemy.

Since in military matters surprise is one of the most important factors, we protect our men against this element so that our troops and our airmen coming up against the veteran forces of our enemy will not have their danger increased by the unknown.

Our training efforts have, therefore, been greatly revised and they now duplicate as nearly as possible all of the hazards of actual warfare. This is an intelligent recognition of the fact that a man's safety depends not only on his physical condition, but largely on his mental condition.

Our ground troops in training attack replicas of enemy positions in the face of fire from live ammunition. These bullets are

fired a specified number of inches over the attacking soldiers as they crawl along toward their objective. If they observe the safety rules and keep down they don't get hit. They know that if they expose themselves they do get hit; and most frequently in a part of the anatomy which will make attendance at the movies somewhat less pleasant than usual. As a result they keep down in training; and, more important still, they keep down when they face the enemy.

Troops unaccustomed to battle sounds are inclined to become rattled in their first engagement; and, therefore, become more vulnerable to enemy attack. In our training we now reproduce the sounds of battle through controlled explosions precisely like those heard on the battle field.

We reconstruct villages and our troops storm them. On entering them they find the same booby trap hazards with which our crafty enemy still kills our unwary soldiers. Those which explode in training do not kill. They are, however, loud enough to scare the pants off you, and the lesson thus learned is remembered. Literally thousands of lives are saved by the modern system of training on the ground and in the air.

Safety Vital In Air Forces

Probably in no branch of the service is the matter of safety so important as it is in the Army Air Forces. Since the Air Forces are my particular concern, I am naturally somewhat more familiar with their safety problems than I am with others.

As a measure of the problem let me point out that we now have combat planes in quantity production which, in level flight at their optimum performance altitude, have a speed only 35 feet a second slower than a 155mm. howitzer shell. In a dive they are considerably faster than a .45 caliber bullet fired from an Army pistol. No matter how you say it to preserve military secrecy, that is fast. Very fast, in fact.

Every day there are 98,000 Air Force men flying in this country as part of their training as members of combat crews. At one of our schools every 20 seconds during the day a gunnery training plane takes off or lands.

In our steadily growing Air Force the training establishment must be kept in phase

with the expanding combat units and must, above all, maintain the highest standards of flight training and thoroughness of mechanic schooling. The superb performance of our combat crews in all theaters of war is the best possible measure of the soundness of the training program.

Reduction Real Achievement

I mention these things in some detail because I think it will point up for you the extent of the Air Forces problem and enable you to measure the achievement in actually reducing the rate of accidents during the past year as compared with the year before.

In this country alone, we flew during the past year more than $3\frac{1}{3}$ billion miles—the distance equivalent roughly to 134,000 trips around the world at the equator. These astronomical figures are unequalled by any Air Force in the world, and represent an increase of 190 per cent over the rather astonishing amount of flying done the year before. It is three times the amount of flying done by the entire Air Force in the whole 20 years prior to our current expansion.

Aircraft accidents naturally receive wide publicity. Because of their spectacular nature and their number, the impression is given to some people that the rate of accidents is extremely high. Actually, this is not the case. The figures given below are summarized from Colonel Harris' (Colonel Sam Harris, Director of the Office of Flying Safety, Army Air Forces) interesting paper on the subject.

Despite the tremendous expansion of Army Air Force flying, the rate of aircraft accidents per 1,000 hours flown did not increase as anticipated in the fiscal year ended June 30, 1943, but was, in fact, reduced fractionally from .739 to .716. This rate of accidents was lower than the average rate for the 10 peacetime years 1931-40, although as indicated above, over three times more miles were flown last year than in the whole preceding 20-year period.

As a result of the increased proportion of larger and heavier planes carrying more personnel, of faster military aircraft and of newly trained pilots, the rate of fatal accidents was up fractionally from .077 in 1942 to .083 for the full fiscal year of 1943. The trend near the end of the year was downward,

and in the last quarter the rate was below that of 1942.

As our Air Force program continues to expand, the number of accidents will increase for the same reason that there generally is a greater number of automobile traffic accidents in a community with 100,000 automobiles than there is in one with 10,000.

Example of Results

In the air, realism in combat training (where risks can be controlled and while expert guidance is available) is of the greatest importance. The technique of attack and the break-off from attack must be learned because they vary with each type of plane in certain details. They must be practiced over and over again in mock combat so that the situation faced is not a surprise.

A shining example of the results of training to reduce the hazard of the unexpected, but more particularly a tribute to the qualities of heart, head and hands of American youth that are beyond all praise, is contained in a combat report which, as a matter of routine, reached my desk from England a few days ago. It is the combat report of a pilot flying a P-47 fighter out of England against the best pilots the Germans can put in the air. I will read it to you just as the pilot wrote it:

"Strikes knocked out most of my instruments and put holes in the right side of my canopy. After breaking away from the attacking enemy aircraft, by diving steeply I found myself at approximately 1500 to 2000 feet, surrounded by enemy planes, with no instruments in my plane. I immediately attacked an FW 190 in front of me, firing several bursts from about 125 yards and saw it hit the deck. Shortly after this, in the general melee I attacked another FW 190 from about 125 yards, which appeared to be going under my attack. I saw hits in and around the cockpit and on the wings, and large pieces were flying from the enemy aircraft however, it was impossible for me to stay and watch this enemy aircraft crash, because it was during this time that I was being attacked by an FW 190 closely followed and supported by two more.

I was badly hit and wounded in both hands, the right knee and both ankles by shell splinters. Due to the fact that all instru-

ments were useless, I was not sure in which direction I was travelling; but suddenly found myself over the channel with low clouds over the water, bases estimated at 1-200 ft. I flew in the clouds as much as possible trying to avoid the pursuing enemy aircraft. Several times I found myself coming out of the clouds headed for the water and had much difficulty getting back into the clouds, due to my wounds which made it necessary for me to fly the ship with my forearms. The right aileron of my plane was gone, and the right wing was badly shot up my tail surfaces must have been hit because I had difficulty in gaining and losing altitude. The enemy fighters followed me to within a few miles of the English coast.

After making landfall, I decided to make a crash landing, but found I had unfastened my safety belt before I had been wounded, because at that time due to the condition of my plane I had thought I would have to bail out, and was unable to fasten the belt again due to my wounds. I headed out to sea again to bail out, because I was afraid that if I bailed out over land the plane would crash in one of the towns along the coast. I knew I was over England because I saw ... of Dover.

I saw a fishing boat just off the shore, and decided to bail out near it. The canopy of my plane had jammed and would not open, but since some ... the glass had been shot away, I was able to punch and force my way thru the canopy, bail out and open my chute. The fishing boat picked me up at once, if it had not I would have drowned because I was unable to undo my parachute harness, and was getting weak from loss of blood."

The pilot's commanding officer notes on the bottom of the report: "No praise is too high. I salute you."

Five Points of Safety

There are a few things I would like to point out about that remarkable document which I just read to you. It is most inspirational. It also contains compelling evidence of our safety effort. Five major examples of our safety program are given in that report and I would like to enumerate them for you.

First, the pilot's technique of diving his crippled plane to escape attack by superior

forces. He learned that valuable maneuver in hours of operational training in this country. Though he had no flight instruments, the safety lesson was so well learned that his reactions were second nature to him. The same is true of his evasive maneuver of flying in and out of clouds, despite his lack of use of his hands.

The third factor concerns the plane itself. The right aileron was gone, the wing shot up and tail surfaces hit, the instrument board shot away, but still it flew. It had been built to stand this kind of grueling punishment and to give its pilot every possible chance of survival.

He rejects a crash landing because he can't fasten his safety belt, and thereby shows sound indoctrination. He refers to his parachute, and might also have mentioned his Mae West and his little individual rubber boat which is built into his chute harness. All of these are safety devices.

Well Being of Men First Concern

That pilot's report tells a real story. It is dogma in the United States Army that an officer must have as his first concern the well being of his men. I ask you to note that his first concern is not killing the enemy. This is understandable because he can not destroy the enemy unless he has the men and the material to do so. An outfit that has 50 per cent of its men down with malaria, has 50 per cent casualties as surely as though that quantity had been put out of action by the enemy. In fact, anything that interferes with the combat efficiency of an outfit is an enemy whether it be an accident, illness or the results of enemy fire. So the well being of troops and their proper equipment are recognized as vital prerequisites of successful combat.

The very extensive and growing program of control and safety education developed by the Air Forces and described this afternoon by Colonel Harris is another manifestation of the thoroughness of our approach to this problem.

Equipment Designed For Safety

I have cited a rather striking example of safety as shown in the toughness of our airplanes. But this same concern for safety permeates every piece of equipment developed

by the Army. Consider the lowly steel helmet which we have come to accept as just a normal piece of equipment. It is, of course, a safety device painstakingly designed after countless tests, to give the soldier the maximum chance of survival. Camouflage is another simple and direct step to reduce risks and thereby promote safety.

This same aim is constantly in mind in design of equipment. In every Army weapon safety factors are incorporated to an extraordinary degree. In a tank, for example, these measures include automatic fire extinguishers built into the engine, padding throughout the interior, decontaminators ready for instant use in case of gas attack and now a method of air conditioning which will drive out noxious gun fumes. All the joints of the body have guards which deflect and prevent the splashing of hot lead which might come into the interior if a joint sustained a direct hit.

In its offensive armament tremendous factors of safety are incorporated and procedures for maintenance and operation are carefully worked out. Artillery pieces are laboriously tested at proving grounds under every conceivable condition and are then further tested under simulated combat conditions.

Each plane and each part of a plane has great factors of safety built into it. Their manufacture is rigidly controlled, and the finished product is subjected to a strict series of tests which culminates in the acceptance flight test before delivery to the Air Forces. Improvements arising out of combat experience are constantly incorporated into Army equipment of all types.

Results of Training and Precautions

All of these factors I have mentioned—the care and engineering skill which goes into the design of our planes, the thoroughness and scope of our aircrew training, the abilities of our young men and their leadership—these things make up the combination which is building up your Air Force as an offensive weapon. That combination is producing results.

Through the safety of the individual, we are endeavoring to contribute to the safety of our nation as a whole. That is the purpose for which our armed forces have been trained. With our new and powerful

air arm we are convinced that we have an instrument which can be made to reduce appreciably the cost of war.

By strategic bombing of Axis industry we are endeavoring to reduce the enemy's ability to produce death-dealing equipment. By tactical Air Force operations we are supporting and protecting our superb ground forces. And by a combination of the two

types of air use, we hope to make the long grim road to victory less costly in lives than it otherwise would be.

Thus your Army, in little ways and in all of the operations concerned with our larger mission, has as its goal the objective to which the National Safety Council has adhered for many years. We, in common cause with you, seek Universal Safety.

Accident Facts

WEDNESDAY MORNING SESSION

October 6, 1943

Presiding: H. W. HANNAKE, Assistant Superintendent, Engineering and Inspection Division, The Travelers Insurance Co., Hartford, Conn.

Formulating An Accident Record System

G. G. GRIEVE

Statistician-Engineer, National Safety Council, Inc., Chicago

The efficient operation of an industrial organization depends on control over men, equipment, and materials. The value of records of production, costs, sales, profits, and losses, as sources of information for effective control, has been established by the experiences of many companies. A record of accidents is just as fundamental to efficient safety work.

An essential in control is knowledge about results, and therefore, a good accident record system must provide information for judging the effectiveness of the accident prevention program. The American Standards Association's Code on computing injury frequency and severity rates is widely used by safety engineers for gauging accident experience. Comparisons of injury rates with previous periods shows whether the accident experience of a company, plant, or department is getting better or worse. Comparisons of rates of various departments also disclose the departments with the worst accident records and thus indicate where most safety effort should be directed. Comparative injury rates, such as the rates of similar departments of different companies, are useful in stimulating the interest of management and foremen in safety. Injury rate information, however, tells the safety engineer very little about what to do to prevent accidents. If the injury rates of his company are not decreasing, he must search elsewhere for the reasons.

Causes Must Be Known

Effective measures for controlling injury rates are primarily based on the circumstances and causes of accidents. A

thorough accident investigation is fundamentally for the purpose of getting the facts about the causes so that the most effective steps can be taken to prevent a similar accident. A good record system should make these facts available for use by the safety engineer. However, he must have methods for readily extracting valuable information from the records.

Accidents may be more numerous in operating some machines than in operating other types. Certain unsafe practices may cause more injuries than do others. Similar accidents may occur frequently but at widely separated locations, so that the high incidence of similar accidents is not apparent. Accidents happen under such widely different circumstances that it is easy to understand why attempts to analyze, classify and code facts about accidents have been generally unsatisfactory.

Old and New Methods

A typical early analysis produced findings such as: 25 per cent of all injuries occurred in handling objects; 10 per cent were falls to the same level; and 9 per cent were vehicular accidents. While these findings had some general value, they were too vague and disconnected to suggest practical corrective measures.

Contrast this information with the usefulness of the type which is available today. The details of 29,000 accidents reported by shipyards during the first six months of 1943 are available for an illustration. Let's take the experience of the entire industry as typical for one shipyard. The principal cause of accidents

was poor housekeeping; 16 per cent of all accidents were chargeable to this cause. This fact definitely indicates the most important corrective step that must be taken to reduce injuries, the one that offers the biggest opportunity for improving the record based on actual experience.

Failure to wear impact goggles caused 9 per cent of the injuries and was the second largest problem. Eye cases must also be reduced to achieve improvement. Current methods enable the safety engineer to put his finger on the sources of eye cases due to this specific cause and thus attack the trouble where his efforts will do the most good.

And so on down the list of 15 major causes that were involved in 60 per cent of all injuries.

American Standards Code

The principal flaw in early attempts to obtain practical information from records was insufficient knowledge about the factors involved in the occurrence of accidents. Especially, failure to break down an accident into its component parts and to understand how these parts fit together to produce an accident. This fundamental oversight was corrected by the Committee of the American Standards Association on Accident Causes of which Mr. Heinrich was chairman.

The Committee's work is summarized in the American Standards Code, "The American Standard Method of Compiling Industrial Injury Causes." The committee separated and identified five fundamental accident factors: (1) the agency; (2) the unsafe mechanical or physical condition; (3) the type of accident; (4) the unsafe act; and (5) the unsafe personal factor. The committee pointed out the relationship of these factors in the occurrence of an injury.

The agency is defined as the tool, machine, or other equipment or material involved in the accident. If two or more agencies were involved, the defective, unguarded, or otherwise unsafe agency is named. Note that the choice of any agency is on the basis of closest association with the accident and not the injury. Typical agencies are punch presses, rip

saws, sledge hammers, freight elevators, overhead traveling cranes, belt conveyors, chlorine, and other substances and equipment.

The unsafe condition of the selected agency is the unsafe mechanical feature of the equipment: harmful substance used in the process; hazardous method of performing the work; or unsafe surrounding physical condition. No guards; worn, cracked, broken, rough, slippery, weak, and other unsafe parts of equipment; unsafe methods of piling and storing; insufficient aisle space; insufficient light and ventilation; lack of goggles and other protective equipment are some of the unsafe conditions.

The accident type is the manner of contact of the injured person with the object or substance; or the exposure; or the movement of the injured person which resulted in the injury. Employees are often injured by striking against objects and equipment; being struck by falling or flying objects; caught in or between moving parts of machinery; falls, on the same level, or from one level to another.

The unsafe act is usually a violation of a commonly accepted safe procedure; but it may have been an accepted procedure, until the accident demonstrated its danger. The unsafe act generally precipitates the event leading to the accident. A typical example is making an adjustment near moving parts of a machine without first stopping it. The accident, getting the fingers caught between the moving parts, follows and the injury occurs almost simultaneously.

The unsafe personal factor is the mental or bodily characteristic which permits or occasions the unsafe act, such as: willful choice of wrong method; failure to remember or understand instruction in safe practices; haste, lack of knowledge or skill, poor eyesight, pre-existing hernia and other bodily defects.

Frame Work For Analysis

The code principles provide the frame work for accident analysis. Some code items, however, are necessarily general and therefore only indicative. *Specific* unsafe conditions and *specific* unsafe acts, particularly, must be named in applying

the code to obtain the most useful information. For example, the code lists as one unsafe act, "using the hands instead of tools." If such listings are taken literally and unsafe acts are expressed in such general terms, the safety engineer, the foreman, and the men fail to get specific and understandable information.

Suppose an analysis disclosed that more accidents happened in operating drill presses than in operating other types of machines in a shop. The safety engineer has identified one of the major sources of machinery accidents. However, he followed the literal language of the code and he notes that using the hands instead of tools is the outstanding cause or unsafe act. This general statement will not be meaningful to a foreman who may be particularly requested to observe and correct this unsafe practice. If the safety engineer talks injuries due to using the hands instead of tools at a shop safety meeting, the men will get only a vague idea of the principal unsafe practice in operating drill presses. He may even get the idea that a tool should be designed to fit the drill handle. But no one is in doubt if the safety engineer points out that most accidents on drill presses were due to using the hands to hold work, instead of clamping it to the table, and to using the hands, instead of a brush, for removing chips.

I have particularly emphasized the principles of the code and the need for selecting specific factors, because this information is fundamental for getting useful facts from records for effective safety work. There are other supplementary items of value in getting accident control information from records; such as the occupation of the injured employee, sex, length of time on the job and the immediate job or duty performed at the time of the injury. These are often standard items on accident report forms.

Essential Features of Report Form

The report of an accident is so important that I want to mention briefly a few of the essential features of report forms. Fundamentally, a good report form is easily understood and provides the essential information with a minimum of

work. Two types of report forms are often used for obtaining basic facts about an injury; the first-aid report for every injury and the supervisor's report. These forms provide for a case number, date, name of the injured, occupation, check number, department, male, female, name of foreman, nature of the injury, date of first treatment; all of which may be useful in making an analysis.

A particularly important item on a first aid report form is the disposition of the case; whether the employee was sent back to work, to the doctor, home, or hospital and the doctor's opinion of the number of days of disability. This information is useful in classifying injuries and computing injury rates. The American Standards Code on compiling industrial injury rates provides that the doctor shall decide whether it is impossible for the injured employee to return to work on the day following the day of the injury and, therefore, whether the case is chargeable as lost-time injury. Therefore, the doctor should be informed about the standard method of classifying injuries and his opinion should be readily available to the safety engineer.

The first aid attendant or nurse should also be trained in the fundamental principles of accident analysis and investigation, so that a brief, concise statement about the circumstances and causes of an injury can be included on the first aid form and provide the safety engineer with useful facts about minor injuries.

The safety engineer and the injured worker's foreman receive copies of the first aid report. The supervisor is usually required to make a report for each case requiring the attention of a doctor, three or more treatments, or some other measure of severity.

A simple listing of questions and statements designed to bring out the essential facts about the accident has produced good results, especially, after the form has been explained and discussed at supervisor's meeting. The time required to teach supervisors how to analyze an accident has produced good results, especially after the form has been explained and discussed at supervisor's meeting. The time required to teach supervisors how to analyze an accident and to make com-

plete and unbiased reports, is a good investment.

A good supervisor's form calls for information on how the accident could have been prevented. How can a foreman fill out items intelligently unless he knows how to take an accident apart and find out what makes it tick? The completeness and accuracy of the entire record system and the conclusion determined from an analysis depend on full and unbiased facts transmitted in individual reports. A foreman also must have an insight into how accidents happen to discharge intelligently all of his duties as the key man in preventing injuries.

Making Analysis of Experience

Now, suppose we have our reporting system working satisfactorily. How do we go about making an analysis of our experience? Mechanical tabulating methods may be used by large organizations and hand tabulation by small ones. But, in either case, an analysis by hand methods is valuable for developing detailed codes for the primary and supplementary accident factors.

The first step, generally, is to identify and locate the principal accident sources and problems. The agency in each accident is selected and designated on the report, by name or by code; then reports are sorted by agency. Next reports are sorted by department or occupation. The number of accidents involving each agency in each department is entered on a sheet which lists each type of agency in the left-hand column and departments or occupations across the top of the form. The agencies are listed on the basis of selections entered on the reports. The tabulation shows the safety engineer which machines, tools, and materials, in a department or used by various occupations, are most frequently involved in accidents, and, therefore, where most safety effort must be directed. He has located the sources and evaluated them.

The next step is to analyze circumstances of the accidents involving each agency for unsafe practices and conditions. This is done simply by listing each specific cause on a sheet of paper and making a tally mark after each repetition

of the same unsafe practice or condition. This will reveal the causes that have given the most attention to achieve the largest reductions in accidents.

Most Important Safety Problems

Let's take a concrete example to illustrate. Numerically, the biggest safety problem in American industry is the prevention of accidents in lifting, carrying and otherwise handling materials and objects. The fact is that one-fourth of all industrial injuries occur in doing such work. The problem has not received the publicity, research and attention that it deserves.

Unsafe practices and methods in handling materials were outstanding causes of accidents in all plant experience analyzed to date. Lifting and otherwise handling steel plate and pipe and other materials was easily the principal accident problem in four or five and an important problem in other departments in a certain plant. Most accidents involved loose or poor grip; placing the hands near pinch points and not observing clearances of the hands in narrow places; insufficient help; not using mechanical handling equipment; and lack of safety shoes. If past experience means anything, unsafe practices in handling these materials will continue to result in numerous accidents unless corrective measures are taken.

Education is principally indicated for eliminating these causes. The facts certainly warrant plenty of discussion at safety meetings. The foremen can use the information advantageously to concentrate on correcting at least the principal unsafe practices. A vigorous safety shoe campaign in the department is certainly in order.

The problems in departments and occupation of this plant differed greatly and, therefore, the corrective measures must be adapted to the special needs of each. The outstanding problems involving welders, in order of importance, were failure to wear impact goggles; lack of ear protection; lack of leather pants and jackets; inadequate shoe protection against foot burns and failure to wear welders' gloves. Here we have a combination of the need for education in using personal protective

equipment and arrangements for additional equipment of this kind.

Hammer accidents were a major problem in one shop and one-third of the total for the entire plant. The analysis disclosed that part of the remedy was in better inspection and maintenance of hammers but that most accidents were due to unsafe practices. Further investigation showed that newly employed women should be particularly informed about safe practices in using this tool.

Classification of Preventive Problem

These few examples in the experience of this plant serve to point out the practical type of information which can be obtained by the application of present analysis methods to plant experience. After some analyses, opinions and guesses about problems and remedies had to be sharply revised. Conditions that resulted in frequent injuries had been overlooked. The large proportion of accidents due to some unsafe practices were not realized. The whole problem of what had to be done became clearer.

The same procedures can be applied to determining the major problems of an industry, so that the combined knowledge and experience of safety men in the industry can be brought to bear on the problems and the best solutions found.

Let's examine the injury rate of some industries. The average rates, of course, reflect the general experience of the companies in the industry. We find that some have high frequency rates and low severity rates and that others have low frequency rates and high severity rates. I want to direct particular attention to the industries having very low frequency rates and relatively high severity rates. In some instances, marked improvement has been made in reducing the frequency of injuries over a period of years but no corresponding improvement has been made in the severity rates. Why? We can take another step and learn that most of the improvement in the frequency rate was achieved by reducing temporary total disabilities, the least serious lost-time injuries. No noteworthy changes were made in the frequency and severity of serious cases. We are stymied at this point. We simply do not have the information about the circumstances and the causes of the serious injuries to put the finger on the major difficulties indicated by the accident rates.

The applications of new methods of analyzing accidents are still experimental. Results to date, however, are indications that a good record system will prove far more useful in the future than it has in the past for pointing the way to control accidents.

Analyzing the Accident Records and Using the Results For Manufacturing Industries

GEORGE F. NUERNBERGER

Supervisor, Health and Safety Division, Industrial Relations Department, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

In May, 1941, by action of the Board of Directors of our company, an industrial relations department was established with a vice president in charge. Prior to the establishment of industrial relations work as a separate department, it was handled as a part of the manufacturing department.

The building of a sound foundation for perpetual health and safety work required the development of a record and analysis

system. Therefore, first of all, the development of a reporting system was needed. This was developed along the following lines:

1. Compensation cases were considered and a reporting system was developed to handle these.
2. Lost time cases.
3. Cases requiring doctor's attention but not lost time.

4. Cases requiring only first aid.
5. A reporting and record system for the tabulation of accidents not resulting in injury.

As yet, we have not developed the latter system completely; however, progress is being made to record such information and I am sure you will all agree that it is necessary in a complete and sound record system.

Need For Analysis System

The information for the record system is all of very little use if not carried further. It is necessary to supply such information to top management and heads of the departments. They, then, can recognize the effectiveness of the safety program and also, determine whether the program is economically sound. However, it does not give adequate information to the Health and Safety Division which is useful and necessary to reduce accidents; therefore, an analysis system was desirable.

Recognizing this need in the early part of 1942, a thorough investigation program was organized to gather information useful for preventive work. From the reports prepared during this program, we, in cooperation with the National Safety Council's Statistical Division were able to develop a tabulation system of the unsafe practices occurring in our plant.

In the following slides I will give you a picture of the procedure used in tabulating this analysis work. We will use a typical accident as the basis for our procedure and follow it step by step through the analysis system.

Slide No. 1. This is an industrial injury report completed by our nurses in the hospital when an industrial accident resulting in injury occurs. You will note:

1. The man's name.
2. His occupation, "lathe operator."
3. The date, time, and department where accident occurred.
4. His foreman.
5. He has been employed for five years, seven months.
6. The nature of the injury is, "crushing injury to right great toe." The

nurse placed a comment in addition that he did not wear safety shoes.

7. The patient's statement to the nurse of cause of injury was, "I was placing a job in lathe, when job slipped from my hands and fell on my foot."

Copies of this form are sent to the man's foreman and to the Health and Safety Division. As soon as the foreman receives the report, he is to make out the Industrial Accident Report.

Accident Report

Slide No. 2. This is the Industrial Accident Report that was developed during the investigation program. You will note that some of the information contained on this form has already been gone over in the previous form. However, you will notice that we also request additional information from the foreman:

1. The age of the employee.
2. The shift on which he or she works.
3. Whether or not the accident occurred on overtime.
4. Length of service, not only with the company but, also, his length of service on the job from which he received injury. In this case, it was one year and four months.

Notice that the next steps in this form are outlined in a manner to make it easy for the foreman to follow these steps and ultimately reach the conclusions which will point to corrective action.

Each accident is charged against the type of machine, the type of hand tool, the working surface, etc., according to the American Standards Association Codes. They have been somewhat simplified, for our use, from actual experience in an analysis of our 1942 accidents.

Please note that the foreman has checked the general classification, "Machinery," and under type has placed, "lathe." He has also checked, "Handling materials." In this case, the latter check was not necessary; however, it is gratifying to note that the foreman recognized the injury came out of handling materials.

Next, we come to a tabulation of unsafe practices that occurred most frequently in our plant. A tabulation is made to promote thinking on the part of

the foreman. You will note that he has checked, "no safety shoes," "poor job housekeeping," "working in an awkward position," and has inserted an additional unsafe practice, that of, "loose grip."

Use of Report by Foreman

The foreman must again answer how the accident occurred; and, if he differs in any way from the patient's statement given to the nurse, he gives his own interpretation on this report.

The next question on the form that must be filled out by the foreman is of major importance to the foreman himself. Here the foreman has taken definite corrective action. The employee has been instructed in correct methods of handling materials and more space has been provided to carry on this operation. The employee has promised to purchase safety shoes and the foreman says that he will follow up on this promise.

He has also made some recommendations which are worthy of notice: "check material handling on similar jobs; put on good housekeeping campaign; use this accident as an example to sell safety shoes." These recommendations are not only for his use but for use by his superintendent and the Health and Safety Division.

The foreman signs this report and the original is sent to the Health and Safety Division. A copy is sent to the Superintendent, a copy goes to the employment Office, for recording on the employee's record, and a copy is retained in the foreman's file. Many of our foremen have found these copies useful and periodically check them over to see whether the same unsafe practices are recurring.

As soon as this report arrives in the office of the Health and Safety Division, the inspector who is in charge of this section of the shop reads the report and determines whether it contains sufficient information. If not, it is referred to a safety investigator. However, if there is sufficient information, he codes the report.

Monthly Analysis Sheet

Slide No. 3. This is the monthly analysis sheet of unsafe practices. There are three rectangles at the top of the page

in different colors, each color noting a particular shift. After the inspector has coded the Industrial Accident Report, he places the code on this analysis sheet. This is done daily as the reports enter the division.

Across the top of the page the various shop numbers are listed, with vertical columns set aside for each shop. The horizontal rows are numbered and represent the days of the month.

This sheet has a twofold purpose: it gives the inspector a daily, visual picture as to which unsafe practices are occurring most frequently in his particular section or group of shops and it is useful in compiling the monthly summaries.

To develop the summary of unsafe practices sheets, we analyzed each of the accidents which occurred in our plant last year. A cross-sectional survey of some 1,500 complete investigations was made. These formed the groundwork for the summary.

First, the Accident Analysis was sorted into groups, using the American Standards Association Code as a guide.

Each group was then taken individually and further broken down into specific classification. Each classification was sorted into specific unsafe practices.

Following this, we assigned code numbers to each of these items. The general classification, "Miscellaneous agencies," having the great number of cases, was assigned Roman numeral I; the general classification of, "Machinery," having the second greatest number of cases, was assigned Roman numeral II and so on, through these major groups. Next, the general classification of, "Miscellaneous agencies," was broken down and we found that, of all the specific agencies tabulated under, "Miscellaneous agencies," "Handling materials," was the most prevalent and, therefore, was assigned the code letter, "A."

In the, "Machinery," general classification, most of our injuries occurred on lathes; therefore, the code, "A," was assigned to, "Lathes." "B," was assigned to, "Drill Presses," "C," was assigned to, "Stationary Grinders," etc., each in the order of the frequency of accidents directly chargeable to them.

Breakdown of Causes

Information is gathered on a three months' basis for this tabulation, because it takes, approximately, three months to have sufficient data from which to draw conclusions. In the period January through March, we have recorded 10 million manhours of exposure. The total number of cases analyzed was 500. Under, "Miscellaneous agencies," we find, "A," the, "handling of materials by hand," since this accounted for the greatest percentage of cases. In this group, we find the most prevalent specific unsafe practice to be, "loose grip in lifting, carrying, rolling, turning over, and placing materials." Therefore, it is assigned Code No. 1. The second most prevalent is, "failure to place hands to avoid pinching, observe clearances in lifting and carrying." This is assigned Code No. 2.

The lack of wearing safety shoes has changed from No. 3 to No. 5. Here we can definitely measure the effectiveness of our safety shoe campaign as carried on with wide publicity throughout the plant last year. However, it is still not down to the point that would be desirable.

The next three months' period, as recorded on this form, is shown in the next three columns. One additional point that can be brought out in this form is that male and female cases are tabulated in different colors, so that they may be analyzed separately.

Slide No. 5 This is another sheet of the Summary of Unsafe Practices. Here we see Roman numeral II, "Machinery," and the subtitle, "A," lathes, on which machine injuries occur most frequently in our plant. The unsafe practices under lathes that are most prevalent are:

1. The lack of wearing suitable eye protection.
2. Not fitting the wrench securely.
3. Lifting, gripping improperly.

We are interested in making our information as specific as possible, so that we can tell a lathe foreman that the third most prevalent unsafe practice in running lathes is that of, "lifting and gripping improperly." The foreman then knows which unsafe practices are most prevalent and require his corrective action.

Other Methods of Using Analyses

This is just one phase of the use of the results of this analysis. We must also, in some way, get this information to the superintendent. The method that has been adopted, at the present time, is through periodic letters to the various superintendents in charge of sections or groups of our shops. These letters include a general resume of the frequency and severity rates in their particular divisions. Following that, the most prevalent specific unsafe practices are tabulated in this letter; and his cooperation is requested in informing all of his foremen of the need for corrective action on these items. Periodic conferences are also held with individual superintendents and the most prevalent unsafe practices are often used as a basis for these conferences.

I have already covered, fairly well, the use of information derived from this analysis at the foreman level. At the employee safety committeeman's level, its use would be somewhat similar; educating the safety committeeman in the safe practices, to combat the most prevalent unsafe practices.

Finally, to be completely effective, this information gathered from the analysis must be used at the employee's level, not only through the superintendent, foreman, and safety committeeman but, in some manner, directly from the Health and Safety Division itself.

Use By Health & Safety Division

This is being done in two phases. The first phase the safety inspector uses in making job procedure inspections. For example, when the inspector is making job procedure inspections in a department where there are many lathes, he can be alert for the most prevalent unsafe practices as shown by the statistical analysis.

The second phase of the use of the analysis system is that of education. We are using it in our new employee lecture period. It can also be used for departmental meetings of employees, making the keynote of the safety talk one or two specific unsafe practices that are most prevalent.

In educational work, publications can

also be developed centering around the most prevalent unsafe practices. Material such as this is mailed directly into the employees' homes. In this manner, the employee is exposed to small doses of safety education in a manner which is enjoyable as well as educational.

I believe it is evident that from this

analysis procedure we not only find out exactly what is causing our accidents, but also build a firm foundation for corrective measures. Most important of all, the analysis system gives us a step-by-step check on just how effective each phase of our program is in eliminating the major cause of industrial accidents.

Analyzing the Accident Records and Using the Results For Construction Industry

By MAJOR R. F. ALEXANDER

Corps of Engineers, War Department, Washington, D. C.

The accident reports required in the Corps of Engineers provide the optimum in accident data. It is important to note, that it is not necessary to require a lot of report forms. A few forms, carefully designed, will give all of the information necessary to administer any accident program. In addition, better cooperation and more accurate reports will result when the reports are held to a minimum.

All of the necessary control and operating information for the Corps of Engineers accident prevention program is obtained from just three reports:

First, an individual occupational injury report.

Second, a monthly injury summary report of exposure, accidents and days lost.

Third, a report of Safety activities.

The individual occupational injury report is an adaptation of that used in the Standard Industrial Injury Reporting System, based on the American Standards Association cause code and recommended by the National Safety Council. The only major change that we have incorporated in the form to fit it to our specific program, is a statement regarding the action of the Supervisor, both prior to and during the accident, an expansion of the section on unsafe practices, and a statement which enables us to tie up the accident with our "Safety Requirements." One of these reports is submitted for each lost time injury and gives all of the pertinent facts and information surrounding the accident.

These reports are submitted with the Monthly Summary Report to verify the injuries reported on the monthly summary, and as the source of information for making special analytical studies and various other reports.

The monthly summary report shows by occupational groups:

- a. The number of man-hours worked.
- b. The number of fatalities and the total number of lost-time injuries, as well as a list of the injured workers showing date of injury, date started losing time and date of return to duty.
- c. The number of days lost during the month resulting from both lost-time accidents in the current month and lost-time accidents in previous months.
- d. The monthly frequency and severity rates.

In addition, the report indicates whether the workers are employed directly by the Government, or whether they are employed by private contractors working on Government contracts. The report also shows the exact type of construction operation, i.e., whether the employees are building locks, dams, airfields, ordnance plants, etc.

The third report is a report of the activities of the Safety Engineers operating in the field. This report, submitted semi-monthly, advises our office of hazardous conditions existing in the field and what steps have been taken to eliminate them. In addition, these reports indicate the de-

gree of compliance with the "Safety Requirements" and reveal additional practices and procedures which should be included in the code.

Use of Information

In addition to having records, you've got to use them. In general, the information may be used in two ways, viz., for general control of the program and for preventing the recurrence of specific accidents. These analyses of the data collected show, first, how many accidents are happening and where they are happening; and second, why and how they are happening and what to do to correct them.

Control figures include frequency and severity rates, and man-hours worked. These may be broken down to show the experience by different departments, or sections. In our case, we show the experience by projects, districts and divisions for both government and contractors' employees. In addition, we show the experience by different types of work and by different occupational groups. These figures enable us to tell promptly of rate changes and trends. We can compare divisions and districts and projects with one another, and with the average for all of them; we can compare the experience for the same district or division or project from month to month. If the rates start getting out of line we can tell the exact divisions, districts and projects responsible, and we can tell soon enough to do something about it before a situation becomes chronic.

The report of Safety Engineer activities affords control over field personnel by indicating the action that has been taken on the recommendations to maintain safe working conditions on the jobs and to effect compliance with the "Safety Requirements" code.

Regardless of whether accident rates get better or worse, research work and accident analysis should be a regular part of every safety organization's functions. Control figures will tell when your experience is getting out of bounds and, in general, they will identify the area of trouble, but this is the extent of their usefulness. Without more definite information regarding

the type of accidents, their causes, the agencies involved and other positive facts, the only tool that you have at your command is moral suasion; but, a loud voice and a threatening manner won't stop accidents.

The Safety Engineer who tells an inspector or foreman to reduce accidents without telling him specifically what to do and how to do it is only passing the buck—passing his job on to someone else. And the safety organization that tells its Safety Engineers to reduce accidents without giving them specific help in this respect is guilty of the same charge and is certainly shirking one of its most important and responsible duties. Analyzing mass data and furnishing operating information to field units and supervisory personnel is one of the primary functions of a central safety organization.

Classification and Analysis

The information that we obtain from the records and make available to field personnel to aid them in controlling accidents include: simple classification, cross classification, and special studies. The simple classification is merely a frequency distribution analysis showing, for example, the total number of accidents, classified by occupation, by age of injured, time of day in which the accident occurred, unsafe conditions, unsafe acts, agency of the accident, and others. This type of analysis provides helpful information, but being general in nature, its application is limited. By knowing the unsafe practices that result in accidents, and by eliminating these unsafe practices, accidents can be reduced, but if it were known, in addition, which workers were committing the unsafe practices, the efforts of the Safety Engineer would be much more effective by enabling him to go right to the particular groups of workers.

A cross classification can be used to give this information. In addition, cross classifications can be made, showing by occupation groups the type of accident resulting, the number of weeks that the workers had been employed on the job, the agency causing the accidents, and others. Each agency can be cross classified to show the

type of accident resulting, unsafe conditions of the agency, and unsafe method of handling the agency. Although still general in nature, cross classification advances the refinement of the problem. Whereas a simple classification merely reveals the unsafe practices which result in lost time injuries, a cross classification will reveal by occupations, who is committing the unsafe practices.

To be more specific, suppose an analysis of injuries by unsafe practices shows that 10 per cent of all accidents are caused by a failure to use safety devices. A cross classification may be used to show which occupation groups failed to use safety devices. This unsafe practice might be of no consequence with one class of workers, but may be a very significant cause of accidents by another. This refinement of the problem assists in directing preventive effort toward the source of the trouble.

Methods and Equipment

The most important element of control figures is promptness of release. To be useful and to have maximum effectiveness the data must be compiled and the results be made available as soon as possible following the period to which the data apply. Every month we process approximately 1500 individual summary reports, but by reducing most of the work to machine operations we have the data ready for use in just a little over two weeks after the reports get to our office.

The monthly summary reports reach our office, with the individual injury reports attached. For every injury shown on the summary report there will be attached an individual injury report. This permits exact verification of each injury, provides a check on the accuracy of days lost and on time charges, and insures that the accident is charged to the month in which it occurred. Accuracy is of the utmost importance in any accident reporting system and every possible check must be employed to be certain that the reports received and the records derived therefrom represent the true experience. After the reports are checked, the summarized information for each station is posted on a card in a visual record file. For each

station a separate card is maintained which is designed to accommodate a whole year's experience, as well as a summary of the previous year's experience. This card shows current and cumulative figures for man-hours worked; total injuries, divided into fatal, permanent partial, and other; days lost, and frequency and severity rates. The entire experience of any job is thus available on a moment's notice.

After the accuracy of the reports has been assured and they have been posted to the cards in the visual record file, the information is punched on IBM cards, a separate card being punched for each occupation on the report. Once the information is transferred to punched cards it is a simple matter to obtain the various tabulations necessary for control.

Records of Corrective Measures

The field reports of the safety engineers which are submitted to us semi-monthly, and in some cases monthly, list the unsafe conditions or practices that were found existing at a particular location and the action that was taken to correct them.

There are several reasons for some control of these activities from a central office. Eliminating hazards is one of the most important components of an accident prevention program and steps must be taken, therefore, to insure that the proper amount of time and effort is expended in this direction. In addition, the effect of such work is increased many fold when the perspective of each safety engineer is augmented by the experience of all of the others.

In our central office these reports are carefully reviewed to find out the degree of compliance with our "Safety Requirement" code. In addition, pending recommendations are followed very closely, especially when a recommendation remains pending for several weeks. In these cases, action is taken from our office demanding a satisfactory disposition of the recommendation. In some instances recommendations are made to eliminate hazards which are not listed in our "Safety Requirements." If certain of these conditions occur often enough they are studied with a view toward incorporating them into the code.

These reports are used to control the activities of the safety engineers in still another way by correlating the recommendations made with the accidents that have occurred. The information on the reports is punched on IBM cards, and periodically a tabulation is made showing the number of recommendations that have been made on each job and the specific hazards that were covered. For the same period, all injuries are tabulated, too, showing the number that have occurred on each job and the specific hazards which resulted in the accidents. By correlating these two reports, then, it can be determined whether or not the safety engineer is covering those hazards which are causing the accidents.

All of the pertinent facts pertaining to the injuries are reduced to code numbers, and this information is punched on a card, one card being punched for each lost time injury. These cards can be sorted and counted at the rate of 400 per minute; 24,000 injuries can be classified in an hour. Simple classifications and cross classifications like those described earlier can be gotten quickly and accurately.

Advance Planning

Information obtained from such mass data is used in advance planning and eliminates the necessity of waiting until a project has suffered a large number of accidents before knowing what accident prevention measures must be taken. Studies have revealed that, in general, accidents occur in the same way and by the same causes on jobs reporting small monthly exposure as they do on jobs with large monthly exposure, the only difference being that it takes longer to accumulate the experience on the smaller jobs. Mass data indicate what the accident experience will be on the job as the job progresses.

The accident experience for the Corps of Engineers for 1942 revealed that in more than half of the accidents there were such hazardous arrangements as overloading of platforms, scaffolds, equipment, etc.; accumulation of debris creating falling and tripping hazards, and foot injuries due to nails; congestion of

workers; and unsafely stored or piled materials. These conditions were contributing factors in one out of every two accidents, and on an average they will continue to be so in one out of every two accidents on any job.

Take a job that has had no accidents to date. Must the supervisor on this job wait until he has had several accidents before knowing what preventive measures must be taken? The answer is definitely, "No." The experience of hundreds of other jobs has conclusively indicated that it is a fifty-fifty chance that the first accident on this job, as well as one out of every two accidents, will result from hazardous conditions like those just described. The supervisor on this job can take immediate, positive action, based on experience as valid and reliable as if he had had thousands of accidents on his own job, instead of none at all. By eliminating the hazardous conditions already present and others as fast as they arise, he need never have his "first" accident due to this cause.

In similar manner, this experience indicates that one out of every six accidents resulted from the use of defective or improper agencies—poorly constructed scaffolds, broken, worn or defective equipment, etc.; one out of every ten accidents resulted from failure to wear protective devices—goggles, gloves, safety shoes, etc.; one out of every twenty accidents resulted from improper guarding.

The principal unsafe practices of employees which contributed to accidents were improper and unsafe methods of handling materials, distracted attention and deliberate chance taking, such as jumping from one level to another instead of using steps or ladders that were provided. Failure to use safety devices caused one out of every twelve accidents. Using defective tools and equipment, failing to report unsafe conditions, and operating at unsafe speeds were the next most serious unsafe practices.

Regarding the agency of the accident, in 31 per cent of the cases mechanical equipment was involved, chief among which were hand tools, motor vehicles, and general construction equipment. Wood and metal materials were the

non-mechanical agencies most often involved, the majority of the accidents occurring in handling these materials. Elements, such as ice, water, sun, lightning, caused 8 per cent of all injuries, as did working surfaces—scaffolds, ramps, runways, work benches, etc.

One important phase of accident prevention work which has received too little attention in the past has been that of supervision. Our bulk analysis revealed that in 40 per cent of the cases a supervisor was at the scene directing operations when the accident occurred. Even while on the job a supervisor is not infallible and some accidents might be expected to happen, but when two out of every five accidents happen with the supervisor right on the scene, this certainly indicates that considerably more attention and more instruction must be given to this class of personnel regarding safe operating practices. In 73 per cent of all cases supervision failure was indicated, most important of which were failure to enforce safety regulations, failure to inspect for hazards, and giving insufficient instructions or training.

Preparing Special Studies

In making special studies, a little different approach must be used. To be most effective, each study should be confined to a particular problem. If it is desired, for example, to effect a reduction in frequency or severity rates, your effort should be concentrated on the one or two really serious causes of accidents.

We are seriously concerned at the failure of our severity rate to decrease in line with expectations. Comparing 1942 with 1941, our frequency rate had decreased 39 per cent, during which time a decrease of only 11 per cent was shown in our severity rate. This fact indicated that the less serious accidents are being reduced while little improvement is being shown in the more serious accidents. In order to reduce the serious accidents, it is necessary to know which were the serious accidents, and also to know something about them.

A preliminary study showed that accidents involving equipment accounted for

42 per cent of the lost-time from all accidents. Motor vehicles and general construction equipment, although comprising less than half of all the equipment accidents, were responsible for 87 per cent of all lost time from equipment accidents. These were the serious accidents which had to be reduced.

In making a special study, the first thing we do is to use our punched cards and find out as much as we can from our bulk data. In this case, we started out with 36,000 cards representing all the lost time injuries reported to us in 1942, and divided these into two groups—those in which mechanical equipment was involved and those in which mechanical equipment was not involved. After making this separation, we found out what percentage of the days lost resulted from each group. The result of this first part of our analysis showed that mechanical equipment was involved in 30 per cent of all accidents and accounted for 42 per cent of all days lost.

From this point on we worked with our equipment accidents only, grouping these cases according to types of equipment such as general construction equipment, which includes tractor, graders, power shovels, bulldozers, and similar equipment; motor vehicles, hand tools, shop machinery, etc. Then we took each one of these groups and tabulated the days lost resulting from the accidents to find out which type of equipment accidents were most severe. This revealed that two groups of equipment, general construction equipment and motor vehicles, were responsible for accidents which totaled 87 per cent of the lost time from all equipment accidents, although representing only 47 per cent of the accidents. Of these two groups, general construction equipment accounted for 52 per cent of the days lost and motor vehicles 34 per cent.

Notice how we used our punch cards to get right down to the source of our severe accidents—how we isolated our problem—another application of the principle of divide and conquer. We started out with more than 36,000 cases, and out of this we got two groups; general construction equipment accidents, totalling

about 2700 cases and motor vehicle accidents, totalling about 2400. A special analysis was then made of each of these two groups.

Using the motor vehicle analysis as an example, in beginning the study we used our cards again to glean as much information as we could from this source. This included such data as: motion of the vehicle—was it going forward, backward or was it stationary; time of day in which the accidents happened; occupation of the injured persons; what were these persons doing when injured; unsafe conditions; unsafe practices engaged in; the number of accidents which resulted from violating our "Safety Requirements" and others. We also made a monthly breakdown to show whether the percentage of motor vehicle accidents was increasing or decreasing, and whether the season of the year affected the number of accidents.

These classifications serve a double purpose: first, the information can be used to indicate general trends and conditions, and second, it acts as a guide in making the detailed analysis of the individual reports, which is the next step.

In making the detailed analysis, we go right down to the individual injury reports. We needed all of the information that we could get now; so we had to use the reports that contain this information. The reports were first separated into driving and non-driving cases, and then each was grouped according to the outstanding causes. Non-driving accidents accounted for 68 per cent of the total, and the principal causes of these accidents were found to be: riding on trucks; getting on and off trucks; loading and unloading; repair and maintenance; and others. After separating the reports into these groups, each group was studied carefully to find out everything about that particular cause.

After completely analyzing the non-driving accidents and making a written report of the findings, we studied the driving accidents which accounted for 32 per cent of all motor vehicle accidents. Here, we found the principal causes to be: backing without signalling, and other violations of good driving; holes, bumps, and other

road conditions; walking on wrong side of road and other violations of safe walking practices; and defective brakes, lights, etc. It must be pointed out that the cause groups set up will depend upon the particular study that is being made. What these will be in any particular situation cannot be stated in advance—these will develop as the study progresses.

Application of Special Studies

In preparing the report, it is helpful to use actual cases in describing and illustrating important points. In addition, the use of cases tends to personalize the study, as well as to make it more interesting and lend authenticity to conclusions. In completing the study it is important to state specific action that should be taken to prevent recurrence of the accident. Indicate exactly what should be done, how it should be done and who should do it. Leave no alternative but to apply the findings of the analysis, and then follow through to see that the recommendations or orders are put into effect.

Another application of special studies is to facilitate the planning of operations on future work so as to eliminate the hazards and unsafe practices which have caused accidents on previous jobs of similar type.

An example of this application of records is a "Study of Occupational Injuries in Igloo Construction" prepared last year, after the construction of several of these projects revealed that the work was extremely hazardous. Igloos are a peculiar type of ammunition storage structure, the exact description of which we need not discuss, but the important point is that it was a kind of construction and presented hazards which were different from those encountered in previous types of construction.

As a result of the study, certain very significant facts were revealed regarding these accidents, facts which were promptly translated into suggestions for safe operation, and in some cases into specific rules and regulations. Every igloo construction project in the country was quickly supplied with copies of this study. Every Safety Engineer, supervisor and foreman on these jobs soon knew what unsafe practices and

conditions were causing accidents. Not only were they informed as to what accidents were occurring most often, but they were told, too, who was getting hurt, exactly what duties these workers were performing when they got hurt, and the specific steps that had to be taken to prevent recurrence.

This information was not only disseminated to safety personnel on jobs already under construction, but it was sent also to safety personnel and supervisors of work that was still in the planning stage. Thus, safe practices were incorporated right into the job itself—before the work was even started. The necessary safety equipment was provided. Instead of simply instructing workers to erect forms, for example, they were instructed in the safe way to erect the forms. Safe methods of operation became an integral part of the job.

Notice how records were used to combat this problem. First, the control figures revealed a type of operation that was causing a great number of accidents. After thus isolating the problem, an analysis of the records revealed specific facts and in-

formation and permitted the application of definite methods of overcoming the difficulty. Factual information was derived from well designed reports which permitted positive result-getting action to be taken.

It is not a result of chance that the Corps of Engineers has the lowest accident rates in the history of the construction industry—it is not a result of chance that the trend of accident frequency and severity rates has consistently declined since the inception of the accident prevention program in the Corps of Engineers.

A sound accident prevention program must include many phases and operations, and it is impossible to say that one part is more important than another, but there can be no doubt that a program is no better than the records that are obtained and the use that is made of them. Our approach to the problem is a scientific one based on facts and information obtained from a well devised system of reports and records. The results of our program offer substantial proof as to the merits of this approach.

Army Session

WEDNESDAY AFTERNOON

October 6, 1943

Presiding: MAJOR GENERAL HENRY S. AURAND, Commanding General, Sixth Service Command, Chicago.

The Keynote of the Army Session

Major General Allen W. Gullion, The Provost Marshal General, to whose supervision the Army safety program is charged, sounded the keynote of the session with the following remarks:

"This is the first all-Army session to be held at a National Safety Congress.

"We are, at the outset, confronted by a paradox: our Army is created primarily for destroying the military power of the enemy. Yet it is simultaneously carrying on the most intensive program for conserving human life ever undertaken by any agency. Today, therefore, we are to tell you of the comprehensive steps taken by the Army to maintain health and to protect those on the fighting and the home front, from the needless death, the dis-

abling injury, which in their incredible totals threaten the success of the entire war strategy.

"The Army's interest is a realistic one. Men to work and to fight must be protected from purposeless destruction. Wherever men work, whether it is abroad in the theaters of operation or here at home, they must be carefully safeguarded. To do this, every device, every plan, every program to conserve our human and material resources is used. The cooperation of every civilian agency, with similar interest, is eagerly sought and highly valued. We want you to feel as a result of this Congress that the Army, your Army, is leaving nothing undone to win this war and win it with the least possible loss in the lives of our people."

Introduction

MAJOR GENERAL HENRY S. AURAND
Commanding General, Sixth Service Command, Chicago

Under the Chief of Staff, the Army is organized in three major components, the Army Ground Forces, the Army Air Forces, and the Army Service Forces. All three forces see to it that every piece of machinery is designed and built with a view to eliminating every possible risk of accident, and that in every hazardous operation, whether in training, in battle, or in the manufacturing plant, men are trained and supervised to avoid unsafe acts and unwarranted risks.

Yes, safety in the Army and in industry is a big undertaking. It is only when we pause to consider the size of the Army itself, and the numbers of civilians em-

ployed by the War Department, that we truly begin to appreciate the magnitude and importance of the Army's Safety Program.

Our Army is a tough school. The training is hard, the weapons are lethal, many of the duties are highly dangerous. By comparison, few industries offer such dangerous day-to-day hazards. But despite the hazards in the serious business of preparing our soldiers for combat, both accidental deaths and accidental injuries in our Army, per 1,000 persons per year, were actually fewer in 1942 than in 1941, and were only slightly higher in frequency than similar casualties among in-

dustrial workers. When we consider that the soldier is often on duty twenty-four hours a day, as compared with the industrial worker's work week of forty-five or fifty hours, perhaps the Army has a better record after all, man-hour for man-hour of exposure, than that among civilian industrial workers.

Last year, industrial accidents cost us 380,000,000 man-days, the equivalent of a full year's production of more than 1,-

250,000 workers. The Army estimates that lost time was enough to completely supply a fighting force comparable in size to the armies used in the invasion of Sicily. That work time is lost forever. Moreover, 45,000 of the worker casualties will never work again—they are dead.

The Army wants to preserve both the lives of its fighters and the lives of the workers who supply the Army.

Safety and Health on the Home Front

MAJOR GENERAL W. H. HARRISON

Chief of the Procurement and Distribution Service, Office of the Chief Signal Officer

At first thought it may seem a far cry from safety and health here at home to preventing avoidable casualties and keeping our soldiers in fighting shape in battle areas—where extremes of heat and cold are commonplace, where even the water supply may be swarming with deadly disease germs, and where violent death may be imposed upon our men at almost any moment. But the safety and physical well-being of our men on the fighting fronts, of our men undergoing their training at home, and of the men and women who produce the weapons and munitions and countless other supplies they must have, are linked together in one continuous chain. What affects one, affects all.

Chain of Safety for Fighting Men

The chain begins here at home. The first link is safe and healthful plant facilities and working conditions. The second link is adequate safety and health training and supervision of our war workers. The third link is building maximum safety into every piece of equipment, every weapon, intended for the use of our fighting forces. The fourth link is careful selection of our soldiers to insure their being physically and mentally fit. The fifth link is clothing, housing and feeding our soldiers so that their health and strength are kept at the peak, and giving them adequate medical, dental and surgical attention. The sixth link is military training—painsstaking education of our soldiers to handle hazardous equipment safely and to

protect themselves against every foreseeable danger.

Every possible safety defense against enemy action is drilled into the skull, muscles and bones of every American soldier. In addition, the individual soldier is provided with specialized equipment designed for his protection and safety.

When we stop to think of it, a gas mask is a safety device. So is "flash-proof" clothing. So is a steel helmet. So is the safety catch on every rifle. So is a mechanism on every artillery piece which does not permit the gun to be fired until the breech is locked. Every moment spent in training soldiers in the use of this equipment—and in taking advantage of natural and man-made protection when under enemy fire—promotes safety and conservation of manpower in one of the largest and most rapidly organized armies of the world, the Army of the United States.

War Department Programs

Your War Department is aggressively tackling the whole problem of safety. Every post, every airfield, every training camp, every depot, arsenal, port of embarkation and every plant with a war contract operates an aggressive accident prevention program. These programs are supervised and coordinated by The Provost Marshal General, acting for the Commanding General of the Army Service Forces.

In each of the service commands into

which the country has been divided geographically, there is a headquarters safety engineer and a staff of inspectors. These inspectors regularly visit thousands of vital war plants, conduct rigorous investigations and prepare reports for the attention of the service command safety engineers. When a report indicates that improvement in safety engineering, safety organization, or an intensification of the plant safety education program is needed, recommendations are prepared and assistance is given.

In carrying on this plant protection work, the help of many outside agencies and specialists is utilized. For example, in cases where occupational disease exposures are involved, the Office of The Surgeon General and the U. S. Public Health Service provide assistance. Among the other agencies which have rendered valuable help are the insurance companies, technical societies, State Labor Departments, The National Committee for the Conservation of Manpower in War Industries, the National Bureau for Industrial Protection, the National Conservation Bureau and the National Safety Council. Through our policy of seeking the best assistance available, through the splendid cooperation we have invariably received, the Army safety program is able to accomplish far greater results than would otherwise be possible, and with a far smaller safety engineering staff than would otherwise be necessary.

Training Schools Conducted

The Army is carrying on an intensive training program for Army plant safety inspectors. A training school for safety education at New York University is helping to turn out competent inspectors. A high proportion of these men already had excellent engineering and safety experience, and all are carefully selected for interest in safety, intelligence and initiative before being assigned to the Army safety schools. By using the best available candidates, by putting them through rigorous training, we are able to get good inspectors within time limits that would be impossible in peacetime.

To measure accurately accident prevention progress from month to month in Army-inspected war plants, a statistical

reporting system which utilizes a single simple report form has been set up. The American Society of Safety Engineers is helping greatly by influencing industrial operators to fill out these forms accurately and return them promptly to the service commands.

As a guide to Army inspectors and plant safety directors, the Army has prepared a minimum safety program for war plants. I am pleased to report that a great many of the plants we inspect are already doing more than is called for in our minimum standards.

The War Department Safety Council invites representatives of the Army, Navy and other governmental and civilian agencies to its meetings. Ideas are exchanged, progress reviewed, and plans for the future are outlined. The various agencies assume responsibility for specific phases of the overall program, thus preventing confusion and unnecessary duplication of effort.

Supply and Construction Safety

Time does not permit me to detail the safety program of even the Quartermaster Corps, for example, which includes accident prevention and health measures in every activity connected with the procurement, storage and distribution of countless items of equipment and supplies, the provision of lease-lease supplies, and the training of Quartermaster troops who are furnished to the Service Commands and the air and ground forces. But I can give an idea of the magnitude and success of that job. At a single warehousing installation operated by the Quartermaster Corps, more than four thousand civilian employees purchased safety shoes, using their own funds. That is convincing proof that we are getting the safety message across!

How about safety in the Corps of Engineers? Here is the biggest construction industry in the world, employing both civilian and military personnel and facilities. The safety - accident prevention branch is charged with "planning, organizing, and promulgating the necessary activities for the prevention of accidental injuries, disease and sickness, destruction and damage to equipment and materials, in connection with military construction,

river and harbor and flood control operations, civil works and operations . . ."

The Army engineers undertake to fulfill that order in typical engineering fashion. They believe in maintaining detailed records—in finding the facts and basing action on the findings. In construction operations, for example, three report forms are used—an individual occupational injury report; a monthly injury summary report of exposure, accidents, and days lost; and a report of safety engineer activities. These are processed, recommendations made, and on-the-spot action is taken immediately.

The engineers don't wait for accidents to happen. From the experience gained on hundreds of jobs, they spot accident potentialities on new jobs and take preventive measures. Take, for example, an application of the principle "forewarned is forearmed" as applied in the construction of a certain highly specialized storage structure we call an "igloo," a building used for the housing of ammunition. This was a new kind of construction, and there were many hazards with which we had had no experience. But from our knowledge of potential hazards, such as overloading of platforms, scaffolds, equipment, accumulation of debris which cause falling and tripping hazards, and unsafe storage of materials—factors which Army engineers have found contribute to one of every two construction accidents—many of the hazards were effectively overcome before work started. Others which showed up in the first few projects were quickly studied and a report on hazards peculiar to igloo construction was promptly prepared and rushed to every igloo construction project in the country. Thus every safety engineer, supervisor, and foreman on those jobs was provided, in a minimum of time, with a practical safety code for his own specialized operation.

Due to the safety program of the Corps of Engineers, accidents decreased in frequency thirty-nine per cent in 1942 as compared with 1941, and eleven per cent in severity. The good work is still going on. It is not due to chance that the Corps of Engineers has established the lowest accident rates in the history of the construction industry. It is the result of foresight, careful investigation of causes, prep-

aration of reports, maintenance of records, and prompt, decisive action when and where action is needed.

Chemical Warfare Service Activities

When we think of the materials and equipment produced and handled by the Chemical Warfare Service, we cannot help but think of safety. There is lethal significance in the mere mention of such items as incendiary materials, toxic gases, smoke, chemical weapons and munitions. The Army very specifically charges the Plant Protection, Safety and Labor Branch of the Chemical Warfare Service with safety "as it pertains to Chemical Warfare Service installations, manufacturing, storing or processing poisonous, incendiary, or irritant chemicals and explosives . . . including safety matters incident to the protection of employees of the Service and of employees in private facilities . . ."

Working with chemicals is a touchy business. In all its equipment, the Chemical Warfare Service has utilized the safest materials and design, and all personnel is required to follow detailed and precise safety procedures. Woe betide the employee who fails to report an injury promptly for treatment!

Every arsenal distributes safety rule books and other literature to employees. Safety films are shown. Safety training courses are conducted for foremen and supervisors. Where protective clothing is prescribed, the worker must wear that clothing or he is not permitted on his job.

Despite the very great hazards involved, the Chemical Warfare Service is doing a magnificent job in holding down accident frequency rates and severity.

Civilian Training by Signal Corps

In radio alone, the Signal Corps has trained more than fifty thousand civilians. At each of the many civilian installations, an intensive safety and health program is carried on. Key civilian personnel are required to take the ninety-six-hour safety course conducted by the National Committee for the Conservation of Manpower. From the Signal Corps' "Health and Safety Training Manual" they then teach a twenty-hour safety course to foremen and supervisors, who in turn teach all

workers. Every civilian employee is given a copy of the Signal Corps' "Safety and Health Regulations." Posters and other visual aids are used extensively. Safety and health rules for women employees, too, are published and distributed. Safety plays an important part in the training films produced by the Signal Corps and used by all branches of the Army.

I am pleased to report that, despite a huge increase in exposure, the Signal Corps has achieved a civilian personnel accident frequency reduction of about sixty per cent in 1943, as compared with 1942. The safety program is getting big results. I am assured that it will continue to get bigger and better results.

The Transportation Corps directs, coordinates, and supervises all transportation functions for the War Department, and operates the field installations pertaining to those functions. Let's see how safety is achieved at a particularly busy and hazardous location—a port of embarkation. Here, everything from sixty-five-ton tanks to block-busters is loaded aboardship for the ocean trip to combat areas. The work is hard, fast, often dangerous. But every port of embarkation has its accident prevention officer. He is a trained safety engineer. He conducts safety training courses for the foremen. Foremen are shown films like "The Know How of Handling Freight in Warehouses," and "The Know How of Stevedoring," which are produced at ports of embarkation. Foremen in turn filter safety information down to the workers. Rule booklets are distributed, such as "Rules for Tractor Drivers" and "Rules for Fork-Lift Operators." Posters and safety rules and slogans are prominently displayed, and the accident prevention officer is always on the job to detect unsafe conditions or practices and correct them.

This program is responsible for an accident frequency reduction at ports of embarkation from 29.4 in January of this year, to 19.3 in July—seven months! The reduction is still continuing.

Extent and Effectiveness of Work

Now let us look for a moment at total accomplishments—at the fact of tremendous achievement to which the service forces can and do point with pride. Man

hour for man hour of exposure, we are carrying on the biggest industrial safety and health program ever organized. In January, 1943, we received, processed, and acted on reports totalling 1,038,702,000 man-hours of exposure. In June, the total had risen to 1,518,363,000 man-hours. More than eight billion man-hours were reported in the first six months of this year. By the end of the year, the twenty-billion man-hour mark will have been exceeded. That is an astronomical figure. Let's translate it into understandable terms.

To accumulate that amount of exposure time, a plant employing ten thousand men would have to operate steadily for one thousand years!

How effective is our program in terms of accidents prevented? That is a difficult question to answer, since accidents prevented are intangible; only those that occur have reality. But there is one way of getting an answer—and it is a most effective way—by direct comparison.

In War Department operated facilities, the accident prevention section has real authority. Recommendations are put into effect—all of them, without delay. This is not always true of the civilian operated plants on the War Department's inspection list. Sometimes recommendations are followed in full, sometimes in part, and sometimes, unfortunately, they are almost completely ignored. So, if our safety work has value, that value should reveal itself in a lower frequency rate in War Department operated facilities than in civilian operated plants. That is exactly the case. In War Department operated facilities, the frequency rate right this minute is thirty per cent lower than in the War Department contract civilian operated plants.

This is proof that the Army safety program can and does get results. It is also an indication that many civilian operated plants can do better than they are doing now—much better! The Army is determined to improve its record. Industry must follow the Army's example with an intensified effort for war worker safety and health. Our acute manpower situation demands an all-out effort—an effort that must be continued and intensified all along the line until the enemy is completely and utterly beaten.

Health In Our Armed Services

MAJOR GENERAL NORMAN T. KIRK, The Surgeon General

The wounded soldier in this war has a much better chance of surviving than ever before. Deaths after treatment among the armed forces have averaged less than two and one-half per cent—the lowest rate in the history of warfare. Casualty lists are long; they will increase, but remember this: Our men are getting the best service that modern medicine can give them and its efficiency is proven by comparison with previous wars.

Primary Mission of Medical Department

The strategies, the tactics and employment of force may change, but the need for manpower to operate the weapons is the initial and final arbiter. The primary mission of the Medical Department is to conserve fighting strength.

Today, the wounded soldier is not brought back to the rear lines for initial treatment. Instead, medical aid and surgical units have been moved forward to the soldier. Treatment is available within the "golden six hours." Against shock, hemorrhage and infection, it is the first few hours that spell life or death for the battle-wounded.

The advances in medical techniques, perhaps, are more publicized but the high recovery rate of U. S. battle-wounded—97½ per cent—is equally due to the courage, speed and efficiency of medical officers and medical aid soldiers in the front lines. Paradoxically, the casualty rate within the Medical Department proper is today one of the highest of any branch of the services.

Approximately 117,000 officers and 500,000 highly-trained enlisted men serve with the several branches of the Medical Department—the Medical Corps, Dental Corps, Veterinary Corps, Nurse Corps, Sanitary Corps, Medical Administrative Corps, the Physical Therapy Aides and the Dietitians.

Our forces are fighting in climates ranging from tropical to arctic in character. There are corresponding variations in the disease picture. The incidence of battle and nonbattle injury also differs widely by reason of geography, terrain, composition

of forces, weather, equipment and tactical situations.

Industrial Medical Service

Industrial, that is, emergency medical service in Army owned plants, the hygienic control of working conditions, and the detection and prevention of occupational disease are a responsibility of the Medical Department. This responsibility is a direct one for Army operated plants, and an indirect one for contractor operated plants in that the Army does not provide personnel for the latter, but satisfies itself, through inspection and supervision, that medical service and working conditions are satisfactory.

The Surgeon General's Office, through the Occupational Hygiene Branch, administers the Army industrial medical program. This program is the expression of a major effort to conserve man hours of production and the lives and health of the Civil Service industrial workers in Army industrial plants. In its purpose and method of administration it differs in no essential principle from the similar functions in private industry. It strives to attain the same high degree of efficiency found in the best regulated industries and to conform to the ethical standards recognized and accepted in industrial medical and personnel administration.

The hygiene of working conditions, the presence of dusts, fumes, gases and toxic substances are controlled by surveys and inspections made by the technical personnel of the Army Industrial Hygiene Laboratory located in the School of Hygiene and Public Health, Johns Hopkins University, in Baltimore. This laboratory conducts periodic surveys and check-up inspections in Army operated plants. The Industrial Hygiene Division of the U. S. Public Health Service, acting for the Surgeon General, performs a similar function in contractor-operated plants.

There could be no better illustration of the fact that health in the Armed Services is but a hairline distinction between the khaki of combat and the overalls of in-

dustry. Just as a soldier is a potential striking force—so is the worker at the forge, the lathe or on the farm.

Health Hazards In Operational Areas

American soldiers are operating today in areas which suffer from the worst health hazards ever to confront a military force; malaria, dysentery, dengue, typhus, yellow fever, infectious diarrhea, and to a lesser extent plague, trypanosomiasis, relapsing fever and filariasis.

No authentic reports have been received of either yellow fever, plague, trypanosomiasis or relapsing fever cases in the Army.

In some foreign areas, among civilian populations, the enteric and insect-borne diseases are so common that it is the exception, not the rule, to find an uninfected native.

Despite constant exposure, the high level of health in the Armed forces indicates the greater controls possible in military establishments as opposed to the civilian community as a whole. Mortality from disease in this war is much lower than ever before.

In this country, during 1942, treatments in the Army for non-battle injuries or sickness totalled slightly more than 3 per cent. Abroad, the rate was slightly lower and this figure includes battle casualties. The Navy's non-effective rate was even lower.

Deaths attributable to the seven key diseases are negligible; preventive vaccines are used against typhoid, smallpox, tetanus, typhus, yellow fever, cholera and plague.

Among overseas troops, malaria, dysentery and infectious diarrhea provide the most serious disease threat in number of cases. Admission to treatment for dysentery and diarrhea averaged about 30 men per thousand per year in 1942. In 1943, with great concentrations of troops in areas where these diseases have high incidence, the rate is roughly 50 per thousand men. Both dysentery and diarrhea are most prevalent during the summer months and among troops in the field. Feces, fingers and flies are basically responsible.

Malaria and Typhus

Malaria is the most widespread disease to which our troops are exposed. Unfortunately, there is no vaccine against malaria. Mosquito control measures are effective but most difficult to apply under combat conditions in active theaters of operation. Since the best cure for malaria is prevention, it is no exaggeration to state that a shipment of fine-mesh screening or netting is more essential than a shipment of tanks or planes.

Some few cases of typhus have occurred in our southern camps each year, but are unimportant. The epidemic or louse borne typhus has steadily increased, however, among the native populations of North Africa, the Near and Middle East and elsewhere since the war. In the Armed Services there have been few cases and control measures have proved excellent. All troops sent to infected areas are vaccinated and revaccinated with improved typhus vaccine. New methods for delousing both clothes and men are used. Strict sanitary discipline is maintained.

Other Hazards

During 1941 the Army adopted immunization with tetanus toxoid for all personnel, and so far, among those immunized, we have had no tetanus.

The problem of gas-gangrene continues unsolved, although improved surgical treatment, prompt use of anti-toxin and the sulfonamides have materially reduced the number of deaths from this infection.

The use of blood plasma to combat shock has provided the greatest advance for field medical treatment in the history of military medicine. Countless lives are directly attributable to the use of plasma.

Oral prosthetics are a must in the Armed forces. To date, over 22,000,000 fillings have been inserted in the teeth of soldiers; dentures have been provided some 680,000 men. Treatments have been made for several million prophylactic and pyorrhea cases.

At no time in this war has the venereal rate for troops in this country been as high as the lowest monthly rate for the last war. In five months—March through July, 1943—more than 40,000 men were inducted, treated and cured by the Army

and the Navy. Eliminating those infected prior to induction, the figure stands at an all-time low for the Army of 25 treated per thousand men through August 1, 1943.

Combat Treatment

Modern surgical and prophylactic methods have literally streamlined the practice of military medicine in the field. Immediate aid for battle casualties, the prompt evacuation of the wounded from the battle, improved methods of transportation and constant forward movement of aid stations and surgical units have saved many lives and eliminated much pain and suffering.

In this connection, I believe you will be interested in the functions of the Medical Department in actual combat, during an invasion or landing operation. In breakdown, it will be seen that the wounded receive these progressive treatments:

After medical soldiers give first aid and attach descriptive tags to the wounded, they are picked up and carried by litter bearers to battalion aid stations where dressings and splints are applied by medical officers. In many cases in the Tunisian and other campaigns, major operations including brain surgery were performed at these stations. Here plasma to combat shock is given together with pain relief-

ing drugs. Seriously wounded men are then moved back to collecting stations, the most advanced point that can be reached, as a rule, by ambulance. At this point, from five-to-fifteen miles back of the front lines, further surgery is performed as necessary and wounds are dressed and splints reapplied. The patient is then prepared for movement to the rear where extensive laboratories and operative facilities have been rapidly assembled as an evacuation hospital. Of course, the lines are fluid and with modern, highly-mobile equipment, units intended for the rear occasionally find themselves right in the thick of it.

The final move for the seriously wounded soldier is by ambulance, plane, train or ship to a general hospital located in the theater of operations. Already in this war, casualties have arrived for treatment in the United States well ahead of their own casualty reports!

Following convalescence, if not permanently injured, the experienced soldier is ready to return to the firing line and action.

This then is the functional cycle of the Medical Department, beginning with the selection of men for the service, extending to the preservation of health and, finally, the restoration of health to maintain the highest possible average of fighting efficiency.

Air Safety—Weapons of Victory

COLONEL SAM R. HARRIS, Director, Office of Flying Safety

The importance of protecting our pilots and their planes from unnecessary sacrifice is known and appreciated by every man in the Army Air Forces. We cannot win the war unless we can furnish skilled pilots and superior planes to the fighting fronts in ever increasing numbers. Our ability to do this hinges in large measure upon the degree of safety exercised in training men for a hazardous job.

As anxious as we are, however, to protect and save these men who fly in military airplanes for the very human reason that they are fine young men, there is another compelling reason for the flying

safety program. Safety is just plain good business. Even though the president of a manufacturing company may be intensely interested in the well being of every employee, it is likely that the size of his company's accident prevention budget will be governed by the contribution which accident prevention makes to the total success of his business.

The same type of thinking guides the Army Air Forces. Accident prevention here is not only a humanitarian responsibility, recognized by everyone, it is emphatically one more way of winning the war. It is another and most effective way of delivering more men and more

airplanes to the theatres of combat, ready and able to fly their missions.

Two Types of Flying

Military airmen must do their flying under two very different sets of circumstances. One of these occurs during their training period in this country. The other is during their tours of duty in actual combat. Our job is to protect them under both sets of circumstances, and each has a very definite bearing on the other. In other words, it is not satisfactory to achieve a good accident record on this side of the oceans, unless at the same time we give our air crews such training and equipment as will protect them under combat conditions.

Let me illustrate. While still in training in this country, our fighter pilots are taught a maneuver designed to enable them to shoot down two ME 109's which may attack from the rear. Dangerous? Of course, it's dangerous—but not half so dangerous as having two ME 109's on your tail and not knowing what to do about it!

We cannot for one moment forget that the lads in the AAF are training for combat duty, and if we let them go out of this country unprepared we have failed in our mission, even though the accident rate sinks to zero.

Training Equipment

The same thing is true of equipment. If one hundred per cent safety on this side were our only objective, we could put our lads in nothing more difficult to fly than a Cub. It so happens, however, that there are a few things like skip-bombing, high altitude bombing, formation flying, gunnery and strafing that have to be done in combat. These are jobs for big, rugged, fast-flying and hard hitting airplanes. It is a rule of business that you "Don't send a boy to do a man's job." It is the same way in the Air Forces when we talk about equipment.

Generally speaking, the bigger our airplanes are, the faster and farther they fly, the more difficult will be the job of flying them. Armor plate and fire-power add to the weight of airplanes, but they

also protect the airmen when the chips are down.

There is one other basic consideration in this matter of aircraft accidents. Training must be done in a hurry. We cannot call time out in this war and adopt a leisurely pace. Pilots and crews must be ready when the airplanes come out of the factory, for they are badly needed right now on all the fighting fronts of the world. Any delay must be paid for in lives sacrificed in the bloody trench warfare required to hold and beat the enemy in the absence of air strength.

Thus, the Air Forces as a whole, and the Office of Flying Safety in particular, must balance safety in training against safety and effectiveness in combat. Our objective is a maximum in both.

Rates Favorable

I have made an honest effort to describe for you some of the conditions and problems which surround this job of flying safety. It can be shown that we are far ahead of the game in terms of accident rates. Of that fact we are proud. We know, however, as you do, that regardless of the rate, a lot of airplanes are being wrecked and a lot of men killed and injured in airplane accidents in this country. So long as this is true, our program will go on and be intensified. It will grow and improve just as rapidly as we can make it.

But with few exceptions, there has been an increase in the number of accidents in the AAF each year since 1921. This curve of increase in numbers has followed the curve of increase in activity. Simply stated, it is a case of the more flying—the more accidents. The proportion of accidents to flying, however, has produced a different pattern. Beginning in 1921 at a very high level, the accident rate per thousand hours of flying has been steadily reduced until 1942, when it reached an all time low.

It is well to point out here that in that same year, the accident experience level in the Air Forces reached an all-time high. We know that there is a definite correlation between experience level and rate of accidents, just as there is a correlation between amount of flying and number of accidents.

The year 1940 marked the end of peacetime activity. Expansion started—and what expansion it has been and still is! In terms of miles flown, activity during the fiscal year 1942 was 238 per cent over 1941, and during the fiscal year just ended there was an increase of 190 per cent over 1942. Actually, in the year just ended we flew more than 3½ times as many miles as we flew in the entire 20 years from 1921 to 1940. And these figures include only flying in the Continental United States—not one mile of combat or other foreign flying.

Predictions and Results

We made some predictions back in 1940 and 1941. We knew that the number of accidents would go up as the amount of flying increased—more flying, more accidents. During the previous 20 years, we have watched the accident rate per thousand hours of flying go down as the experience level went up, and so now we were sure that the rate would go up as this experience level did a right about face.

The rate did go up in 1941. It went up a bit more in 1942. In fact, our predictions looked pretty accurate. Of course, our curve of predicted increase went right on up in line with the expansion that continued during fiscal 1943 and is due to continue in the future. Actually, however, we have accomplished something that even we did not really expect. The upward trend in the accident rate halted in the year just ended and has actually moved downward.

Until now, all figures revealing the rate of aircraft accidents have been classified as confidential because the enemy might use them to learn our strength. That isn't so important now because what he knows will only hurt him. Therefore, I have here a few figures that I am authorized to quote.

We started the last fiscal year with an accident rate for all accidents of .739 per thousand hours flown. We ended the year with a rate of .716. The rate of fatal accidents has followed approximately the same trend as that for all accidents. During the past year, however, the fatal accident rate showed a fractional increase from .077 to .083. However, dur-

ing the last three months of the past year the trend for fatal accidents, too, was downward, the rate being below that for fiscal 1942.

In order that you may keep our present accident picture in its true perspective you should know that the accident rate for last year was lower than for the 10-year peacetime period 1931-40 and less than half that for the 1921-1930 period.

Situation In Hand

These are the facts. The number of accidents is increasing. The upswing in the accident rate immediately following 1940 has been halted. The rate today is substantially below what was predicted and also below that of any peacetime year previous to 1937. It is not our desire to gloss over the situation. We begrudge the loss of every crew member and every ship. On the other hand, we want to put away any unfounded fears that may exist in the hearts and minds of American parents. The situation is in hand and we intend to make it more so.

Since experience is such a basic and important factor in flying safety, our program of accident prevention is based largely on the collection of all the experience possible and directing the findings to the points of greatest need. For example, we know that a careful study of an airplane accident in Maine may give us a clue which will prevent a similar accident in California. In our research and statistics division are row on row of filing cases containing complete reports on every accident that happens in the AAF. On the walls are charts and graphs showing where, how and why these accidents happened. From this information we map our attack and supply the entire AAF with information designed to prevent repetition.

Field Organization

We have a field organization, too. In it we have gathered together the best men we can find. For the most part they are in their late thirties and early forties and have spent all their adult years in aviation—definitely long on experience. These men are on the go constantly, every day and many nights, making safety surveys and accident investigations. They are

trouble-shooters with the full authority of my office and, through my office, the authority of the office of the Commanding General behind them. Very often they themselves spot trouble as they make their rounds, more often we spot trouble in analyzing accident reports and we send them out to find the reasons for it.

The work of the Regional Safety Officer takes him into practically every activity connected with flying, from maintenance to field traffic regulations, from oxygen training to weight and balance of aircraft. He investigates and reports upon such varied items as control tower operations, flight control and instrument let-down procedures, clearance procedures, lighting and obstacles, taxiing precautions—even including what the cadets are having for breakfast!

Safety Education

Fifty Regional Safety Officers, scattered from Maine to California and from Florida to Washington cannot, of course, be everywhere at once. That's a big reason for our safety education setup. Where we can't spread experience in person, we try to do it in printed words and pictures.

We learned quickly that in the Air Forces, as in many other fields, the human factor is chiefly to blame for accidents. Nearly 75 per cent of accidents in all phases of training are caused by personnel error—carelessness, thoughtlessness, poor technique. So, as part of our intensive educational program, we use safety posters extensively, stressing the amusing, the factual, the informative approach—avoiding the gruesome. Our cadets, we feel, need no added reminders that flying military aircraft is a dangerous business. We cannot afford to plant fear in their minds.

We have learned a great deal from the educational methods of the National Safety Council. As a matter of fact, I recall that in acknowledging receipt of the National Safety Council's Distinguished Service to Safety Award, last June, General Arnold said, in part: "In attacking our accident problem, we resorted to methods of the National Safety Council itself, flooding our airfields with posters and educational literature..."

We also use motion pictures extensively and they, too, vary among the amusing, the entertaining and the informative. We use cartoons and editorials in camp papers and other publications read by cadets.

We have our "Accident Facts"—yes, we even borrowed the title used by the National Safety Council. It is our statistical bible, pointing to sore spots needing quick, corrective action. We have a monthly publication entitled "Accident Experience," aimed at supervisory officers.

We have learned also that good, solid information about flying in all its phases is the best kind of safety education. Right now a group of safety education officers is rewriting eight flying training manuals for greater clarity, simplicity and uniformity.

Our Pilot's Information File is a condensation of volume of information relating to countless phases of flying.

Flight Control

Another element of our program is flight control. Its purpose is to eliminate accidents caused by poor judgment, or inexperience in pilots on cross-country flights, adverse weather conditions, shortages of gasoline caused by unforeseen circumstances, or any trouble in flight that can be corrected by expert direction from the ground.

Functioning in its present phase as advisory rather than regulatory, it is the job of Flight Control to get military aircraft from one point to another safely and with dispatch, and to control traffic so that the maximum number of flights can be operated and the maximum number of missions can be completed.

Just as safety education has brought results for the National Safety Council, it has brought results for the Air Forces. During the first six months of the calendar year 1943 as compared with all of 1942, accidents due to pilot error were reduced as follows:

2.3% in primary schools
5.5% in basic schools
11.0% in advanced schools

That is the story of accidents and our program to prevent them in the Army Air Forces.

Preventing Avoidable Casualties in Our Combat Forces

An address by Major General Alvan C. Gillem, Jr.,
Commanding General, Armored Command

I'm not a safety expert in the usual sense of the word. Actually, however, you and I have been doing the same job with different titles for a number of years. It's a soldier's job to fight and die, if necessary, but it's also a part of his job to stay alive.

On behalf of the Army Ground Forces, I want to give you an idea of a few of the many measures we are taking to utilize our military manpower to the fullest degree. We pursue these measures with the express purpose of lessening the burdens of the Surgeon General and eliminating needless and costly accidents.

Calculated Risks

The keynote of our peacetime training was "Safety First." We believed, and I think properly, that hazardous risks to personnel were unwarranted when no national emergency existed. On the other hand, when war was declared, our training became guided by more stringent requirements. It was necessary to qualify our previous operations by the assumption of certain calculated risks. To add realism and an element of danger to training, and at the same time to apply that training to several million raw recruits, is a tremendous task.

The cornerstone of the Army's safety program is discipline. Discipline is based on knowledge. It assures maximum efficiency under any set of circumstances. For example:

The disciplined soldier will leave a wounded comrade when ordered to retreat, well knowing that to remain and attempt a rescue would result in capture and loss to his unit.

The disciplined soldier never smokes in a tank, knowing that he endangers the lives of his crew to fire.

The disciplined soldier never stops to pick up a shiny souvenir on the battlefield, for it might be an enemy booby trap—powerful enough to kill him and his friends nearby.

From the moment a soldier reaches the induction center, the Army systematically plans his future, with the single idea of landing him overseas trained mentally, physically and technically, and supplied with equipment to defeat the enemy. Defeat of the enemy requires power—mechanical power, will power, and above all, manpower. Only those men who have been found physically and mentally fit for the shock of battle are assigned to combat units. Previous "screen tests" eliminate those not qualified for the extreme exertion of battle. This classification of personnel in itself constitutes one of the Army's first and most important safety measures. This initial procedure eliminates the chance of accidents resulting from the mere fact of having a square peg in a round hole. Through constant and strenuous physical exercise, those who are physically fit are built up, their senses sharpened. They become alert, avoid carelessness—the cause of most accidents.

Dangerous Training Actually For Safety

Paradoxically, some of our most realistic and consequently dangerous training methods are actually safety devices. Experience has shown that the average recruit is frightened, not only by the bullets in battle, but also by the noises. He will become careless, make simple mistakes, such as recklessly firing his weapon and causing accidents fatal to himself and to others. For that reason, Army Ground Forces has devised elaborate means of familiarizing the soldier with the sounds and scenes of actual combat. We have infiltration courses where newly-inducted soldiers are required to crawl 125 yards across rocky terrain, through shell holes criss-crossed with barbed wire, while machine guns are firing live ammunition thirty inches above their heads. Added realism is gained by the use of charges of TNT, which are exploded a few feet away, simulating land mines. Occasionally, stuffed dummies, bloody and in uniform, hang in the barbed wire. Yet this is for safety.

We have found these courses very effective in convincing the soldier that it is vital to keep his head down, to apply correct methods of crawling, to negotiate barbed wire by crawling under, not over it, and to keep his weapon clean and ready to function under the most adverse conditions. Meanwhile, he must remain alert and obey orders, given amid the confusion of his surroundings.

Training Units Under Field Conditions

Just as individual soldiers are trained under conditions approximating combat, advanced training of units is most effective when conducted under field conditions. The Desert Training Center, in California, is the best location for such maneuvers, and there units are prepared for service on all the battlefronts. There the physical hardening reaches a peak. Men who learn to care for their persons in face of harsh natural conditions will survive any climate. There they learn the meaning of water discipline, and the necessity for taking salt tablets to avoid physical exhaustion. The cost of disobedience to such orders on rare occasions may be severe. Drivers who can maintain vehicles in the sand and dust of the desert will have enough experience and resourcefulness to keep them rolling anywhere. Lessons of care and safety learned in the desert are applied with profit later when the bullets are flying. These lessons will be of special value in a possible theater like Mongolia, but the knowledge is of general value regardless of the area.

A special and advanced phase of this type of realistic training is found at the Invasion Training Center near Oran, Africa, where troops prepared for attack on Sicily and Italy. There men learn the inherent dangers in one of the most difficult of military operations—that is, the establishment of a beach-head in the face of hostile fire.

The procedure is as follows: As many men as possible are taught to swim; then they are taught how to leave decks of transports or other ships; to climb down cargo nets with full equipment; to embark in wildly-tossing landing boats; and to debark in heavy surf. Hour after hour and day after day, combat engineers practice laying steel matting to make beach sand

firm; thus permitting quick, safe unloading of vehicles from landing boats. Specially trained tractor and bulldozer crews practice their tasks of promptly unloading anti-aircraft guns to assure protection for the beach-head.

The over-all operations at Oran represent another up-to-the-minute example of the Army's practice of safety with the calculated risk. All of us know that a major landing operation, even under the most favorable conditions, usually will be costly both in men and material. Such detailed training permits us to obtain maximum effective effort in an attack at the cheapest possible price.

Contributing to the maximum conservation of manpower is the increasing emphasis on night operations. A well-controlled attack at night will encounter less effective resistance than one by day. I know of an almost perfect example of this in the night assault on the town of Mottola in southern Sicily. Located on a pinnacle of ground 1,000 feet above the surrounding countryside, the town looked to be impregnable. A daylight attack on such a formidable objective would have cost us severe casualties, and might well have failed. The night attack cost us a few men wounded. Nevertheless, this operation could never have been carried out if the troops had not been thoroughly disciplined and trained in all those essentials which insured reasonable safety from our friendly fire and proper use of darkness and ground features for defense from enemy machine guns.

Aid of Scientific Experiments

Meanwhile, removed from the actual battlefields, but in constant touch with developments there, Army scientists are steadily developing clothing and equipment designed to eliminate, as far as possible, avoidable casualties in combat units. At Fort Knox, for example, our Armored Medical Research Laboratory carries on exhaustive tests of men and vehicles under the most extreme conditions. In the laboratory coldroom, where artificially-operated "weather" can pull the temperature down to forty degrees below zero, groups of men live, sleep and eat while medical officers keep careful check on their reactions. Comparable tests are carried on

in the hotroom, where torrid jungle conditions are reproduced.

In another phase of its program, the laboratory developed a plaster cast head to the measurements of the average Armored Command soldier. On this model were tested all of the various types of goggles used in the Command, and some startling results were disclosed. Goggles which suited one man permitted irritating dust to sift into the eyes of another. On the basis of these tests, a style of goggle was adopted which, in general, gives satisfactory service to virtually every soldier.

Careful measurement of tank interiors, and determination of the average tanker brought laboratory recommendations which altered the head-room and other specifications of tanks, thus avoiding many a bruised elbow, knee or knuckle.

Thus, by experiments on the few, we derive protection and benefit for the many.

In no sense do we coddle our men. Tankers as a group are rough, tough and smart. At the same time, the tank, like the flying fortress, is a crew weapon; we train our men to fight together for a common objective. Every man must know the essentials of the job performed by every other member of the crew. If one member is injured or killed, another can take his place—perhaps prevent capture of the tank or death of the entire crew.

Utilizing All Available Manpower

I have already shown that by proper classification we suit the men for the jobs. There is, however, still a great variety. Less apt individuals need more time to learn to operate equipment with safety. The Army, unlike a commercial firm or

factory, cannot afford to reject such men. It must make use of every man available. Consequently, more time for training is allotted such soldiers. By this means are prevented costly accidents—accidents which could be charged directly to ineptitude and lack of training.

We do have problems which are hard to solve. For instance, a soldier who drops a shell on his toes is a very common case. To counteract this, the fuze was designed so it could not explode until fired out of a gun. Then, we train the soldier in gun drill, emphasizing care and attention to each individual motion. If a soldier learns to act automatically in training, the chances are less that he will be careless in combat. The chances are less—but the possibility of an accident still remains—this is the calculated risk.

Every hospital has cases of injury because some soldier picked up a "dud" and it went off. These accidents are attributable to the innate curiosity of the individual. He constantly receives orders, he sees innumerable posters, modeled on the Safety Council's design, to "leave it alone," but his actions are dictated by something other than his better sense. There are countless such persons, and they impel you and me toward greater effort in safety.

The record which the Army has made thus far in accident prevention is, beyond question, an excellent one. I think we have made this war about as safe as possible from the military point of view. We trust that the several million men in the Army will return to civilian life completely indoctrinated and firm believers in the need for training, discipline and habits of self-protection.

Full text in Hazlco-1943 (Army Session - Oct 6-43)

Safety and Health in War Industry and on the Battlefield

(Excerpts from extemporaneous remarks by Lt. General William S. Knudsen, Director of Production, O. U. S. W.)

I spent forty years in the shop in this country and four years in the old country, the country of my birth, and fundamentally, the safety question comes down to knowledge of your job, knowledge of your machinery. Where I came from, and also in the shops where I worked later over here, when a skilled mechanic got hurt, it wasn't an accident, it was a disgrace.

In the early days my first experience with safety was in a pressroom where I had sixty-two operators operating draw presses, and I learned early that between two o'clock in the morning and five o'clock you had to be on the lookout all the time. I instituted the first original safety measure, coined it by myself. I used to walk up and down this press line, and whenever I saw a fellow get his finger near the punch, I'd take him from the back of the neck and yank him from the stool. He'd generally get good and mad and invite me to fight, and all that sort of thing.

"Here," I said, "if I hadn't done that, you might be missing a finger."

In those days we didn't have the National Safety Council, we didn't have literature, and I was the first aid department. If these fellows got hurt, I had to tape them up before we could send them to the company doctor who generally lived two, three, or four miles from the place, and I got fed up on accidents; I had my nose rubbed and that caused respect for programs developed later on.

Coming into the shop now and noting the progress that's been made in the meantime—progress is great, there's no question about that—but with the number of people that we have had to put to work in an emergency like this, the only thing that can be done is to keep eternal vigilance.

There's no plant too small to have safety in the plant. To preach safety means, first, that the operator thoroughly knows his machine and what might happen to him if he makes a mistake. The

second thing is that you insist upon quality of work turned out on the machine. That, in itself, will make him more careful.

I just had a little demonstration of safety. I took a little jaunt down to the South Pacific. Twenty-eight thousand miles in the same plane for the whole trip, except where we took a side trip into combat areas and had to use armored planes. Naturally, this being the first really long trip I ever had, whenever I got down on the ground, I'd go around and take a look at the plane and see if there were any pieces missing. On this entire trip the total delay was about twenty-five minutes. That was to fix a couple of switches on a governor. Then I began to look around at the crew. The mechanic of the crew was on the field from two to three hours before the plane took off, and the radio operator generally joined him there. The pilot and the co-pilot were on the field at least an hour before we took off, and the pilot himself would go over the plane very carefully before he started the motors. After he started the motors, he listened very carefully to each of them. I think it's a great tribute to the Air Transport Command that we could ride that distance, averaging almost a thousand miles a day, and not be held up for repairs to the plane. There were no attacks in the air, but if there had been I probably would be here to tell my story just the same, for I have a great deal of respect for them.

Now, safety is an adjunct to efficiency. Safety in plants is a necessity to good operation. There is only one way you can stop people from getting hurt. That's by telling them; you have to tell them to look out, "or you and I will get killed." You have to go around and tell the same thing to these new people that come into the shop and try a new job.

Operations must be studied all the time. They must be, for I'm telling you that the shop that has fewer accidents has better efficiency to produce the finished product.

Employee Transportation Problems of Industry

WEDNESDAY MORNING SESSION

October 6, 1943

Presiding: T. C. Barwell, Vice-President, Staley Manufacturing Co., Decatur, Ill.

"Getting Employees To And From Work"

By FREDERICK J. WALTERS, JR.

Director, Employee Transportation, General Motors Corp., Lansing, Mich.

Transportation of employees became a problem for management nearly 22 months ago. Since that time, we have seen this problem grow and expand to such an extent that it now merits the most constructive thinking which we can bring to bear on it.

The implications of our possible failure to solve this problem strike at the very heart of our war effort. Reduced to its simplest form, it means just this—

If the war worker cannot get to his job he cannot produce war materials.

If war materials are not produced, our Armed Forces cannot successfully prosecute military action against the enemy—and without such action, the outcome of the entire war is imperiled.

However, like all problems, this one must have a solution. The best augury for the future is that Government, Management and Labor recognize the extent of the job and, in general, are determined and mobilized to meet it.

Meeting the Employee Transportation Problem

Our primary job is to get the employees to and from work. We know that in this area we must depend upon the private automobile for better than 80% of war worker transportation. We also know that at present more passengers per pound of rubber can be carried by private automobile than by buses or other public conveyances. Our entire war industry is tied in with the use of the private automobile for essential transportation.

There are approximately 150,000 buses in this country, of which about 90,000 are school buses and not as many as 45,000 are in urban service, whereas there are upwards of 27,000,000 private automobiles, so that the importance of the latter means of transportation cannot be exaggerated.

Keeping employee cars running requires a well planned and well executed program.

A year ago, a number of companies were invited to submit to the War Department a proposal for the operation of an Employee Transportation Plan and the program which you are about to see is the one which Oldsmobile has instituted and put into effect under a contract with the War Department. However, I would like to make the point that we were actively at work on the problem of Employee Transportation months before we were approached by the War Department. We did this as a matter of insurance, as it were, to make sure that at no time in the future would our production be imperiled by any cause over which we had control.

Survey Cards

The first step was to make a survey of all employees in order to determine their gasoline, tire, share-riding and other transportation requirements. A Survey Card was prepared and run through the addressograph for every worker in the plant.

This card furnishes all of the pertinent data needed, such as distance from the plant, Zone and Section in which the

employee lives, starting and quitting times and other needed information.

These Survey Cards were distributed by Departments to the General Foreman's Clerks who were charged with the responsibility for the return of a properly filled out card by each employee. This method resulted in a 97% return.

The information contained on these cards was then tabulated and the cards filed geographically by Zone and Section, according to a map of the central Michigan area which has been adopted by all plants in Lansing.

Having made the survey we were then able to deal with the employees on all subjects related to their transportation.

Gasoline Rationing Activities

First and foremost of the activities of the Department are those dealing with the rationing of gasoline.

Our objective here is to save productive time of the employees by handling their rationing problems for them in the Plant without the necessity of their having to go down to the Rationing Boards.

"Share-The-Ride" Group Card

Early in November, an aggressive campaign was launched to increase "Share or Swap the Ride" participation by employees. Many groups were, of course, already operating at that time and from each group as they came in to make application for their Supplemental Gasoline in the latter part of November, a "Share-the-Ride" card was secured.

These were filed according to the Zone and Section in which the employee lived and showed the hours worked, number of passengers carried and other pertinent data. When a new employee applies for gasoline or when an employee has been transferred between plants, between shifts, or otherwise, he is furnished with a list of possible share-riders from these files. When a major change of shifts occurs, it is, of course, necessary to make a new "Share-the-Ride" card on all individuals effected. Permission was secured from the Rationing Board to issue interim books, valid for one month, to allow the employee time to form a new "Share-the-

Ride" group. When the interim book was issued a new card was filled out by the employee. As the survey cards were completed and filed, it was possible to furnish potential ride-sharers to the holders of these interim books. At the end of a month, having organized new "Share-the-Ride" group, they were issued the regular books upon certification by the Plant Committee and approval by the Rationing Board.

Tire Rationing.

By this time, we are all so familiar with the various aspects of tire rationing that there is no need for us to go into the details of it. However, there are a number of factors affecting current operations which are worthy of note. The first one is the mounting rate of applications.

Here is the trend of applications for new tires and tubes—recaps are not included—from January through August. In January, there were 123 applications; in February, 112; in March, 145; in April, 163; in May, 283; in June, 404; July, 396; in August—

The second factor with which we must cope is the excess of applications to the local boards over the quotas allowed them by O.P.A. When it became obvious that an insufficient number of tires had been allotted to the counties in our area, a letter of transmittal was developed whereby it was possible to show the group riding information on the applicant so that the Tire Rationing Board could allocate the available tires to those cars carrying the largest number of employees. This letter of transmittal has been adopted by all plants in the Lansing area.

The second step which was taken in the correction of quotas was to draw the facts to the attention of the proper OPA officials who were most helpful in bringing about a re-adjustment of the quotas when presented with the facts.

Oldsmobile maintains a full time Tire Inspector whose duties include inspection of tires while employees' cars are on the parking lots. These inspections are planned so that every employee's car is checked at least twice every three months. It should be emphasized that these inspections are of a visual nature only and are

intended to supplement and not to replace the official OPA inspections.

Tire Inspection Tag used.

The tire inspection tag is perforated down the center so that the left half may be attached to the steering wheel and the right half turned in to the Employee Transportation Department. By means of the check marks in the proper spaces, the employee is notified just what attention each of his tires needs. The right-hand stubs are filed by License Numbers, and when a second stub on the same car is filed, a letter is sent to the employee calling attention to the fact and advising him that further neglect of the condition noted may jeopardize his chances of securing new rubber.

It is felt that this service has been extremely helpful in promoting safety as well as conservation on the part of employees.

A Good Organization.

1. Must be a full-time organization.
2. Must be adequately staffed.
3. Must report directly to top management.

The size and importance of the Employee Transportation Job is such that it deserves a full time organization, even if, in the case of small plants, it consists of only one person. It is very difficult to obtain good results when the Transportation Department is a part-time stepchild of some other Department.

Securing Employee Cooperation

In order to make it possible for such a program and organization to operate at peak effectiveness, it is necessary to get the cooperation of the workers.

This is accomplished by—

1. **Bulletins**—From time to time, employees have been kept advised of the latest information regarding gasoline and tire rationing, tire inspections, driving safety, etc. These bulletins are posted on boards located near time clocks throughout the plant.
2. **Letters and Folders to Employees**—On matters where it is deemed advisable

to put the message across to the entire family, letters signed by the General Manager or Director of Employee Relations are mailed direct to the employee's home.

For example, when it became apparent that the principal problem was the breakdown of employees' cars, a special folder was prepared dealing with Preventive Maintenance. This, accompanied by a letter, was sent to every employee.

3. **The Supervisor Conference Groups**—These discussion groups are held each two weeks with all Foremen throughout the plant and have provided the means of getting timely and pertinent information into the hands of these key employees who, in turn, can transmit the information to the men.

4. **Articles in House Organ**—Timely articles have been presented by the Oldsmobile "Cannoneer," our semi-monthly house organ, setting forth the latest available information on all phases of rationing which come within the scope of the Transportation Department. In addition, the pages of the "Cannoneer" have been used to foster the formation of "Share-the-Ride" groups and to promote preventive maintenance and highway safety.

5. **Newspaper Publicity**—In addition, publicity stories and pictures have been prepared for the local newspapers, including the Union Weekly.

6. **Plant Posters**, too, have played an important part in fostering the group riding idea.

The posters are produced by our War Publicity Department and "Okched" by our "Keep 'Em Firing" Committee of which the Transportation Advisory Committee is a part.

Labor-Management Committee

Working in close co-operation with the Employee Transportation Department is the Labor-Management Transportation Advisory Committee.

This Committee continues to act on all matters pertaining to the transportation of employees to and from the plant by all types of carriers, public and private.

Certification of all gasoline, tire and bicycle applications is handled daily in order to expedite issuance of the needed

rations. Approximately twenty percent of the time of the Chairman is devoted to this work.

Bus and Coach lines are contacted by the Chairman in order to bring about the most effective use of public transportation facilities by and for employees of the plant.

The Job Ahead

Thus far we have covered what has been done to make the Plant Transportation Program more effective. Now I would like to touch briefly on what we will probably have to face in future months.

While we at Oldsmobile are proud of the fact that of the *total man-days lost* from all causes, only 1.1% are attributable to transportation difficulties. However, we feel that, had it not been for the campaign you have just seen, these absences would undoubtedly have been well in excess of this figure. But when we analyze these transportation absences themselves, we find a very striking picture.

During the month of August, man-days lost due to transportation difficulties were as follows:

Mechanical failure of cars.....	51%
Tire Failure.....	15%
Share Ride Failure.....	14%
Other (Missed bus, etc.).....	11%
Lack of Gasoline.....	9%

In other words, more than half of all transportation absences were due to the mechanical failure of the car. Certainly there is a very significant trend here—one that has serious implications insofar as highway safety is concerned. It is worthy of the most constructive thinking which we can give to it.

What then can we do to forestall the crisis which this trend indicates we are going to face?

First—We must educate the individual employee on the importance of preventive maintenance and safe driving to keep his car running and his tires in condition. As a soldier of production he must protect the means of getting to his battle station, which is his job in a War Plant. We teach the employee to conserve material and maintain his tools within the plant—

it is only logical that we should advocate similar measures with respect to his car.

Second—We, in Industry, must co-operate with the car dealers and service stations in our areas.

At the present time, our Transportation Department is making appointments for employees to have their cars serviced during working hours so that a minimum of time is lost due to this cause.

Assistance is also rendered in securing parts which may not be readily available in dealers' stocks thru our connection with Parts Warehouses, etc.

Third—We must recognize that the maintenance of employees' cars is just as vital an activity as the fabrication of war materials for the latter cannot be produced unless the employees can get to their jobs to produce them.

The organizations which are engaged in servicing these cars have been heavily drawn upon by industry to fill other jobs. It is earnestly hoped that we will all recognize the essential nature of their work for these organizations must be preserved if we are to "Keep 'Em Firing."

As we see them, our present and future objectives in the field of Employee Transportation are:

To increase our effectiveness in handling Employee Gasoline Rationing problems.

To promote and increase "Share-the-Ride" participation.

To conserve the workers' tires by every possible means.

To prolong the life of cars now in use.

To support all phases of transportation safety.

To make the most effective use of public transportation to supplement the private automobile.

To improve still further the co-operation between Government, Industry and Labor.

By attaining these objectives, we who are charged with the responsibility for Employee Transportation will have discharged our obligation by keeping the implements of war flowing out to our Armed Forces and thereby hastening the day of final and inevitable VICTORY!

Getting Employees to and from Work

LT. COLONEL ARNOLD H. VEY
District Transportation Officer, U. S. Army, Detroit

Both labor and management have a joint responsibility maintaining and supervising the transportation of employees to and from war plants. There also must be an acceptance of individual responsibility on the part of each employee.

On the average, more than twice the number of workers use private vehicles than public conveyances. This is not alone because of preference and convenience, but many times because of necessity. Of necessity, therefore, most private vehicles now in war worker service must continue in service, if there is to be no let down in production of war materials.

The Transportation Corps of the United States Army, through its zone and district offices, has a vital interest in employee transportation problems involving, directly or indirectly, the war effort. It is the function and duty of these offices, among other activities, to maintain liaison with local traffic organizations, transportation companies, transportation associations and local transportation representatives of other governmental agencies.

What Should Be Done

To insure continued essential transportation, it is the policy of the Transportation Corps to encourage the establishment and maintenance of employee transportation departments in all war plants, both large and small, where such departments are determined necessary. Both management and labor share equal responsibility in the policy making activities of plant transportation departments and all such departments should:

- Conduct surveys and maintain adequate records of the transportation needs of the employees of the plant, including public, as well as, private transportation facilities.
- Assist employees in securing necessary gasoline and tires as well as encouraging proper and adequate upkeep of their vehicles.
- Coordinate starting and leaving hours with local staggering of

hours program to make maximum use of public transit vehicles.

- Encourage, through adequate educational activities, conservation of vital transportation facilities.
- Cooperate with government agencies as well as local transportation companies in the solution of problems involving employee transportation.

Stated briefly, plant transportation departments have a dual task: first, take the necessary steps to make available essential transportation to meet existing needs; and second, to develop and encourage adequate conservation measures to stretch transportation facilities for the war's duration.

For the most part, the first task has been well done. The majority of the plant transportation departments, of which the writer has knowledge, have done well the necessary paper work to obtain for their employees adequate amounts of rationed transportation items essential for their needs. With regard to the latter task, however, most departments have just scratched the surface. The records show lack of conservation consciousness on the part of most employees. The increasing promiscuous use of private cars, together with a decreasing occupancy rate, bears witness to this fact. A recent war worker transportation survey for the State of Michigan, conducted by the Michigan State Safety Commission, shows an average of only 2.28 persons per car, when driven to and from war plants. This is less than the car occupancy figures of a few months ago; and is slightly more than one-half a person higher than the peace time average of 1.7 persons per car.

Shortages Still Pressing

The battle of transportation shortages is not yet won. Although it may be true that the passenger tire shortage looks brighter, at least by next year, the gasoline problem becomes more acute with increased military demands and, with the passing of

each day, irreplaceable civilian cars leave the road for the junk pile.

Public transportation vehicles are carrying the greatest loads in history and, with increasing equipment and manpower shortages, it is impossible for present facilities to carry large volumes of additional riders during peak hours, except through further extension of staggering of hours.

Short of an abrupt ending of the war within the next few months, the only solution is the adoption and strict observance of intense conservation measures; including restrictions, designed to limit materially, if not entirely, all non-essential use of transportation facilities.

Staggering of Hours

Staggering of hours, in the opinion of the writer, offers the greatest opportunity for increasing the carrying capacity of existing public transportation vehicles and providing transportation services for additional manpower needed by many war plants. Through staggering of hours already established, transportation companies have increased passenger loads by 50% or more in larger cities and 100% or more in smaller cities, despite small increases in equipment. Such programs have made available transit space for those who formerly used private vehicles for transportation to and from work and now find it necessary to change over from private to public facilities; and, in addition, have permitted greater economy of transit equipment and personnel.

Recently, there has been agitation on the part of employees of some industrial and business organizations to revert back to the starting and quitting hours in effect prior to Pearl Harbor. The potential seriousness of the employee transportation problem makes it necessary, in the opinion of the writer, that a hold the line policy be adopted with respect to staggering of hours; and until those responsible can clearly foresee improvement in the transportation situation, all organizations should be requested to maintain starting and quitting hours assigned them at the time of inaugurating the staggering of hours program, except in cases where a change in hours will improve conditions.

Group Riding

As indicated previously, the records indicate room for material improvement in the sharing of war workers' cars for home to work transportation. A forceful indication of the potential carrying capacity of such facilities may be had in the following fact. At the present time, some 150,000 to 200,000 private cars are used by war workers, within the area of metropolitan Detroit, for transportation to and from work. If each war worker's car carried one more passenger, resulting in a car occupancy figure slightly above three persons per car, this additional load would be equivalent to the carrying capacity of nearly twice the number of street cars and coaches owned and operated by the Detroit Street Railways for a single trip.

It is appreciated that inherent difficulties in sharing rides in private cars are many and that, in a number of instances, these difficulties cannot be resolved. On the other hand, considerably more can be accomplished than has in the past, if all concerned are convinced of the necessity and make special effort to join with their neighbors in conserving vital transportation facilities.

Heavier loading is just as essential in the use of private cars, used for employee transportation, as in the case of trucks and rail cars, carrying freight.

Tire Maintenance

Upon the resignation of Rubber Director Jeffers, he stated that his work was completed and that all indications pointed to the future solution of the tire problem. There is, however, some difference of opinion as to whether the supply of material and manpower is available in sufficient quantity to produce tires in amounts to meet all civilian needs.

In the next several months, therefore, at least until synthetic tire production is in full swing, it would be well that a pessimistic rather than an optimistic viewpoint be taken.

A recent survey made by the Michigan State Safety Commission of Michigan's automotive transportation resources, including a condition survey of some 7,000 tires on cars operated by war workers, in-

dicated that 30% of the tires revealed neglect on the part of the automobile owners. For example, 15.5% showed irregular wear. An additional 20% showed immediate need for repair or recapping.

If this survey can be considered typical, it is apparent that there is urgent need for the inauguration of adequate conservation measures, both on the part of individual care operators as well as Plant Transportation Committee.

Private Car Maintenance

Although it may be true that the yearly total of private cars scrapped has decreased approximately 50% over pre-Pearl Harbor totals, it is also true that, as time goes on, the converse will result unless proper and adequate repair parts are produced and the necessary repairs made. It is of utmost importance, therefore, that war workers using private cars for em-

ployee transportation be encouraged through frequent inspections to properly maintain their cars, and when required, the necessary repairs be made.

Since little, if any, factual information is available concerning servicing facilities including availability of repair parts, it is suggested that a survey be made to determine the frequency of vehicles leaving the road because of inability to complete the necessary repairs, and also to discover required parts for which production is or will be necessary, in order to maintain essential private car transportation.

To compensate for transportation shortages and to insure essential employee transportation for the duration, it is necessary that we stretch and squeeze, crowd and adjust the facilities now available until truly the ends do meet.

Keeping Employees' Cars Running

By WARNER J. RANES

Supervisor, Employee Transportation, Dravo Corp., Pittsburgh, Pa.

There still remain many serious phases to the car transportation problem we have not yet solved.

I say "serious" because of:

- (1) The difficulty in procuring gasoline.
- (2) The difficulty in procuring tires, and
- (3) The difficulty in procuring replacement parts.

I think we all agree that the last of these, replacing worn out parts, is definitely the most serious. While the necessity of rationing our gasoline and tires will continue, it is safe to assume that sufficient gasoline and rubber will be made available to get our vital workers to and from their plants. However, no such assumption can be made about replacement parts. Few new parts are being manufactured and no new cars.

The Office of Defense Transportation estimates that two million cars will be scrapped in 1944 with no new car replace-

ments. The pool of 520,000 unsold new cars, frozen at the start of 1942, will be gone some time late this year.

The average age of employees' cars is seven years, according to a survey of 94 war plants in ten states made by the Public Roads Administration. The survey showed 57 per cent to be seven years of age or over. In half the industrial areas surveyed, 20 to 30 per cent of the cars serving war plants are ten years old or over.

The shortage of certain replacement parts is already acute. The situation with respect to older cars is going to become even more serious. Certain functional parts which can only be used on car models ten years old or over are not being manufactured at all, and to a lesser extent this is true on cars seven years of age and older. These facts have a still more serious significance when it is recalled that cars ten years old or over are owned predominantly by war workers who operate in higher mileage brackets.

Obtaining Employee Cooperation

We all know the desirability of selling the idea of preventive maintenance to employee car-owners, but getting the idea across in such a way that employees will actually take steps to prevent breakdowns is something else again. We are only sure of one thing—the easier we make it for car-owners to have maintenance work done on their cars the more chance there is of their doing something about it.

If it were possible to take their cars as they drove up to our plant, have a complete servicing job done, then turn the car over to them without charge when they finish their shift, I will guarantee you would still have a few incorrigibles who would refuse to have anything done to their cars. However, we need not be concerned with these few "die hards." The point I want to make is that if we can make adequate arrangements for servicing or doing repair work on a car so that the owner is not delayed in getting to work or in getting home, and if we give sufficient publicity to such arrangements a fair percentage of the employee car-owners will take advantage of such a set-up.

Approach To Problem

We had a choice of two methods of approach to this problem. We could either go into the automobile business ourselves, or we could offer the business to someone else.

Our plant extends up and down the island for a distance of three-quarters of a mile with two main parking lots holding 1,600 cars situated roughly in the center of the property. There is no garage on the island, the nearest being six miles away. However, a small service station leased to an individual operator by one of the major oil companies was located just west of our plant. This was staffed by a man and his wife with two boys as assistants, and besides selling gasoline they could lubricate a few cars a day under pressure.

The problem we presented to that oil company was that we had about 4,000

automobiles coming to our plant throughout the three shifts daily. What arrangement could they make to service these cars while the men were at work?

Service Program

This company really took their coats off and dug in. They definitely felt it was an opportunity to contribute to the war effort. They transferred pieces of equipment to this station. They made available three of their employees who had formerly had years of service station experience. They assigned, in an advisory capacity, a man who had organized and operated their most successful stations in the Pittsburgh area.

We erected two small office-booths at strategic points in each of the parking lots. An area was roped off adjacent to these booths marked by large signs reading "Car service maintenance area." Signs directing drivers to these areas were placed leading to the parking lots.

For 45 minutes prior to shift changes, a service station employee was stationed at each of these booths equipped with special order forms which enabled him to make out a work-order for a car in a few seconds. The driver desiring such service was presented with a receipt for his car key, and he went off to his job. Upon the completion of his shift, he returned to the same booth, paid for his work and drove off without losing one moment from his day's work.

The physical operation of this scheme involved each attendant driving a car from the parking lot to the service station, completing the work on the car, returning it to the parking lot and driving the next car to the service station.

It was most important to take no orders for work which could not be completed by the time the driver returned for his car. A delay here meant a delay not just to the car-owner but to the riders as well. The work at this service station was arranged on a production line basis, and the service manager knew exactly how much work he could complete in any given period of time.

We gave great publicity to this program through our plant paper, through jumbo bulletin boards, and by direct mail.

Mechanical Service

So far no mention has been made of any work other than the ordinary functions performed at a service station. And that is still the great weakness in our particular set-up. This service station performs no mechanical repair work. It was necessary, therefore, to make a thorough survey of the surrounding territory in order to make arrangements for such work to be done.

After many meetings we secured the services of six high-grade garages that had the man-power and equipment to make their cooperation feasible. All these garages were located within a radius of from 6 to 8 miles of our plant. Cards bearing the addresses and telephone numbers of these garages were mailed to all car-owners. A supply of cards was kept on the parking lots, at the service station and at our Share-the-Ride Club. The driver who needed repairs for his car was instructed to call the garage located closest to his home and make an appointment for the work to be done at which time the garage would undertake to leave him at his home or at the plant. In the case of a car which would be out of service for some time the driver and his riders were to make other transportation arrangements through our Share-the-Ride Club.

In actual practice, the weakness that developed in this plan was the failure in many cases of the car-owner to realize the necessity for making appointments in advance. Some would appear at a garage with the statement, "I'm a war worker at Devo," and expect all work to stop while

they fixed his car. Actually, over 50 per cent of the mechanics in our section of the country have been lost to war industries or to the services, and the average garage has all it can do to look after its own customers, let alone take on new business.

The only inducements for these garages to take on additional work were: the patriotic one of keeping the ships sliding off the production line by getting the workers to work; and the definite hope that by establishing the fact that their mechanics' work was directly connected with war industry and, therefore, they might be granted a deferment for some of their key mechanics. In some cases, this was granted by the draft boards.

To curb this lack of foresight on the part of the car-owners it was often necessary for the service manager to present a clear picture of their problems to the customers, and even then, I regret to say, their patience was sometimes strained by the unreasonable demands made upon them.

Cooperation among these six garages was a prime factor in whatever success this program has had. Prices for various operations were standardized both as to labor and material, and the parts in each garage were made available to all the others. Complaints to our transportation department were referred back to the garage involved, and when several were made about the same garage a meeting was held to straighten matters out.

You will see by the program I have just outlined that our set-up at the service station is much more effective than that for mechanical repair. This is entirely due to physical factors beyond our control.

Government Safety Services to Industry

WEDNESDAY MORNING SESSION

October 6, 1943

Presiding:—R. R. ZIMMERMAN, Executive Director, Council of Personnel Administration and Chairman, Executive Committee, Federal Interdepartmental Safety Council, Washington, D. C.

The War-Time Trend of Work Injuries

By M. D. KOSSORIS

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Washington, D. C.

We entered the war in December, 1941. All through that year many of our industries were engaged in producing material for our rapidly expanding Army and Navy, as well as for some of the countries in the war since 1939. During 1942 we turned increasingly to all-out war production and have remained so up to this time. The year 1940, in comparison, was a peaceful one. What has been the trend of work injuries since then?

Changes in Manpower and Working Conditions

Before surveying this trend in some detail, let us look briefly at the changes in the composition of our industrial manpower and working conditions generally. First, there has been a very decided increase in nonagricultural employment. The total has risen from an average of 31 million in 1940 to nearly 38½ million in June, 1943, a rise of about 25 per cent. In manufacturing alone, the increase has been from about 10,800,000 in 1940 to 16 million in June, 1943.

Many of these new employees are women. Since the spring of 1942 more than four-fifths of the net addition to the working forces in our factories have been women. War-time industrial expansion resulted in an increase of two million

women in manufacturing alone since October, 1939, as compared with an increase of three million men. In June, 1943, we had 4¼ million women in our plants, fully 30 per cent of all our plant employees. In fact, during the last year women accounted for fully 80 per cent of the net addition to our plant forces.

In addition to women, our industries have absorbed a large number of older persons, as well as younger people of school age.

The prospect for the immediate future is that four million additional persons must be added to the armed forces and munitions industries between July 1943, and July, 1944.

The element of new employees in our industries, however, is very much larger than these figures indicate. In addition to net increases there have been millions of replacements. Our armed services have drafted a large portion of experienced men who in turn had to be replaced by employees with less industrial experience, and in many cases without any such experience. This drastic change in the composition of our industrial force is the second fact to remember.

Third, we are working our people longer hours generally, and very much longer hours in specific occupations. Seven-day-

per-week operations, while not the rule, are not infrequent. Weekly hours of 54 to 60 are not uncommon.

Fourth, there have been tremendous expansions in some of our industrial facilities. It is difficult to measure these, but increases in employment afford some idea of what has happened. Our chemical industries increased from 319,000 in 1942 to 743,000 in June, 1943. The automobile industry went from 465,000 to 676,000. Shipbuilding increased employment from about 98,000 to over one million. Aircraft moved up from 90,000 to nearly 34 million. Our machine tool industry grew from 57,000 to 115,000 workers.

These expansions were usually accompanied by the erection of new plant facilities, and, in any case, the addition of much new equipment. Because it was hard to find additional trained supervisors, supervision had to be spread more thinly over a large number of people. It is not necessary for me to expand to safety engineers on the implications of the combination of green personnel, congestion, and less adequate supervision. I might also add, as you well know, that safety personnel was not expanded in keeping with the growth in employment, thereby complicating and increasing the difficulties in the work of safety men.

This is but a partial recital of the factors which go to make up the background against which the accident experience must be viewed.

The Overall Trend of Work Injuries

What has been the trend of work injuries during this period?

As you would expect offhand, there has been a great increase in the number of work injuries in nonagricultural industries. The Bureau of Labor Statistics estimated that a total of 1,620,000 nonagricultural workers were injured or killed at their jobs in 1940. During 1941, this figure rose to 1,910,000, and during 1942 to 1,984,000. Average employment increased by 19 per cent from 1940 to 1942. Work injuries increased by 23 per cent. The total of work injuries, therefore increased more rapidly than did employment.

It is interesting to note, however, that deaths and permanent impairments in-

creased by much smaller percentages. The main bulk of the increases came in temporary disabilities. Even so, the number of actual days lost from work, without any regard for economic time charges for death and permanent impairments, was about 53 million man-days. If the economic time charges are added, the total time loss comes to 263 million man-days. If we forget for the moment the effects of deaths and crippling injuries, we are still faced with the fact that the actual time loss of 53 million days is enough to provide 177,000 workers with full-time employment for an entire year.

Manufacturing Industries

The sharpest increase in the size of employment occurred in manufacturing. The increase was from 10,780,000 in 1940 to 12,816,000 in 1941, 14,563,000 in 1942, and to 16,056,000 in June 1943. The number of work injuries in manufacturing in 1940 were estimated as 316,000. In 1941, this number had risen to nearly 453,000, and in 1942, to 635,000. The monthly returns to the Bureau indicate that the total for 1943 will be about 700,000 or more. For the first six months alone, total work injuries are estimated at 387,000—which is about 70,000 more than occurred during the entire year of 1940.

You know, of course, that this comparison leaves out of consideration the lengthening of working hours, and that a better measure of the incidence of work injuries is the frequency rate: The average number of disabling injuries per million employee-hours worked. In 1940, the weighted frequency rate for manufacturing, as computed by the U. S. Bureau of Labor Statistics, stood at 15.3. In 1941, it was 18.1, and in 1942, 19.9. Indications are that the 1943 rate, as measured by monthly returns to the Bureau, will be still higher. My guess is that it will be somewhat in the neighborhood of 21. In any case, for the three-year period from 1940 through 1942, the frequency rate has gone up by 30 per cent. In other words, for every million employee-hours worked in 1942 there were one-third again as many disabling injuries as in 1940. Indications are that the 1943 frequency rate for manufacturing will be the highest in many years.

Within the manufacturing group, the experiences of individual industries have varied widely, as you would expect—considering that employment in some of them receded while it skyrocketed in others. Let us look at the records of a number of important war industries. For the group of iron and steel industries, the group frequency rate rose successively from 17.9 in 1940 to 22.5 in 1941, and 24.9 in 1942. Within this group, the frequency rates for foundries went from 36.1 to 47.0 and 49.9. For the group of chemical industries, which more than doubled in employment for the period under discussion, the frequency rates rose from 11.5 to 12.2 and, in 1942, to 13.9, an overall increase in the rate of 21 per cent. For shipbuilding, the rates moved from 20.6 to 26.4 and, last year, to 33.1—an increase of 60 per cent. In the automobile industry, which now builds tanks and planes, but few automobiles, the successive yearly rates are 7.7, 9.3, and 12.2—an overall increase of 60 per cent. In the aircraft industry, 1942 was better than 1940, but above 1941. (Its frequency in 1941 dropped to 10.4 from a level of 15.8 in 1940, but rose again in 1942 to 11.4.) The rubber industry, on the other hand, showed a decline in 1942, but its frequency of 13.3 was above that of 11.6 for 1940.

Mining

The work-injury experience in our mining industries was no worse in 1942 than in 1941, and slightly better in each of these years than in 1940. According to the statistics of the U. S. Bureau of Mines, there has been a constant downward trend in the frequency rate of disabling injuries during the last 10 years, and the 1941 and 1942 rates are the lowest reached during this period.

But when that has been said, we are still faced with the fact that the accident experience in our coal mines is among the worst among our industries. Even during 1941, with the lowest frequency rate in years, we had nearly 64 disabling injuries for every million employee-hours worked. Of the nearly 92,000 injuries, over 1,600 resulted fatally. If we prorate these injuries over the entire employment, out of every 1,000 miners working during this year, two were killed and 108 were in-

jured. In other words, at least one man out of every 10 had a disabling injury that year—that best accident year. During 1942, employment dropped slightly from the 1941 level, but was still somewhat higher than in 1940. The total number of injuries stood at 99,100—close to the 100,000 mark.

Among the mining industries, the most important from the standpoint of size is the mining of bituminous coal. In 1942, this industry employed close to 450,000 workers. The production of coal, spurred by war-time requirements, exceeded that of every year in the history of coal mining in the United States, with the possible exception of 1918, another war year.

Although employment in 1942 was about 2 per cent less than in 1941, the total number of employee-hours worked was nearly 12 per cent greater. Disabling injuries, on the other hand, increased from about 47,800 to about 55,400. The frequency rate went from 69.0 to 71.5—an increase in the number of injuries per million hours worked of about 4 per cent.

If the accident record of bituminous mining is bad, that of anthracite mining is worse. Employment has decreased constantly over the last three years, with the 1942 level nearly 10 per cent below that of 1940. The frequency rate of injuries also declined, but by only about 7½ per cent. In 1942, the anthracite industry averaged nearly 123 disabling injuries per million hours, or about 213 injuries per 1,000 employees. That means that during 1942 one man out of every five was injured.

Although employment in all other types of mining is very much smaller, the frequency rates of disabling injuries are not. The 1942 rate for gold mining stood at 96 and that for slate mining at 92. Among the other industries, frequency rates in the forties and fifties are not uncommon.

Construction

The group of construction industries had a varied experience during the last 3½ years. Employment grew from about 1,500,000 in 1940 to a peak of about 2,200,000 during the third quarter of 1942. By the middle of 1943, however, employment

had declined to about 1,277,000. With the virtual cessation of heavy and highway construction, the sharp increase during 1942 was attributable largely to the erection of camps and barracks. When this type of construction came to an end, employment sharply declined. Now that most of the building activities sponsored by the Federal Government are completed, or nearly so, a further drop in construction employment may be expected.

The shift in the types of construction during these years resulted in a decrease in the total number of disabling injuries during 1942. Heavy engineering and highway construction are considerably more hazardous than building construction. Although average employment in 1942 was only slightly less than in 1941, a much larger portion was engaged in building construction. As a result, the total number of disabling injuries decreased from 495,000 in 1941 to 349,500 in 1942—a drop of nearly a third. As employment decreases further, the total of disabling injuries should also decrease.

Railroads

Railroads, on the other hand, experienced a remarkable increase in work injuries over the last 3½ years. According to reports to the I.C.C., the total number of disabling injuries to railroad employees increased from nearly 30,100 in 1940 to 43,700 in 1941, and to 59,700 in 1942. If the injuries reported during the first five months of this year are fairly indicative of what the 1943 experience will be, the total number of work injuries for this year will be in the neighborhood of 75,000.

If we include all disabling injuries, the frequency rate for 1940 is 12.0. During 1941, that rate rose to 15.3, and during 1942, to 18.3. In other words; for every million employee-hours worked, there were 25 per cent more disabling injuries in 1941 than in 1940, and 50 per cent more such injuries in 1942.

In 1940, our railroads employed about 1,200,000 persons. In 1941 employment increased to 1,323,000 and 1942, to 1,468,000. These represent increases over 1940 of 10 per cent and 22 per cent respectively. Comparing these increases with the in-

creases in the injury rate, it is apparent that the reported disabling injuries increased about twice as fast as employment.

That relationship has continued, and at an accelerated pace, during the first five months of this year. Average employment increased over the five corresponding months of 1942 by about 8 per cent. Man-hours increased by less than 13 per cent. But the frequency rate increased by 26 per cent.

What are the reasons for this skyrocketing of the number of work injuries of the railroads?

First, as already indicated, there has been a very substantial increase in employment. Not only has it been necessary to add new people to carry the tremendous increase in railroad transportation, but it has also been necessary to replace experienced men, drawn into the armed services, by inexperienced people—people not familiar with the hazards of the railroad industry. The net increase in employment falls far short of indicating the number of new people in the industry. It also has been necessary to recall from retirement older and less agile men and to employ, in certain occupations, young people without prior industrial experience. That has meant, on the whole, a dilution of the railroad personnel with persons who are greater accident risks, causing a considerable drop in the level of safety consciousness of employees. Hand-in-hand with this problem, of course, goes that of the increased difficulty of adequate supervision, which is so important with new personnel.

The second, and probably equally important, factor is that of crowding and congestion. The more trains and the more cars that are in use at any one time, the greater the hazard of accident, and the more likely the chance that more people will be hurt. Head, rear-end and side collisions can occur more frequently. That this actually happened is amply born out by Interstate Commerce Commission statistics. In 1940, there were 5.43 train accidents per million locomotive miles. In 1941, that number went up to 6.30, and in 1942 to 7.84. This is the highest rate

during the last 13 years. Collisions increased from 1,869 in 1940 to 2,899 in 1941, and 4,235 in 1942. Derailments increased from 3,723 in 1940 to 4,866 in 1941 and 6,828 in 1942. The total number of train accidents increased from 7,106 in 1940 to 9,401 in 1941, and 13,380 in 1942. This represents increases in total train accidents over the 1940 experience of 32 per cent and 88 per cent respectively. The story for 1943 promises to be even worse.

Thus far there have been few cases of material fatigue leading to accidents. But the roads are now using every piece of usable equipment they can lay their hands on. With the hard, constant use of the old as well as more recently built equipment, the point will inevitably be reached when material fatigue will become an important accident factor. It is merely a matter of time. Perhaps one indication of this fact is that locomotive and motor train miles during the first five months of 1943 were only 10 per cent above the corresponding mileage for the same period in 1942—but the number of train accidents due to defects in equipment and failures of equipment had gone up by nearly 43 per cent.

A third factor is the greater intensity of railroad work. Trains must run on schedules. That means that more freight must be loaded and unloaded within the same time span as before. The greater intensity of work stems from the fact that cars are now loaded much more heavily than they were before. Similarly, passenger trainmen must handle a very much larger number of passengers. Shop crews

must repair more items, and repair them faster in order to keep every bit of available rolling stock moving. In many instances these increases in work have far exceeded the increases in the size of crews, or yard or shop employees.

As a result, the railroads are faced with a problem of accident prevention for a larger personnel, of which a heavy percentage is new and inexperienced, working at an accelerated pace under greater congestion than heretofore. It is not difficult to understand why the frequency rates have gone up.

What Does It Mean

What does all this mean to you safety men? It means that you have by no means licked your problem. Your efforts must be increased, because the number of work injuries has risen sharply, both numerically and proportionately. Our losses in manpower because of industrial injuries are higher than they have been for many years—and at a time when we can least afford it. Considering the trends during the last two years, the further drafting of men out of our industries, and the expected growth in our industrial employment, the trend of injuries can be expected to continue upwards.

I wish I could congratulate you on having reversed this upward trend of industrial injuries. But I cannot. Not only have most of you not been able to decrease your frequency rates, but most of you have not been able to hold your own. The frequency rates of disabling work injuries are still going up.

"The United States Government and Its Safety Program"

EDWARD B. LANDRY, Chairman
Federal Inter-Departmental Safety Council, and Chief Safety Engineer,
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For several years and more especially within the past three years, public attention has been focused upon the active interest and leadership which the federal government has taken in safety problems affecting the home, business and industrial life of the people. This activity of the federal government in the field of accident prevention can best be illustrated by a few examples.

The Department of Labor has been active in safety legislation, promulgation of safety standards, accident statistics and safety consultation services. The Corps of Engineers of the War Department has been conducting a very successful accident prevention program with private contractors engaged in its construction work. The Provost Marshall General's Office of the War Department has undertaken a gigantic safety program affecting Army and Navy industrial contractors. The Civil Aeronautics Authority has done much to improve safety in the operation of commercial airlines. The Maritime Commission's shipbuilding safety program is playing a vital role in speeding up shipbuilding production. The Bureau of Mines has and continues to influence improvement in the safety of one of our most hazardous industries. The Coast Guard, National Park Service, Interstate Commerce Commission, U. S. Public Health Service and numerous other governmental agencies have done much in the interest of public safety. The foregoing list is not intended to be comprehensive or all-inclusive. Time will not permit further elaboration.

The fact that the federal government has been so busily engaged in problems affecting the safety of the nation as a whole has overshadowed information which otherwise would be known regarding the efforts which the government has directed toward the safety of federal workers.

What is the country's largest employer of labor doing for the safety and health of its employees?

I will not attempt at this time to describe in detail the safety and health programs of the several agencies of the federal government. But I will give you a general idea of how

the federal government is organized to handle accident prevention in its operations and some of the results of the program.

A few of the federal departments have had safety programs in operation for a score or more years. However, several years ago there was evidence compiled by the Secretary of Labor showing the need for all federal agencies to establish safety and health programs for their employees. This need was made known to the President and resulted in a request that the Secretary of Labor undertake a study of the problem. A steering committee was appointed, headed by Rear Admiral Lackey of the Navy Department. This steering committee recommended to the Secretary of Labor that the following be submitted to the President for his consideration and approval:

"(1) The head of each government department and independent establishment shall set up, in such agencies of the department or establishment as may be warranted by their activities, safety organizations directed by competent and experienced persons. The head of such safety organization shall report directly to a responsible executive and shall act as his advisor on all matters pertaining to safety.

"(2) Financial facilities, adequate for the conduct of this program, shall be provided in budget estimates of the separate divisions.

"(3) A permanent inter-departmental safety council, composed of representatives of various federal departments and independent establishments, and designated by the department heads, shall be established.

"(4) This inter-departmental safety council, through committee, or otherwise, shall assist the various departments and individual establishments in effecting Section 1. It shall further assist the organizations set up under Section 1, to:

- a. Make provision for investigation of accidents and maintain an accurate record thereof.
- b. Supervise and coordinate the establishment and maintenance of safety organization in component units of the agency.

- c. Maintain regular and detailed inspection of conditions pertaining to all premises, equipment, and processes; and recommend corrective measures where needed.
- d. Draft safety rules for various operations; plan and conduct educational activities.
- e. In other ways accomplish the objectives hereinabove described.

"It is suggested that when these recommendations be approved by the President, they be given the status of an Executive Order."

The Secretary of Labor transmitted this report to the President, who asked her to take immediate steps to establish an inter-departmental safety council as recommended in the committee report. In addition, the President addressed letters to the heads of departments and establishments asking that there be set up within the department or establishment such safety organizations as were warranted by their activities and that financial facilities adequate for the conduct of this program be included in budget estimates.

As a result of the first year's activity which was more or less organizational in nature, 190 persons representing all of the major departments, establishments and operating bureaus were enrolled as members of the council, 9 technical committees had been formed and the council was given executive order status on March 29, 1939. These technical committees were: agricultural, auto and highway, construction and industrial safety, safety education, occupational health, hazards, mining and tunneling, water transportation, walkway surface safety and safety office administration personnel.

Since its organization the council, through meetings, conferences and correspondence, has created an awareness of the accident problem on the part of many government administrators.

Through the influence of the council, the U. S. Employees Compensation Commission now produces for the federal agencies comprehensive statistical information on accident losses, expresses these losses in terms of the standard accident frequency, severity and "cost per \$100.00 payroll" rates, and has provided detailed analyses of accident types, sources and causes for a number of agencies.

Through publicity methods the accident records of individual agencies have been spotlighted and brought forcibly to the attention of administrators.

Through the facilities of the council as a clearing house, industrial hygiene engineers, ventilating engineers and safety experts have been made available to a number of agencies occupying leased space, for the purpose of checking and making recommendations on health and accident exposures.

The council conducted six annual safety conferences, including exhibits, addressed by top-ranking government officials and industrial leaders. Over 200 committee meetings have been arranged, conducted and recorded.

Several meetings on safety and health in the federal service have been conducted with the Council of Personnel Administration and the Society for Personnel Administration.

Technical committees have produced several objective studies and have conducted special programs.

A uniform accident prevention clause was developed for inclusion in all government construction contracts. The first to adopt this in all of its construction contracts was the Corps of Engineers whose construction program involves over \$7,000,000,000.

A detailed safety code for safety in excavation and building construction was prepared. Supplements to this code include "Safety Code for Explosives and Blasting" and "Safe Use of Inflammable Liquids."

The walkway surface safety committee, in cooperation with the Bureau of Standards, developed methods for testing the relative slipperiness of various floor surface materials as well as maintenance materials, such as waxes, polishes, paints, etc. The development of this study was made possible through collective action and financing on the part of a number of government agencies.

The safety education committee has organized a federal employees safety and health program, which has included the designation of a responsible program head in each office, department and establishment, the development of a series of office safety posters, a suggested safety committee organization chart and an office accident hazard check-list.

The council, through its committees, has worked with the Federal Specifications

Board in the development of specifications for eye protection devices, first-aid kits, etc.

The mining and tunnelling committee has developed an excellent report on safety in quarry, mining and tunnelling. This report served as the basis for a bulletin on safety in tunnelling issued by the Bureau of Mines, which has worldwide circulation.

The committee on occupational health has done a good deal of preliminary work in the development of uniform sick leave records and suggested methods for the analysis of these records and the correction of conditions responsible for employee illnesses. This activity is subject to further development.

These are some of the more outstanding results of the federal government's safety program. Some of these objective reports

are of direct interest to industry. There is still some organizational work to be undertaken in a few of the federal agencies before it can be said that the federal government has adopted a safety program throughout its entire operations.

Several of the federal agencies participate in the contests sponsored by the National Safety Council and have had winners for successive years.

Industry has provided healthy competition for a number of federal agencies with similar exposures.

Government's problem is parallel to industry's problem. We, therefore, desire that there will be continued interchange of ideas between industry and government to an even greater degree than now exists.

Using Handicapped Workers for War Production

VERNE K. HARVEY, M. D.

Medical Director, U. S. Civil Service Commission, Washington, D. C.

Shortly after the attack on Pearl Harbor, the U. S. Civil Service Commission, the central recruiting agency for the Federal Government, was faced with converting its examining and recruiting procedures to an all-out war basis. The Medical Division of the commission, which services all the various functions of the commission on medical problems, undertook to convert relatively high physical standards for employment in both Government industry and within the Departmental Service in Washington, D. C. to standards which would assure the maximum use of all available manpower.

Surveys Undertaken

Within a comparatively short period of time the Medical Division initiated extensive surveys of a large number of positions in government industry, including navy yards, arsenals, and air depots, for the purpose of determining the physical demands of these positions.

The scope of this undertaking can be judged by the fact that over one hundred governmental industrial establishments scattered throughout the continental

United States were surveyed, and that in these establishments over 2500 titled positions representing many thousands of positions were carefully analyzed to determine the physical demands of the position in relation to functional and environmental factors.

I have indicated that one of our objectives in initiating these surveys was to assure the maximum utilization of manpower. This was, of course, an immediate objective; however, we realized that later we would be faced with the problem of absorbing our share of disabled veterans during and after the war.

The information which we have obtained as a result of the physical demands studied has been incorporated into a manual entitled "Operations Manual for Placement of the Physically Handicapped." This manual has been widely distributed. It is an instrument for placement which enables us to match a handicapped person's disability with his qualifications to position in government industry. In effect, it has promoted a liberalization of physical requirements for ap-

pointment into the federal service under the War Service Regulations.

The commission announcements of examinations now carry a physical paragraph encouraging handicapped persons to apply for employment. We found, however, that this was not sufficient to insure the utilization of the relatively large untapped reservoir of handicapped persons, and that we must strengthen our working relationships with agencies primarily interested in the physically handicapped.

Records Compiled

We have kept records of placements which have been made in the federal service, including those of physically handicapped persons, since October 1942. There have been recorded approximately 17,000 judicious placements of physically handicapped persons in the federal service. This indicates that they are being placed at a rate of over a thousand a month. These placements have been in positions ranging from clerical to unskilled, semi-skilled and skilled positions in heavy government industries. Among those placed are a large number of blind persons at air fields. Unusual placements have been reported such as:

1. An armless telephone switchboard operator at a large government hospital.
2. A footless truck driver at an army air base.
3. A one-armed auto mechanic (tire changer) employed in the motor pool in the Quartermaster Department at a Port of Embarkation.

In meeting the large veteran problem after the war, the commission must be ready to demonstrate to appointing officials, as a result of its experience in placing the handicapped during the war, that physically handicapped persons who have been judiciously placed, as a whole, make efficient employees. We must be able to show what their personnel turnover, their production both in quality and in quantity, their accident and absenteeism records, have been comparable with employees possessing all of their physical faculties.

Study of Efficiency

With this in mind, the commission's

next step is to make a study of the manner in which the physically handicapped employees have carried out their work.

Why do we wish this information? First, to determine whether the program for the full utilization of handicapped workers should be given greater support and emphasis; second, to determine what changes, if any, should be made in medical standards after the war effecting the retention and employment of physically handicapped workers; third, to obtain useful information for all employing agencies on the efficiency of handicapped workers by types of disabilities; fourth, to obtain information useful to the commission in connection with the problems of placing disabled veterans during and after the war.

Several studies have been made contrasting the efficiency of handicapped workers with normal workers. The one most generally referred to was carried out by the Western Electric Company a few years ago. 482 physically disabled workers and 652 able-bodied workers were employed at the same time on the same jobs. Careful records kept over a period of one year disclosed that the physically handicapped workers had fewer accidents and fewer absences and they all had satisfactory or superior production records.

A recent study was made by the Office of Vocational Rehabilitation, Federal Security Agency, on the efficiency of physically handicapped employees. Executives of large corporations engaged in manufacturing war materials were asked to submit reports showing how their physically handicapped workers compared with their able-bodied workers in respect to absenteeism, labor turnover, accident rate and productivity.

Record Favorable to Handicapped Workers

The National Industrial Conference Board will soon release a report dealing with the industrial employment of handicapped workers. It will include the results of a recent survey made of 805 handicapped factory workers in comparison with 71,066 able-bodied workers.

As in the other studies referred to, the results were favorable to the handicapped.

The frequency rate of accidents was considerably lower than that of the able-bodied, although the number of days lost per accident and number of days lost per employee per accident was higher. The physically handicapped had fewer absences per hundred employees, fewer days lost per absence and fewer days lost per employee.

At a time when our country needs all the services of all the people, physically handicapped persons must be considered qualified for employment because of their abilities; not disqualified because of their disabilities. However, our regional medical officers tell us that the greatest difficulty encountered in the program to utilize the services of the physically handicapped to the utmost is where medical and safety officers still maintain very rigid medical requirements.

Why is this? Are they still operating under the misconception that handicapped workers are more susceptible to injury, based on the fear that injuries which would cause partial disability to normal workers may cause permanent total disability to workers already partially disabled?

The June 10, 1943, number of the *American Machinist* reported that a study of the employment records of a group of 4,404 men having orthopedic impairments disclosed that over a period of 13 years only eight were reported to have incurred a second injury.

Second Injuries

An executive in charge of the vocational rehabilitation program of one of our largest cities was asked the question: What has been the experiences of rehabilitation workers in the country with second injuries? He reported that the number of second injuries that result in total disability is very small—a small fraction of 1 percent. Even so, there persists in the minds of employers the idea that the existence of a disability makes the worker more susceptible to a second injury. Actually, the records show that physically handicapped people, who are intelligently placed in suitable jobs, are the safest workers in the world.

Even in the case of the totally blind

who have been employed in industry for the past forty years, there has not yet been a major compensable accident in any of the many plants and factories in which they are employed. The reason is that the physically handicapped are more careful to obey safety regulations.

In order to take full advantage of the relatively untapped source of desirable physically handicapped employees, the office of Chief of Ordnance, Safety and Security Branch, War Department, issued Circular No. 17, dealing with the utilization of handicapped workers. This circular urges the medical, personnel, and safety directors of each ordnance establishment to review their employment procedures and policy with a view of attempting to place every applicant for employment who is capable of productive effort at a job he or she can perform safely and efficiently.

When a second injury does occur what relationship, if any, does it have to the permanent injury? This question was recently presented to the U. S. Employees Compensation Commission. During the past few days they have analyzed 185 cases where a permanent injury occurred during federal employment. In no instance did they find that a second injury was at all related to the permanent injury.

Proof and Methods of Approach

The fact that the field officers of the Commission have placed approximately 17,000 persons with permanent physical handicaps in Federal establishments since last October and that many more have been placed in private jobs by the U. S. Employment Service and by State Rehabilitation Agencies, is abundant proof that handicapped workers can be used successfully in industry. However, appointing officers have not yet fully utilized to any great extent the reservoir of approximately two million physically impaired workers available for war production employment.

Our first step in attacking the problem was the job analysis study of 2500 different positions. Our second step was to change our physical standards based on knowledge of actual job requirements.

Third, our Operations Manual was published and placed in the hands of federal appointing officers and rehabilitation workers. Fourth, a committee for the recruitment, training and placement of physically handicapped in the federal service was created to establish more direct relationships between the agencies working with the handicapped and to coordinate their activities. The fifth step is a continuing one; the overcoming of the resistance and inertia on the part of employers to the employment of qualified handicapped workers and the convincing of appointing officers that there are many jobs in their agencies which can be adequately filled by physically disabled persons.

As a part of this fifth step the Commission has just published a pocket sized booklet called *Untapped Manpower*. It was prepared especially to answer questions raised by appointing officers such as the following: (1) Why should we em-

ploy handicapped persons? (2) How do we know which jobs can be filled by disabled workers? (3) How do we match the qualifications of the applicant with the physical and environmental demands of the job? (4) How do we get handicapped workers? Copies may be secured by writing to the Central Office of the Civil Service Commission.

The sixth step is the efficiency study of more than two thousand physically handicapped persons who have been employed in the federal service for six months or longer. It would be short-sighted to encourage the employment of handicapped persons merely to help meet the manpower shortage. The study should provide facts which will result in policies and programs that will contribute to the solution of problems directly affecting millions of disabled civilians and war veterans and indirectly affecting the economic well being of millions of other citizens of this country.

THURSDAY MORNING SESSION

October 7, 1943

Presiding:—E. G. QUERSZEL, Director of Safety, The Borden Co., New York City, and Regional Representative, National Committee for the Conservation of Manpower in War Industries.

Protecting Your Teen-Age Workers

S. W. HOMAN, Safety Engineer, Industrial Division, Children's Bureau, U. S. Department of Labor, Washington, D. C.

From a national viewpoint, the increased employment of young workers is tremendous. The Children's Bureau estimated that in July 1943, the summer vacation period, roughly 5 million boys and girls, 14 through 17 years of age, were at work, 3 million of these youngsters were 16 and 17 years of age, representing about 2 in every 3 of the population of these ages in the United States. Even in April 1943, a month during which schools were in session, about 2 million 16 and 17-year-olds were engaged in full or part-time work. It is the 16 and 17-year-old group that we are particularly interested in, because this is the group that is finding its

way into industry; and young people of this age are the ones who can be reached through organized industrial safety programs.

Out of the 2 million young workers of 16 and 17 years of age in April, 1943 about 500,000 were in manufacturing and the remainder in agriculture and other types of work. The proportion as well as number of young workers of these ages in manufacturing industries has been increasing over the past 3 years.

Higher Accident Frequency Rate

For, if any, of the half million young-

sters in manufacturing have had any previous industrial experience, and safety engineers pretty well agree that the new employee is one reason for the alarming increase in accident frequency and severity rates. In addition to lack of previous experience, youngsters are particularly lacking in the characteristics of caution and judgment that make a safe worker. Furthermore, these teen-age workers have not reached their full physical development, and injuries such as strains and hernia are a serious problem.

The question often arises, "Are these young workers more susceptible to injury than adults?" There is considerable evidence that younger workers have a higher accident frequency rate than adults in comparable occupations. In the matter of occupational disease, it is widely accepted that growing boys and girls are more susceptible than mature individuals to injury from industrial poisons. Lack of mature judgment renders young persons more likely to neglect the use of personal protective measures and observance of the other necessary safe practices. It is interesting to note that here, in the State of Illinois, the 998 injuries to minors under 18 years of age reported in 1942 represented an increase of 60 percent over 1941, and were three and one-half times as numerous as in 1940.

Attitude of War Manpower Commission

The Children's Bureau is not alone in recognizing that the employment of these young workers in such large numbers does create a serious problem. In January of this year, the War Manpower Commission issued a statement of policy on the employment of youth under 18 years of age. This statement points out that, in most cases, youth under 18 can best contribute to the war program by continuing in school and, when their services are required, accepting vacation and part-time employment. It recognizes, however, that the demands of the war period will increase the number who in normal times leave school to enter full-time employment before reaching 18. It asks for the active cooperation of government agencies, educational authorities, management and labor in safeguarding young workers, so as to bring about their maximum contribution to the manpower needs consistent with their health and welfare and the fullest utilization and development of their aptitudes, abilities and interests. In discussing

the employment of youth under 18, the War Manpower Commission offers in its statement of policy, among other things, that they be employed "in work suited to their age and strength, avoiding especially occupations that are hazardous or detrimental to health or welfare."

Cannot Minimize Importance of Protection

Occasionally, someone may try to belittle the importance of protecting teen-age workers, either through training or placement in safe jobs, by pointing out that they are subject to the draft at 18, or that they can enlist in certain branches of the service at 17, where they are exposed to the hazards of war. This argument fails to consider that before a recruit is ready for battle he goes through a long period of training, often a year or more, and when he does see active service, he is trained and equipped in the best possible way. Industry, too, is dangerous and it is important that young industrial recruits be protected against the hazards of this industrial age. Industry is faced with a tremendous moral obligation to these young workers, and even economic reasons alone dictate that their future productive capacity shall not be impaired by injuries on the threshold of their careers.

Three Point Program

Now let us see what can be done to prevent injury to these young workers. The Children's Bureau suggests a three-point program which, I believe, will materially assist in cutting down the number of injuries to workers in this young age group:

- First: Thorough safety training and close supervision.
- Second: A safe and healthful place in which to work, and
- Third: Placement only in the least hazardous occupations.

Regarding thorough safety training, this is a job which must start in the schools and be carried along by industry. Safety instruction should be given not only in school training, particularly vocational training, but also in preemployment training carried on by the schools. Some time ago I had occasion to visit a school where preemployment training in aircraft work was being done. In one

part of the school trainees were being instructed in hand drilling of aluminum sheets prior to riveting. As you know, when aluminum is drilled it throws off a great number of spalls. These trainees were operating portable electric hand drills without eye protection of any kind. This certainly is not the type of training that we want to give our boys and girls as their introduction to industry. Safety lessons learned in a school shop and emphasized in preemployment training will make the young person a safer and better worker when he takes his place in industry.

Plant Training

Plant training for the job is likewise essential. In many instances, the plant will represent an entirely new environment to the young worker who may be coming from school without any previous industrial experience. He should be given the opportunity to get the feel of the shop before he is allowed to work. Certainly no inexperienced worker should be permitted to do a job until his supervisor is sure that he knows how to do the work safely and that he clearly realizes the safe way is the right way.

To give the kind of training which will produce the desired results, the supervisor must put himself in the place of the inexperienced worker. What seems simple and easy to the supervisor may be very difficult to others. He must not only tell the worker how to do the job, but he must show the worker by doing the job himself. The supervisor, in turn, watches the worker do the job, checking and supervising him until he is sure that the worker knows how. Steps in training must be taken in order, patiently and slowly.

Job Supervision

After his preemployment and plant training is complete, the young worker still requires careful, continuous supervision on the job. Safety is largely a matter of acquiring safe habits: and young workers must be given continuous and careful supervision to make certain that the work is being done correctly and safely. Being naturally adventurous, the young worker may tend to be negligent in the proper use of guarding and protective equipment; he may become over-fatigued; he may attempt to lift objects too heavy for him; and in many cases he may have a tendency

toward horseplay. Constant supervision is necessary to encourage him in acquiring habits of good housekeeping and knowledge in the use of proper tools for a job. Since he is young and responsive to suggestions, he can acquire good habits quickly. Many shop practices are learned during the first year of employment, and good supervision is particularly necessary then to insure that the young and inexperienced worker learns to do things the safe way.

One of industry's troubles has been the difficulty of securing properly trained supervisors and foremen. Industry is aware of this and is making every effort to train persons for supervisory jobs. Considerable help is available from the government, and I would like to urge that more industries avail themselves of the job instructor training service of the War Manpower Commission. If properly trained supervisors are available, more adequate training and better supervision of the new workers under them should help in reducing injuries.

The plant can also help in this matter of supervision. For example, many plants have adopted the policy of furnishing their 16 and 17-year-old employees with a special type of identification badge so that they can easily be spotted by their foreman, supervisor, or the safety engineer, in case they are working in hazardous occupations or are engaged in other unsafe practices. This apparently has worked out very well in the aircraft industry, and I would urge its adoption in other industries.

Working Conditions

I am not going to dwell at any length on the matter of a safe and healthful place to work. Most of you will agree with me that a safe work place, including properly guarded machines, adequate lighting, safe floors and stairs, and air free from dust or other contaminants, is the very foundation of any worthwhile safety program. If this is true where adults are concerned, it is doubly true for teen-age workers who have not learned to protect themselves and must depend for protection on the physical safeguards afforded them.

Machines, particularly, should be adequately guarded when operated by young and inexperienced workers. Injuries due to machines, especially those caused at the point

of operation, are usually more severe than those due to other causes, such as hand tools or falls. Lacking operating experience, young workers are more likely to get hurt in unguarded gears or unguarded points of operation than are operators who know their machine and their jobs. A great deal of help in providing a safe place to work is available to industry from the federal and state government. You will hear more about that feature from the other speakers on this program.

Placement of Youthful Workers

After the teen-age worker has been thoroughly trained, is under good supervision, and has been given a safe place to work, he can still get hurt if he is not placed in a safe job. This brings us to the third, and I believe the most important point of the protection program—placement in only the least hazardous occupations. Strange as it may seem, many employment officials do not have information about which jobs in their plant are the most hazardous.

I recall visiting a large shipyard some time ago and discussing the matter of relative degrees of hazards with the employment manager. I mentioned that work on the ways was more hazardous than work on the skids in the yard and that, as a matter of policy, teen-age boys should first start to work on sub-assembly in the yard. He said that in his plant work in the yard was more hazardous. When I questioned this, he called in his safety engineer and asked him if it was not true that they had more accidents in the yard than on the ways. The safety engineers said that this was true, but since they had over four times as many men in the yard as on the ways, the actual frequency rate in the yard was approximately one-quarter that on the ways.

Now here was a case of an employment manager who hired thousands of workers and yet did not know which of his jobs were the most hazardous. Fortunately, this is an exception rather than the rule, but it does indicate that close cooperation between the personnel department and the safety department is necessary.

Some Standards Already Established

The matter of prohibiting work in hazardous occupations to young workers is not new. It is an accepted function under most state

child-labor laws; and some states have done an excellent job in keeping young workers out of hazardous jobs. The Fair Labor Standards Act, commonly known as the Wage and Hour Law, contains a hazardous-occupation provision under which a minimum age of 18 is established for work in occupations found particularly hazardous by the Chief of the Children's Bureau of the U. S. Department of Labor. Up to this time, six hazardous-occupations orders have been issued under that law, establishing a minimum age of 18 years for work in or about explosives plants; as drivers or helpers of motor vehicles; for work in and about coal mines; for most occupations in logging and sawmilling; for the operation of power-driven woodworking machines; and for work involving exposure to radioactive substances. Many other hazardous industries or occupations are not covered by either state or federal laws or regulations; and there is need for additional guides to help employers in placing their teen-age workers in the least hazardous occupations.

The Children's Bureau has recognized this fact and has undertaken to help employers by providing information about which jobs are the least hazardous. Early this year, the Bureau began issuing a series of so-called advisory standards. These advisory standards are published as leaflets, each one covering some one industry or occupation. They call attention to the hazards of the industry and suggest not only where young workers should not be employed, but also where they may be employed with comparative safety. These advisory standards differ from state laws or federal regulations in that they are advisory only; they carry no penalty for noncompliance. They are used by the personnel office in the placing of young workers and other new or handicapped workers; they are useful in setting up job analysis; and should be valuable in planning vocational-training programs. They are also of value to the safety department in following up to see that boys are placed on those jobs where they can work safely and efficiently.

Method of Drafting Standards

In drafting these advisory standards, the same procedure that has been found so successful in safety-code development is used. A technical advisory committee, made up of representatives of employers, employees, in-

surance companies, safety organizations and others interested in safety, is formed, and they, in effect, make the recommendations. In all advisory standards that have been issued to date, there has been almost unanimous agreement by the advisory committee; and the suggestions, therefore, represent the views of people who know the hazards of the occupations or industries covered by them. They are, in fact, industry's own answer as to which of its jobs are the most hazardous.

Up to this time, seven such standards have been issued. The first one, being introductory, gives a little of the philosophical background of the others in the series. Individual leaflets have been issued on the employment of young workers in shipbuilding; in lead and the lead using industries; employments involving exposure to carbon disulfide or to chlorinated solvents; in welding and in the operation of metal-working machines. Approximately 250,000 of these have been distributed to industry since January of this year, and we get many requests for them every day.

As distribution is almost entirely on request, this indicates that employers are interested in getting information about where their teen-age workers should be employed. Several other standards are now in preparation. One of these will deal with aircraft manufacturing, this particular standard being the result of a request made to the Children's Bureau that a standard for that industry be made available.

Should Profit from Suggestions

To you safety engineers representing manufacturing industries, I would like to suggest that you avail yourselves of the information contained in this series of leaflets. If

you are in doubt whether you do employ many 16- and 17-year-old persons, it might be a good idea to check with your employment office and urge them to give careful thought to the kinds of work these youngsters can do safely. You safety men helped write these suggestions, and you should profit by them.

Many of our own federal government departments are using them to advantage. The U. S. Maritime Commission has distributed these standards to all shipyards having Maritime Commission contracts and, through their own safety engineers, are urging their adoption. The safety engineer's office of the Navy has furnished copies to all Navy shore establishments. The standards are used by the National Committee for the Conservation of Manpower in War Industries, when they run up against the problem of advising employers on where young workers should be employed. The Federal Committee on Apprenticeship of the War Manpower Commission has assisted us in preparing these standards and has found them useful in setting up apprentice-training programs. Insurance companies, trade associations, labor unions, and other organizations have requested copies for their own use or for distribution to their members. They have apparently been useful to others; perhaps they can also be useful to you.

To you representatives of state labor departments, these advisory standards should also be helpful. I am sure that the increasing number of these young workers is getting to be a source of worry to you and, by using the legal authority you have or using your persuasive power, you can do a lot for these youngsters by seeing that they are placed in jobs in which they are least likely to get hurt.

A Government Safety Consultation Service to Industry

W. T. CAMERON, Chief Safety Advisor, U. S. Department of Labor, Washington

At this moment (11:00 A. M., October 7, 1943), we've been in the war exactly one year, ten months, five hours and thirty minutes.

In that time we've spent well over \$16,500,000,000 building the world's greatest industrial establishment, dedicated to equipping the world's finest fighting force.

To do this job we've recruited, converted, trained an industrial army of 20,000,000 men and women; an industrial army which has already put in the staggering total of 70,000,000,000 man-hours of brawn and brain, skill and energy.

We've used 4,600,000 tons of copper, made 52,800,000,000 phone calls, consumed 20,000,000 bales of cotton, driven 28,000,000,000 miles, processed 200,000,000 pounds of synthetic rubber, and poured 153,000,000 tons of steel.

Four Mediums of Exchange

It's the price we're paying to assure an early and complete victory over the enemies of our way of life. It's the "price" we're paying? I should say it's the *few* prices we're paying to win this war. For we're dealing in four mediums of exchange:

One, the faster you spend it, the more there is for everyone—*Money*.

One which is doled out in like amounts to both ourselves and our enemies. You've got to use it while it's there, you can't save it until tomorrow or next week—*Time*.

One which when at the right place at the right time may mean the difference between a battle won or a battle lost—*Material*.

One which can be spent today, can be spent again tomorrow, as long as we guard it carefully while it is being used—*Manpower*.

But in these 22 months we haven't always spent wisely—we've wasted money; frittered away the equivalent of 1,923,600 man-years of time; damaged or destroyed a vast amount of material and equipment; and thrown a tremendous amount of manpower on to the scrap pile.

Many agencies, both public and private, have become alarmed and are doing something about this tremendous drain on our country's productiveness. My report to you, however, is on one battle front of the war being waged against accidents—the job safety campaign of the Department of Labor's National Committee for the Conservation of Manpower in War Industries.

Basic Purpose of Program

When the Secretary of Labor appointed the National Committee for the Conservation of Manpower in War Industries some three years ago, she pointed out that industrial manpower, a vital resource in our production program, was liable to wastage in a number of ways; and that one of the chief causes of this wastage was in industrial injuries. Since the control of job injury is a local problem, which rests squarely upon plant management, and since a quarter century of organized safety effort had resulted in the development of practical methods of accident and disease prevention, the program set forth was designed to bring directly to plant management the will to safety, a knowledge of basic safety methods, and expert assistance in initiating safety programs. The program of the committee has been broadened in the three years that followed, but it still adheres to its basic purpose, to attack the accident problem where it exists, in the plants and shops which are producing the supplies and materials of war.

Three years ago there was no shortage of manpower; but to those who read the lessons of the past, the shortage was inevitable. And it is not least among the committee's accomplishments that its cry for safety, unheeded at first amid the clamor for speed at any cost, is now a national crusade, echoed daily in the press and on the air. But the committee has other, more tangible, accomplishments to its credit. And despite a general rise in work injuries—a phenomenon beyond the control of the National Committee or any other safety group—evidence points to a definite improvement in those plants which have taken advantage of the committee's services.

Responsibility of Certain Groups

Within every industrial establishment there are four groups which have either a direct responsibility for safety, or an immediate concern with its effectiveness. Management, top operating personnel, supervisors and workers, each has a definite part to play in any plant safety program. For each, the committee has fashioned definite services. To management, in more than 20,000 war plants, the committee's special agents have brought their personal services. Two-thirds of a million copies of publications, dealing with the fundamentals of safety organization and the handling of specific safety problems, have been distributed to management, operating personnel and supervisors. Three million copies of a little booklet listing practical tips on safe work practices have reached war workers, through either the employers or their unions. Some 40,000 key supervisors have completed the National Committee-Office of Education safety training course, and thousands of foremen are already enrolled in a recently launched course on foremen safety training. The campaign of direct-worker education has been stepped up, on the air, in the press, and on the screen. Unions are playing an increasingly effective part in accident prevention.

Management: Its Responsibility for Safety

The primary responsibility for safety rests squarely on the shoulders of top management. Management has a legal responsibility for safety—to provide a safe and healthful workplace; a moral responsibility for safety—to protect the lives, limbs and health of its employees; a financial responsibility for safety—to safeguard the plant owners from wastage of funds in the compensation, medical and indirect costs of preventable injuries. And most important, in these times, management has a patriotic obligation to speed production by efficiently utilizing and guarding the dwindling supply of war workers and by preventing the loss of time, life and skills which result from work injury.

Assistance in Meeting the Responsibility

The keystone of the National Committee program is the bringing to war plant management the will and the knowledge necessary to the establishment of a sound plant safety

program. As means to this end, the committee makes available to management—

1. **Personal Consulting Service:** The personal services of some 600 volunteer safety agencies, practical men in the employ of private industry, who call upon management for the purpose of stimulating interest in safety and assisting in the establishment, expansion or improvement of a plant safety program.
2. **Printed Material:** Publications which point up the need for and value of safety, explain the services of the National Committee, and outline the fundamentals of a sound safety program.

Top Operating Personnel: Functions and Responsibilities

Top operating personnel, plant engineers, personnel directors, plant superintendents, safety directors, is typical of the staff of officials whom management holds responsible for plant operation, quality of product, safe and continuous operation. The plant engineer makes sure that new processes and new machines are set up and equipped to safeguard the operators. The personnel office acquaints new employees with the plant safety program and trains them in safe work practices. The plant superintendent checks to make sure that the safety equipment is used and the work carried on in a safe manner. The safety director coordinates the safety activities of the others and assists in handling technical safety matters.

Assistance in Fulfilling Functions

The National Committee assists operating personnel in fulfilling its safety functions by providing services designed to improve the general understanding of the field of industrial safety and its basic methods and to give technical information on specific safety problems:

1. **Safety Training:** Through a 96-hour evening course in the fundamental principles and basic methods of safety, the committee assists operating officials in gaining a better understanding of safety and assists management in developing men and women qualified to carry out the safety program.
2. **Personal Consulting Service:** The spe-

cial agents assist and advise in the development of educational campaigns, plant surveys and safety instructions, and in solving special problems.

3. **Printed Material:** A series of special bulletins and reprints on such technical subjects as welding, machine guarding, industrial sanitation, industrial lighting and the safe handling of hazardous substances.

Shop Supervisors: Functions and Responsibilities

"Top Kick" of industry, the foreman, bears direct responsibility for performance on the production line. Through him must flow all of the management plans for quantity and quality of product and for the safety of the men. From him must come reports on the practical workings of ideas, techniques and campaigns. He, his line subordinates and his safety co-workers have a vital part to play in the plant safety program. They have the job of seeing that safety equipment is used, tools and equipment are in safe working condition, that safe work practices are followed. They must report back to management the practical operation of new ideas and equipment and submit recommendations for necessary changes. Without the active support of supervisors, the most elaborately conceived and carefully worked out program of safety is doomed to failure.

National Committee Service to Supervisors

The National Committee renders direct service to foremen, assistant foremen, leadmen and safety committeemen, in the following three ways:

1. **Safety Training:** In addition to the training course for key supervisors, the National Committee has worked out a special course for the training of foremen in the details of safety as it applies to their own work.
2. **Personal Assistance:** Upon request of management, the special agents work directly with foremen as a group, outlining their safety functions and discussing practical shop problems.
3. **Printed Material:** A series of publications prepared by or in collaboration with the Division of Labor Standards upon specific safety functions of shop supervisors.

The Worker's Stake in Safety

The individual worker has a direct and personal stake in safety. To the nation, safety means a smoother, more constant flow of the arms and equipment essential to victory. To plant management, it means a saving in compensation and medical bills and related costs. But to the worker, safety means a longer life, a whole body and unimpaired earning capacity, a full pay envelope instead of a compensation check. Despite more liberal workmen's compensation laws and improved restorative medicine, the worker is still the primary victim of industrial accidents. He is the primary beneficiary of industrial safety.

The union, an association of individual workers banded together for mutual protection, reflects the personal stake in safety of its individual members. Organized labor has made great strides in improving the conditions under which American men and women toil, in gaining for them a larger share of the fruits of production, in gaining for them protection against the vicissitudes of modern economic life. But of what value are high wages, shorter hours, old age and unemployment benefits to the worker who is maimed for life by an accident, or to the family of a worker who has been killed at work?

Organized labor has already contributed to organized safety. Its force was solidly behind the drive for workmen's compensation laws, the enactment of which gave impetus to safety by holding management responsible for at least a share of the financial burden of job injury. Labor helped inaugurate and has supported state safety codes and inspection codes and inspection services. It can and is helping its individual members to better understand the need for working safely always and for taking a direct and active part in plant safety programs.

Committee Program Bears Fruit

The end of all industrial safety activity is a reduction in the number of time-wasting, skill-destroying injuries. The ultimate test of the effectiveness of any program is, then, the extent to which it succeeds in accomplishing this end.

Plant accident experience is measured in terms of frequency rates—the number of in-

juries per million man-hours of exposure. The vast majority of plants in the United States have never computed their rates, nor have most of them maintained records upon which rates may be computed. However, 4,377 of the plants contacted by the National Committee during the first 30 months of its existence had records which could be used in computing experience before and after committee service. 74.2 per cent of the reporting plants experienced a decrease in accident frequency; 4.8 per cent reported no change; and the remaining 21 per cent continued to show an upward trend.

Improved Safety Effort

For the majority of plants serviced—those which maintained no accident records—the sole criterion of progress is the extent to which they have undertaken to put to use those tools of safety which eventually result in lowered accident rates. Improvement in safety effort is indicated by the following table.

It is surprising that, with management and men in many plants convinced of the value and practicability of safety, the committee is receiving more and more requests for specific service on definite problems. This is the kind of service that is productive of

tangible results; and the record of accomplishment during the next year should reflect improved safety performance in a large number of plants. But, unfortunately, the majority of plants in the country still are doing little or no effective safety work, and the will to safety must be instilled in their managements before the groundwork for progress can be laid. This is the unfinished business of the National Committee—and its challenge.

Beneficial Changes in Plant Safety Work Resulting from National Committee Service

Plants Contacted July-Dec., 1942

	No. of Plants	Percentage of Plants Contacted
Initiation of safety program.....	956	18%
Intensification of plant safety program	1293	24%
Employment of full-time safety engineer	257	5%
Employment of part-time safety engineer	339	6%
Organization of plant safety committees	832	15%
Enrollment of supervisors in safety training courses.....	1453	27%

Industrial Health

WEDNESDAY MORNING SESSION

October 6, 1943

Presiding:—WALTER S. PAINE, Manager, Engineering Department, Actna Life & Affiliated Companies, Hartford, Conn., and Vice-President for Industrial Safety, National Safety Council.

An Approach to Tuberculosis in Industry

C. RICHARD WALMER, M.D., Medical Department,
Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Assuming that one of the greatest individual losses of earning power in the productive period of a man's life, that is, in early or middle life, is due to tuberculosis, we, in industry, feel it our obligation not only to seek out these cases but to counsel them accordingly.

Our approach to these cases is, of necessity, limited due to the fact that, generally, a prospective employee will offer nothing in the way of past or present medical history. In order to cope with the situation, we must have a system of rules to which we can turn. In our situation we go about this by:

1. Preplacement examination—routine of all prospective employees.
2. Transfer examinations—which are required of all present employees seeking advancement in certain jobs.
3. Periodic examinations—this type, unfortunately, is limited to those of selected occupations and comprises only 4,000 (or one-sixth) of the total population of our plant.
4. Cases reported sick and examined upon returning to work.

Preplacement Examination

The preplacement examination may be our last chance of ever physically evaluating the employee for the duration of his employment with our company and, therefore, must be comprehensive and all inclusive. All new employees are fluoroscoped routinely and their chests examined clinically. Insofar as the prospective employee offering informa-

tion about himself is concerned, one would classify him as a mental case if he were to offer any damaging evidence to hinder his obtaining a new job. All new employees are routinely X-rayed, as is any case of doubtful fluoroscopy or clinical chest finding. We pay particular attention to any case giving past occupational history of employment in mining, welding, or in the dusty occupations, such as foundries.

Any prospective employee having sufficient chest findings to warrant his rejection as an employee is promptly told of our suspicions and advised to see his own physician without delay. We offer him a letter of our findings to take to his doctor and in many cases receive an appreciative reply from both the doctor and prospective employee.

Transfer examinees are not routinely X-rayed unless they have actual complaints, clinical findings, or are to assume duties in a dusty atmosphere.

Periodic Examinations

Periodic examinations are, as mentioned before, unfortunately, limited to about one-sixth of our personnel. However, we feel that these men and women are the ones whose occupations may cause occupational illness, if environment is not properly controlled. The system of examination in this category depends upon the type of job and hazards involved. We will limit this paper to that of chest findings only. Each man receiving a periodic examination receives a thorough clinical chest examination includ-

ing fluoroscopy and X-ray. These men are examined yearly, and in this way, we have a more accurate control of them.

At present, the majority of our cases of tuberculosis have been found as a result of these periodic examinations. In our East Pittsburgh plant alone, we have fifty-eight cases of active pulmonary tuberculosis. 31 per cent of these cases, at present, are undergoing sanatorium treatment and the remaining 69 per cent, after having received the proper instructions, or previously having been under their physician or sanatorium care, are convalescing at home. The majority of these cases were discovered rather early in the course of the disease.

Financial Analysis

A financial analysis of these cases represents a gross loss to them as a whole of \$139,200 per year (based on the present day average earnings of \$2,400 a year). This figure may seem high but it speaks for itself. Since September 21, 1942, we have had twelve cases return to work. This does not mean that they were all able to resume their original occupations; but it does mean that each one was able to resume a full day's work, even though it was in a less rigorous type of occupation. When a man's illness has been pronounced arrested and he is able to return to work, an evaluation is made by one of the physicians of our staff and an occupation is found in which he can carry on safely. At no time do we permit an active case, regardless of its incipency, to work. There are some cases, however, who after arrest are able to do only light work. These cases we permit to pursue an outside occupation until we feel reasonably sure that they are physically able to carry on in our plants.

Hypothetical Case

Let us now take a hypothetical case: John Brown, age 27, a painter, presents himself for periodic examination. He has worked for our company six years. His preplacement examination, as were his first four periodic examinations, was essentially negative. At this time, he shows evidence of auscultatory changes in his upper right chest. We interrogate him about subjective complaints but, likely as not, he volunteers no information, or at the most confesses to one

or two tangible symptoms. Although his job card does not call for an X-ray, we offer and advise him to have one, asking him to return the next day. In the meantime, a conference of his case is held with at least one and usually two other physicians of our staff. At this time we will determine which of the three courses his particular case will require, namely:

- (a) Immediate study.
- (b) Further study, meaning monthly or quarterly checkups.
- (c) He may be held over with safety until his next periodic examination.

If this case should fall into class (a) of immediate study, we will at once try to obtain a series of sputum tests and sedimentation rate, and by this time we may win his confidence sufficiently to delve into his past history and subjective symptoms. If, after exhausting all of our facilities, we still cannot arrive at a positive diagnosis, we will seek outside consultation. Assuming that this hypothetical case has an active tuberculosis, we attempt to learn of his financial status. If he cannot afford private treatment, we offer to apply to one of the state sanatoria for him.

Cooperate With Family Physician

Looking at this particular "John Brown" in retrospect, I would like to state that this man's own physician is notified of our findings, and if he wishes to handle the study, we will cooperate with him to the fullest extent; but, as a rule, his physician prefers that we continue investigation of him and keep him informed of our actions. If we are to handle this case from our own state clinic, the man will have a waiting period of from two to six weeks, before a bed can be secured for him at one of the sanatoria. During that period, he is instructed how to conduct himself, impressing upon him the common sense hygienic measures which are so all important, stressing the adequate amount of rest and the proper type of nourishing diet. He will be seen from time to time by one of our visiting nurses, who in all probability will also be the one to take him to the train when he departs for the sanatorium. After he has gone to the sanatorium, he will be visited periodically by one of the nurses or doctors.

The contacts of this case are our next point of consideration. All of his immediate contacts in the shop are studied clinically, then X-rayed, and a record is kept of them. His home contacts, particularly his wife and children, are offered our services.

Care After Return From Sanatorium

"John Brown" will remain a patient at the state sanatorium as long as the medical director deems necessary. He may even remain until he can return directly to some type of work with our company; but as a rule, he is discharged before this time and continues his convalescence at home. In that event, we will be notified of his return and our visiting nurses and doctors will contact him. If he is ambulatory, he will be asked to call at our medical department from time to time so that we may follow and advise him. When he is able to resume work, every consideration will be given to his previous ailment and a suitable type of occupation will be found for him. In many cases, the new occupation may be quite different from the original one.

Reports from Selective Service

Experience in World War I should make us remember quite vividly that war and tuberculosis don't mix. The number of draftees who have been rejected thus far in World War II for tuberculosis should put industry on constant guard against employing these men who have tuberculosis, for their own good and the safety of their fellow workers.

If for no other reason, the reports from the various state draft boards should spur our every effort to render as much assistance as possible in the diagnosis and control of tuberculosis. In the State of Pennsylvania alone, it has been estimated that over 11,500 young prospective draftees were rejected for tuberculosis; and it is quite obvious that many of these rejections are seeking employment in war industries.

Survey of Industries

The "Current News of Official Industrial Hygiene Activities" Vol. 3, No. 3, March, 1943 reports:

"Seventy-seven war industries in 11 different states were surveyed by the eight 35 mm. photofluorographic units operating in

industry prior to February 1, 1943, reports the Office of Tuberculosis Control, U. S. Public Health Service.

"A total of 194,896 individuals were X-rayed. Tabulations on results of the X-rays are available for 125,190 people. Of these, 1,631 or 1.3 per cent were found to have significant pulmonary tuberculosis. The distribution of the positive cases by stage of the disease was as follows: 874 or 53.8 per cent minimal; 707 or 43.3 per cent moderately advanced; and 50 or 3.1 per cent far advanced.

In the District of Columbia 28,098 government workers have been X-rayed. Exactly 300 cases (1.1 per cent) of pulmonary tuberculosis have been discovered. Of these 182 (60.7 per cent) were minimal, 106 (35.3 per cent) moderately advanced, and 12 (4.0 per cent) were far advanced. In addition, 1,300 workers at the National Institute of Health have been X-rayed. Among these, 15 cases of tuberculosis were found—9 minimal and 6 moderately advanced."

Necessity for Education

Not only must we seek out and counsel the tuberculous and potentially tuberculous, but we must also institute an educational program to maintain the health of the worker. This type of program should be year-round. It is well to keep tuberculosis in the fore, but at one or two times in the year tuberculosis should be particularly stressed. During the past year at Westinghouse Electric and Manufacturing Company, we had a period of two months devoted exclusively to tuberculosis. Each second week of the two months, a pamphlet was circulated which dealt with the various aspects of the disease. The titles of these pamphlets were:

1. What is Tuberculosis?
2. War and Tuberculosis.
3. Do I Have Tuberculosis?
4. How the Doctor Diagnoses Tuberculosis.
5. Infected Sputum Spreads Tuberculosis.
6. Hygienic Living Protects from Tuberculosis.
7. Good Nutrition Helps Prevent Tuberculosis.
8. The Modern Treatment of Tuberculosis.

It is the earnest hope that each one of these pamphlets, in addition to being read by an employee, was carried home and read by at least six people not directly associated with our plant. Assuming that this was the case, our educational health program would have a most direct bearing on community physical well-being. If a similar type of educational health program were instituted in each war plant, an inestimable number of the nation's population would be reached.

Expense Justified

With the egress of the physically fit from

industry to the armed forces, and with the ingress of the physically unfit to industry, a program of tuberculosis prevention and weeding out is imperative. If this program is not carried out, the number of cases of active tuberculosis unquestionably will mount. When this happens, not only the present generation but also the future generations will suffer immeasurably. One cannot conceive the number of contacts an unsuspected active tuberculosis case may have without attempting to curb its harmful potentialities. The expense involved in a thorough preplacement or periodic examination program will be repaid many times, if but one active case in many thousands is discovered.

Evidence Pointing to the Need for a Broader View of Accidents Due to Electricity

CECIL K. DRINKER, M.D., T. J. SHAUGHNESSY,
and J. A. MCCARTHY¹

Those who have been interested in the effects of the electric current have concentrated their attention upon accidents where serious harm has resulted. Thus, if an individual receives a shock which stops breathing, the emergency treatment by artificial respiration, with the accessory measure, accompanying it, have now become the subject of systematic records. If the patient recovers, an attempt is made to subject the part played by treatment to impartial analysis, and as time passes, a body of medical information relative to the most severe electric accidents accumulates comparable to the engineering data which, for many years, have been collected with the greatest care. This means that we are in process of trying to learn how successful our efforts are in meeting the most serious effects of electricity.

Turn to Prevention

The experience of the authors in New York City, and at close second hand through the country at large, has not led to any great degree of satisfaction with our life-saving record. To put the matter very baldly, our record has caused us to become increasingly pessimistic over the ability to gain recovery in persons who have received an electric

shock which stops breathing, and this is in spite of the utmost care in training employees and assisting in the training of others who may be called upon for aid when an accident occurs.

As a result of this impression, which might be changed by a series of cases in which we were certain that modern methods of resuscitation had saved life, we have turned more and more to prevention as the essential means of combating electric shock. This does not mean the slightest relaxation of our program for training in resuscitation nor confidence that so far as knowledge goes we are utilizing the best measures available, including access to respirators when long-continued artificial respiration must be given.

Two Lines of Inquiry

It is the habit of those who are engaged in attempts to control conditions menacing health to attempt to evaluate the magnitude of their problems through two lines of inquiry. First, one examines the mortality records, the number of deaths which are due to the condition. This method of appraising the status of a disease gives information of the toll taken at the moment and fairly satisfactory evidence upon the question as to

whether the disease is an increasing or decreasing menace.

The second line of inquiry is always more difficult and sometimes impossible. But most investigators feel they have little satisfactory perception of the extent of a disease hazard unless they know as much as can be learned of what is called the morbidity of the condition. This means the total count of those who are afflicted by the disease, in distinction to the mortality tables which list the number actually killed.

Let me illustrate by a couple of examples. In the pneumonic form of bubonic plague apparently the totals of those getting the disease and those dying from it are practically identical, conclusive enough evidence of the dreadful severity of this form of plague. If, however, a more familiar affliction is selected, infantile paralysis, we should have but a poor conception of the problem confronting investigators if mortality lists were the sole source of information. Death from infantile paralysis is not common and in those suffering some degree of paralysis during acute illness, permanent crippling—so much dreaded by us all—is also relatively uncommon. Yet everyone fears this pestilence, and it commands the undivided attention of an army of doctors. Obviously, in combatting poliomyelitis, whose mysterious ubiquity has been extremely puzzling, investigators have gained greatly by recognizing that this disease has an extremely high morbidity, is, perhaps, one of the most widespread of childhood infections, but only occasionally reaches a severity where it causes crippling or death. The struggle against infantile paralysis is, thus, not a matter of controlling and extinguishing outbreaks here and there as is the case with pneumonic plague, but is a battle against a widespread infectious disease.

Industry is no stranger to interest in morbidity. Safety men record the total number of accidents, the lost-time accidents, and the fatal accidents in their plants. It is the first figure which gives the accident morbidity and really grades the efficiency of the safety program.

Too Little Attention Paid to Danger of Electricity

It is our opinion that in the case of electrical accidents, while one can obtain very reliable figures for mortality in our own and

in other countries and fairly good estimates as to the number of serious electric burns, too little attention has been paid to the universality of the danger from electricity. We are in the position of the medical profession if it evaluated the problem of controlling infantile paralysis in terms of the few hundreds crippled or dead each year and failed to recognize the widespread nature of the infection.

My father brought me up as a gunner and from the very beginning it was hammered into my consciousness that all firearms were dangerous and most dangerous of all were those accepted as unloaded. Experience in the laboratory and in the field has caused us to regard all electric currents as potentially dangerous, just as we have learned to look upon all productive sources of carbon monoxide gas. Some of you, particularly in the electric industry, may disagree with such sweeping apprehension. Such disagreement will do no harm if you recollect that contempt is often the child of familiarity and that, aside from burns, the effects of the electric current are instantly negligible or instantly fatal.

Methods Lack Fundamental Point of View

We are aware of the fact that the National Safety Council, the Edison Institute, the Red Cross, and other national organizations have worked unremittingly upon the prevention of electric accidents, indeed one of us has been a consultant of many of these bodies in their efforts at prevention. But this knowledge does not release us from a feeling that the methods used so faithfully lack a fundamental point of view, forced upon us rather against our will during the past two years. It has become our view that in the education of the public toward reducing the number of electric accidents every accidental exposure to electric shock should be considered dangerous. We have learned that there can be no truce with carbon monoxide in dealing with its threats. Safety for the public depends on realization that all gas leaks are dangerous. Twenty-five years ago, when I first became a consultant of the gas industry, there were many who saw this attitude was both inevitable and essential, but there were others who did not care to emphasize so sweeping an indictment of a substance which was part of their manufactured product.

Study of Cases

My interest, and that of my collaborators, in this aspect of the electric problem began during 1942. Prior to that year the Department of Resuscitation and Related Matters of the Consolidated Edison Company of New York received reports of serious electric accidents from the police department through the emergency dispatchers. These cases were investigated in the field, and all medical data relating to burns, etc., were checked with the doctor who attended the case. Hospitalized patients were followed during treatment, and information relative to complications, time in hospital, and other pertinent data were recorded. This resulted in very complete accounts of a small number of serious burns and deaths.

We, however, knew that a large number of domestic and commercial users of electricity received shocks each year which were never reported to any one, such accidents being due to carelessness, to defective appliances, or to improper use of current. Since fatalities are readily caused by the usual house current, none of these minor shocks is without danger, and it was thought worth while to attempt some sort of listing of their character.

So far as total numbers of minor shocks in New York are concerned, nothing can be learned since few citizens report a defective lamp, cord, or small household appliance. The current is immediately shut off and the householder sets about correcting the cause of the shock. It is, however, true that customers of the Consolidated Edison Company do occasionally notify the company as to their experience, and this has enabled us to add a small but representative group of mild cases to the serious instances reported by the police.

ELZ55 The data gathered are presented in three tables. They cover accidents involving 113 persons during 17 months—a small number when one has in mind the millions of users of electricity in New York. But we feel these accidents represent experience by many others, of which no trace can be gained.

Shocks from Household Appliances

Table 1 deals with electric shocks which occurred at home and from the ordinary appliances and settings common to us all. There

are 3 fatalities. There is a variety of causes of shock. There is no reasonable doubt that in the next few years such instances will increase as old appliances wear out and the possibility of repair and replacement become less and less. The average householder views electrical devices with the utmost confidence. The idea that the case of a refrigerator, a range, a washing machine, or other common appliance or common object about the house may be included in an abnormal electric circuit is not considered until a shock gives notice of something seriously wrong.

Very few people bother about the age or amount of use of household appliances or the cords leading to them, and many handiworks would become indignant if inquiries were made as to the history of an electric refrigerator. These things work or they do not work! The public assigns them no middle condition in which they may behave peculiarly and even very dangerously. It is traditional that shocks from the usual house current, 120 volts A.C. or D.C., are either in the nature of harmless annoyances or fatal. This is because severe burns are rarely caused by such currents, and unless the heart fibrillates, which can readily happen if the current passes through it, nothing serious occurs. Yet, always, these minor shocks carry the threat of something worse.

Is it not time to advise the public to have old electric installations inspected and put in safe repair, to make this a definite and compelling policy? Long ago it was learned that public discussion and education relative to the dangers of gas were appreciated, and the information so gained has helped to reduce gas accidents. Nothing was accomplished by minimizing or covering up the fact that gas is dangerous unless properly supplied and properly used in safe appliances. We believe the time has come when more of the same sort of attitude should govern our problem of electrical accidents.

Railroad Yards and Subways

Table 2 covers 15 serious cases with 7 deaths in railroad yards or subways. Attention is called to the 9 instances of boys shocked in railroad yards. Five of these were playing on top of freight cars or on a pole and fell off when shocked, thus breaking the contact abruptly. In none of these 5 did death occur at once, though all were so

severely injured as to require hospitalization and one died soon after admission. In the old days this would have been used as an argument for "counter-shock" but it is more probably the hand of the particular god that looks after the small boys who always have and always will infest railroad yards.

Ordinary Occupational Shocks

Table 3 has a certain similarity to Table 1. There are several deaths. A few details as to these are as follows: case 14, occurred from a voltage of 124-246 D.C.; case 17, from 119 volts A.C.; case 19, from 106 volts; case 20, from 120 volts A.C.; case 25, from 100 volts A.C., 400 amperes in an arc-welding job; case 33, from 119 volts A.C.; case 54, from 121 volts A.C.; case 55, from 80 volts A.C. Two further deaths involved high voltages. This table again emphasizes the dangers inherent in the ordinary circuits which are met at work, and teaches the need for more education in the direction of greater care for and more frequent inspection of electrical appliances and installations.

Basis of Education on Subject

In our opinion these meagre data represent a cross section of morbidity from electric shock in New York. That the total morbidity for any year can never be known does not affect their validity. Similar data could unquestionably be collected in all our large cities and the electric industry would do well to gather the cases, if only for their usefulness as teaching material in the education of the public.

This teaching should be based upon the principle that no electric shock is without danger and users of electricity must employ every means to avoid accidental contacts. Everyone is familiar with the standards for equipment of the National Board of Fire Underwriters, but obviously regulation of installations is not what we drive at. Householders need to know that the electrical appliances which are so much part of their everyday life are potentially dangerous in-

struments, perfectly safe when in good condition and properly used, but that they require watchful care, not only to perform their tasks but so they will do it without leaking electricity.

It will be a long day before regular inspection of electrical appliances is forced legally. Indeed, we hope no such comprehensive nuisance ever is inflicted upon us. But we do feel the public needs to know that every electric shock is potentially dangerous and that wherever household appliances are old or under suspicion for any reason, they should be inspected by representatives of the local electric company who, though in no way involved with the problem of repairs, should be able to explain what may be required not only to make the appliance work steadily, but, emphatically, to make it work safely.

We feel that the immense extension of appliance use in the home, and the fact that at the present time deterioration of household equipment outpaces replacement—with which goes unceasing willingness on the part of mechanically inclined individuals to make novel and often highly original connections with the house current—make it essential to regard electricity as we do gas, always dangerous unless used without the possibility of abnormal escape. This point of view, presented without compromise, should have a prominent place in all educational work for the prevention of electrical accidents.¹

¹ Read by the senior author who is Professor of Physiology at the Harvard School of Public Health and has served as chairman of three national commissions on resuscitation. T. J. Shaughnessy entered the field of resuscitation in 1923 while employed by the manufactured gas industry and for the past 15 years has been supervisor of resuscitation and allied activities in the Consolidated Edison Company of New York. J. A. McCarthy, a safety engineer of long experience in the electric industry, has been Mr. Shaughnessy's associate in the Consolidated Edison Company since 1928.

² In the production of this paper, it is a pleasure to acknowledge the interest and backing of John Stilwell, Vice President of the Consolidated Edison Company of New York and President of the National Safety Council, in whose department the work involved is centered.

Discussion

BY W. R. SMITH

Safety Engineer, Public Service Electric and Gas Company, Newark, N. J.

I wish to endorse Dr. Drinker's point of view and to express appreciation to him for the emphasis which his paper gives to a very important matter and recognition of the efforts which are being made by the electric light and power industry to prevent electrical accidents. Also on behalf of the Edison Electric Institute I wish to acknowledge Dr. Drinker's contribution to the effort being made to secure dependable reports on electric shock cases.

Throughout the electric light and power industry there is recognition of the need for a better dissemination of information on the subject of low voltage electric shock, and I would like to call attention to some of the things that are being done.

Literature of both the Edison Electric Institute and the National Safety Council on this subject is available to electric light and power companies and others for distribution to industrial users and household consumers of electricity. Many individual companies and other organizations have prepared special literature pointing out the dangers of low voltage and calling attention to the precautions that should be taken in using and maintaining such devices. Representatives of electric light and power companies are being constantly called upon to address associations and other groups such as foremen's safety clubs on the subject of

low voltage hazards and films have been prepared which, while usually concerned with the subject of resuscitation, do point out the dangers of low voltage shocks.

Throughout the country generally there has been in evidence lately an understanding of the need for giving to the public a better appreciation of the importance of this matter. In some sections courses of instruction have been instituted for the purpose of showing how repairs should be made properly to cords, plugs and switches which are used in connection with ordinary household appliances.

Recent publications of the U. S. Bureau of Health also have called attention to this matter through well prepared charts. In our own company there recently was inaugurated a program under which the representatives of the power sales department made calls on the domestic consumers for the purpose of giving advice concerning household appliances and instruction and advice in the matter of repairs.

There is no question but that Dr. Drinker's suggestion should be followed and every opportunity taken to inform users of electrical energy at ordinary household voltage concerning the precautions that should be taken and the importance of proper installation and maintenance of wiring, connecting cords, and appliances.

Industrial Nursing

WEDNESDAY AFTERNOON SESSION

October 6, 1943

Presiding—Mrs. Christian Seabrook, R. N., Local Group Nursing Supervisor, Metropolitan Life Insurance Co., Chicago, and Chairman, Industrial Nursing Section, N.O.P.H.N.

Records—the "Seeing Eye" of Industrial Medicine *

BY WILLIAM J. FULTON, M.D.

Medical Director, Eastern Aircraft Division, General Motors Corp., Baltimore, Md.

Starting point number one—and the point on which all to follow hinges—is the adequate manning of an industrial medical department to give prompt and efficient service, and to maintain records that meet minimum standards.

We will briefly review the services of an industrial medical department, exclusive of physical examinations or physician's time, and call them the direct service items.

The time required to attend to the wants of each of these patients varies with different types of service, and each service calls for many timings in order to arrive at an over-all average. Analysis of ten thousand stop watch studies of all types of plant hospital service resulted in an average of 11.57 minutes. We feel confident it is applicable to the great majority of medium type industries, such as airplane and automobile assembly plants. 11.57 minutes will go into an eight hour day (480 minutes) a fraction over 41 times, which leads to the conclusion that one nurse can take care of the direct and indirect services to not more than 41 cases per day—if those services and records are to be of good quality.

Two other general rules may be laid down here; namely, first, that where shifts are eight or more hours in duration, a case seeking one of the items of direct service just outlined will come through your doors for every 120 man hours worked; second, during any single shift,

one case for every fifteen employees working will seek some form of service.

This second general rule (one case per fifteen persons per shift) leads to another conclusion; namely, that 41 times 15, or 615 employees, working on any one shift, will produce sufficient direct service cases to keep one plant dispensary nurse or attendant completely occupied. The number of cases per day produced by 615 employees will range from 32 to 50.

Consider that this service is required only for the cases that come through your doors, and that we have left out physical examinations which, exclusive of physician's time, require from ten to seventeen minutes of hospital personnel time. Add this consideration to the foregoing and we have a basis for calculating the necessary hospital personnel to give adequate service and produce records of the type that we are going to discuss.

Cost of Under-Manned Staff

A startling amount of production time can be lost through the inefficiency of an under-manned medical department, to say nothing of the costs and poor quality of service. Every penny's worth of bad medicine that results from under-manning will be multiplied to a dollar's worth of bad personnel relations.

Finally, if industrial medicine is to get out of the flat cost bracket and is to enter the field of practical applied prevention, it must be additionally manned. It is only in the range above personnel adequate to

* Records — on file He 351 suw

care for the direct service that industrial management is justified in expecting returns on medical investments in reduction of accidents, occupational hazards, sick absenteeism and insurance premium, and an improvement in personnel relations and environmental hygiene.

Foundation of Records

Now let us start our industrial patients through the dispensary and lay the foundation of our records. Here is a 3x5 form, carried in pads by the foreman. Emergencies excepted, all must present it. It is made in duplicate. An automatic time clock stamps the time of dispensary arrival and departure. The duplicate is returned by the patient to the foreman. On this pass the foreman has noted the name, clock number, time of the accident, and indicated by an "X" the exact spot in the plant where the injury occurred. The dispensary personnel adds the following data. In the upper left corner, the anatomy, such as face, arm, eye, cornea, leg, etc., in the upper right corner, the type of injury, such as laceration, puncture wound, burn, fracture, embedded foreign body, etc., and, across the top, the date is stamped. These slips are sorted and filed as to type of injury. We call this the accident prevention file. It is kept up to date and at all times is at the disposal of the director of safety. The use of this pass as an instrument of accident prevention will be demonstrated later.

Aside from safety, this pass has several other attributes worth mentioning. It prevents waste of production time by loitering. It partially regulates the flow of surgical redressings and minor complaints through the plant dispensary.

Surgical Card

Here is the 5x8 surgical card, on which is recorded the complete history of any injury, from admission to discharge. This and all similar forms have been whittled by experience to a point that will satisfy maximum simplicity and practical adequacy. Three points should be stressed:

1. The exact time and date of the occurrence of the accident or onset of the complaint.

2. The exact time and date of the initial report by the patient.
3. Meticulous recording of the employee's statement in his own words and, preferably, in his presence.

The reverse side holds the record of subsequent redressings or treatments.

A few remarks are in order here on the tendency to highlight the importance of potential legal defense in the making of medical records. Ascertaining the true facts regarding injury or illness is more important medically than legally. Make good medical records and any need for legal application will be met automatically.

Redressing Sheet

To facilitate the recording of redressings in a busy dispensary, each staff member has a redressing sheet for each shift. On it, they record the time, name, clock number, treatment and progress note of each case handled. These are subsequently entered by the same staff member on the reverse side of the surgical card, and checked off on the redressing sheet. These sheets lend themselves readily to summing up the total number of revisits at the end of the shift.

This 3x5 card holds the record of each initial medical complaint: the diagnosis, treatment and the final disposition of the case. When the severity of the symptoms warrants sending the patient home, a duplicate pass home for sickness is made out. One copy is attached to this card and the other passes through the personnel department. These cards are filed alphabetically in a permanent yearly file.

When an employee is absent from work or late, the clock card is replaced with a red "absent report" card. If the absence or lateness is due to any type of physical condition, the employee must pass through the dispensary for a check-up before being allowed to return to work. This is obviously a valuable safety and health protective measure. The dispensary staff indicates the ability or inability to return to work on this card and returns it, along with the employee, to the personnel department. In order to keep track of the number of these absentee cases, a tally sheet for each shift is kept near the files.

On this, each case is indicated by a small pencil mark. This sheet is also used to record those cases of injury that require treatment by outside surgical or medical consultants.

When the physical condition of an employee, following injury or illness, indicates a change in work, a slip is made out in duplicate—one copy going to the supervisor, the other copy being clipped to the employee's medical record card.

Daily Hospital Report

At the end of the shift, the surgical cards, redressing sheets, medical cards, passes home for sickness, and absentee tally sheets can be quickly totalled, divided into men and women, and entered on the daily hospital report. This report is made up for each 24-hour, 3-shift, period. This same form serves to hold the total monthly, quarterly, or annual report, copies of which are forwarded to management, personnel and safety departments.

In order to facilitate the making up of monthly reports, a time and labor-saving "recap sheet" is used. It measures 17x11 inches, has thirty-one horizontal lines, and columns for the items recorded on the daily hospital report form. The totals from the daily report are entered on this sheet every day. When the end of the month (or any other period) is reached, we are in a position to arrive at our totals quickly. It is from such data, kept over a long period of time, that our time studies and calculations to determine adequate hospital personnel are made.

Attention is called to two facts in regard to the development of our records from this point on: First, it adds one minute and ten seconds to each direct service case, including totalling the data and filing the pass to the hospital, and has been included in our time of 11.57 minutes per case. Secondly, this system need not disrupt or displace any system or type of recording now in effect, but may be installed as a valuable adjunct to it. From here on we make our individual records live.

Index Record

Based on day-to-day experience, we have developed a 5x8 reversible card, di-

vided into 512— $\frac{1}{4}$ "x $\frac{1}{2}$ " sections. It is divided into a surgical and medical side, and is capable of holding, in code, a ten to fifteen year record of every injury and medical complaint on the job, along with other items entered in code on medical side, such as periods of employment, leaves of absence, physical examinations, personal contacts, etc. We call this form the index record of plant hospital service.

The entire surgical code consists of a minimum of symbols, has been based on practical experience, permits further additions to its present construction, and can be easily mastered in two weeks practice by any grammar school graduate. It's a simple form of industrial medical shorthand.

Let us return to the surgical record card of our eye injury case, and enter it on our index record. Now let us enter a medical record card for the same individual.

Sick Absenteeism Data

To have signed and returned to the personnel department the red absent report card, without further ado, would have thrown away the opportunity to record sick absenteeism. We have taken advantage of it for some years. Here is the 5x8 card designed to hold sick absenteeism data. It is a simple form, carrying two columns down the right side which indicate "calendar days" and "working days." Here we enter a record of sick absence for the same individual. The standing orders for sick absent recording are as follows, from left to right; first, the day of the week and date of employee's return; next, the "off date" or date of the onset of disability, including the day of the week. Next the diagnosis. If the employee had no medical attention of any kind and makes his own diagnosis, put it down in his own words and always put quotation marks around it. If the diagnosis is professional; i.e., by dispensary staff or via a physician's note, record it without quotation marks. Any note from a physician is filed in an envelope bearing the physician's name. The presence of such a note in the file is indicated on the absent record. Keeping such a physician's file is of great value. Lastly, the time

lost is recorded in calendar days and working days.

We are not going to discuss pre-employment and periodic physical examinations in detail in this presentation. They should be mentioned, however, to complete our individual record. The examination form has been greatly simplified, and folds to a 5x8 size. All practical data derived from each examination, that is of value in proper placement, together with medical department ratings, etc., is forwarded to the employment and personnel departments on the request for physical examination form.

These three records (physical examination, index and absent) are kept together as one unit in a pocket. The pockets are filed alphabetically in trays.

Value of Individual Records

Here should be stressed the importance of keeping medical records active and up-to-date. To do this, it is essential that the medical department receive routinely the daily report of the employment department to management. This type of report contains—new hires, lay-offs, transfers and various leaves of absence, etc., including names and dates. Failure to keep your files cleared, by this means, will soon find them hopelessly cluttered with inactive records, and your all important record of periods of employment will be lost. Routine file clearance is especially important in times of a high rate of employee turnover.

A discussion of all of the values and varieties of application of this combination of individual records would take thrice our present allotted time. We can only enumerate a few points.

1. In dealing with large numbers, the efficiency of individual application is enhanced and the personal relationship of medicine to patient is markedly improved.
2. The time and labor saved in reviewing individual histories is tremendous.
3. The value of any therapeutic or safety measure can be swiftly and accurately evaluated, individually or collectively, the conclusions having the added weight of large numbers, backed by records of other individuals that constitute controls.

4. The ground work for research in almost any form of occupational hazard is made available—research by groups, ages, occupations, etc.

5. Data covering a cross section of the population, for a long period of time, is made available for all forms of industrial, local, and national statistical research.

6. The actual degree of hazard to health and safety of any operation, process, occupation, material or group of materials can be accurately measured and compared.

7. The safety factor relevant to any operation analysis can be accurately computed.

8. The relation (if any) between sickness and accidents can be established.

Rating and Comparing Records

Our individual records are now condensed into a simple, accessible unit. Before a fair and practical individual application can be realized, some base line or standard for measure and comparison must be made. To establish our base line for measuring and comparing, we divide the total number of each of our three recorded items—namely, injuries, medical complaints, and sick absenteeism—by the average number of employees working. This produces a table of averages which may be used as a standard of measure or to compare the individual employee with his fellows. We have used two periods to illustrate how the standard may vary, by sex, in proportion to length of the work week, or under conditions of peace or of turmoil.

Our standard is now set by which the medical department may rate fairly and compare accurately an employee's status in safety, medical complaints while on the job, and number of sick absences. Further, these visible, condensed records paint a day-to-day, ever-changing picture of each individual, continually singling out those who need attention in some phase of safety and health.

The Problem Group

Before we go on to the method of application and the measure of its success or failure, some further general truths should be stated—general truths that have

come from repeated mass analysis of these records over a period of years and from recorded observation of those who have made these records. Repeated analyses of the index record of plant dispensary service over an eight year period invariably lead to the same basic conclusion:

PER- CENT- AGE		PER- CENT- AGE
Accidental		of
Injuries		Total
and		Employees
Medical		
Complaints		
80 to 85%	are produced by	30%
15 to 20%	are produced by	60%
0%	are produced by	10%
100%		100%

There are some observations pertinent to this basic conclusion that should be recorded.

a. Not only do the mathematical percentages remain constant, but the individual employees within the percentage groups, to a large extent, remain the same individuals. This holds true regardless of length of service, transfers among occupations that are hazardous by varying degrees, location in the factory, etc. There are, of course, employees who pass back and forth from one group to another, but they form a minority in each group.

b. There is no consistent connection between the physical condition of an employee as determined by pre-employment and periodic physical examination and the plant dispensary record that the employee accumulates. We find no evidence to support the theory that employees who, at pre-employment physical examination, were found to have major physical disabilities and were classified as physically below average are any more prone to injury, sickness on the job, or sick absenteeism than are those who were judged to be physically above average.

c. Comparison of the plant dispensary record with that of the personnel department demonstrates that a majority of those making up our basic 30% group produce the majority of problems for supervisors, personnel and safety departments. It is

within this group that we find the preponderance of neurotics, indigents, irresponsible, and otherwise below par brothers and sisters.

The foregoing conclusions and observations add up to this—environment, occupation, physical condition, etc., play the minor role in the incidence of injury and physical complaints during working time. The major role is played by what we term "the human factor." A safe and an unsafe worker retains the same status regardless of environment and occupation. We do not intend to convey the idea that the status never changes. It does. We do, however, point out that, with extremely few exceptions, the status of those individuals who make up our basic 30% group never changes so long as they are left to their own devices. When a change for the better does occur, the reason can almost always be traced to some personal attention paid directly to the individual.

Some comfort may be derived from these conclusions in the realization that at least 70% of our industrial family is composed of good, average, safe and relatively healthy American citizens. This emphasizes the point that "an industrial medical department, manned only to take care of direct dispensary service, is at best realizing but 40% of its potential value to industry." Our safety, personnel and medical departments should be sufficiently manned to do more for our dependable majority. Too often they are truly "the forgotten men."

Applying the Records

We are now in a position to make our records live, and to apply them. Let us outline the machinery of application, follow-up, and evaluation. Every visit to the dispensary affects someone's record in some way. The members of the dispensary staff making the entry on the index or absent record are familiar with the basis of measure. Trained to recognize deviation from the average, or unusual departure from the past record of the individual, they are expected to act immediately on these occasions. Where accidental injury is the offender, the case should be referred to the safety director. Medical complaints and sick absenteeism are ini-

tially medical problems, and are handled by the plant physician, the head nurse, or other staff members that they may designate. Frequently, cases turn out to be distinctly personnel problems. Lastly, some may become the problem of superintendent or higher management.

Let us take a look at a typical case. This employee has worked only three and one-half days, yet already has suffered three accidental injuries and registered one medical complaint. This is distinctly a case for the director of safety. The nurse immediately sees to it that the index record, together with any pertinent observations and remarks, is transcribed on a form and to this is attached a 3 x 5 personal contact record card. Both are forwarded to the director of safety. The nurse enters the code symbol on this employee's index record to indicate this personal contact. After the safety director makes whatever investigation he deems necessary, he records his findings and action on the personal contact card, and returns it to the hospital file. This is the record of the entire transaction—including the notes by the safety department and the request for follow-up in thirty days. The investigation by the safety department located the underlying cause of these accidents—"horseplay"—and corrective measures are being taken. The date for follow-up of the case is set and noted on the hospital calendar. When the follow-up date is reached, a glance at the individual's record will serve to measure the effect by comparing the recorded items after the date of the personal contact with those before. This appraisal will determine what future action may be necessary.

When the appraisal indicates that definite improvement has taken place, you are faced with the most important follow-up of all; namely, to call the individual in and tell him about it. I know of no maneuver that better promotes morale and if omitted, creates a more subtly damaging psychological effect. This same routine of find-the-case, action, record, follow-up, measure, and evaluate is carried out in all such personal contact cases.

Collective Study

Now we leave the individual and go into the collective study of accidents. In so doing, we hope to demonstrate that industrial medical records, applied co-operatively, serve to further safety and act as its guide and measure. What we have to say here deals specifically with accidental physical injury, but bear in mind that such studies are likewise applicable to all phases of industrial hygiene.

Kept hanging near the surgical treatment booths in the dispensary is a simple mimeographed form that we call the medical log. A clean sheet is begun each shift. Immediately following the care and recording of a new injury on the surgical card, this data is transferred to the medical log by means of pencil marks. The entry requires but a few seconds.

This log record is at all times accessible to the safety staff, and places in their hands an ever present mint of material that automatically serves as an instrument to direct numerous attacks at the source of accidents. Observing a rise in any type of injury, the safety director can refer to the accident prevention file, spot the individuals and locations immediately, and put control measures in motion without undue delay. This type of accessible co-operative record also saves much time that would otherwise be required of medical and safety personnel to make many individual queries and investigations. It has one more point worthy of note—namely, it takes from other than professional personnel the necessity or excuse for general access to medical records that are properly accepted as being confidential.

At the end of the day or shift, the pencil marks on our medical log are tallied and can be permanently recorded. Here we build the material for research too comprehensive to discuss in detail. The weather reports, absenteeism, and many other items may be correlated with it. Here, hour by hour, is the bedside accident chart of our collective patient, the barometer of injury, and the hidden answer to many unsolved problems.

Anatomical Distribution

The final portion of our one minute and ten seconds is spent on the entry made on the anatomical distribution of injury form. At the end of the day the surgical cards are entered with small pencil marks. It can be done quite rapidly. This form serves as a cross study of types of injury (horizontal columns) with anatomy (perpendicular columns). Each month, or at any other desired period, the pencil marks are added and the totals recorded. By dividing the total of any column into the grand total of injuries, we may get a ratio index for each horizontal or perpendicular item. A year or more of such a study establishes a standard for each type of injury or anatomical part. We have learned from long observation of this ratio index that certain types of injuries, like many diseases, are epidemic and that seasonal variations are almost constant. The same is true of injuries to certain parts of the body. This type of study is of more than academic interest. It is capable of numerous practical applications and is an instrument that indicates the optimum time to "bear down" if you would prevent a recurrence of undesirable past experiences. The anatomical distribution record is, like the medical log, accessible to the director of safety, and can be applied much the same way.

We deem an injury severe if it reduces the efficiency of the patient fifty percent or more for any period over four hours. We express severity by the factor resulting from dividing the number of injuries we deem severe into the total number of new compensable injuries. This measure has been watched over a period of years and proves to be an accurate and valuable measure and prognosticator. It is a simple measure and easily understood by management.

Corrective Measures

What is done when our measure spots a rise in any particular type of injury? We know from past experience that if something is not done, severe injuries soon occur. Let us use eye injuries as an example. A sudden rise in the frequency or severity is noted. The last hundred passes to the hospital, filed under eye injuries, are taken from the file and beginning with the remote date, they are rapidly plotted on the factory map with tacks. No time-consuming plant inspection by safety committees is necessary. Two closely grouped tack areas disclose and eliminate the hazards responsible for the epidemic.

Thus we begin and end our study of accidents with the little pass to the hospital. It is the Alpha and Omega, and furnishes the five "W's" of safety—who—where—when—what and why.

Thus we conclude, leaving it to you to decide whether or not the information accumulated in our one minute and ten seconds of extra recording per case will prove to be a worthwhile investment. Our aims are set forth, and the basis for realizing them made concrete through the planning of various types of records. Our "seeing eye" is now ready to function. It warns of danger, the presence of unsuspected and alien influences; it automatically records and reveals data which enable us to improve the whole society of industry in health, safety, and mental hygiene. The "seeing eye" is a miracle of electrical engineering; records—our "seeing eye"—open the door to vast opportunities in human engineering. Dreams and medicine may not sound like a practical combination, but if you would make progress, do not be afraid to see visions and work toward their fulfillment. A last thought—to its patients and to the nation industrial medicine has much to give—nothing to sell!

THURSDAY AFTERNOON SESSION

October 7, 1943

Presiding—Joanna M. Johnson, R.N., Supvr., Industrial Nursing Div., Employers Mutuals, Wausau, Wis.

Nurse's Part in Physical Examination Program

By H. GLENN GARDINER, M.D.

Medical Director, Foster Brothers Gear & Machine Corporation, Chicago, Illinois

There has been a change of recent origin in the part the nurse plays in a physical examination program.

The changes in status have, in certain instances, not been simply those of privileging ourselves to use the nurse increasingly in the simple mechanics of the examinations, but in the interpretation of findings as well.

There is no question that there is a considerable lack of competent available physicians which is a challenge to use in the manner of utmost efficiency the time of those we do have. It does not require any great amount of initiative to set up a procedure so that one physician assisted by two or three nurses can, without difficulty, examine 100 or more examinees in an ordinary working day. The quality of this examination can be far better than today's average and is completely adequate for today's needs. We simply substitute a streamlined means of examining which is necessary for the duration, yet contains the essentials found apropos in our peace time activities.

The nurse can call for the physician to double check any of the obvious abnormalities detected, but what of the borderline or hidden cases in which the training and experience of a physician are often taxed to detect and interpret? Certainly the nurses' training and experience are not such that they can be expected to display such achievement. Yet these are the very cases which have, in many instances, shifted the scale to a proven economic advantage to industry of a physical examination program. No matter how willing and well meaning the nurses may be to accept it, we are not playing the game fairly when we thrust such responsibilities on their shoulders.

Much of the effectiveness in creating the desired impression upon the incoming applicant and in determining his decorum as a worthwhile employee is effected by letting him know that his employer thinks enough of him to provide for him in many ways. The first example he meets is the dignity, care and consideration at the time of the preemployment examination. Thus, he will carry the memory of his reception in the medical department as the representative attitude of the company with which he is affiliating himself.

Dividends of many types are to be expected if these impressions are what they should be. They may be minimized by any apparent lack of attention such as that of an examination without a physician.

In these days of war there is a perfectly natural coincidence lending material aid to the cause for the use of nurses in the physical examination program. Most of our nurses are female and our present great influx of workers in industry are female too.

Another important factor in facilitating a maximum number of reasonably complete examinations in the minimum time possible—and thus the most efficient *modus operandi*—is that of the physical layout of the examination and dressing rooms used. If a large number of examinations are to be done routinely, or if the examinations are done on both sexes, it is almost a must that two examination rooms be used.

Each examination room should have two dressing rooms attached—each having a door opening into the examination room proper and another door opening into the exit hall. In addition, these dressing rooms should contain facilities for obtaining urine samples as well as for dressing, with hooks

for clothing, a place to sit while waiting, a mirror, etc. Each examining room should have doors permitting the coming and going of the physicians and nurses without going through the dressing rooms.

Perhaps the best way to bring out just what is our conception of the part a nurse takes in a modern, comprehensive physical examination program is to give a general outline of procedure. For convenience, we will suppose the examinee is feminine and enters the examination routine fresh from her interviews in the employment department. After recording her name, she is given a preliminary eye test—preferably by orthorater which has been selected for its speed and efficiency, and is operated by a lay technician.

A nurse then records the age, sex, address, marital state, color, number of children and their ages, etc., and includes a careful history of serious illness and injuries, operations, menstruation, admitted defects, deformities, or weaknesses, previous occupations and the position sought now. If these findings are to be of full value the nurse must not only have a general knowledge of such procedures coupled with more than a little tact and friendliness, but a special knowledge in the art of developing the loose ends of a history, into a lucid revelation of conditions which may materially influence the attitude of the physician in classifying the examinee and in placement recommendations.

The examinee is then escorted to a dressing room where she changes to an examination gown. While she is waiting

for her examination a urine sample is obtained and blood pressure, temperature, pulse and hearing records are taken by the nurse. During the examination the nurse records the findings as dictated by the examining physician. Additional laboratory tests, if indicated, are then made before the examinee is allowed to dress in street clothes. In many instances the laboratory technician is a nurse who if not too busy may function in addition as one of the nurses helping in the examination routine.

As the need arises, the nurse may enlarge her activities to include more detailed histories such as vaccination, family history, etc., being limited only by the degree of exhaustiveness the director of the examinations sees fit to request.

In summarizing, let me call attention to the fact that although the scope of the nurses activities has been broadened immensely, it has not put her in a position of rendering opinions. She has made certain technical and factual records, largely a mechanical activity—but in no way an unimportant procedure.

The interpretation and analysis of these findings is still left to the physician who, is in the logical position to accept the responsibility for presenting the official opinion, and for making recommendations regarding placement, need for care, etc.

There is every reason to suppose that this rationalized concept of the part of the Nurse in a physical examination program will continue after the present urgencies have subsided to normalcy.

New Trends in the Treatment of Industrial Injuries

By HENRY H. RUBIN, M. D.
Industrial Surgeon and Physician, Chicago

New trends in the treatment of industrial injuries incline toward conservatism and a greater consideration of physiological principles. This has resulted in improved care. But the primary concern should be prevention and control of injury and disease. The means of accomplishment are through safety educational programs in industry regarding safe practices and the use of protective equipment. A good work environment is essential. Good vision, proper nutrition, and the avoidance of fatigue are requisites for the worker. Physical examination and medical supervision are also of importance in the program.

Psychological Aid

In ministering to the injured workman it is not enough to bind his wounds according to the modern precepts of first aid. Psychological aid is just as essential. In approaching the injured person, one must gain his confidence through words of reassurance and sympathy and by one's own composure. Recovery will be hastened by gentleness of handling the patient as well as by gentleness in handling the wound. Keeping him quiet in the first aid room, rather than rushing him to the doctor's office or to the hospital will do much to allay his mental anguish. In most instances, it would be better for the attendant to seek the doctor's advice over the telephone or to have the doctor go to the patient.

Eyes

"Arc flash" conjunctivitis is a condition quite prevalent among electric arc welders. It is caused by exposure to ultra-violet or actinic rays and is characterized by delayed onset, self-limited course of twenty-four hours, swelling of the lids, photophobia, and sandy feeling in the eyes. Prevention is effected through educational pamphlets and personal instruction in protection by flash goggles with side pieces, helmets, welding clothing, and screens. Active treatment con-

sists of keeping the patient in a darkened room or having him wear dark glasses, cold applications to the eyes, a local anesthetic in water solution as butyn or pontocaine for immediate relief, and in ointment base—as butyn or holocaine at night while attempting to sleep, and a vasoconstrictive drug such as adrenalin. Analgesics and sedatives may be required in severe cases.

Wounds

To guard against infection and promote primary healing is the objective in the treatment of wounds. The broken skin admits bacteria and it has been found that it takes about six hours for them to multiply and invade the tissues. Thus it is seen that prompt care is of the essence if bacterial invasion is to be prevented.

The simple abrasion is cleansed and an antiseptic, such as mild tincture of iodine is applied, covering with a sterile dressing.

The small incised wound is cleansed with white soap and water and the edges are brought together with flamed tape, small skin clips, or non-absorbable sutures, whichever is indicated.

The contused, lacerated and penetrating wounds may be more extensive and may be complicated by the entrance of the wound into tendons, muscles, joints, or to fractured bones. These wounds are cleansed thoroughly with a mild soap and water. The operator should be capped and masked and wear sterile gloves and gown. Irrigation with sterile saline solution follows the soap and water cleansing. All torn, ragged and damaged tissue is excised and bleeding is controlled.

The extent of debridement should be to the point where the tissue looks normal, bleeds freely, and the muscle fibres contract. Tendons, nerves, and large blood vessels must be spared. This repair is done within the six hour period. The wound may be closed by primary suture and covered with a copious fluffed gauze pressure bandage. If the "golden period"

has passed, non-absorbable sutures are inserted and the wound is packed with sterile gauze. The pack is removed in three days and the sutures tied. This is called closure by secondary suture. The consensus is that sulfanilamide should be powdered into the wound, using from three to ten grams.¹ Where tendons and nerves are severed, they should be sutured, enlarging the wound if necessary. Fine suture material is used. Early passive motion after tendon suture tends to give the best results.²

Foreign bodies should be removed if they are accessible. Otherwise, they should be left undisturbed if the search would be prolonged and mutilating. The "Locator," an electro-magnetic induction apparatus, has been used in determining the surface location and depth, and has proven of value in removal of foreign bodies.³

Anti-tetanic serum should be administered in cases contaminated with street dust, and for massive wounds anti-gas gangrene serum should be given.

Fractures

In industry, fractures occur most frequently in the hands and feet. The only means of ruling them out is by X-ray which should be used frequently wherever there is the slightest doubt. The fingers are most frequently involved and they are best treated in flexion with early motion to prevent stiffness. In the foot the phalanges are most frequently involved. They are treated by strapping to the adjacent toe, inserting a piece of cotton between the toes. For metatarsal fractures the use of a transverse metatarsal bar is very effective.⁴ This hardwood bar is placed under the sole of the shoe 1½" in front of the heel and retained by flat topped screws drilled through the inside of the shoe. The bar must be high enough so that the ball of the foot will not come in contact with the floor. One must wait about ten days—or until the swelling has subsided to a point where the patient can put on a shoe.

In fracture of the long bones the various types of accepted treatment are classified as open reduction and internal fixation, skeletal traction, plaster cast immobiliza-

tion, and external fixation. The latter is accomplished by means of fixation pins placed above and below the fracture or the fixation and reduction splint, and has been used with satisfactory results in fractures of the tibia and fibula.⁵

In compound fractures the trend is toward the modified Orr treatment. After careful debridement of the wound and proper reduction of the fracture, sulfanilamide is placed in the wound and fifteen grains of sulfa drug is given every four hours for three days thereafter. The wound is packed open and the fracture completely immobilized with a plaster cast. Little or no treatment is required until the cast is changed four to six weeks later.⁶

Burns

Minor burns are apt to heal in less than a week no matter what preparation is applied. In a statistical study of minor industrial burns occurring in a group of about 250,000 employees, the recommended treatment consisted of washing the area with white soap and water, leaving the blisters unbroken and "undebried," covering with fine mesh gauze impregnated with petrolatum or 5 per cent boric acid ointment and applying a firm dressing over this, bulky enough to keep dirt away but not too large to keep the man off his job.⁷

In extensive burns first aid consists of covering the burn with a sterile towel or gauze moistened with soda solution. Pain is controlled by the hypodermic administration of ½ grain of morphine. Shock may have to be combatted. Further care consists of cleansing gently with plain white soap and sterile water as described under "Wounds." The soap is removed by rinsing with sterile saline solution. Fine mesh gauze is impregnated with sterile vaseline or 5 per cent boric acid ointment and this is applied to the burned area, followed by pressure dressings. Blood plasma and oxygen may be required. General anesthesia should be avoided.

After the slough is removed, which takes from ten to fourteen days, the denuded area may require skin grafting. This is usually effected by means of small

deep skin grafts which are covered by vaseline gauze or moist fluffed gauze and an Ace bandage.

Traumatic Shock

The treatment of shock is dependent on the various types of injury which it may follow. More than one factor may be present, shock being due to crushing injury or hemorrhage which may accompany the injury.

The treatment of shock following hemorrhage is blood transfusion given as quickly as possible and in adequate amounts.

In shock following burns the treatment is blood plasma given in amounts of from 200 c.c. to 500 c.c. every hour and from 1,000 c.c. to 5,000 c.c. for twenty-four hours, depending on the severity of the shock. This and the withholding of water oppose the concentration of the blood, and have been successful in the treatment of burn shock.

In shock following crushing injuries there is a loss of serum and plasma into the tissues and the treatment is the administration of plasma.

The treatment of shock following injury to the soft parts is whole blood or plasma to replace that which is lost as a result of the condition.

The practice of overheating patients in shock has been found harmful. Experimental studies on the effect of various external temperatures in shocked animals reveal that cold and heat proved dangerous to life. There is a loss of energy to the shock victim at a time when he needs every bit of it to keep alive. He will do best if wrapped in blankets and kept comfortably warm at room temperature.

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The Nurse's Part in A Program of Industrial Safety & Hygiene

CLARK D. BRIDGES

Industrial Hygienist, National Safety Council, Chicago

When your Chairman and program committee suggested this topic several months ago, it was readily accepted because of my conviction of many years standing that the nurse is a vitally important cog in the gears of the efficient industrial organization. Or it might be stated this way—and this is particularly true in the smaller plants—the nurse performs so many functions to aid management and employees that her real value is often not recognized until the plant, through accident or design, tries to get along without her.

Monetary Value

The actual dollar value of effective health and safety programs has been dem-

onstrated. In 1941, the National Association of Manufacturers conducted a survey to determine the results obtained by its member firms from such activities. This report disclosed the following highly significant results:

Reduction in Accident Frequency.....	44.9%
" Occupational Diseases	62.5%
" Labor Turnover	27.3%
" Absenteeism	29.7%
" Compensation Insurance Premium	24.5%

The report also indicated that the average actual savings in a 500-man plant amounted to over \$5,000 annually. This report contains other valuable information and is recommended to all who are interested in getting the most out of their safety and health programs.

In reprint No. 1765, of the U. S. Public Health Service, published in 1936, it was estimated that the minimum monetary value to industry of medical and engineering services for the development of health and safety programs is \$18,800 annually per thousand employees. Also of interest in this connection is the study made several years ago by the American College of Surgeons, which disclosed that per capita medical costs are higher in small plants than in large ones—one of the reasons being the lack of programs of prevention.

Personnel for Program

It is simple enough to recite these benefits and the methods by which they may be obtained. The real problem in many plants is locating persons with the necessary training and enthusiasm to convince management of the benefits of such a program, the ability to put it into effect and carry it through. The nurse is often in an ideal position to bring this about, inasmuch as many firms do not have full-time safety engineers or industrial hygienists but must depend upon only occasional service of this nature from their insurance carrier, and the doctor is usually on a part time basis. Even in the larger organizations, where full-time medical and safety personnel are employed, the nurse can be of immense benefit to the entire program through her interest and participation.

Special Training Needed

Graduate nurses find that there are many phases to industrial nursing for which their previous training has not prepared them. It behooves them, therefore, to take advantage of all the special training they can obtain, if they are to enhance their position and increase their value beyond that of simple first-aid service.

Even though nurses generally do not have fundamental engineering training, they can obtain instruction in fundamental principles of accident prevention by attending the war training classes being conducted by the various engineering colleges throughout the United States as a part of the training program of the United States Office of Education. These classes teach the student to understand the fundamental

causes of accidents and give them a knowledge of effective measures which can be taken to combat them. She will meet other men and women concerned with the same problems and with whom she can discuss her own problems with benefit. She will learn sources of information and of expert help. These courses are usually 96 hours in length and are tuition-free. In some parts of the country similar courses are given in industrial hygiene and occupational diseases. Anyone interested in this general problem should take advantage of the training offered by these courses.

References and Exchange of Ideas

It is very desirable that the nurse attend the local and national meetings on industrial health and safety. Most progressive communities have safety councils which meet periodically where many valuable ideas may be obtained and experiences exchanged. She should have available for reference the Safe Practices and Health Practices Pamphlets of the National Safety Council applying to the processes and hazards in her plant. She should read regularly the periodicals in the medical and safety fields.

She should, as one of her very first duties, make a thorough inspection of the entire plant in order to become familiar with the processes and materials used and obtain a general knowledge of the operations. She should also accompany the safety inspection committee on their periodic inspections and investigations of accidents. Through familiarity with the plant processes, the hazards involved and the corrective measures necessary for their proper control, the nurse can do a good deal of effective safety work while she is taking care of minor injuries in the first-aid room by questioning employees regarding the cause of their injuries and what to do to prevent a repetition.

Accident Records

The importance of accident and first-aid records will assume new meaning after the nurse has completed her course of instruction in safety engineering. She will realize the importance of watching frequency trends, the importance of detecting individuals or departments or operations

which are responsible for more than their due share of injuries. The cause of the accident will be emphasized in her record rather than the nature of the injury as probably was the case before her realization that the keystone of prevention is a knowledge of the causes of accidents; therefore, her periodic summaries of cases handled will include more valuable information for the use of the safety committee.

I believe the nurse belongs on the safety committee as a permanent member of it, possibly as secretary if her duties permit her this much time for the keeping of these records also. Through her acquired familiarity with the plant processes and appreciation of the importance of accident records just mentioned, she is in a position to be of definite assistance to the safety committee.

Treatment and Examination

First-aid treatment of industrial injuries by the nurse under the standing orders of the physician should also encompass intelligent evaluation of the nature and extent of the injuries to the end that employees may be returned to their own work just as soon as possible, consistent with the condition and ability of the patient, to reduce lost time from work. Where a variety of operations are performed in a plant, it is usually possible to find some kind of productive activity which employees with minor injuries can perform without loss of income to themselves or productive capacity to the employer. Such procedures, when properly handled, are beneficial to all concerned.

Nurses can be of more than ordinary assistance in the physical examination program. Many doctors, in these days of shortages of medical personnel, find it desirable to take the time to train capable nurses in methods by which they can aid in the screening process, thereby reducing the amount of time which the doctor must spend with each individual. Nurses can be taught to recognize significant conditions and bring them to the attention of the physician for his expert examination and decision.

Whether such a program is in effect or not—and it should be stated here that

there are definitely two schools of thought on this subject—nurses should know the industrial significance of defective physical conditions. These may affect the accident proneness or be aggravated by injuries which may be suffered or health hazardous materials and processes to which the worker may be exposed. The nurse should maintain check records to see that periodic examinations are made promptly. Furthermore, those employees who appear to be accident prone and those who are habitual callers at the first-aid room for aspirin and similar medication can be detected and referred to the doctor for special examination.

Other Functions

With the increasing employment of women in industry, experience has shown the desirability of having a women's counselor in every plant where any appreciable number of women are employed. The nurse is in an excellent position to perform these functions. By special study of the rapidly accumulating literature relative to induction, training, susceptibility to industrial poisons and the peculiar health and safety problems of women, a most effective program can be developed.

There are a number of other functions the industrial nurse can perform for the benefit of the general program. She can supervise sanitation facilities such as toilets, lockers and locker rooms, wash rooms, drinking fountains and the drinking water supply. The field of health education offers great opportunity for improvement of employees' off-the-job health. Early detection of non-industrial illnesses and diseases will prompt reference to a physician reduces lost time due to these conditions. Supervision of the canteen or cafeteria, with emphasis on proper nutrition, is another field of endeavor which can show paying results.

In summary, it is apparent that the industrial nurse can be one of the very important factors in the production of and maintenance of a smoothly and effectively operating industrial organization. One word of caution, however, these results are not achieved overnight, in fact, it may take years to do it. It's hard work but don't give up.

Labor and Safety

THURSDAY MORNING SESSION

October 7, 1943

Presiding—Daniel S. Ring, Dir., Div. of Shipyard Labor Relations, U. S. Maritime Commission, Washington, D. C.

CHAIRMAN RING: I will introduce myself. My name is Ring. I am with the Maritime Commission and I am the Director of the Division of Shipyard Labor Relations, under whose general jurisdiction comes the safety and health program for the shipyards that have contracts with the Maritime Commission.

Already on the platform is Mr. Joseph D. Keenan, who is the Vice Chairman in charge of labor production of the War Production Board and Secretary of the Chicago Federation of Labor. Just to his left is Mr. Robert Butler, president of the Walter Butler Shipbuilders, Superior, Wisc. Mr. Butler will represent the viewpoint of management in the general discussion.

I want to call now for the presence on the platform, if they are here yet, Mr. Fullerton Fulton and Mr. A. F. Whitney.

I think we can start off by hearing

from Mr. Keenan, who has been identified with the labor movement for many years, and who in a very capable manner, has filled the shoes of Mr. Hillman, who was formerly the chief adviser on labor, coming from labor's ranks, in the organization that preceded the formation of the War Production Board.

Mr. Keenan has had a wide opportunity to observe the necessity for labor's attention to safety, he understands the responsibilities that go with labor organizations, and I think that you will find that his views regarding this subject will be extremely interesting.

I take great pleasure in presenting Mr. Joseph D. Keenan, Vice Chairman of the War Production Board, who has come here from Washington to represent in these discussions the viewpoint of labor, together with Mr. Fulton and Mr. Whitney. Mr. Keenan!

Labor Believes In Safety

JOSEPH D. KEENAN

Vice Chairman for Labor Production, War Production Board, Washington, D. C.

The subject on which you asked me to speak is self-explanatory. Labor does believe in safety. More than that, labor wants to have safety—safety equipment, safety inspection, safety instruction and safety measures.

Right now, when manpower is obviously the nation's most precious asset, it is too often being wasted by disregard for safety in the factories, on the highways and in the homes.

If a full division of American soldiers

were wiped out by the enemy on some battlefield, it would cause screaming page one headlines in all our newspapers and heartaches throughout the entire nation. But each year a full division of soldiers of production die of accidents at their work! The individual reports get small headlines occasionally and every one of them cause bitter heartaches in some family; almost every one causes economic suffering for dependents; almost every one causes financial expense to industry

through insurance carriers; and most of them cause some degree of welfare burden to the community.

Despite this heavy toll from fatal accidents, the economic loss is made even more serious by the additional loss of hundreds of millions of manhours from accidents causing temporary or permanent disability.

I know what such accidents mean to a working family. My own father was crippled by an industrial accident and so paralyzed that he was a bed-ridden invalid for the remaining years of his life. I was about 12 years old. I know what it meant to our family. I got a very early start in industry as a result, running errands for a small wage instead of staying in school to complete my education.

Of course, I realize that preventive measures have improved in the past several years but I also know that the safety job is not yet being carried on adequately. The casualty lists prove it.

It would be a good idea, if it could be worked out, for our newspapers to print casualty lists from the battle of production. On a month to month basis, they would often outnumber our losses on the firing front. The publicity would, I believe, shock the American people into action.

Illness and injury are our major causes of that economic ailment called absenteeism. The facts prove it. I think it is very interesting to note that a few months ago, when certain prominent people denounced absenteeism, tremendous agitation developed. Some prominent publicists and public officials said we ought to pass a law.

Indignation was boiling up among patriotic people and especially among industrial associations. They claimed that workers were shirkers and that the nation was endangered by this absenteeism. The Office of Labor Production and several other agencies, however, produced evidence to show that a very large part of the so-called absenteeism was due to illness and accident, and that much of the balance was due to inadequate plant and community facilities. Suddenly, almost instantaneously, the furor subsided.

I want to be emphatic about this because, in my opinion, the public reaction showed prejudice on the one hand and defeatism on the other. Many people denounced absenteeism as long as the publicity seemed to indict "labor,"—the working men and women of America. Most of them stopped short as soon as they faced the fact of illness and accident. They threw up their hands as if that ended any chance of improvement.

Absenteeism is a far more serious danger to the war effort because of the fact that it is caused by accident and illness than it would be if it were caused by the eagerness of the individual workers to stay in bed in the morning. Accident and illness cause absenteeism but they also cause actual loss of manpower from the factories in excess of the absentee record. After a while, the ill or injured worker is separated from the payroll, furloughed or discharged. Hence the absentee record shows only a part of the real cost of illness or accident. The balance appears in the turnover record, which is one of today's most serious industrial problems.

Organized labor has long criticized the attitude which has existed so largely in business that illness and accident, like the poor, are always with us and that business should simply reconcile itself to the condition and buy some insurance to protect the company against disabilities for which the company might be held accountable.

It is a sad commentary that much of the safety prevention work which has existed is due to the insurance companies' efforts to reduce accidents which would cost money and to industry's willingness to accept insurance company advice so that premium rates can be held down.

But it is fortunate that some suffering has been averted because of this cash incentive for safety.

What I have said thus far may sound to you like the speech of a labor union official rather than of a government official. On the subject of safety, I see no legitimate basis for difference of opinion between any conscientious and intelligent government official, trades unionist or even management official. Furthermore, my responsibility as a public official is to maximize labor productivity and to

overcome whatever obstacles exist in our path.

Without wishing to be too provocative, I would like to ask why the whole subject of industrial safety has been kept in the hands of professionals with a primary financial interest rather than promoted among the representatives of rank and file workers who have a blood and bone and even a life interest in the subject.

Please note that I am not complaining that professionals are employed in the field of industrial safety or preventive medicine. Far from it. Rather I would urge that the profession be vastly expanded and given a greater role in the conduct of industrial enterprise and of public affairs. The National Safety Council has done much excellent work, for example, and your members deserve high praise for the accidents that never happened and the industrial diseases that never developed because of preventive and educational measures which were initiated.

I do complain, however, that the practice of industrial health and safety has been operated too much from the front office and too little among the ranks of the workers themselves. I complain of this because the present method fails to secure the results which are needed. The average worker, rightly or wrongly, is suspicious of front office purposes. The average worker mistrusts front office methods.

You men and women know that the average worker has some reason for his attitude. Under a competitive profit and loss system, many managements operate on the strict comparison of costs. They figure the cost of a safety device or method against savings in liability.

We recently had a meeting of a foundry labor advisory committee at which union representatives talked with us about the difficulties of securing and maintaining an efficient labor force. You would be surprised to know how much emphasis was put upon lack of safety measures, sanitary facilities, dust and fume control, ventilation, heating, and eating facilities. These men know that the industry is not a wealthy one and that the employer is operating at a small, highly competitive

margin. They showed a sympathy for his problems, but a deep resentment at the employer's apparent disregard for their well-being. The oldtimers said they were used to it, but that newer workers either couldn't or wouldn't tolerate the conditions at a time when they could easily get other jobs under more suitable conditions.

That illustrates the gap between employer and worker on the question of health and safety. It is a big gap, but it also is largely an unnecessary one. The employer could help eliminate the gap by bringing these problems right to the workers and giving them a real chance to join up with him in the solution.

I can give many other illustrations. I refer to the numerous union contracts which incorporate minimum requirements for safety and health measures as part of the collective bargaining agreements. I suspect there would be many more if the local unions were better informed as to corrective measures and were able to write their contracts on an industry basis so as to equalize competitive conditions.

I also call to your attention the fact that union agitation and pressure have been the major factor in forcing into the statute books of state and nation provisions for safety standards, factory and mine inspection, and industrial accident and disease control and insurance measures.

I refer to these matters today as proof that labor, especially organized labor, believes in safety. I cite these examples, too, as evidence that issues on which management and labor should have a common interest and attitude have unfortunately been forced by shortsighted opposition into the area of labor-management controversy.

Workers are the agents of management in using the tools of production to process raw materials. They deserve at least as much care and attention as are given the machines they operate.

Certainly, today, manpower is one of the greatest assets that an individual management can possess. From a standpoint of profit and loss figures, many managements can replace machines, even under present limitation conditions, more

easily—and even less expensively—that they can replace trained manpower.

I make that statement to reassure those management people who may believe that their duty to stockholders prevents their making an investment in safety. I think it will help remove the restraints which may have been causing many managements to hold back on safety programs which they otherwise would sincerely wish to undertake. I am one of those who realize that most men in management positions are thoroughly decent, humane people who want to treat their employees as they would wish to be treated themselves. But, too often in the past, a plant superintendent would find himself facing price competition for his product, which might cause a temporary deficit if he expended corporation funds for adequate health and safety measures—and such deficits would probably cost him his own job!

Let me refer at this point to the excellent address of another WPB official, H. C. Mesch, chief of the Safety Equipment Section, who spoke here yesterday. He estimated that the total cost of safety equipment sold to industry this year will be around 100 million dollars. That seems like a lot of money—but his figures also reveal that the top expenditure per capita in major manufacturing industries runs from \$6.00 in the chemical industry down to 61 cents in tanning and leather. He also pointed to the fact that the industries with the higher rates of expenditure enjoyed the lower rate of accidents.

Need I say that under present conditions it costs an industry far more than \$6.00 to gain and train a new worker? The extravagant turnover figures in most industries, however, indicate that few are investing funds to hold workers, no matter how much they may have to pay to get and train new ones.

But as I have pointed out, a health and safety program is worth exceedingly little if it is expressed only in terms of a dollar and cents expenditure by a corporation, however desirable and essential such expenditure undoubtedly is.

You must have the confidence and the participation of the workers. You can get that confidence and participation

through agents whom the workers trust, through the organization selected by the workers as their collective bargaining agency.

Today, about 85 percent of all war workers are in plants covered by collective bargaining agreements between unions and management. As never before, the vehicle for cooperation awaits your use of it to reach the workers in industry.

Do not be alarmed by the term collective bargaining agency. A union does bargain for employees of industry, but it also exists to serve its members in economic and social activities. A union is, in a very real sense of the word, a brotherhood of workers—as many of them are actually named. Many unions developed directly out of organizations formed for welfare purposes.

A union, formed by workers to act on their behalf, naturally and logically deserves and holds their confidence. In getting a real safety program under way, such confidence is necessary. Furthermore, since a safety program necessitates a high degree of participation by workers, it is essential to use the medium which assures such participation.

The logical way for such cooperation between unions and managements to be carried out is through a labor-management committee or sub-committee for the purpose. As I have said, the professional experts, the safety engineers and industrial health doctors, can and should be on such committees and give the needed expert direction and advice and receive the practical comments, criticisms and suggestions from the workers' representatives.

This seems a simple and straightforward approach. I see no legitimate basis for objection from either side. Yet, whether from timidity or inertia, only a small proportion of the 2500 labor-management committees now known to be operating in America war plants have established health and safety committees or programs.

Of course, some joint programs are undoubtedly in progress among the very larger number of war plants where union-management agreements exist but where

labor-management committees have not yet been established. But the field is hardly scratched.

I am glad to bring you word that a definite and vigorous campaign to get cooperative labor-management programs under way will be undertaken by the Office of Labor Production of the War Production Board.

We do not plan to duplicate the work of other government agencies now carrying on excellent specialized health and safety programs. We intend to make use of their data and their facilities. We intend to open up a channel between unions or labor-management committees through the Office of Labor Production in the War Production Board. Our office, staffed by men from the ranks of labor and experts in production problems, fortunately enjoys the confidence of workers' organizations. Both the American Federation of Labor and the Congress of Industrial Organizations look to us as the medium through which government and workers can exchange ideas, programs and criticisms. Hence, I am confident that we are especially well qualified to translate into action a long proposed plan for industrial health and safety activity. I believe we can help to harvest excellent results from the splendid facilities of other government agencies about which workers are so unfortunately uninformed.

I am glad to announce to you that we

shall have as chief of the Industrial Health and Safety branch a man who has earned a splendid reputation in the ranks of organized labor and who, as many of you know, has gained practical experience here in Chicago in the field of physical education. I am pleased to tell you that John M. Fewkes, former president of the American Federation of Teachers, will take office within two weeks as chief of the Industrial Health and Safety Branch of the Office of Labor Production.

I ask you in the field of industrial safety to be ready to join with us in launching a real program to conserve American manpower from unnecessary accidents in the battle of production. While our program will not be a ballyhoo measure, I can tell you that our special appeal will be on the basis of the necessity for such measures in order to mobilize and maintain the maximum effective strength among the soldiers of production in our gigantic struggle against the slave-masters of the Axis. We won't be asking men to be careful so as not to hurt themselves. We will ask them to "keep safe and well to give Hitler hell!"

That is a program which we are sure will go far towards making America in wartime and in the peacetime which follows, a safer and more productive and prosperous nation for management, labor and the general public.

CHAIRMAN RING: I think I speak the wishes of all here when I extend to Mr. Keenan the heartfelt appreciation for the careful analytical talk that he has given. I think he has brought a viewpoint here that is tangible and concrete, rather than abstract. He makes safety something more than a word.

I think when we get down to that point we are at the real starting point, if we get a real appreciation inside us that the man whose hand or arm is cut off presents a terrific demoralizing effect not only upon himself and his family, but upon all workers who are in the immediate vicinity of that man.

I also am glad to find Mr. Keenan talking about labor organizations as he does.

The abstract words, labor organizations, collective bargaining, unity, are too frequently taken with a degree of shallow consideration. These organizations are made up of men, like all of us here, banded together, each equally interested in the welfare of all.

I am sure that all that is needed is a decent halfway approach to all responsible labor organizations in order to secure from them full, hearty and complete cooperation with respect to safety programs. I know that most of us base our safety programs upon such cooperation. I am sure that the appreciation for safety on the part of labor, which Mr. Keenan, who is in a position to very well evaluate those things, indicates is present in the labor

movement today, that with such appreciation of the necessity for moving ahead, we will find frequency and severity rates constantly declining from here on.

Accordingly, in line with the announced program, I open up the meeting for discussion on the remarks by Mr. Keenan. Is there anyone who wishes to say anything with respect to any of the points that have been raised by Mr. Keenan?

MR. T. A. WILSON (Chairman, North Carolina Industrial Commission): A gentleman from New York, who yesterday morning was at the Accident Facts Session, stated that he had a peculiar problem.

As I recall his problem, it was something like this: He had an employee that was accident-prone, who has had several accidents, and he was violating the safety rules and regulations. He wanted to know what to do with that employee inasmuch as they had a union shop, and as he expressed it, they were "fearful of maybe having them try something" if they used disciplinary measures in regard to trying to bring this man into line, to observe their safety rules and requirements.

Now what would be your answer as to how to handle an accident-prone employee, particularly in a union shop?

MR. KEENAN: I think there is a definite understanding that the management has a job to do. I don't know who he may be, but if he is operating under a union shop agreement, all organized labor understands that the management has a job to do and labor has a job to do. Now, if the management sets up rules and when the agreement is negotiated these rules are understood, then every employee must accept them, and must be guided by them. I don't think any union will take exception to any management carrying out their part of the bargain. This fellow has been violating the rules; he is subject to the penalties.

Of course, sometimes we may have cases where an individual union may step over the bounds, but that is an exception. That isn't the custom, because in every organization that I know of, the working rules are there. Anything outside of the working rules is the management's rules. It is

understood that they must live up to the management's rules if they agree to them when they sign their agreement.

MR. WILSON: May I add this thought to the remarks? I think the logical approach in connection with this would be to take it up with the shop committee, or whatever type of committee you might have by way of a grievance committee, and if necessary, the next time the scale committee meets.

MR. KEENAN: That's right.

CHAIRMAN RING: Anybody else have any questions? I think that was a very important one.

MR. C. P. TOLMAN (Consulting Engineer, Kew Gardens, Long Island, N. Y. and past president N.S.C.): There is a method used in a few companies controlled by committee action, as to a violation of a safety rule. After the offender fails to note the rules, having been warned, he is ordered to report to the committee, which is made up entirely of fellow employees, naturally including the union steward. The company is guided entirely by the recommendation of that reference committee. It works out one hundred per cent in the cases I know of. You can see the psychology of it, because if a man breaks those rules again he makes a fool of his fellow employees, and they're not going to stand for that.

MR. KEENAN: The labor organizations and most of the state federations and the other bodies that have to do with the setting up of labor legislation, are fighting for these safety devices and these safety measures, and it wouldn't make sense on one hand to be fighting for these measures and then support a fellow that was ignoring the use of them and causing accidents.

CHAIRMAN RING: Is there any further discussion with respect to Mr. Keenan's talk? If there is not, I would like to have the members of the panel who are engaged in a round-table discussion, present themselves. I will ask the members of the round table panel that have been designated to please come to the platform.

I know Mr. Gibson. He is President of the Michigan CIO Council, from Detroit.

I see Mr. Zimmer coming down the aisle. He is the chief of the Division of Labor Standards, U. S. Department of Labor. Mr. Butler has already been introduced.

Mr. Holzbog, director of industrial relations for the Western Cartridge Company, has just arrived.

To open the round table discussion, I think I might ask Mr. Zimmer what he thinks might be the most practical means to insure the best results of labor's offer to actively support and participate in the prevention of industrial accidents and industrial diseases, whether through the operation of the collective bargaining method or through the labor management committee, whether it should proceed on a plant level, department level or be further localized in the plant.

I think Mr. Zimmer is in an excellent position to give us some very fine views regarding that subject.

MR. V. A. ZIMMER: Mr. Chairman, that sounds like one of those long hypothetical questions they submit to a witness on the stand.

I do want to say that I listened with a great deal of interest to Mr. Keenan's talk this morning, and it certainly was a very good analytical picture of the situation that exists in the country as I see it. I might say that in my department we view this picture through the eyes of some 650 men who have been going into these war plants for the last two and a half years to render a safety service.

Most of us are familiar with the work of the National Committee for the Conservation of Manpower. In that program we have 600 volunteers from private industry, the best safety engineers in the country, and augmented by a very few fulltime men.

We have a pretty realistic picture, as you might surmise, after visiting 24,000 plants in the last two and a half years. I would be inclined to agree with that statement of Mr. Keenan's that one difficulty is, perhaps, that we still have too much front office safety activities, and that it doesn't, in hundreds of instances, reach down to incorporate or utilize fully the cooperation of labor, of the worker,

whether that be an organized shop or an unorganized shop.

I am convinced, and I think every other safety engineer is convinced, that no matter how good a safety engineer you have in charge of the safety work at the plant, he is not going to succeed unless he is able to elicit the active support of the workers, perhaps through the foreman or some other means, but that must be done.

I was interested in the suggestion that Mr. Keenan made as to what can be done under union contracts. About five years ago through the help of the Bureau of Labor Statistics in Washington, and a little relief fund from the government, we made an analysis of some 3500 labor union contracts that are filed with the Division of Labor Standards.

My particular interest in that project was to see what type of approach, what provisions, exist in these contracts in reference to safety. We were tremendously disappointed. In eighty-five per cent of the cases, I should say, what we say in those contracts was a simple statement that the management agreed to abide by the laws of the state with respect to safety measures. I don't see how any plant owner could refuse to sign that without making himself a criminal, but of course you know and I know that doesn't mean much in actually getting safety in the operations. In only a handful of the cases did the provision that we saw in a contract really reach the difficulty and contribute substantially to any control of a hazard.

Of course, that led me to the conclusion that what really is needed, in my estimation, is a better understanding on the part of labor of accident prevention, what constitutes good technique. There is admitted a dearth of that type of planning.

I remember in Illinois some years ago, I read the proceedings of the State Federation of Labor, and I have always been impressed by one resolution that came out of that convention. It was to this effect: The usual resolves, that labor had too long devoted its attention exclusively to the question of wages and hours, and too little to question of accident prevention . . . They made a further statement

that impressed me, that "high wages and short hours are of very little use to the man who is laid up in a hospital."

Taking you back to Mr. Keenan's statements, we have had definite complaints from even the labor members on our national committee, that in many instances the management is making it clearly evident that labor should keep out of this matter of safety. "That is our responsibility, and we don't want any interference." Well, it is. There is no question at all that safety in a plant is primarily the responsibility of the management. I think, of course, that they never can exercise that responsibility fully unless they draw in a labor man.

On the other hand, in these 24,000 contracts with plants around the country we have frequently heard the complaint of the management that labor doesn't cooperate. This question that Mr. Wilson presented a few minutes ago is one that frequently occurs. I remember only a few weeks ago that our state chairman in Oregon reported to me a plant that was having a very large number of eye injuries. The management had supplied protective goggles, but one steward, or one local officer of the union, didn't like the idea, and said to the men, "Never mind what that bird tells you, you don't have to wear these unless you want to."

Well, he wanted to know what to do about that. Of course, I sent a fellow like Harry Gilbert out there to talk to the union members, and when he got through he scared them to death.

I should say this, though, in answer to those complaints, if the workers are given a part in the formulation of these rules in the plant, they will abide by them. What they resent, and you can't blame them too much for that, is to be called upon to comply with regulations that they have had no part in forming.

I think there is a brighter picture in the fact, as stated by Mr. Keenan earlier, that labor around the country, labor at the top, has always been interested in safety. The difficulty has been to get it translated into the local units. I think there is quite a lot of satisfaction in the very evident fact that there is an increasing awareness

on the part of labor of the need to educate itself in accident prevention techniques.

Now as some of you know, this is a part of our program nationally, and for two years we have been carrying on safety instruction through courses under the auspices of the local colleges, this in collaboration with the office of Education. In two years, 44,000 enrollees in those ninety-six hour courses have completed the course, and 90 per cent of them have gone back to the production line.

The major part of those enrollees were plant superintendents and foremen. At my insistence, those classes were made available to responsible labor officials. Unfortunately, not a great number of labor officials took advantage of this opportunity to become thoroughly acquainted with the problems of the management in respect to accident control and to become familiar with the necessary techniques for the prevention of accidents. I should say that out of 44,000 not more than a couple of hundred persons from organized labor actually participated in these classes, despite the fact that we publicized it rather broadly.

Mr. Gibson who is the President of the CIO in Michigan, formerly Industrial Commissioner of that state and therefore has a first-hand knowledge of accidents and accident prevention, launched a move to set up training factors solely for labor officials. I personally think that would be a good idea in every state, because labor can participate more intelligently if they themselves have a genuine knowledge, a knowledge even to that of the management, in what these hazards are and the methods of control.

In several thousand cases among these 24,000 contracts, our safety engineers, who are volunteers largely, have succeeded in setting up in these plants, in connection with the safety program, shop committees, in a sense much like the committees that Mr. Keenan talked about. In an unorganized shop, of course, the workers are drawn directly from the workers' groups, and in most instances, in organized shops, they invite designated participation by the union.

When that is done, for the most part, as we get the reports, effective work is

done. There is very little difficulty along the lines that Mr. Wilson mentioned a few minutes ago. I do still know a number of safety engineers in this country, and mighty good ones, men of long experience, who are just a bit reluctant in their own operations to give over representation on the safety committee to union designated officials. They fear it, they tell me, because they fear the lack of trained knowledge on the part of these officials.

However, I personally don't think that is well founded. If I were the manager of a plant, an organized shop, I certainly would invite the union to take designated participants to that committee, and I would want the rotation scheme so that a large number of union workers could best become acquainted with the accident control measures that are necessary.

I think that is all that I want to say at this time. I don't know whether I have answered this long question of Dan Ring's or not. To sum up, I am thoroughly convinced, and I think everybody here must be thoroughly convinced, that you have got to control these accidents at the plant level. We can't do it in Washington, neither can Mr. Keenan. It's got to be done on the job.

I think that if we can extend accident prevention knowledge more widely among the unions, we will have less and less difficulty on the part of the management in carrying out its responsibilities.

CHAIRMAN: I am sure that we all very keenly appreciated Mr. Zimmer's talk.

I think that as we have heard of the relative responsibilities of labor and management in this, we mustn't feel that one side is to be excused because they're our side, and the other is to be condemned because they're not our side. I think that we have before us a pretty clear line of thinking with respect to the relative responsibilities of labor and management, and we heard from Mr. Keenan, who is now what we call at the Washington level. I would like to get down closer to the fellows in the field that are carrying on the fight.

Mr. Gibson, who is President of the Michigan CIO Council, will speak to us.

MR. J. W. GIBSON: Thank you, Chairman Ring. I am really pleased to see the number of management people present in this round table this morning, who obviously recognize that there is a problem confronting management and labor in relation to their joint cooperation in an enterprise where there can be no difference of opinion, or where there should be no quarrel.

Labor is keenly interested in safety. They are extremely interested in the health standards of the plant in which they work. If you had ever been a labor commissioner in one of these state departments where you have a high degree of organized labor within the state, and received the multitude of complaints that a commissioner in that position would receive, you would know that labor is floundering, trying to find some medium by which they can solve some of these problems.

As chairman of the Michigan State Department of Labor and Industry, I received many complaints from labor organizations on these same conditions. The United Automobile Workers health unit has started a move, in a very inadequate way, to do something about it. They have recommended the injection into the labor agreements of the various branches of that organization, specific clauses dealing with health and safety. They are so lengthy and cumbersome, in spite of the sincerity of the people who drafted them, that I have seen many trade union agreements that would be subordinated to the clauses they want put in on this subject.

In the U.A.W. convention in Buffalo, which I left late last night, a resolution was adopted on manpower. The first provision in that resolution was this: "That an inadequate health and safety standard within a plant would be grounds for granting a worker the right to change jobs." So labor is thinking about it. Labor does want something done about this problem. I think we can all do something in bringing that about.

I have worked with management and state departments for the active interests in safety, and I think I recognize the importance of it to everyone. I know the machinery set up at the present time with-

in the trade union movement to solve their grievances within the plant, and I think I recognize clearly the weaknesses of that machinery to carry out this all-important mission.

I am not going to say to you that these steward bodies, or labor management committees, or the shop bargaining committees, should be enlisted by management in this problem. I think their aid should be enlisted in this problem by the union movement itself. You ask me why? In the first place, the shop steward in the plant is primarily concerned with the economic problems of workers in relation to wages, hours, and what have you. He is dealing with production people or personnel and settling the grievances in that plant. We must have safety people to take care of the safety problems. Time and time again we have said the production man is interested in production and not interested in safety. So if there isn't some other medium within the trade union movement to start taking care of these problems, who have a genuine and cooperative understanding of safety, then how do you expect to get anywhere?

With the shop bargaining committee safety would be the last thing on the list of items that they might take up with the management. And they're not taking them up with the right people within the industrial plant. I think the only solution to this problem is adequate safety committees with union representation chosen by the union working in cooperation and coordination with the safety department within the plant. These grievances on safety, the recommendations that labor has to make, should first go to the safety director who has an understanding of safety within the plant, and whose chief job it is to correct all of these hazardous conditions and who lets nothing else, if he has top management's wholehearted support, interfere with taking corrective measures.

I think if it can't be settled at that level, then there is only one other place to take it, and that is just as high as you can go in the bargaining committee—top management itself. I think if the safety director and the union people, in a joint committee, can't settle these problems,

they must be taken to the top. And top management must be apprised of these things.

Many managements have a fear that labor would take over the safety movement. That is foolish. Labor can't take it over. Without management there can be no safety program. Management spends the money. Management makes the corrections. Management furnishes the educational material. Management should be taking the lead. The only role that labor can play is a role of cooperation, cooperation on the educational activities within the plant and cooperation by helping keep the safety department on its toes, by giving to that department additional eyes and ears that can be on the alert and on the watch for unsafe conditions throughout the plant. They must be supplemental to the plant safety machines, and there isn't a chance in the world that they could take it over because they can't buy the guards that guard the machinery, they can't give orders to the working men; that is the foreman's job.

On the other hand, labor's problem is that they don't know what safety is all about. We had a session in Detroit about a year ago that I participated in. It happened to be in Bay City, Michigan, a few weeks following that session. I went out to a plant whose safety record was very bad. It was a small plant, four or five hundred people. The inspector of that district wanted me to talk to the management about putting in a good safety program.

When I arrived at the plant and sat down to have a little chat, the supervisor said, "Mr. Gibson, I'm ahead of you." I said, "What do you mean?"

"Well," he said, "three members of our union went down to a conference in Detroit. They came back here on Monday morning, walked in our office and said, 'We want an organized safety program and a safety director in charge of it. We want a joint committee of labor and management, and we'll give you one hundred per cent cooperation in enforcing the safety rules and in helping you make this venture a success. It's us that are getting hurt.' So I said, 'We're going to have a safety program.' When the men in my

plant get interested enough that they come to me and demand that I get up a safety program to save me money and protect them. I think it shows real cooperation."

The place had an extremely high accident record. Three hundred workmen, sixty-five disabling accidents in less than twelve months. The first thing they did was put in a goggle program. It took labor's cooperation to make that a success. The results were astounding. Those fellows still didn't have an understanding of safety, but they knew they wanted it. They went to the management and said, "You give us the leadership, we'll help you do the job." And they did.

I think that's the problem. It's a problem of extending to labor, first, the necessary machinery set up on the proper lines so that safety can be gotten out of the regular procedure in the plant.

Another thing that might be pointed out at this time: A good safety program means that you have good working conditions, a clean plant, a well-lighted plant, a well-guarded plant. Those are all working conditions in the terms of unionism. They will cut down and minimize the number of plant grievances that are otherwise working from other channels. They will make a happier relationship between labor and management in some of these plants.

That is why, if you don't set up the right machinery within the safety movement itself, to extend this cooperation, you're going to get it through the collective bargaining channels of the plant, which is going to be inadequate, which is going to be cumbersome, and which may never develop to a point where it can be a real protection.

Right along that line, I had a call the other day from a worker steward in one of the largest plants in Detroit. He was complaining about a spray booth. He said, "I have kept that thing shut down on my shift for six months, and they're trying to start it because they say they need the production."

I said, "What kind of a spray booth is it?"

"Oh, it's got water falling in it."

I asked him a few questions. He had the very latest type of a spray booth, the

most modern money can buy, completely adequate for the job that it was to do. The only trouble was that it was a little out of adjustment, and once in a while it didn't separate all of the paint from the exhaust, and a little spray of yellow paint might be thrown out toward the roof of the plant. Immediately everybody thought he was in a serious health hazard. He had kept it shut down for six months, and I told him, "You have no health hazard there. It is true that maybe that duct should be run outside the plant." I called the safety director. Immediately, adjustments were made on the thing. It took a couple of weeks to make them, and in the meantime they started using it. They were using it on the other two shifts, but here was a union steward who didn't know what he was talking about, and he had never had an opportunity to learn. Nobody had taken the time to explain it to him.

That is why, as Mr. Zimmer told you, we are trying to sponsor—we are going to sponsor, we are not going to try, we are going to do it—the first safety class of strictly trade union people. We are going to get people from the safety committees where they are in existence in the plant. We are going to get other places where we know the management is strong for joint committees, and we are going to try to give them a basic understanding of safety. We are going to try to point out to them whose responsibility it is within the industrial plant to see that safety conditions are maintained. We are going to try to direct them, not through the production machinery of the plant in settling their safety grievances, but through the established safety machinery within the plant that is designated to do that job.

If safety is eighty-five per cent education, and I don't think that is an exaggerated figure, then how are we going to do that important job unless we bring those workmen into the safety program through a medium of education?

If we go out to sell war bonds, what do we do? We get everybody whom we think can promote the sale of war bonds. If we go out on a Community Chest drive, we get everybody who can donate or who can help influence people to donate. If

we are going to go out and really sell safety in these plants and carry on the proper type of safety educational program, then we must enlist the aid of everybody who can make a contribution to that program and we must set up machinery adequate to give them that opportunity.

CHAIRMAN RING: Now I would like to ask you whether it would be your pleasure to hear a few short talks like this rather than a round table discussion. I don't want to keep you beyond your time, but I think at any time that we're beginning to get ideas like this in intensified form before us, it is quite possible that they may be more beneficial than a round-table discussion that will wander around aimlessly. (Applause)

Well, that's what we'll do. We'll keep on with that. I have this thought in mind, though, there are about eight or nine points that I have written down as we have gone along that in about ten or fifteen minutes of discussion I expect to lay before all of you to find out whether or not it will represent a consensus of what all of us feel about this thing, so that something definite and tangible can come out of this conference, which I think is represented by as fine and broad a group of people interested in safety as we can find anywhere.

Now, we have with us Mr. John Holzbog, Director of Industrial Relations of the Western Cartridge Company. Mr. Holzbog.

MR. JOHN HOLZBOG: Mr. Ring, I can say that Mr. Gibson gave me a very excellent springboard from which to start. He made the statement here just a few minutes ago that labor doesn't know anything about safety. I was very glad to hear him say that, because it is true. Labor doesn't know anything about safety.

Now whose fault is that? I don't think that you could say that it is labor's fault alone. Nor can you say that it is management's fault alone. I think there is a joint responsibility there on the part of both parties. We talk about these labor and management committees, and how do they operate? You take a group of management people and have them sit down and talk about this thing, and what do they say? "If we could only get the men

in the plant to do this, and to do that." Then we take a group of labor people and they sit down and talk over this thing, and what do they say? "If we could only get this guard, or that guard, or if we could only get these conditions fixed up, that would be the answer." Each one thinks about the problem in the terms of what the other fellow could do about it.

Now, that isn't the way to get at the thing. Whenever you get one of these mutual admiration societies like we have here this morning, you can get all the answers and everybody working together, but then you go back to your plant and what happens? You get back to the same old thing of each one thinking in terms of what the other fellow could do about it.

Cooperation on a thing will work. We have to think about it from that standpoint. And education is a very important part. We hear a lot about bad working conditions, things that need to be guarded, inadequate safety devices, and all that sort of thing, and that is important. But let's not forget that eighty-five to ninety per cent of our accidents are not caused by the lack of safety equipment, but are caused by somebody doing something the wrong way.

The automobile is a perfectly safe device if it is handled properly. And that means just operate it in the right way. Yet we still have between thirty and forty thousand people killed each year because automobiles are not handled properly.

It has been pointed out that some eighteen thousand people were killed in industry. Well, that's true, but there are also approximately twenty-eight thousand people who have been killed outside of industry, and those people are lost to industry just as much as those that were injured in industry.

I can't ever get away from the viewpoint of educating people not only in industry, but outside of industry as well. We have a tremendous job to do in that respect. I think this program of education in the plant has to be carried on with the cooperation of the men. And it will work.

A few years ago, in a plant where I was located at that time, we tried to get

the men interested in this thing, so we asked the men in the various departments to have meetings, to set up their own safety rules. They didn't particularly care about the safety rules which we set up for them, though they abided by them to some extent.

They sat down and wrote a better set of safety rules than we ever could have written, and they made them work.

They made them work, and they had a fine accident record in that department. When you do that sort of thing, you've got to provide backing for them, you've got to help them get their education, you've got to give them the material to work with and stay with it. If you don't, it isn't going to be a success. But that was one attempt on the part of the management to help to educate these workers and get them to thinking about safety.

This problem will never be licked until every single individual thinks about safety most of the time.

I was glad to hear Mr. Gibson make the remarks as to what the unions are doing to help educate their people on safety. This question is one that has often occurred to me: I wonder how much the matter of safety education is ever discussed in local union meetings? I have heard a lot of other things come out of local union meetings, because they bring them to the collective bargaining meetings, to the grievance meetings, and so on, but I wonder how much safety education is actually discussed. I wonder if the unions ever devote a meeting entirely to safety education. Now I know that I'm asking a question that will probably get a rebuttal here this morning, but I think that is one of the ways in which we are going to have to correct this thing. I don't think management can duck its responsibility one iota. Management does have to provide the stimulus for this thing, and management does have to keep it going; but I think that if we can get management to think about labor's side of the thing a little bit more, and labor to think about management's side a little bit more, we can get across this program of real education, getting people to think safely. Then we can operate on a basis where we're going to reduce frequency and severity.

CHAIRMAN RING: Well, it looks like we're still rolling along. We have a late arrival, Mr. Victor Olander, who is the Secretary-Treasurer of the Illinois State Federation of Labor, located in Chicago.

I am sure Mr. Olander has a few words to add to keep this discussion going steadily on the upswing. Mr. Olander.

MR. VICTOR OLANDER: Mr. Chairman, Ladies and Gentlemen: I came into this room not at all sure as to just why I was here. I had no notion that there were to be any formal speeches, so I had made no preparation. I listened very carefully to what was being said after I arrived to get a keynote of some sort that would enable me to participate in the program without being too monotonous, and it came in the allegation, or the statement by one of the former speakers, that somebody has said that labor doesn't know anything about safety.

I came ashore as a sailor forty-three years ago to take office in the Sailors' Union. I have been active ever since. In almost all of my duties I have had to give attention to legislative work. Up to about ten years ago, in dealing with safety regulations through law, before Congress and the state legislature, I never had the privilege of meeting anyone working on that subject except the representatives of labor. I often wondered where the rest of the folks were, because I knew, of course, that a great many must have been interested in this question of safety. It's all very well to talk about getting together with management and to try to work out some rules that will safeguard life and limb in industry. But speaking as one who has come up for a long period of years and has had a good deal of experience in that field, let me say quite frankly that the lack of cooperation has been mainly due to the claim that we, labor, are interfering with business of management when we undertake to say how the plant ought to be run.

That is almost universal. In later years there has been less of that, of course, but there is a good deal of it today.

Let me give you an illustration as to how that works out. One of the first problems I encountered upon coming ashore was the danger, the very apparent

danger of heavy loss of life through the appearance of a new style of ship on the Great Lakes, a vessel having a very long open deck, with part of the crew forward and the other part aft, and maybe three to four hundred feet in between. It seemed to me obvious that on a vessel of that sort, with seas sweeping across the deck and men moving from one end to the other, something had to be done in order to safeguard them during that trip, or they would be carried overboard.

There had been a bit of equipment known to the sailors from the days of antiquity, the life line—just stretched in between the spars. I suggested this to the management at that time—and the only chance I had of suggesting anything to management was through the union that had been formed against the wishes of the management—I suggested that they resort to that old method by stretching a cable from the foremast aft to the boilerhouse or some other spot where it could be fastened, then put some rings on that and some lanyards hanging down, that a man could tie around his waist. Then if he went over the deck and if he was carried off his feet, he'd swing back. It's not a comfortable arrangement, exactly, but one of safety.

I think forty men were lost before that was accepted, although attention was directed to the governmental men having power in that sort of a situation.

Now that experience is illustrative of many other experiences of that sort that I have had. Please don't misunderstand me, I don't want to be in the position of pointing an accusing finger at the management and saying that it has no regard for life. I think the men who occupy managerial positions are just like the rest of us. They are creatures of habit, they will follow the customs of the day and what the other fellow does, they do. We and they are much alike in that respect.

This sick condition of loneliness in the safety field, as relating to legislation on the subject, continued, insofar as I am concerned, up to about ten years ago. Then there came a change. Now it was obvious, it has been obvious down through the years, that one who hires another to enter his service has a moral obligation

to furnish safe conditions of work insofar as he can. There are many occupations that cannot be made safe, in which the worker must take very grave risks. The one that I spent my early career in is one of those. The structural iron workers, the bridge builders, and many others of that type are other illustrations.

This moral obligation to furnish a safe place was inescapable. The logic is so obvious that there is no way of getting around it in any sort of argument, and as a result of that, the law set up a liability on that point. Management countered with the argument of assumed risks. They wrote above the places of employment, "All who enter here do so at their own risk." You know the story, and the long fight we had to break that down. That was a fight for safety. And who made the fight? Organized labor, and nobody else. It was a lonely job. I have had forty years of that sort of experience, and there are many older men than I and many men of longer experience than I, who have had the same sort of experience.

In the course of time there developed a somewhat better spirit, more progressive—I'm saying that wrong—liability grew, the courts began to be more reasonable in that respect. Common sense and some humanitarianism induced the more progressive leaders among management to give very careful thought as to the cost of this wounding and killing of workers, and they found that by reducing that slaughter they could make it pay in dollars and cents.

Out of that grew the present safety movement in the form that we have today. I don't mean to say that that is what inspires the National Safety Council. I don't think so. I don't believe that today it is the sole inspiration among the leading employers. I know it is true of quite a number, however.

In the development of health and safety rules through various agencies, labor and management have gotten to the point where they sit across the table to discuss these things, and there has been relatively little difficulty in reaching an agreement. It is surprising how simple the work is when we get close enough to one another to see the glint in each other's eyes, and

are kept there by some force of circumstance until we find a way out of the difficulty that confronts us.

Here in Illinois the experience in that respect is of rather recent origin and has been most satisfactory. We haven't done as much as we ought to do, but the spirit is there and we are getting somewhere and getting somewhere fast. Out of that have grown other approaches. One of them is my appearance here. I think it is the second time that I have appeared in a meeting of the National Safety Council, the first time being purely a visit out of curiosity. Here recently, however, inspired by the need for conserving labor in the war situation, a movement was started that I think is going to grow very rapidly and may extend itself over the country. That is, cooperation between organized labor, the National Safety Council, the state governments, and during the war, the United States Army and the United States Navy.

Ours is a very small thing, but I see it in my mind's eye moving ahead. The Chicago Federation of Labor named a Safety Committee, after I had a talk with Mr. Dearborn of the National Safety Council, who came to me about the matter. That Safety Committee was brought into conference with representatives of the Safety Council. While that was going on, the U. S. Army made an approach to my office, that is in the 6th Area, as to the possibility of some experimental work in the field of safety. A conference with the representatives of General Aurnand followed. While that was going on, the Safety Division of the Army was called into cooperation with the Safety Council, and the Committee of the Federation of Labor.

Now we are throwing all of these agencies together, and we are going to move ahead as fast as we can into this field. We may not do very much, but I will venture to say that, by and large, labor knows as much about it as anybody else does, and we'll be glad of the chance to go in deeper in an effort to find the solution for all of our difficulties in this respect.

CHAIRMAN RING: Before we wind up, let me give you a little quiz, a little

test along this line, to see whether or not all of us feel that the following things which have appealed to me, personally, aren't pretty much generally recognized by all of us; so that we will have something tangible to take away from here.

I have about seven points written down here, and I want you to correct them, elaborate on them or do anything that you want with them.

"Cooperation between labor and management can best be achieved in the opinion of this gathering, by recognizing the following points:

"1. Promotion of safety should be just as definite an objective of labor as wages and working conditions."

I think most of the labor speakers have indicated that that is labor's viewpoint. If I am wrong on it, call me. Anybody want to call?

MR. OLANDER: Go ahead, you're all right.

CHAIRMAN RING: Mr. Olander says I'm all right. I take it that that is the unanimous opinion here.

"2. Management should actively seek labor's cooperation." (Applause) All right.

"3. Education in what safety means should be stressed by management and labor to the end that the attack on unsafe conditions and practices can be centered at the job level through full knowledge of every worker of the principles of safety." (Applause)

"4. The cooperation of workers must be sought without detracting in any way from the necessity for expert and professional safety guidance in the plant." (Applause)

"5. Plant Safety Committees should always function in full coordination with and under the official sponsorship of the plant Safety Department." (Applause)

"6. The basic responsibility for safety and the safety program is that of management." (Applause) "Labor recognizes that its cooperative effort must be dovetailed into the management's structure with recognition of the authority of management, that runs concurrently with its basic responsibility." (Applause)

"7. The physical condition of the plant

with respect to cleanliness, sanitation, and general housekeeping, is an essential factor in any safety program." (Applause).

Now unless somebody dissents, I am going to turn this in as the unanimous concurrence and consensus of this gathering. (Applause)

MR. GIBSON: I would suggest one addition to your point 7 on the physical conditions to pass on safety and cleanliness. What was your point on that?

CHAIRMAN RING: "The physical condition of the plant with respect to cleanliness, sanitation and general housekeeping, is an essential factor in any safety program."

MR. GIBSON: Couldn't you broaden that to mean in any labor relations program as well, since it borders on working conditions that normally crop up in the collective bargaining proceedings?

CHAIRMAN RING: I wonder if we wouldn't be going outside of our field if we began talking labor regulations—I am quite willing—"is an essential factor in any safety program or in any labor relations setup." Is that all right? (Applause). All right.

MR. OLANDER: I'll give you an amendment. I think it would fit. "It is our opinion here that organized labor should cooperate more completely with the National Safety Council." (Applause).

"8. It is our opinion, and we request that the President of the National Safety Council so communicate to the heads of organized labor that we feel full cooperation of organized labor is desired with the National Safety Council in order to put across the best safety program we can."

MR. GIBSON: And management.

MR. OLANDER: Yes, and management.

CHAIRMAN RING: Now let me say to all of you, there are very few of you here who know me. I want to say, however, that I have seldom been privileged to be in the position that I am with respect to such a large and representative gathering. Let me say further that the few hours that we have been here have been marked by most complete attention and intense concentration upon the subject matter. I hope this hasn't been too dry. It hasn't been for me. I hope you all feel the same way.

I want to say that I am keenly grateful and appreciative of the courtesies that have been extended on all hands, and I think our speakers here echo what I say in that we who have been put in the position of trying to carry this along are most heartily thankful for your attention and your indulgence, and I hope that what we have done here will prove of some benefit in the days to come.

Occupational Disease

THURSDAY MORNING SESSION

October 7, 1943

Presiding—A. L. Brooks, M. D., Medical Dir., Fisher Body Detroit Div., General Motors Corp., Detroit.

Occupational Disease From War Substitute Materials

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One of the results of war activities is that there are many things that can no longer be obtained. As a result, there has been a great deal of substitution of one material for another. This wide spread situation in industry has resulted in a considerable increase in industrial health hazards, either actual or potential.

Two Kinds of Substitutions

In the main, there are two kinds of substitutions; (a) where a material or substance similar to the one replaced is used, for example, the use of one type of solvent for another type which is no longer procurable; and (b) the substitution of one material by another that is entirely dissimilar, as in the substitution of laminated wood for metal.

Generally speaking, the first type has more implications with respect to hazards than the second because, in the former, the substitution is often not apparent and may therefore be unsuspected.

It is not always a simple matter to determine what may be a substitution product and what should be considered as a new product or new application to an industrial process. It is not possible to consider all the substitution products that are in use today, but the following discussion aims to present the more important ones from the viewpoint of industrial health hazards.

Solvents and Metals

Most prominent in the list of substitu-

tion materials are the solvents. Many of the more common and less toxic solvents are now practically unobtainable. As a result, benzol is being re-introduced on a fairly wide scale. The danger here, of course, is that its presence is often not suspected. The more dangerous solvents, such as tetrachlor-ethane, are appearing here and there along with a variety of others too numerous even to list.

Also, solvents are being used for purposes and processes where they had not been used before, which implies their use by workmen unfamiliar with their properties. The point to keep in mind, therefore, with respect to solvents, is that today's solvents may be quite different from the ones you were using yesterday and nothing should be taken for granted where solvents are employed. In each case, the exact nature of the solvent used should be determined.

Some interesting substitutions are occurring among the metals. Cadmium and antimony are both toxic and are apt to be used to replace zinc and tin. Selenium and vanadium have shown a greatly increased use in the last few years. Exposure to these may also cause toxic symptoms.

Beryllium is another metal in increasing usage. There is a growing evidence that this metal is toxic and produces severe pulmonary damage. An exceedingly interesting study of its effects has

lately been instituted by the Massachusetts Division of Industrial Hygiene. The effects of manganese have long been known but the manufacture of new materials makes it essential to watch out for this metal also. Indium, osmium and palladium have been mentioned by Pendergast as rare metals about which little is known and whose use is increasing.

Treatment of Textiles

The use of textiles in war industries also has occasioned problems connected with substitution and toxic exposures, both to those engaged in manufacturing processes and those who may use the final product. It is frequently necessary to treat textile fabrics with preventives against moisture, mildew, and insects, as well as to make them fire resistant. There are a number of methods for accomplishing these purposes, some of which are more or less familiar, while others are new. Here again, the scarcity of certain chemicals may make it necessary to forego a familiar or accepted treatment for a new process.

All such war materials come under the jurisdiction of the Quartermaster General. His department exercises meticulous care with respect to possible hazards to either those who make or process the material or those who are to use it. No material is accepted or authorized unless it has been cleared through the Surgeon General's Office. This may involve chemical analysis, animal experimentation and sometimes field trials on selected volunteer subjects. The army may conduct its own investigations or refer research studies to the National Institute of Health or various accredited laboratories.

Fumigants and Insecticides

Another very important group of substances are fumigants and insecticides. Disease has always been a formidable enemy of armies, sometimes more formidable than the opposing military forces. Two of our chief concerns in this war are the mosquito and the louse. Consequently, an enormous amount of work has been done on the development of insecticides, insect repellants, and fumigants. The demand for these substances

by the armed forces has led to the exhaustion of the supply of the materials that were commonly used for this purpose; and this, in turn, has led to the development of chemical agents, many of pose; and this, in turn, has led to the them of the complex organic type.

About some of these, we have a fair amount of knowledge; about others, we know little. Many of them are highly effective but that also may be an objection. It is necessary that the substance used be toxic for the insect but not toxic within reasonable limits, for the individual who uses it on his person or on his clothes. These observations have an interest for the civilian population also. New insecticides and insect repellants offered for sale should not be used until it has been determined that they are free from possible toxic effects.

Refrigerants and Fuels

To a lesser extent, the same comments apply to refrigerants. Here again, lack of more commonly used refrigerants may lead to the use of others that are less desirable from the toxic standpoint.

Solid fuels have become an important military item so that the supply of those formerly used may be exhausted. Much experimentation is being conducted to develop satisfactory solid fuels, but it is necessary to be cautious with such fuels as may be put upon the market to make sure that they do not give rise to undesirable or harmful fumes, especially if used in small rooms or enclosed places.

The unusual conditions under which this war is being fought, with respect to extremes of climate, exposure to jungles, deserts, and to the hazards of being cast adrift upon the ocean, has stimulated a great interest in the production and use of cosmetics. By this I refer to creams, ointments, and lotions designed to protect against sunburn, and ultra-violet rays. New formulas have been devised and various new chemical agents have been used, or their use suggested.

Obviously, great care must be exercised to insure that no toxic chemicals are used in such preparations, all of which must be cleared through the Surgeon General's Office before they can be issued.

Potential Health Hazards from Plastic Substitutes

The natural peacetime expansion of the plastics industry has been tremendously accelerated under the stress of wartime shortages. In particular, the scarcity of metals has stimulated the development of plastic substitutes, substitutes which in some cases may prove superior to the original articles. The increased demand for certain types of plastics has in turn created a shortage in some of the components of the plastics, necessitating substitutions in the substitutes themselves. This has resulted in the possible introduction of new health hazards from new industrial chemicals, from new manufacturing operations for old chemicals and from new conditions of use for the finished plastic.

For instance, some types of plastics can be made with a wide variety of plasticizers. In consequence, new plasticizing agents may be used, which means that consideration must be given to the possible toxic effects on workers handling the material or inhaling the vapors during processes requiring heat. New uses for the finished product, such as for containers or for a wrist watch strap, may require testing to ascertain that the plastic is non-irritant and non-sensitizing when kept in contact with the skin.

"Arc Flash" Conjunctivitis

(Acute Conjunctivitis From Electric Welding Arc)

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When the war came to Portland, Oregon, early in 1941, it brought with it a host of problems new to the medical profession of this community. The establishment of three major Kaiser shipyards and several other smaller Navy contract shipyards in the heart of the lumbering area could not do otherwise. Prior to 1941 the chief industries in Oregon and southern

Testing and Precautions Apply to All

The list of substitution products could be prolonged but the same methods of testing and the same precautions in their use apply to all. The use of artificial rubber, substitutions in paints and pigments, the use of lacquers for protective coating, the rust proofing of metal surfaces, the use of fluorine and fluoride salts in the welding of magnesium alloys as well as many others which are military secrets might be quoted as examples. Drugs must be included also. The most conspicuous example of substitution in this field being the development and use of atabrine as a substitute for quinine.

The situation with respect to substitution products and health hazards may be summarized as follows: Their effects are to be sought for both in industrial establishments and among the public and military personnel, who may use manufactured or processed articles in which the factor of substitution plays a part. On the other hand, it must be recognized that valuable discoveries, both with respect to materials and the treatment and prevention of disease, are due to exploration in substitutions, and the general public is going to benefit from the research that has been stimulated by the war.

Washington were lumbering, fishing and agriculture, and their importance has continued.

At the same time, in the past twenty-one months approximately 85,000 men and 25,000 women have left their regular pursuits and turned to employment in steel shipbuilding. It is safe to say that 80 to 90 per cent of this group are now occupied in work foreign to their previous employment in strenuousness, speed, hours and location.

New Problems For Employees and Physicians

Steel shipbuilding now ranks ahead of all other industries in this area, and the problems which it introduces in health and industrial hygiene are new to the employees and their physicians. In protecting the health of these employees it has been and continues to be extremely important, therefore, that both the workers and their physicians receive the fullest possible instruction in shipyard hygiene, health hazards and safety practices.

Because the Oregon Shipbuilding Corporation has been one of the foremost shipyards in rate of production of Liberty freighters in the United States and the training ground for a major share of the workers of all the shipyards in this community, because Portland has shared equally with the nation in doctor shortages, and because our local doctors have been too busy to do postgraduate study with experienced industrial physicians, we have had to find the answers to many of our medical problems in the school of experience. This has been true in many fields, and particularly is this true in the case of electric arc welding as applied to eye injuries.

Eye Complaints Rank High

For the first six months, 40 per cent of the treatments administered in the shipyard dispensary were for eye complaints. With better workman training and adequate eye protective devices this percentage has gradually dropped, but it still remains above 30 per cent of all treatments, which have totaled over 650,000 in 25 months. In the first year of production, the supply of goggles and other safety equipment was constantly inadequate to cover our rapidly increasing number of employees. Many hundreds of eye injuries that were then seen were preventable and have since been prevented.

Inherent in steel work is a potentially high incidence of eye trouble, and certain recent changes in fabrication methods have increased the dangers of eye injury. I have reference to one of the most outstanding changes from the last war, namely, electric arc welding. A multitude of

uses has been found for welding not previously employed.

Oregon Shipbuilding Corporation, alone, now employs 3,800 male and 1,650 female welders. Welding is done in every part of the yard, and therefore, at least 25,000 of the 33,000 employees are exposed to possible eye injury through radiation and other hazards found in this process.

"Arc flash" eye injury is important and frequent with these persons, and the information given here concerning the recognition and treatment of the condition is recorded with the hope that it may prove useful to the physicians and safety personnel of this and other war production communities.

Nature of the Injury

Actinic or ultraviolet conjunctivitis bears the unfortunate name of "arc flash" and may be defined as a conjunctivitis or inflammation of the whites of the eyes, usually of both eyes, caused by excessive exposure to the welder's electric arc and characterized by delayed onset, self-limited course of twenty-four hours, pronounced bulbar hyperemia or redness of the whites of the eyes, swelling of the lids, slight "sunburn" of the face, absence of discharge other than tears, extreme photophobia or sensitiveness to light and a feeling of sand in the eyes.

The name "flash" is heavy with the implication that this eye injury is commonly incurred through an incautious or unguarded exposure of the eyes to the flash of the welder's first brilliant contact spark and thus is an instantaneous affair. This can occur, but the injured person must be very close to the arc, within a foot or two, and this proves infrequently the case. It is so usual as to be the rule that the painful eyes of "arc flash" result from an excessive exposure to the arc over a minimum of several minutes, more commonly several hours of time spread through the working shift. It is a cumulative injury similar in pathogenesis to that of snow blindness and sunburn, which obviously are quantitatively related to skin pigmentation and length of time spent in the sun's rays. For this reason, it has been necessary, occasionally, to change the lo-

cation of work for certain very blond or red haired workers from shops in which they were constantly bombarded by ultraviolet radiation from nearby welding operations. The oxyacetylene torch does not commonly cause "arc flash."

At Oregon Shipbuilding Corporation we saw several hundred cases of true radiation conjunctivitis during the first year, most frequently among our new employees. During our second year, with a much larger payroll and two to three times as great a rate of ship production we have seen relatively little of the arc flash "red eyes."

At Kaiser Company, Inc., Portland, currently in the first year of production, with 27,000 employees and a large number of men and women new to the work, history is repeating itself and a far higher percentage of "arc flash" injury is occurring than at Oregon Shipbuilding Corporation.

Statistics on Arc Flash Eye Injuries

Accurate figures on the incidence of arc flash eye injury are impossible to secure for various reasons. Purely for the sake of the record, the figures are included and their heading is self explanatory. They must be taken with certain reservations and are more interesting than conclusive.

The figures represent workmen who filed reports of accident with the State Industrial Accident Commission. In the "no time loss" cases either only part of the day of injury was lost or a claim was filed so that the state would reimburse the attending ophthalmologist. Any workman losing time other than the day of injury is considered to have suffered a "time loss" accident. These figures are, of course, low, for a large proportion of flash injured workmen have treated themselves at home or have been treated in the first aid units at the shipyards without time loss, in which case no state claim has been filed. Many others have not bothered to file a claim for a day of time loss, so they do not appear in the "arc flash" records.

Unfortunately, a number of the cases in this group represent questionable diagnoses, even though reported to the State Industrial Accident Commission as "arc flash." Until July 1, 1943 there was no occupational disease law in Oregon. "Arc flash" was accepted by the State Industrial Accident Commission as a compensable "accident." As a result, physicians when in doubt as to the exact diagnosis have not infrequently accepted the workman's theory and have listed a nonspecific conjunctivitis as an (alleged) "arc flash."

FIGURES ON ARC FLASH AND FOREIGN BODY CASES

Oregon Shipbuilding Corporation
Period of June, 1941, to July, 1943

TABLE I

Date	Injury	Total	Non-Time Loss	Time Loss	Days Lost	Average Days Lost Per Time Loss Case	Average Monthly Payroll
*June, 1941	A.F.	4	4				
	F.B.	7	5	2	2	1	
July, 1941	A.F.	4	1	3	6	2	2,500
	F.B.	13	12	1	16	16	
Aug., 1941	A.F.	16	10	6	7	1.17	5,300
	F.B.	22	13	9	45	5	
Sept., 1941	A.F.	21	7	14	18	1.28	7,100
	F.B.	25	13	12	45	3.75	
Oct., 1941	A.F.	27	13	14	50½	3.61	9,800
	F.B.	33	17	16	101	6.31	
Nov., 1941	A.F.	30	21	9	23½	2.58	12,200
	F.B.	45	31	14	41	2.93	
Dec., 1941	A.F.	22	6	16	31	1.94	14,600
	F.B.	25	9	16	49	3.06	
Jan., 1942	A.F.	60	28	32	91	2.52	17,100
	F.B.	94	49	45	113½	2.84	
Feb., 1942	A.F.	31	12	19	39	2.05	22,600
	F.B.	71	43	28	121½	4.34	
Mar., 1942	A.F.	40	20	20	57	2.85	27,200
	F.B.	79	48	31	158½	5.11	
Apr., 1942	A.F.	59	35	24	54½	2.27	30,100
	F.B.	98	53	45	242½	5.39	
May, 1942	A.F.	53	29	24	73½	3.06	30,800
	F.B.	116	65	51	210½	4.124	
June, 1942	A.F.	56	26	30	66½	2.22	30,000
	F.B.	101	50	51	335	6.57	
July, 1942	A.F.	51	23	28	73	2.61	32,400
	F.B.	114	76	38	183	4.82	
Aug., 1942	A.F.	54	28	26	63½	2.44	34,900
	F.B.	216	142	74	232	3.14	
Sept., 1942	A.F.	92	55	37	56	1.51	34,200
	F.B.	417	258	159	338	2.13	
Oct., 1942	A.F.	76	44	32	78	2.44	32,900
	F.B.	394	245	149	428	2.87	
Nov., 1942	A.F.	57	36	21	42	2	33,100
	F.B.	359	218	141	286	2.03	
Dec., 1942	A.F.	77	45	32	111	3.47	33,600
	F.B.	309	173	136	342	2.51	
Jan., 1943	A.F.	79	32	47	174	3.70	33,800
	F.B.	269	134	135	480	10.97	
Feb., 1943	A.F.	76	37	39	118	3.03	34,800
	F.B.	267	155	112	445	3.98	
Mar., 1943	A.F.	92	43	49	192	3.92	33,500
	F.B.	281	172	109	256	2.35	
Apr., 1943	A.F.	80	34	46	158	3.43	33,500
	F.B.	277	185	92	182	1.98	
May, 1943	A.F.	54	30	24	51	2.13	33,200
	F.B.	269	150	119	306	2.57	
June, 1943	A.F.	68	34	34	115	3.38	33,400
	F.B.	269	118	151	520	3.44	
July, 1943	A.F.	60	28	32	74	2.31	34,200
	F.B.	348	186	162	411	2.54	

FIGURES ON ARC FLASH AND FOREIGN BODY CASES

Kaiser Company, Inc., Portland
Period of June, 1942, to July, 1943

TABLE II

Date	Injury	Total	Non-Time Loss	Time Loss	Days Lost	Average Days Lost Per Time Loss Case	Average Monthly Payroll
June, 1942	A.F.	6	4	2	6	3	4,647
	F.B.	3	7	1	2	2	
July, 1942	A.F.	4	1	3	6	2	3,353
	F.B.	6	2	4	9	2.25	
Aug., 1942	A.F.	2	1	1	2	2	6,757
	F.B.	8	5	3	7	2.33	
Sept., 1942	A.F.	8	3	5	19	3.8	9,597
	F.B.	34	16	18	48	2.67	
Oct., 1942	A.F.	20	11	9	18	2	13,782
	F.B.	31	14	17	36	2.12	
Nov., 1942	A.F.	23	8	15	36	2.4	16,215
	F.B.	49	19	30	94	3.13	
Dec., 1942	A.F.	35	14	21	54	2.57	16,430
	F.B.	62	31	31	75	2.42	
Jan., 1943	A.F.	31	15	16	40	2.5	18,711
	F.B.	48	19	29	97	3.34	
Feb., 1943	A.F.	35	15	20	70	3.5	20,961
	F.B.	63	27	36	177	4.92	
Mar., 1943	A.F.	39	20	19	64	3.05	17,260
	F.B.	52	31	21	77	3.19	
Apr., 1943	A.F.	22	8	14	33	2.36	17,452
	F.B.	40	21	19	73	3.84	
May, 1943	A.F.	34	12	22	103	4.68	24,000
	F.B.	44	27	17	50	2.94	
June, 1943	A.F.	35	18	17	54	3.18	25,200
	F.B.	69	31	38	111	2.92	
July, 1943	A.F.	35	16	19	42	2.21	26,500
	F.B.	56	27	29	103	3.55	

A Typical Case

In order that you may secure a clear understanding of the nature of "arc flash" injury let me describe a "typical case." The workman leaves the job in a healthy condition and is entirely unaware that he has received eye injury until he has been at home for several hours. The day shift man usually awakens at midnight or later with the painful, sandy, swollen eyes described in the definition. One rarely sees the condition develop in the injured person during the shift in which he has received the ultraviolet "overdose", although, on occasion, one will see a new workman who received a very heavy irradiation early in the shift and begins to feel pain and develop redness toward the end of the shift.

This latent period between injury and onset of symptoms is undeviating except in fuse box explosions and the like, a point emphasized in personal communications by Dr. Hedwig S. Kuhn. The strongest confirmatory point that "arc flash" is not due to the single bright flash but rather to an accumulated excessive exposure is the fact that, almost without exception, the injured workman is caught by surprise in the middle of the night, as aforementioned, having been entirely unaware at the time of injury that he was receiving trauma sufficient to elicit a delayed inflammatory response.

It is commonplace for workmen to enter our "eye treatment" room in the shipyard medical unit seeking treatment for "arc flash." Examination reveals normal eyes,

and further questioning brings out some such story as this: "I have no pain, but I was working near a welder a few minutes ago when he struck an arc. I'm sure I was flashed, so I want some of that medicine put in my eyes which you use to prevent arc flash trouble." Most of the workmen believe staunchly that we have such a medicine.

The misconception has arisen through a lack of understanding of the pathogenesis of radiation conjunctivitis. The workman who thinks he has received a "flash" injury through exposure to a bright flash, receives treatment of any sort immediately afterward, and develops no symptoms, naturally assumes that this treatment has been prophylactic. In actuality, he has had no injury. This occurs many times daily, and over months of time the shipyard employees have come to believe this obvious fallacy. As a result, our records are misleading and we have for some months attempted to keep a record of alleged arc flash as opposed to real, clinical flash with red, painful eyes.

Confusion From Records

The confusion in our records on alleged and real, clinical arc flash has caused much trouble in that any workman who develops eye trouble for any one of a number of reasons tends to put the blame for the pathologic condition on some previous alleged arc flash, and he will find corroboration in our recorded, inaccurate diagnosis. Close questioning here almost invariably reveals that the workman has reference to some bright flash, since subsequent symptoms, experienced days or weeks before. One sees here again the age old practice of seeking an obvious cause for a disease process often far removed from the real cause.

The misconception exists that "arc flash" injury is more apt to occur at night. We have not found this to be the case. After dusk the workman's green tinted protective goggles are put aside because of interference with vision in the semi-darkness prevailing under coastal "dimout" conditions. The probable increased exposure to "arc" thus engendered is usually minimized because of the increased perceptibility of the welder's arc with con-

sequent exercise of greater caution by those exposed.

The relative infrequency of "arc flash" injury to one eye is emphasized. If a workman with inadequate protection has held material being welded for several minutes to hours and thereby received heavy radiation to one side of his face, he will display a unilateral sunburn and "flash" injury of the eye on the exposed side. We observe a hard and fast rule that a workman with one inflamed eye does not have an "arc flash" injury until foreign body injury or other types of conjunctivitis have been ruled out by diligent examination.

The pathologic changes of "arc flash" conjunctivitis are confined to the superficial structures of the eye. The slit lamp reveals some superficial epithelial devitalization and minute edematous blebs on and in the epithelium of the cornea which is quickly repaired within twelve to eighteen hours after onset of symptoms. The cornea, iris and lens absorb the ultraviolet rays and prevent penetration, thereby protecting the deeper structures of the eye. We have found no evidence that this temporary injury to the corneal epithelium either permits ready bacterial invasion or contributes to permanent injury of the cornea, even though frequently repeated.

To return to the discussion of the typical case, we find that "arc flash" conjunctivitis is self limited, that the photophobia and pain last from twelve to eighteen hours from the time of onset and that some workmen lose no time, while the severely affected person needs miss, at the most, only one shift. Many men will lay off for several days, but this absenteeism cannot legitimately be attributed to real flash injury.

Apropos of this matter of unduly prolonged time loss for "arc flash," one may note in table 1 the definite trend toward increase of average days lost from "arc flash" injury from 1.17 days in March, 1943, a change which can be laid only to errors of diagnosis and wilful absenteeism. On the other hand, in the first year of our operation, when "arc flash" was quite common, I found that our men displayed fortitude of great degree, remaining on the

job with very painful, red eyes against my strongest advice, motivated largely in this obstinacy by the bonanza wages. It has not been my custom to try to dictate to the workman who presents himself for care of a definite arc flash whether he shall leave the job or remain, unless he chooses to ignore his personal safety. The degree of photophobia (sensitiveness to light) and pain usually has determined his willingness to work or go home.

Treatment

Because of the fleeting nature of this injury and its affection of the superficial structures, our treatment is directed toward symptomatic relief of local pain, redness and heat, iris spasm and photophobia. The "sandy" pain is of such degree that general sedation is frequently indicated. The various agents employed are:

1. A darkened room or dark glasses.
2. Cold applications to the eyes.
3. A local anesthetic applied to the eyes; in watery solution while on the job and for immediate relief, in ointment base at night while attempting to sleep. The following are suggested: in water, pontocaine, butyn; in ointment, holocaine, metycaine, butyn.
4. A vasoconstricting drug such as ephedrine or epinephrine.
5. Occasionally, 1 per cent homatropine to relieve iris spasm in severe cases.
6. A lubricant to relieve corneal drying—castor oil or lubricant base anesthetic.
7. Analgesics and sedatives in the very severe cases.

It has been recommended that the patient be treated for arc flash by gazing into an infra-red lamp for one to two minutes. I have been afraid to use this method and see no reason why it should be either safe or beneficial.

Shipyard Program

Our shipyard program to control this malady has been directed along several main channels:

1. Protective devices have been employed: "calobar" type flash goggles with side guards, helmets, welding clothing, screens surrounding the welder at work.

2. Hazards have been explained through training classes, newspaper articles, labor union news sheet, shipyard magazine, safety pamphlets and the like, and instruction in the methods of protection has been widely disseminated.

3. Ophthalmologists have been brought to the shipyards to instruct medical personnel in the diagnosis and care of eye injuries and diseases. They have also discussed the same problems in medical society meetings.

The most effective education agent of all in the abolishment of "arc flash" injury has been a personal experience by the individual workman with the exquisitely scratchy pain of the full fledged conjunctivitis. The repeaters are few and they usually have been caught off guard.

Summary

1. Actinic conjunctivitis, or "arc flash," as seen in the Oregon Shipbuilding Corporation and the Kaiser Company, Inc., Portland, among 60,000 shipyard workers exposed at various times to the emanations from electric arc welding, is defined as a conjunctivitis caused by excessive exposure to the welder's electric arc and characterized by delayed onset, self-limited course of twenty-four hours, pronounced bulbar hyperemia, swelling of the lids, slight "sunburn" of the face, absence of discharge other than tears, extreme photophobia and a feeling of sand in the eyes.

2. Treatment is given for relief of symptoms through dark glasses, cold applications and the use of local anesthetic, vasoconstricting, mydriatic, lubricating and sedative preparations.

3. Prophylactic measures are outlined for the patient and his environment which can completely prevent occurrence of the injury.

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The Measurement and Prevention of Eye Flash

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It has been reported recently¹ that some 40% of the calls at shipyard dispensaries and first aid stations are for eye injuries. In new yards with inexperienced workers about half of these calls are for "eye flash." This is an unfortunate misnomer but a term which is free of all ambiguity—the doctor, the patient and everyone else knows precisely what is meant.

The burns which can and do occur occasionally from flashes are the result of a sudden heavy discharge of current through a fuse, circuit breaker, or the like—a real flash, with the power almost of an explosion, vaporizes the copper conductors in a momentary blaze and those nearby may be severely burned.

Standards for Protective Glass

In arc welding, nothing comparable occurs. It is well-known that the electric arc, regardless of the electrodes used, is fairly rich in ultraviolet light. The cutting flame of the acetylene torch also gives off ultraviolet. Both the electric arc and the gas torch have such high intrinsic brilliancy that they should not be viewed without the aid of proper goggles or of special glass in the welding shield. The specifications for such glass have been developed and approved by the Bureau of Standards and adopted by the American Standards Association.² We have no criticism of these standards and no fault whatever to find with their use during welding, cutting, burning and even shrinking.

Most workers are cautioned not to look at the welding arcs and no welder would try to weld without his welding shield. Also he knows he can get a nasty burn, like sunburn, on his arms and neck if they are not covered. But when he flips up his welding shield to change rods, he is very apt to receive the ultraviolet rays from his neighbor's arc. If he is near enough and the exposure is long enough, he knows he will be burned, especially in

his eyes. But it does not happen in a "flash"—it takes a surprisingly long time unless he is within a few feet of the arc.

Distance and Exposure for "Arc Flash" Injury

The question we have been asked repeatedly is: how near must one be to get an eye burn in a reasonable length of time? It was evident from the medical literature that no one had ever troubled to determine the precise relationship of time and distance which we needed to know in our shipyards.

The monograph by Verboeff and Bell³ describes in great detail the effects on the eye of various radiations. These authors showed that the biologic response varies inversely with the square of the distance from the source of radiation and directly with the time of exposure. They showed further that, within a 24-hour period, the effects were cumulative. Their experiments were done with a mercury vapor lamp and a magnetite arc. So far as we know, no one had attempted to define in practical terms the time-distance relationship which applies to modern arc welding.

Drs. Kinsey and Cogan⁴ performed with an electric arc welding set a series of experiments⁵ and determined the combination of distance and time necessary to produce minimal ocular lesions in rabbits, dogs and men.

Measuring Dosage By Light Meter

It was found that a simple way of measuring dosage was to measure illumination at the subject's eyes by means of a light meter such as is commonly used in photography. This meter is intended to be used with visible light, but it was found by comparing readings with those of an ultraviolet meter that the ratio of ultraviolet to visible did not vary significantly with changes in electrodes

⁵At the Howe Laboratory of Ophthalmology of the Harvard Medical School.

or with changes in operating current and voltage.

Therefore, if we find that a typical shipyard welding unit will just cause a perceptible eye flash in man, when viewed at seven feet for twenty seconds, we know that at fifty-six feet a comparable exposure will be $(56 \div 7)^2 \times 20$ seconds or 21.3 minutes. A number of us, without any protection, looked directly at welding arcs for ten minutes at fifty feet without any burn resulting. Obviously we played safe as the dosage we used was less than half that of the computed threshold.

The welding expert will object that what we call dosage can be varied according to the way welding is done and again with the equipment, current, and voltage available. This criticism is just and to take such variations into account one should measure the intensity of illumination caused by the arc at the point where the possible eye flash is to be studied. In bright daylight, the light from the sun interferes with such measurements, but in the holds of ships, in shops, and at night there is no appreciable interference by extraneous light.

Workers Must Be Properly Protected

No one can say just how many minutes daily of unprotected exposure to welding arcs the average shipyard worker experiences. Arbitrarily we chose ten minutes, but it might be argued that the figure should be more or less. At fifty feet, the average man will need over twenty minutes exposure to show any real evidence of eye burns, and at one hundred feet he would need eighty minutes, assuming typical shipyard welding arcs.

The ultraviolet screening effect of ordinary glass, including that in all types of eye glasses and safety goggles, is so

good that eye flash virtually is non-existent among workers who wear glasses. All shipyard men know that the yards can not be lighted up like factories so that colored goggles may offer an annoying and sometimes serious risk of accident. We would welcome a more logical system of issuance of goggles; that is, issue the colored anti-flash goggles only where there is a definite need for them, such as to men constantly exposed to indirect radiations from electric arcs. Most shipyard workers would be adequately protected by hardened lens safety goggles with side shields.

But all goggles to be worn near welding operations should be equipped with side guards for protection against foreign bodies. Eye flash from the side is a rare occurrence, as is proved by the fact that burns of only one eye are virtually a medical curiosity. Theoretically they can occur, but practically they are extremely rare. However, welding is apt to cause some sputtering of tiny droplets; to avoid such droplets, goggles with side guards are essential.

In conclusion, we would like to point out that it was not our intention to investigate the diagnosis or treatment of eye flash. For that we would refer the reader to the paper by Dr. Rieke published originally in the Journal of the American Medical Association and given again before the Occupational Disease Session of this congress.

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Off-the-Job Accidents

THURSDAY MORNING SESSION

October 7, 1943

Presiding—Julien H. Harvey, Managing Dir., National Conservation Bureau New York City.

The National Off-the-Job Safety Program

CURTIS BILLINGS, Secretary

Off-the-Job Safety Committee, National Safety Council, Chicago

The problem off-the-job accidents presents to American industry can be stated in very few words. Last year occupational accidents—job accidents—killed 18,500 workers, a wartime toll which has aroused the nation. But in the same year no fewer than 26,500 workers—exactly the same kind of workers who were killed in the plants—were slain in non-occupational accidents—off-the-job accidents.

In addition off-the-job accidents permanently disabled 90,000 workers, temporarily disabled 2,100,000 and resulted in the loss last year of 110,000,000 man-days.

What Program Embraces

We are here to discuss the "National Off-the-Job Safety Program," but first I must make clear just exactly what that program is. First, it is not the complete program to prevent home and traffic and other public accidents.

The police are active in preventing traffic accidents and, of course, their work cuts down the number of workers who are killed and injured on streets and highways. The same purpose is achieved by the driver testing and licensing programs of state departments of motor vehicles, and by the excellent work being done in states and cities throughout the country by traffic engineers and highway designers. The schools also are active in preventing accidents and many of the precepts learned by the students are carried home and influence the parents.

Many large organizations, including the National Congress of Parents and Teachers,

the Federation of Women's Clubs and others, are conducting effective educational programs which have a direct bearing on off-the-job safety. Most important of all, perhaps, is the general work of local safety councils in communities and states. They encourage the police and traffic engineers; they stimulate activities on the part of various civic organizations; they work with the schools, and so forth.

But there is another and still more direct approach to the off-the-job accident problem and one which has been neglected. It is the approach by and through industry.

Industry's Part

It is industry's part in off-the-job safety which is the purpose of this meeting to discuss. Thousands of industrial concerns have done and are doing an excellent job to prevent accidents to their workers while they are at work, but until this war—until, in fact, a few months ago—most industrial concerns did little or nothing to safeguard their employees while they were away from work.

There are perfectly good and sound reasons for this. To say that industry has neglected off-the-job safety is not necessarily a criticism of industry.

The cost of off-the-job accidents to industry is not readily apparent. These accidents are not compensable as are work accidents. Moreover, industry has felt little responsibility for the off-the-job safety of their employees. That was a problem for the

employee himself and for the city police departments and the other agencies interested in public and home safety. In addition, industrial concerns have been reluctant to make too great a show of interest in their employees when they were away from the plant. The employees might resent it. Also, industry lacked the materials and methods to use in successfully combatting off-the-job accidents.

Origin of Program

It was the war which changed industry's attitude. Absenteeism became a major problem and now threatens to become even more pressing. Today industry is interested in keeping everybody on the job—keeping employees safe from accidents whenever and wherever they might occur.

A year ago, with funds provided by the War Production Fund to Conserve Manpower, the National Safety Council began to build an off-the-job accident prevention program for industry.

For quite obvious reasons the program was confined to educational efforts, industrial concerns being unable to use the other two E's in preventing these accidents. Industry can use engineering for plant safety; rules can be established and enforced; and employees can be educated. But the industrial concern can set up few rules governing the conduct of their employees off-the-job, and do little to enforce them. The employer cannot do anything of an engineering nature to prevent, let us say, a man from falling down the broken porch steps of his house. Plants are limited to educational activities in preventing accidents to personnel away from work.

In building the National Safety Council's off-the-job safety program, other considerations presented themselves. Most important was the fact that everybody in war industries is working at top speed and any new program to be introduced—even so important as the prevention of absenteeism caused by off-the-job accidents—would partially defeat itself if the time of new personnel were required for it. We had to devise a program, which would fit into the present safety program of a plant. It had to be simple. With these facts in mind, we devised the following program. In mentioning each item I'll give an indication of the extent of its use during the past six months.

Use of Employee Publications

First, because many plants regularly published employee magazines, it seemed to us reasonable that a method should be found by which the plant could use its plant publication to remind its workers of home, traffic and other public accident hazards. Here was something that would certainly take no effort on the part of the company—it would simply provide the editor with material to use. We prepared thirty cartoons on off-the-job safety, each accompanied by a brief feature article of about 250 words. On the basis of the number of American war workers reached, this has proved to be the most effective device developed by the off-the-job safety committee. More than a thousand plant publications, many of them with enormous circulations, now use a cartoon and feature article in each issue.

There have been variations in the use of this material. Some magazines have printed several at a time. Some plants, as a matter of fact, have reprinted the cartoons and feature articles in special leaflets for distribution to all employees. Several unusual uses have been called to our attention. The City of Cincinnati, for example, printed the cartoons and articles in a pamphlet and distributed one hundred thousand copies. Although there was no orderly way available to ascertain the ultimate circulation of the cartoons, it can be said conservatively that millions of war workers in America have been reached through this one medium on the subject of off-the-job safety. Remember that until six months ago no such educational material reached workers at all.

Leaflets and Posters

Another simple device used by many industrial concerns and for which there are simple and regularly established routines is the distribution of literature directly to employees. We produced a series of six two-color, profusely illustrated leaflets for this purpose. The whole tone of the leaflets tied the war worker up with the war effort and words were sacrificed for pictures. About a million and a half of these leaflets have been purchased and distributed by industrial concerns during the past six months. Thus, at least a quarter of a million workers have received and presumably read the leaflets.

Another device was a very obvious one, that of using special off-the-job safety

posters. Most plants have boards for safety posters at strategic points and an established routine for putting up the posters. There was nothing new or startling about offering off-the-job safety posters, and using them certainly required extra time on the part of nobody in the plant. We produced a series of twelve posters. Since 200,000 of them have been used, it is conservative again to say that millions of employees have seen these posters.

Safety Meetings

Most of the larger plants and many smaller plants throughout the country have safety organizations and conduct safety meetings of one kind or another. It seemed to us that if an all-out effort was to be made to prevent these accidents, then one or more of these meetings in every plant should be devoted to the subject of off-the-job safety.

This was a new subject for the meetings, however, and we wanted to make it as easy as possible to conduct intelligent and constructive and helpful discussions of the subject. Thus, we prepared a little leaflet giving facts and suggestions for discussion, so that it would be unnecessary for the safety engineer or anybody else to do any research on off-the-job safety in order to lead such a discussion.

About 10,000 of these leaflets have been distributed and as a result many thousands of meetings have been held devoted to this relatively new subject.

Two sound slidefilms were produced and about 300 copies of these have been purchased and are being shown at plant safety meetings from one end of the country to another. One of the films deals with home accidents and the other to traffic accidents.

Since many plants have a traffic safety problem right outside their gates, it was decided to provide them with a special data sheet on safe plant parking and safety at public loading points near the plants. Here again, an unusual show of interest was made on the part of industrial concerns in this small segment of the off-the-job safety problem. More than 6,000 of these data sheets, were purchased or distributed on request. Thus there are about 6,000 industrial concerns with material to assist them in safe-

guarding the men and women as they enter and leave the plant.

The committee also prepared a leaflet and a pamphlet for presenting the whole problem of off-the-job accidents to management. About 40,000 industrial executives have received this literature and from the figures that have just been given, it would seem that many if not most of them have read them and have been influenced by them.

Program Just Begun

Understand that the off-the-job safety program of the National Safety Council has just begun. It is an infant. It might be said that a quarter of million employees receiving the sets of leaflets represent only a drop in the bucket when one considers a nation engaged in a mechanized war and employing millions of men and women in war industries. It is only a drop in the bucket, but it is a start. And through other devices such as the cartoons and posters and meetings, many millions more are being influenced.

It would be unfair not to point out, also, that National Safety Council has been assisted in its program by the cooperation of numerous local safety councils which have used the same materials to stimulate activity in this field among their local concerns.

New Materials Being Developed

This campaign is continuing. This month we will release to the daily press of the nation a dozen cartoons on the subject, each accompanied by a clever jingle. Entitled "Victory Verses". They will probably appear in your local newspaper.

We are soon to announce a new series of a dozen posters which will be part of the regular poster service of the Council. They will be based on the cartoons and jingles.

We are now looking into the feasibility of preparing a publication on special off-the-job hazards to women, including the problem a working mother faces in providing for her children while she is at the plant. We are considering a new publication on special winter off-the-job hazards. We expect to produce a publication on vacation hazards before next spring.

So the program proceeds. Incidentally, it should certainly be said that on all of

the subjects just mentioned, special articles will be prepared for plant publications so that on each subject we will reach the employee through at least two media.

Significance of Program

The off-the-job safety program of the National Safety Council is a war-time program. The changed attitude of American industry toward off-the-job accidents is a war-time phenomenon. Industry is interested in off-the-job accidents because absenteeism is a particularly great problem now and everybody wants to produce everything that he can for the war. But the goal of the off-the-job safety committee of the National Safety Council goes beyond wartime. It is to establish off-the-job safety so firmly in the routine of American industry that it will become a permanent part of industry's safety program.

Off-the-Job Accidents and What A State Safety Council Can Do To Reduce Them

LEWIS E. MacBRAYNE

Executive Vice-President, Massachusetts Safety Council, New England Director,
National Committee for the Conservation of Manpower in War Industries,
Boston, Mass.

When this war is finally won, the engineers, both army and civilian, will be able to show that we could not have fought it without countless blue prints. Not only every campaign planned, but every ship, plane, gun, and all the countless pieces of equipment required to carry it out, had their origin in a blue print and were subject to further change and adaptation even before each campaign was concluded.

We might as well accept this point of view in the problem of interruption to war production caused by injuries to war workers when they are not on the job. We should examine the types of accidents off-the-job that are now occurring, before we organize our campaign to inform the public how to prevent them. As a total, they are never fully tabulated, since so many occur at home and are treated by

the family doctor, but the hospital records will give the general information. We undertook such a study before organizing one off-the-job accident campaign in Massachusetts.

Our largest Boston hospital had treated over 9,000 emergency accident cases in the first eight months of this year. Some of them even occurred on the premises, for accidents among the employees of this very hospital, short-handed because of the war, have become of such frequent occurrence that a set of posters has been produced within the institution for purposes of safety instruction.

In theory, at least, a state campaign is more effective than a local campaign, because in all of our large war industries workers travel to and from the job, every day, over distances that vary from the

trailer camp half a mile away, to a round trip of one hundred miles in extreme cases. The workers who travel by bus are much better protected, however, than those who travel in their own jalopy and step on the gas when they are within ten miles, either of home or the job destination.

In preparation for the Massachusetts campaign, a member of my staff followed some of these cars over a numbered route and interviewed police officials as to traffic conditions in each city and town. He learned that the speed of these motorized workers increased in many cases until it frequently hit 60 miles an hour, in spite of the fact that 35 miles is the legal limit. This speed was attained as a climax in a town that had almost no war industries and was within a dimout area. Naturally, its pedestrian residents were placed in great jeopardy. Following this route in reverse, until a large shipyard in a country town was reached, our investigator found that it had recorded two dead and 216 injured on the highway in the past six months. This compared with one dead and 104 injured in the corresponding period of the previous year, when the shipyard was in partial operation. This was an increase of 100 per cent and, it should be noted, in a state that had reduced fatalities 33 per cent and injuries 44 per cent within the same six months period.

This will justify my statement that under war conditions the civilian accident hazard is more than local. We therefore selected ten cities for our first efforts in a state-wide campaign in Massachusetts, with an organized local effort in each, but with the wider background to make it effective. So far in this discussion, I have been speaking in general terms. You are more interested, perhaps, in learning the successive steps by which we developed the campaign.

Three members of the staff, representing the industrial, highway safety, and safety education divisions, were assigned to visit each city every ten days or two weeks, after the executive vice president of the Council had made a preliminary survey and assigned the special work to be done. This survey is important and usually comprises a 600 word report. That

is too long to offer in this address, but I will give it in tabloid form in order to indicate the points covered. The city in question has a population of 110,000, and 90 per cent of its industries are working on war contracts. The tabloid report follows:

"In order to conserve time and add to the importance of the visit, I arranged in advance for several leading citizens, representing various civic interests, to meet me at one of the state offices. As this conference, the president of the local safety council, which was very active prior to Pearl Harbor, reported that its members had been so largely absorbed by the Civilian Defense committees that the activities of the council were impaired, and that he would revive the organization for any activity the Massachusetts Safety Council might desire.

"The officers assigned to public safety instruction in the state and local police departments reported that they had been diverted to Red Cross instruction, but that a special group had been trained in home and farm safety and were now looking for a program, which it was suggested we might provide. The local branch of the Registry of Motor Vehicles reported to our meeting that in its opinion more war workers were being injured off-the-job than on.

"Of the 42 plants holding major war contracts in this city, 17 are taking part in the state-wide Industrial Accident Reduction Contest sponsored by the Massachusetts Safety Council. Contacting a number of them during the day, I found them to be in favor of calling an evening industrial meeting to discuss the problem of accidents off-the-job and develop a local program. Other calls during the afternoon included the mayor, who gave out a press release based on our discussion of the conservation of manpower for warpower."

In addition to the survey report, three members of our staff were given instructions concerning the objectives to be attained on their follow-up visits. The local program now began to unfold. A study of 285 accident cases, that one of the two hospitals in the city had treated in the previous five months, disclosed that only 69 of them were for injuries sustained while at work in an industrial plant. There

were 163 accidents due to falls, many of them in public places; there were 88 motor vehicle injuries; there were 75 mishaps in the home. This provided material for a good press release.

Ten days later the industrial evening meeting was held with 120 people present. This had certain unique features which became a standard for other cities. Admission was free, but by tickets which were sent to manufacturers in advance, with a request to designate from five to ten foremen or supervisors to attend and to report this fact to our Boston headquarters.

It was announced that the speaking at the meeting would be limited to 15 minutes, two film strips on conservation of manpower and war production would be shown, and samples of new printed material would be distributed at the close of the meeting. This material was the set of leaflets just issued by the National Safety Council, "Part-Time Patriots," "Without Storm Troopers," and the others with which you all are doubtless familiar. The Massachusetts Council had purchased 150,000 of them; and we had been non-committal when the question was asked as to how we could guarantee a house to house delivery and as to what it was likely to cost the council for distribution.

We had no occasion to worry. The 150,000 copies had been exhausted on September 1, and we have requests on hand for 56,000 more. Instead of limiting the distribution to the ten cities where we planned the campaign, it had been extended to 17 cities. We had used 15,000 other pieces of literature including the excellent booklet, "Prevent Off-the-Job Accidents," published by the National Conservation Bureau.

We had allotted 15,000 of the National Safety Council leaflets to the city to which I have referred, and these were given a house to house delivery by the local lighting company with its bills. In a second city we distributed 20,000 through a similar agency. In a third, we tied in with O. C. D., through its block leaders, and when they rang 20,000 doorbells they passed out our leaflet. In the other cities the distribution was taken over by local industries, as a payroll insert.

No one can accurately estimate the value of illustrated leaflets, any more than he can prove the value of billboard advertising. Some advertising experts say that it is general background stuff to make the sales article or the public campaign generally known. It must be followed up at once with other methods before a sale is made or a subscription obtained.

Two weeks ago, additional publicity got under way for the organization of the new 20-hour industrial safety training course for foremen, based on the new set of ten sound slide films prepared by the National Safety Council in cooperation with the U. S. Department of Labor under the War Production Fund. It is worth noting that these courses are being provided by the Massachusetts Safety Council for all the cities included in the leaflet distribution. These are in addition to courses being set up within many of the large war plant and army installations.

From a rather wide experience with my federal staff in organizing the 96-hour safety engineering courses, I have learned that an organization program that will click in one city may run at half speed in another. For that reason, any plan to instruct the civilian to be responsible for his own safety must be flexible. We must be constantly on the alert for new contacts and fresh ideas.

For example, we employed the community and public health nurses for a home inspection in one city where 500 accident cases were being treated each month in the local hospitals. After authorization had been given by the city health department and the nurses' association, a two-page circular was prepared and given to each one of them, setting forth the types of home accidents that were occurring, based on a hospital study. We said to the visiting nurses: "You are in contact with hundreds of homes. You are a welcome and trusted visitor. Will you check on home conditions that may cause accidents and give instructions?"

This use of the nurses worked admirably in two cities but was ruled out in the others. In two other communities our staff found the auxiliary police excellently trained for civilian defense but restive from inaction. The threatened bombing

of the Massachusetts coast had not occurred. We worked out a project by which a group of them went on duty each night, studying traffic conditions under the dimout and listing the cars that were violating regulations. This gave us excellent information and additional press releases. But you cannot always walk into a city, selected at random, and borrow the auxiliary police.

Familiarity with conditions that invite accidents often results in their avoidance, though the reverse will be true when the personnel on the scene is changed. I recall a small plant that received a war contract in a country town. One of my federal inspectors found it to be in such a disreputable and defective condition as to put it outside the requirements for safe working conditions. It had loose boards on the stairways and large holes in the floors. The housekeeping was the worst possible. Yet the 30 employees, who had grown old with the plant, knew where every hazard was and lost time accidents were almost unknown. But when the employment expanded to 85, the accident rate established itself and began to climb. The new workers had developed no instinct to step over the holes.

Three years ago I undertook to prove, on a research project undertaken by the Massachusetts Safety Council, that many home accidents were due to environment and poor living conditions, and if we abolished a slum quarter of a large city and substituted model homes, we would find a safer and happier community. The material was close at hand for the experiment. The federal government had pulled down a weather-beaten section of dilapidated blocks and over-crowded tenements and replaced them with one thousand modern brick apartments.

We gave to these families a questionnaire, in which we asked them what accidents members of their family had suffered in two years of occupancy in the model homes, and what the record had been for the previous two years in the old home. There were 857 families who filled out the blanks. The balance were interviewed by a member of our staff, who devoted some weeks to the job.

The resulting information that we obtained contained some surprises. In the poor tenement homes, with their unsightly backyards, children had received hand and foot injuries from broken glass; now they pushed their hands through glass that replaced wooden panels in the doors. Washing machine accidents increased greatly in the model home, chiefly because there had been no such machines in the tenements. Steam pipes in the new home had reduced winter ailments but had increased injuries from burns.

What somewhat disturbs me, as I give serious thought to the variation in the forms of accidents under war conditions, is the knowledge that to date the selective service has rejected 1,400,000 drafted men as unfit for military service. This is 28 per cent of the number called to the colors. Where are they? Presumably at work in our war industries; perhaps driving cars on the highways; certainly at home and on the street. Perhaps the defects that kept them from the armed services are not serious enough to give them a higher accident expectancy at home or at work. Or are they? We have no information upon this important question.

It is proper for you, as inquiring delegates, to ask me, before I conclude the discussion of this subject, whether we can yet measure results from the efforts to reduce accidents off-the-job. In past years, as manager of a state safety council, I have endeavored to appraise the value of some of the campaigns that we have supervised. In one effort we conducted an intensive week's highway and industrial safety campaign in a city of 110,000. We found that it was definitely effective for 30 days. Within that period, there was an important reduction in accidents of all types. In the second month the accident curve from this low mark began slowly to climb, until eventually it reached the average of the months preceding the campaign.

At another time, we supervised a month's state campaign for the reduction of highway accidents, at the request of the Governor of Massachusetts. We had ample funds. There was a definite reduction in accidents. But we were certain,

when we checked over a longer period, that one month was not enough for a state-wide effort. Two years later, in a three months campaign, also sponsored by the Governor and supplied with state funds, we put over a program that rolled from its momentum for 60 days after the three months had terminated.

The National Safety Council is, therefore, correct in calling for a two-year conservation of manpower effort. Its contribution of the 20-hour course, financed as only one of many items, and handed over to the U. S. Department of Labor as a new method of instructing industrial foremen by means of illustrated sound slide lectures, cannot be evaluated for another year. Already, this course is booked to be given within industry by a score of large plants in New England, and at least 500 Massachusetts foremen and part-time safety men will be instructed in the evening public classes for smaller plants offered by the Massachusetts Safety Council.

It is much too early to measure the off-the-job accident campaign that we began in the first month of this year. In Boston, all this week, we are carrying on a special campaign, sponsored by a committee of twenty-five prominent citizens, headed by the mayor of the city. This will launch a drive to continue until the end of the year.

A Railroad Fights Off-the-Job Accidents

P. F. BUCKLE,

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

Webster's definition of the word accident probably is known to all of you, but I shall presume to refresh your memory upon it. Accident—a befalling; an event that takes place without one's foresight or expectation; an undesigned, sudden and unexpected event; chance; contingency; often, an undesigned and unforeseen occurrence of an afflictive or unfortunate character; casualty; mishap; as to die by accident.

Now, if we are to believe literally in Mr. Webster's definition, then accident

In the City of Cambridge, however, the first of ten municipalities selected at the beginning of the year, we were able to present to the mayor and the police department a 900-word report of progress at the end of six months. On the highway, motor vehicle accidents had been reduced from five dead and 661 injured, in the first half of the previous year, to one dead and 409 injured. This was a larger rate of improvement than in the other cities of comparable size, which had reduced motor vehicle accidents by 30 per cent, while the reduction in Cambridge was 43.8 per cent.

In the industrial field, we had been able to bring 18 important industrial plants, employing 9721 workers, into close relation with the council. They were reporting accidents to us and developing stronger safety programs. In the first quarter of the year they reported 95 lost time accidents; in the second quarter this was reduced to 84, though employment had increased by 350. Since then the industrial director of our counsel has increased the enrollment of plants reporting since the group for the first half of the year represented only one third of the industrial workers in the city.

Our objective in the Massachusetts cities where we are working is, "to train people for the war effort to take care of themselves." That might well be our national objective.

prevention endeavor is rather hopeless. For how can we, as humans, successfully cope with an event "that takes place without one's foresight?" You have seen signs such as these: "Drive accidents from the highway," or "Drive accidents out of this shop." I submit that there are no accidents on the highway or in the shop until they are created.

Therefore, I suggest that we use the dictionary definition too loosely in safety work. How can you ask a man to prevent something he cannot foresee? Let me

give you a definition for accident, which is not original, that I believe those of us interested in casualty prevention endeavor would do well to keep in mind: "something that occurs because a hazard was allowed to exist."

Now, this hazard doesn't necessarily mean an unsafe property condition, although such conditions do cause personal casualties. It can well be an improper practice, indulged in because of lack of self-discipline or improper training of the employee upon the part of the management.

Off-The-Job Toll Higher than Work Injuries

The National Safety Council states that 18,500 workers were killed in vocational accidents last year and that 26,500 were killed in off-the-job accidents. On our own railroad, and I am confident it is true on all railroads, more fatalities are occurring to our employees while off the job than while they are working at their vocations. It is clear then that industry ought to take due cognizance of this problem and seek every possible means for its solution.

The safety officers on our railroad, for years, have preached safety off the job as well as on the job. We have said, "don't leave safety in the shop or caboose, as you leave your tools or work clothes, but take it with you, on the highway, in your home or when you go afield to hunt or fish." We have welcomed the opportunity to talk to mixed groups of employees and members of their families. Upon such occasions, we stress the need for railroad employees exemplifying safety when driving their cars, to correct hazardous conditions in their homes and to play safely as well as to work safely.

It costs money, real money, to train a person for any position; and that money is just as surely lost if a person is disabled off the job, as if the disability occurs while the person is working. Perhaps we have given too little heed to that truism.

We are interested in the conservation of man-power for the war effort and certainly that should be a spur to our efforts. Of course, we are interested in the econ-

omic phase of the problem but if the social phase of it is not outstanding in our thoughts, then our cause is hopeless.

Approach To Program

Off the job, the average American believes in his inherent right to dispose of his time as he sees fit, and certainly it is difficult to successfully take issue with such thinking. If we believe in such a premise, then we have to appeal to the better instincts of the worker, if we are to encourage him to safeguard his person.

It was such reasoning that prompted us to adopt the Council's "Off-The-Job Accident" program to our general safety endeavor. We purchased and distributed 6000 sets of the six pamphlets and several hundred of the posters. Our program lasted for six weeks and was carried on in our four system shops, and on nine divisions where the concentration of mechanical and stores forces is the heaviest. We are giving serious consideration to the expansion of this program to include all departments and all divisions. This will mean the distribution of some twenty to twenty-five thousand additional sets of the pamphlets and related posters in suitable quantities.

A poster related to the subject matter of a particular pamphlet was put on the bulletin boards one day, the next day at group meetings the employees were handed the pamphlet to be considered that week. The foreman made a little talk about off-the-job accidents and indicated our interest in the welfare of the employee while off the job, as well as while on the job. This was repeated each week while the program was in progress.

Analysis of Results

Officers and supervisors were requested to analyze, as best they could, the results of this program. Concrete results, however, are most difficult to determine. The supervisors were queried at the out-set as to their belief in the value of such an endeavor. We sent sample kits to each principal supervising officer, at the same time asking them the number of sets of pamphlets and posters they would require.

and to select the posters they wished to use. This, of course, made it their project, and they responded most enthusiastically. When the material was sent out, another letter was written to all of the supervisors from which I quote, "The success or failure of this endeavor will, as always, depend upon the interest shown in it by the local officers and supervisors."

I now read from some of the letters I received after the campaign was well under way or concluded.

A storekeeper wrote: "We made a canvass of our employees, most of them thought the literature was interesting and instructive, and doing good."

Another storekeeper said, "Believe we should have similar campaigns at least once or twice a year."

One of our master mechanics said, "Think this campaign is having a good effect upon the morale of the workers. They look forward to the pamphlets as they are handed out each week. The pamphlets are read and discussed. The employees are asked to take the pamphlets home to their families. Think we should have other similar campaigns about every three or four months."

Another master mechanic wrote, "There is no doubt but what the campaign did have some good effect upon the morale of the workers. Safety is much like any nationally advertised product, the only way we can keep safety before the men at all times is through some method of advertising, and various new or unique methods of advertising or getting it before the men must be constantly explored. The campaign just closed was another method of advertising safety."

The personnel reacted favorably to the program. Therefore, it is believed that it had a real morale building value, difficult to correctly evaluate. But any such program, if properly handled, cannot help but be of value to employee morale, especially when it is in the interest of the welfare of the employee and members of his family.

We intend, on our railroad, to combat this problem continuously and as aggressively as our abilities will permit, not alone during this war period when almost every accident prevention program assumes great importance, but in the days to come when peace shall return. We believe this to be our duty to our employees, to our country and to society as a whole.

Package Training for Safety

(Early Morning Classes)

WEDNESDAY and THURSDAY MORNING SESSIONS

October 6 and 7, 1943

Presiding: Ned H. Dearborn, Executive Vice-president, National Safety Council, Inc., Chicago.

Out of the experience of the period since Pearl Harbor those in industrial training work have developed a new approach to the philosophy and methods of training during wartimes.

These techniques and approaches can be of great aid to the safety man who must provide and administer training programs for the development of safe work habits in war plants with their host of new and inexperienced personnel.

Dr. Hazlehurst, who has assisted the Office of the Chief of Ordnance in the development of such a program for arsenals, loading plants and other ordnance establishments, outlined the methods and tools used to train personnel in hazardous jobs. The methods and materials should provide concrete suggestions and guidance in developing practical and direct pack-

age training procedures in safety for any type of industrial plant.

Each of the two sessions was a unit in itself, but the two form a unified whole.

Dr. Hazlehurst was introduced by Mr. Ned H. Dearborn, Executive Vice-president of the National Safety Council, as follows:

A year ago I introduced this gentleman to you, and I remember the distinguished record that he has had in his special field. I also know the great popularity that he enjoys here in this Congress. I do not believe that I need to detail his academic and practical experience over the years. He knows the field of management. He knows the field of personnel relations. He knows psychology, and we in the Council who have heard him before are always glad to welcome him back. I am sure you are, too.

LECTURE NUMBER ONE

Fundamentals of Teaching

BY JOHN H. HAZLEHURST, Ph.D.

Safety Training Consultant, Safety & Security Branch, Office of Chief of Ordnance, Chicago

Thank you, Mr. Dearborn. In a very real sense, the things that I want to talk about this year are a follow up on our discussions of last year.

Last year, you will recall, we talked about ways the safety man could use the Job Instruction Training program of the Training Within Industry Service of the War Manpower Commission. We dis-

cussed certain fundamentals of how people learn, and then talked about the use of Job Instruction Training or JIT as it is usually called in safety work. Some of you may remember we tied an underwriter's knot, and had a demonstration of the Job Instructor Training 4 step method of teaching. I am sure that in the past year a great many more of you have

become familiar with Job Instructor Training, because in the last year Training Within Industry has brought that program to well over half a million foremen in war industry.

Now what we want to do today and tomorrow is to think about specific and current safety training procedures, for yesterday's methods may be a little out of date in the hurly-burly of wartime development. If we will stop for a moment to see the shifts in industry's broad training problem, we can see the kinds of shifts that may be made with benefit in our own field of safety training.

Of course, we started to arm before Pearl Harbor, but really it has only been in the last two years that war industry has gotten under way with tremendous strides here, and in those two years we have transferred about 25,000,000 people from civilian industry to war industry. These 25,000,000 people had to be trained in their new jobs, and thus industry faced a tremendous training program. In meeting that challenge, new operating principles emerged.

First of all, with 25,000,000 people coming into industry, it was impossible for training departments and training men to train those people directly, for there weren't enough skilled trainees available. So, as usual, the job was delegated to the foreman. By and large in war industry the foreman has been the man whose responsibility it was to train our industrial army in its new duties.

This allowed industry's rather limited group of professional trainers in its various training departments to concentrate on assisting the foreman to become skillful and effective in discharging his new and important training responsibilities.

So, actually, it has been a two-step process. The foremen have carried the load of training all of these 25,000,000 new workers; and professional training people have directed their efforts toward showing the foreman how to do it.

A second development growing out of these expansion needs we spoke of briefly a year ago was the emergence of package training as an important teaching tool. It was impossible, with rapidly ex-

panding personnel in our shops, to develop long-term traditional foreman training procedures. A normal foreman training program that a company would undertake in peacetime would cover twenty-two, twenty-six, or perhaps forty weeks. It would cover all of the areas of knowledge that a foreman might want to have: company policies, labor relations, costs, pay systems, how to cut down waste, how to handle grievances, how to run his job safely. All of these traditional areas of training that a foreman needs would be given in one of these long-term programs.

Obviously, industry couldn't do that in its expanding stage. You could not keep one group of foremen together that long. They would be sent from one shift to another. They would be shifted from one department or one plant to another. New workers had to be rapidly upgraded. As soon as a man had been in the plant for six months and was, therefore, a real oldtimer, you would have to move him up and make a foreman out of him and he would have to come into the training program in the middle. To overcome these difficulties in conventional training programs, it became the custom to develop a group of little packages, each of which could be put over in a comparatively few hours, and have each package cover one specific area of a foreman's needed knowledges or skills. These packages were put up on the shelf so to speak, and a group of foremen could be given the package they needed most. This was done quickly, and then groups could be rearranged, and another package given. Thus, over a period of time, this flexible approach made it possible to give foremen a rounded training without too much interference with work schedules.

During that expansion period, it was important that we put first things first; so Job Instruction Training, as a typical example of package training, swept across the country like wildfire. Its purpose was to teach foremen how to instruct a new man in the duties of his job. In other words, when one of these 25,000,000 new workers came in to a plant he had to be taught how to do a job that was new to him. His effectiveness was dependent upon how well and quickly that foreman

was able to train him. Job Instruction Training was designed to help the foreman meet that immediate need.

Because 25,000,000 people came flooding into industry in two short years, the first concern of management was simply to get badges on them, get them assigned to jobs and to make some sort of productive effort. Management was not so much concerned about whether or not a new man worked safely. First they wanted him to work. There was a lot of deemphasizing of some of the general industrial services that in peacetimes might have gained a foothold.

I have heard many a safety man in the last year or two cry about the fact that his work seemed to be shoved off to one side. That is true. Management began to forget about safety, just as they forgot about costs in a lot of cases. They were willing to forget costs. They were willing to forget safety. They were willing to overlook a lot of other things to get 25,000,000 new people on a job and begin to produce, so that the Army Ordnance or the Air Corps or the Navy wouldn't be riding them about production. Therefore, training programs designed to meet those immediate needs were of paramount importance.

In general, however, war industry is now at the end of its period of rapid growth. So, while some companies still have plenty of opportunity to use these training tools, nevertheless, the broad training problem is already beginning to shift. We are getting away from the expansion and tooling up stages over into the operational stages. Management, as we all know perhaps, is beginning to be more cost conscious than it was a year and a half ago. Management is beginning to give a great deal more consideration to some of its more specific and detailed needs; so training procedures are beginning to shift over into more specific areas.

The safety man then has an opportunity to take inventory of just where he stands, now that some of this hurly-burly is over. He has a chance to blueprint some of his needs, to think in terms of some kind of integrated effort. He might even be able to get management to listen to him a little

more calmly and a little more attentively than management has listened during these tooling up periods.

Now I speak broadly when I say that the safety man is in a position where he can do a lot more inventory-taking and a lot more specific thinking about what he can do. He can think a good deal more in terms of going through his plant and getting some of the equipment guarded and changed that in the past was put off because of inability to get materials or manpower to do the work. He can begin to get serious about some program for relocating materials and getting away from congestion and bad housekeeping. He can think more in terms of selling the engineering department on some changed layouts, and he can think a little more seriously in terms of specific training procedures. That is what we are concerned with—thinking in terms of more specific training procedures.

How would anyone, and particularly the safety man, go about making some kind of determination as to the types of training procedures that he might need? Well, again I recommend to you the facilities of Training Within Industry because of its general availability to organizations all over the country and its very practical type of approach to training.

One of the little-known activities and one of the little-known package programs that Training Within Industry has developed is known as PDT, and I should like to bring it to the attention of safety men. That is their Program Development Training. It is not taken out to industry generally. It is a program designed to teach training directors and others who must develop training programs how to go about it and how to develop specific training programs for plants. Anyone who is interested—and I hope that when we get through you will be interested—can find out about it by getting in touch with the War Manpower Commission and asking for their Training Within Industry service.

I attended one of the PDT sessions not long ago in Chicago. We had a training director of one of the big steel companies. We had a man from a packing company in Minnesota. We had the training director

of a large Wisconsin utility company. We had the training director of a manufacturer of light metal parts. We had a training director of a large shipyard. Those were the people who came into this program, and we spent three days developing a systematic method of exploring each of their own organizations, to find out what their training needs might be and how to go about developing a training program to meet those needs. Then we met a week later, and each person brought in as a project his own exploration to locate a training need and his own solution of that problem.

We have had some safety men sit in on those programs, safety men who have had to develop training programs, and we have had some crackerjack safety training needs uncovered and practical approaches to them brought in. Anyone who is faced with that problem can get a lot of assistance in taking one of these PDT programs that are, like all of the others, free of charge.

Like all of the TWI procedures, they have a four-step plan for attacking the problem. The first step is to spot the specific needs. The second step is to develop the program. The third step is to get management's support, and the last step is to launch the plan and follow through.

I think it would be profitable for us to spend some time seeing how we, as safety men, might apply these four steps to our training efforts. Today, I'd like to talk about step No. 1 and tomorrow about step No. 2, particularly in relation to Package Training and the safety field. I'd also like to tell you about a package training procedure that has been developed here in Chicago by the Office of the Chief of Ordnance in safety, an industrial safety training package that may give you ideas for use in your own plants.

Because I have dealt so much with small companies as consultant, I used to think that it was only in the smaller organizations that it was difficult to obtain management support on modern procedures such as safety. However, in the last few years, when I have had a lot of dealings with larger companies, I have decided the only real difference between

the large company and the small one is that in the large company management talks a lot more about safety than in small companies, but when it comes to producing I sometimes feel they are on a par. Managements swear, with their hands on their hearts, that they are safety-minded. But you take in a program that takes foremen off the job for a little while, or costs money, or might interfere with some plant superintendent's idea of scheduling or something else of that sort, and you find that it takes a lot of sales effort and heart-break, after all.

Fortunately a good job in step 1 of PDT, namely spotting specific needs, will help a lot when you get to step 3. The secret here lies in two things: specificity and tangible evidence.

How do many people go about developing training programs? They sit down and say, "Well, let me see if I can dream up a training program. Let me see if I can whittle out something that we might use." That is what we do, I think, in a lot of cases. We get a hunch, or one case comes up—a fellow gets hurt doing some particular thing, and we say, "Well, that is evidence of a need for training everybody on that." It isn't evidence of a need for training everybody necessarily. It might be evidence of a need for training just that one man or training the foreman of that one department.

If we are going to develop sound training programs, we must get down to something specific as a need and get specific proof, both for yourself and for management, of that need. I used to do a lot of work training salesmen, and one of the first things that you must teach a salesman is the necessity of being specific about his product and not simply flashing his personality and dishing conversation off the arm.

For example, if you are in a restaurant and the waitress comes up and says, "What do you want for dessert?" you seldom can tell her unless you have seen a specific item in the menu. You say to her, "What have you got?" Dessert is too non-specific. It is just a general term, and your response is, "I don't know. What have you got?" She says, "Pie, ice cream, custard, cake." Now, you begin to get

somewhere. You say, "Pie? What kind of pie have you got?" You see, the word pie is still a little non-specific. She says, "Apple, strawberry, chocolate, banana" or am I living in the past? Anyway, she mentions whatever they have. Then you can begin to see those little wedges and you say, "Give me apple." You have finally gotten down to something specific.

So it is with the training program. If you go into management and say, "We need training," management will buy that idea generally speaking, but not in terms of really doing something about it. You have got to get down to a specific training procedure. Analyze accident records. That is one good way to spot specific needs. Are you having a lot of trucking accidents? Do you need specific training in the trucking operations in the plant? If you get down to something that specific, then you take an apple pie into management and not just dessert.

Maybe it is a matter of tools, and most of your accidents are happening in those situations where people are dealing with tools. It might be in materials. It might be slips and falls. It might be something else of that kind that would indicate a specific need. You can say, "What we need is to train our workmen in this plant, or all over our organization, or just in this area on these particular procedures. That is what we want to do. How do I know it? Because I have a lot of evidence. Out of all the accidents we had in the last eight months, 35 percent of them were of this particular nature, the majority of them were in just these several departments, and there is an indication of a specific need, not for training but for a particular kind of training."

Maybe the analysis needs to be made from the point of view of the kind of employees. Maybe these accidents are happening largely to women employees, or maybe they are happening just to new employees or just to the employees at certain kinds of operations. It may be that you need to develop an induction system.

If an analysis of these records shows that what you need is a good deal sounder induction system, to take care of the people as they first come into your plant

and to get them started off on the right foot as far as safety is concerned, then you can go into management and say, "This is the specific thing we want. You have a regular induction program here for bringing people into the plant. Safety does not have the part in it that it should have. We would like to have a larger part in this induction program for new employees. We think it ought to take this form. Here is the specific outline of it, and here are the records to show why we think so."

This approach has several values. In the first place, you cannot develop a program that will carry its own weight and will pay its way, unless the need does exist. You have got to develop this specific need or find it in order to justify it financially to yourself and the organization. Secondly, if you can justify it to yourself, and there is a real need for it, you have the ammunition that it takes in step 3 to sell it to management.

Maybe you have to analyze costs. Perhaps, somewhere in your cost accounting you can find some records or some evidence of some training needs from the safety point of view, or maybe you have found these other needs from an analysis of your accident records, but you can get the cost accounting division to give you some arguments of the kind that management listens to most carefully, on how much some of these things cost them.

Another good source of specific information is opinion of foremen and other workers. In every organization there will be some very safety-minded foremen, some of them who are casual about it, and some of them who are not at all safety-minded. You can get a lot of tips from the first group as to what they think would be helpful in the way of safety training.

You can also get ideas from employees. We had one case of a fellow who brought in a crackerjack safety program. He said it worked out very well in his company, and he told us how they ran onto it. The company had become interested in morale studies or attitude surveys, and sent a questionnaire to all of the employees asking such questions as, "What do you

think of the boss? Do you think your pay check is big enough? Are you treated right? How are working conditions around here?"

Such studies are designated to find out the employee's attitude toward the company, toward management and toward his job and security and things of that kind. But something else came out of it, too. They found that there were a number of employees in two of the departments who, of their own accord, enlarged on one part where they asked, "Do you feel that you were well trained for your job, or were you just allowed to go out on it and wander around?" These employees mentioned some needs for a particular kind of safety training in the handling of some equipment that the company had. That attitude questionnaire was the thing that gave them the tip off.

The personnel man who handled that attitude survey, called in the safety man and said, "Look what we have found." The safety man followed up and uncovered a specific training need that actually came from the opinions of employees.

I know of another instance where the safety man got on the track of a good training need through the operation of the suggestion system in the plant. They kept getting suggestions for a safer way to operate a certain process. Unfortunately, while the suggestions might have increased safety, they didn't increase production and they did increase costs. A study of the matter, however, showed the real truth of the matter was that these people hadn't been properly instructed in the safe use of this complex apparatus. Through this suggestion system and an analysis of those suggestion records, a specific training need in the safety field was uncovered.

Inspection reports, of course, are another good source of information for uncovering specific training needs. You will have such reports if your organization and safety staff is large. If you don't have them, or if you are a kind of a part-time safety man, doubling in brass on two or three other duties around the plant, your own safety inspection operations may give you an indication. If there is consistently bad housekeeping,

maybe you need an actual training program in teaching people something about housekeeping. A lot of people aren't bad housekeepers just out of pure cussedness. They are bad housekeepers because they do not know some of the real principles of good housekeeping, and training might be part of the answer.

Checks on the job, particularly in the use of safety equipment, are helpful. Certainly, there is too much taken for granted in assuming that foremen and operators really know how to use safety equipment, and although the safety man may make occasional demonstrations, a check may show the need for some systematic training program for that field.

The important thing then, the thing that we want to stress here this morning, is the necessity for developing something specific in the way of training needs. In this period of shake-downs, of consolidating gains and solidifying the industrial position, the safety man has got to develop his own little integrated program. He can think now in terms not only of roosting on a JIT program with his safety work, but of developing some little specific training packages or procedures that may take care of safety hot spots. If you climb on to a JIT program and do a pretty good job there, you will cover in a broad way a lot of hazards in jobs, but just a broad coverage does not give any selective consideration to hot spots. Now is the time to think in terms of going after these problems and beginning to bring about some integrated activity to the training side of safety. Don't just rely on hunches.

Even when you get opinions of foremen or workers, it is important that you don't just take that man's word for it, but see if you can trace it back and find some actual evidence. Say, "Give me some cases. You say we need training here. Can you give me cases?"

"Yes, so-and-so had an accident, you remember, last week. We had a fellow here whom I had to shift to another job because he wouldn't do it this way. I was scared to death he would hurt himself. We had this situation. We had that situation." If he and a few other people can multiply those things for you, then

you know that is a specific need, but if this one fellow has only one case, that isn't enough evidence. You cannot take that into management and sell it. Failure to do this constitutes the greatest weakness of training men in general, as well as safety people. They fail to develop specific needs and prove them with evidence.

That kind of hunting toward specific training needs is of the utmost importance, and you cannot do a good job of developing a program until you have it.

I have seen a lot of weak training programs, not just in the field of safety, but in the field of industrial training at large, and they are weak because somebody feels, "We ought to train foremen on the Wagner Act. Gosh, they need some knowledge about that." Well, do you want to make it an approach from a legal point of view? Do you want to make it specifically grievance handling? Is it a knowledge of their rights and privileges in dealing with employees under the Wagner Act? Should it be designed to teach them how to get along with union stewards? Unless that is done, this is what will happen: You will say, "Well, we ought to teach them something about the Wagner Act." Then you get the foremen together; someone talks to them in general terms about the Wagner Act and covers a few legal points and a few incidental cases, and the training program is a bag-punching session. It is windy and the people don't get much out of it. Why?

Because there was no thinking in specific terms. My greatest quarrel, as a training person, with safety men is that they have primitive notions as to what constitutes training. Now I know this does not apply to everyone here, but too many safety men think that a good training program consists of pep talks or safety meetings.

The safety meeting has an important place as a training technique but pep talks in safety meetings are a long way from an integrated training program. Usually, there is a failure to say specifically, "This is what I am trying to accomplish. This is my objective. This is the thing that I want to teach these people. How do I know I ought to? Because I have some objective evidence of it."

The ability to make that kind of an approach to a training problem is the most important single thing that the safety man can get, if he is going to do training. Incidentally, it applies just as well to the engineering phases and to the other aspects of safety work, too, doesn't it? We know, for example, that in making inspections if a man doesn't know what his goal is, if it isn't clearly defined, he isn't going to get anywhere. Step 1: Spot specific needs and get objective evidence of what they may be.

Tomorrow we want to talk about step 2, how to develop this plan, what its contents should be, and how you do the training.

LECTURE NUMBER TWO

Package Training for Safety

BY JOHN H. HAZLEHURST, Ph.D.

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Yesterday, you will recall, we spoke first of all of the changing character of our industrial training needs. We said that during this change-over to war effort it was necessary first to go through a tooling up period and an expansion period, during which management was concerned only with doing first things first, to quote the signs that you saw over many peo-

ple's desks. Largely, management was interested in getting new employees at work somehow, getting out some kind of production and coming close to schedules that they had promised to government organizations. Costs were neglected, safety was neglected, relationships among workers and foremen were neglected. Many of the things that constitute part

of the maintenance operations of keeping people working at an effective level were neglected.

Now that we have begun to stabilize a little, there is an increasing need for specific programs to meet specific needs. We can begin to tie up the loose ends. In the training field this was the process followed by Training Within Industry in its package programs.

They first introduced Job Instruction Training, to aid in teaching people how to do their new jobs. Now packages are available to train in such fields as job methods; teaching foremen how to do some planning about their jobs; job relations; teaching them how to handle grievances and how to deal with their employees. So the safety man can begin to develop specific training programs to meet actual, practical safety needs in his plant.

Yesterday, we spoke about the four steps that are essential in setting up such training programs. First of all, you have to identify specific needs. Then you want to develop a plan, get the support of management, and finally launch the plan and follow through. Here on the board is a way that you could set up a sheet to cover that material. Say that a person wanted to develop a specific training program. He would list at the top what his training problem was and the specific evidence of the need for that program. Then down here is the plan for training in outline, saying what the contents would be, who would do the training, how it would be done, when this training would be done, and where he would undertake it. Then its relationship to the overall training program. Finally, his plan for getting management's support and the way he would launch it and follow through.

Yesterday, we discussed in some detail this first step of finding evidence of a specific need. We said that there was no use undertaking any kind of a training program unless you knew that there was a need and had specific evidence; but if you did have that, it would be of assistance in step 3, selling management. Today we want to discuss primarily this second

step of developing a plan. In doing this, we have to ask the questions that are listed across here. What is the content? Who is going to do this training? How is it going to be done, when and where?

Now what is the content? If you have decided that you have a specific need for some type of training, then what is going to be the content of this program? Well, perhaps you are going to have, first of all, some instruction in safe practices. Second, perhaps, someone is actually going to give instruction in the way to do the jobs. Third, you may plan to have demonstrations in making out reports. Finally, you might want to have discussions of typical accident cases. Those four items would be listed over here under "content."

Then who will do it? One of the safety engineers might handle the first part. He would give this material on safe practices. Making out reports might be handled by someone from the personnel department or from the clerical division, or wherever that it being handled. The discussions might be the conference type, led by a trainer. In any event, you would list those who would do the training.

It might even be necessary to break this one block into several sections and several people might enter into it. The training director might coordinate the work for all of these. He would appear in every one of them. The safety director might appear in every one. The plant superintendent might appear on one or two of the parts, but you would have listed definitely who would participate in each of the sections of the instruction that were listed over under content.

Then how? Well, maybe one part would be by demonstration and lectures, another part would be conference—another part might be done by sound slide films with discussion, but again specificity. In this way you begin to make it possible to set up a schedule for your sessions.

Next you want to determine when it will be done. Is this program going to be undertaken after working hours, during working hours, or is it going to be right after lunch, or in the middle of the afternoon? Will it be three days a week or

five days a week? Also, where will it be held?

It is also important that it be related to the overall training program of the company.

Any training undertaking should have broad objectives, and we want to know where this specific program fits in. For example, the organization might decide that its general training program would revolve around the traditional approach to what a foreman needs. We will say this is the foreman training program and what we have here is one little part of a foreman training program. In our company, for example, we may decide that a foreman has to have two knowledges, that is, knowledge of his work and knowledge of his responsibility, plus three skills: skill in leading, skill in instructing, and skill in planning. In this event our training program is going to revolve around teaching these three skills and these two knowledges.

We will say we decide to attack this overall program by teaching the three skills with the aid of Training Within Industry packages, JIT, JMT and JRT. We are going to teach the responsibilities through lectures, conferences and things of that sort. This specific safety training program then should be designed to teach one of these responsibilities, namely, his responsibility with regard to the safety of those he supervises. That is the way we relate a program to the overall picture. Then you do not have a bunch of heterogeneous training programs shot in here and there, with no coordination, no integration of all of the effort.

If you write down on paper what the relationship is to the total training program, it forces the training director, safety man, office manager or whoever is going to do training, to think in terms of the broad training problem that he has to face, and to see what part this specific program plays. That one process will help a great deal to crystallize thinking about these training procedures to make them hard hitting.

Let us discuss for a while the whole question of how training will be done. There are a lot of traditional methods of teaching—lectures, conferences, slide films,

demonstrations and all of the other general training tools. We want to talk today about just one, for we only have time to cover a little bit of this whole subject. I have tried to outline it in its general terms so we can see the total picture, but we will have to limit our discussions to specific phases of it. Of all of these "hows," certainly at the foreman level, the most common and most useful type of training is conference training. Lectures are good, all of these others are good, but the most useful training tool at the foreman level is the conference method.

Good foremen have a lot of experience under their belts. Any man who has been in industry for any length of time does, but he has never codified it, he has never crystallized it. What a conference training procedure does is help him organize his experience and that of the other people in the conference room. So we want to talk about conference training and a specific kind of conference training, namely, package programs. Because today's experience has shown us that packaged types of conference procedure have great potentialities. The only difference between a package type and ordinary conference procedures is that the package type is generally short, designed to hit one specific thing, and in general practice has been found to be a lot better organized and a lot tighter than traditional conference programs.

The great weakness of conference training in the past has always been that you decide you are going to have a conference about something. The fellow who is going to be a conference leader thinks, "Well, all I have to do is to go out and toss out a couple of controversial statements, and let the boys grab the ball and roll it around for an hour. Then we will get back to work." That is not good conference training. The good conference leader has a well defined program in mind before he goes into the conference. He knows what things he is going to have the discussion revolve around and the order in which these things will be taken up, and he leads the discussion along predetermined lines. He does not always make sure of the nature of the discussion, of course. He isn't always certain about

some of the specific viewpoints, but he knows what general viewpoints he is going to develop, and he has a good, tightly-designed program. Package Training is this procedure in streamlined form.

To develop a training package there are several steps to be taken. Under each of these steps, if we want to use JIT terminology, there are certain key points to be observed. The first thing, of course, in designing any kind of a training package is to state the specific goal of the program. That comes from the needs that you have developed through analysis. We said last time that you can either analyze records, talk with people, do it through inspections or some other approach, and thus develop a specific need.

Once you have found the specific need, the next step in developing the package is to define the objective. For example, the objective might be to teach foremen how to spot hazards, or how to train workers in safe practices on some particular kind of work, or how to make out accident reports, or it might be to teach workers how to handle cranes and hoists safely. The next thing is to develop a system of approach.

The important thing in getting a package training procedure together is to have the thing set up in a formula. Now there are lots of weaknesses in formulas, but in these times the purpose of training procedures is not to turn out a finished product but to do the most you can within a given time. We are up against time. If you are going to have a ten-hour training program, you must design it to give the most in ten hours. You cannot do everything in ten hours; therefore, the best approach is that of simplification or I will even say of over-simplification.

Our key points then, are to keep the system simple, to reduce it to a formula and, of course, to keep it from tangling with plant policy. Make the formula fit within the framework of company policy whether you like the policy or not.

Now what do I mean by reducing it to formula? Well, as an example we can use JIT because I presume most of you are familiar with it. In JIT the formula is the 4 step method of instructing. You prepare the worker, you demonstrate the

job, you try out his performance, and then you follow up. As another example consider how you handle a grievance with an employee. There are four steps. You get the facts. You weigh and decide, you take action, and you follow through. That is the formula used in the JIT package. In this package that I want to talk about in safety training this morning, the formula revolves around how to find the hazards in jobs. To do this you just look at five things, five hazard spots. You check the work area, the material handled, the machines, the tools and the clothing. That is all there is to it, very simple. People are afraid to get down to simple formulas because they know that nothing really reduces to a simple formula, and they fear that some expert will come along and make holes in it and point out the weaknesses of the thing. An expert, if he understands his job, won't.

We recognize that we are not training specialists in a field, but trying to get over the essentials of this problem to working people in as simple a way as possible.

After you have gotten your system worked out, the next thing is to develop the materials that go with it. Are you going to have this formula reduced to cards that you can give the people? Are you going to have some little, simple forms that they can fill out in using this mechanism, like your JIT break-down sheets that list steps and key points? Are you going to have some other type of form that will allow you to get some kind of control in follow up? It is important in setting up any kind of package training to get some sort of materials that will reduce to paper the work of those who take the training. One of the hard problems in any training program is to follow up and see whether it really has been carried out, and whether the instruction has been carried into the job outside of the classroom.

The best way is again to have specific, tangible evidence. If you get a bunch of men together and discuss, for example, the problems of cutting down waste, you don't know whether, when they get back on the job, they will put into operation the program that you have talked about.

On the other hand, if they have to fill out some little, simple form, or undertake something that gives concrete evidence of what they have done, then you have a method of checking up later.

Your JIT breakdown sheets are a good example. If a fellow takes his JIT outside of the instruction room, he has got to break his jobs down, and he breaks them down on this sheet of paper. Those sheets of paper are evidence of whether or not these people who have gotten training have put the training to use out on the job. Wherever possible that kind of thing should be developed. Cards, forms, and other materials should be kept simple, and the amount of work to be done, that is, clerical work, should be a minimum, particularly when you are dealing with plant personnel.

One of the things that is important in setting up the package is some kind of a demonstration of your formula, whatever it may be. I demonstrated the JIT formula last year here by tying an underwriter's knot, as you will recall. Anyone who has seen this knows that is the way you demonstrate the formula of JIT, which is the four-step plan of preparing the worker, demonstrating the job, trying out the performance and following up. In JIT you provide a number of demonstrations by giving the group actual cases, situations where foremen did or did not handle hot problems well. You show how the four-step formula works in Job Methods Training by demonstrating how a job was simplified, the job being that of assembling some phase for a radio shield. In the safety training package of the Office of the Chief of Ordnance we demonstrate the formula by showing how a foreman taught a new man to carry a tote box, before and after learning how to spot job hazards.

It is important in developing a demonstration to pick some little, simple, typical job that requires few props to carry around. Furthermore, it must be a selling demonstration, one that not only illustrates the scheme or the formula but, in addition, has sales appeal as far as the observers are concerned.

Then it is necessary, as a fourth step, to package up the program. You have a

formula. You have the materials that you are going to use. Now you want to package it up, to outline the thing, to say, "All right, we are going to have three conferences. They are going to run two hours apiece. The first conference will cover this material in the first half hour. This material in the next half hour. This material in the next ten minutes and in the next fifteen minutes."

Make what is called a sessions outline, so that you have a time table on the one hand and the subject matter to be covered on the other. This should be outlined in detail, so that any conference leader can sit down and see what he is going to do for every ten, fifteen or twenty minutes of the two hours that comprise the conference. He does not go in having ahead of him two hours. He has ahead of him fifteen minutes or ten minutes in which this specific phase of the subject is going to be handled, and then in the next twenty minutes the next phase. In that way a conference leader maintains control of the discussion. Unless he is given a very complete sessions outline, he isn't going to have a good package.

The next step is to train the people who are going to handle the conferences. Since this package training has come into such wide use, the general procedure has been to do it through what are commonly called institutes. You get people together and drill them on the handling of these conferences for anywhere from three to six days, depending upon the type of package and the extent of your program.

Most of the time in an institute is taken up in teaching the formula, teaching the mechanics of the demonstrations, and teaching the philosophy of the thing that is trying to be put over. Usually, it includes some instruction on how to be a conference leader. Good trainers really can take up these packages in a very short time, if they have skill and experience in conference leading.

Lastly, of course, a package training program should have some kind of a follow-up. It must be geared into the plant organization and operation so that it becomes part of it. To help keep it alive and working you should have something in the way of refresher programs or ad-

ditional collateral material that rounds out the concept of the basic package.

Chiefly, a follow-up program will succeed or fail depending upon whether the original program was sold to top management and whether the top management will assume its responsibility in following through on training procedures. For example, today the philosophy of Training Within Industry is, "Don't go into a plant and sell a ten-hour package. Go into a plant and sell a total training procedure that includes follow-through. Sell an entire training operation to management. In the same way, the safety man shouldn't simply sell a series of lectures or a few safety meetings or a ten-hour package, but he should sell a continuing program of training and get management to commit itself to that. Then his follow-through will be considered part of the total plan. He does not have another sales job on his hands later, for he already has the acceptance of management on follow up.

Now we have talked in generalities here about how this might be done. I want to give as an example the package that was developed at the Safety and Security Branch of the Office of Chief of Ordnance. The commanding officer, Colonel Miles, set up that branch a year ago, and it was charged with maintaining safety and security in ordnance establishments. That included all government owned and government operated ordnance establishments and government owned, contractor-operated ordnance establishments. Generally that embraces all of our arsenals, our depots, our large loading plants, proving grounds and other establishments of that kind.

In discharging its responsibilities, the Branch developed a training program for use in these establishments. What was the evidence of a specific need? Well, the way the thing grew up was that the people from the branch performed an inspection service. These people, who went out into the plants and made inspections to see whether safe practice procedures were being observed, frequently had requests from the management of the establishments for information about training programs. They were told, "Here is a big

plant. It employs 15,000 or 16,000 people. We have been in business six or eight months. That is all. All of our employees are new. Everybody is new. Even management is new, and we need some training. Have you any ideas?"

Those requests began to drift back to the Branch and showed a general need. The Branch keeps careful accident statistics on all ordnance establishments and an analysis of those statistics showed certain characteristics. I don't know how many people here visited the Chemical Section the day before yesterday and heard Major Niederauer give information on these statistics of accidents in ordnance establishments, but it was interesting to notice that, although they might be loading bombs or shells, handling dangerous explosives and things of that kind, the statistics showed the majority of the accidents were industrial accidents. There were few explosions. What was found was that people would trip over dunnage out in the yard. They would strain themselves picking up a box of TNT or loading a bomb into a railroad car. They would crush their hands handling boxes of ammunition on a conveyor, or a fellow would step back and an ammunition train would run into him and push him up against the wall and break his leg. That was the sort of accidents they were having, purely industrial accidents. Roughly a third of them were due to slips, strains and falls.

There we are beginning to get specific evidence of the kind of training that might be needed. From that kind of analysis of records and actual discussions with safety men in the plants, the need for a specific type of training procedure became quite clear. What was it? It was a need for training foremen. Again we recognized that the problem today was not to train the worker directly. He was the fellow who needed the training, because he was having the accidents, but the safety organizations were not big enough to deal directly with all of these workers. Therefore, the training program had to be directed to the foreman and he had to carry it to the worker.

The necessity became clear: a program for foremen, a program designed to teach

foremen to spot the hazards on their job, to pass the information on to the workers about these hazards and how to keep them from turning into injuries. That was a specific need. In other words, we wanted to make, in a sense, safety men out of the foremen.

Now, having gotten down to something specific, we had to work out a simple formula for finding hazards. We said, "What should be done is to find some way of limiting and defining the areas in which a person will look for hazards. You want to find the hazards in a job. Let's find some systematic way of checking over the job.

The systematic method finally decided on was to check five hazard areas on each job. We looked for hazards in the work area, in handling the materials, on the machines, hazards with tools, and hazards as far as clothing is concerned. Those five spots were decided upon after a lot of research and discussion.

Out of the various experiences of the men who assisted us, we synthesized this little simple formula: To find the hazards in a job, examine the job, step by step, in five places: the work area, the materials handled, the machines used, the tools used, and the clothing worn. When the hazards have been found, do one of the following 3 things about each hazard: remove the hazard, protect the worker against the hazard or develop a safe practice to avoid injury from the hazard.

Of course, you and I know that is not 100 per cent. That is not the answer to the whole safety problem, but it is a good, simple little formula and it works. It hits perhaps 90 per cent of the cases, and it can be understood and undertaken by foremen.

Having our formula, we developed the materials for the program next. One of them was a hazard spot card. We got a little card about 2 1/4 by 4 inches and listed on it these five hazard spots. Under each we listed suggestions to kinds of hazards. For example, when checking over the work area, look at the illumination, the ventilation, the congestion in the aisles, the housekeeping. Take a look to see what exposed surfaces there may be, where there are holes or excavations or

anything of that kind that might provide hazards. Take a look at any stair treads. Examine all of those things that are commonly found in a work area that result in injuries or that provide hazards.

Under the hazard spot of materials, we listed the kind of materials that might be unsafe or might present hazards. Typical examples were: sharp materials, long materials, heavy materials, rough materials, caustic or acid materials, explosive materials. The same thing was done with machines, tools and clothing.

The hazard spot card could be carried by a foreman in his vest pocket and provided a ready reference or check list in analyzing a job.

In addition to this hazard spot card, we developed a safety analysis sheet on which a foreman could list the steps of the job, the hazards in each of the steps, and the instructions to be given to the worker concerning each hazard. These constituted the materials to be used in the operation of the program.

In packaging this program, that is, setting it up in a clearly defined series of conferences, we followed the procedure of all good packages—the four steps of good instruction. This means that our conferences were designed, first, to prepare the foremen and sell them on the necessity of training. Then we demonstrated our formula and showed them how it worked. Next, we gave them a chance to try it out and practice using it in the conference room; and, finally, we gave them some follow-up on their broad safety responsibilities. Briefly, the program of conferences, of which there are five of two hours duration each, is as follows:

The first day, we talk about safety and the importance of safety. A demonstration is given of the formula by showing the way a foreman taught a man to carry a tote box from one place to another, in an ordnance establishment we visited. Then we show how he might teach the job, giving full regard to all of the job hazards. It is a good little selling demonstration. They see the difference in the two types of instruction. Then we explain that the second instruction is better, because there has been a safety analysis of the job made and a good instructional

method used. That is the content of the first conference session.

In our second session we show how to use our formula and how to check over a job from the point of view of the five hazard spots. We take the first step of the job, examine the work area that is involved, and ask, "What kind of work area hazards are there?" Then, through conference, we bring out all of the common types of work area hazards. This step of the job is next checked from the point of view of materials handling, and through the conference method we bring out the types of hazards that can exist in handling materials. The same with tools, machines and clothing. By the time the second session is over, these men have had a lot of direct discussion about the kind of hazards that can exist on their jobs in those five hazard spots, and they gain a whole new concept of these hazards.

Our next sessions are spent in having these fellows practice applying this formula to their own jobs. We say, "Take one of your own jobs and check it over. In doing the job you go through certain steps. List those steps. Then take your first step and check over the work area hazards. Then check over your tool hazards, your materials hazards, and so on in each step of the job." These fellows then go out and do that on their own jobs, and they begin to see the hazards that exist. They discover that they have many hazards on the jobs that they had never recognized heretofore.

Then comes the second part of the formula, which covers what you do about hazards. We say that if there is a hazard, there are three things you can do. The first thing to do is to remove the hazard. If it is some hazard like a piece of material in the aisle or a spot of oil on the floor, wipe it up—get rid of it. Remove the hazard. On the other hand, if you cannot remove that hazard, then protect the worker. Give him a pair of goggles, a pair of safety shoes, a leather apron, a respirator or whatever may be needed to protect the worker against the hazard.

If you cannot remove it or if you cannot protect the worker against it, then give him a safe practice to follow. If it

is a lifting hazard, a heavy box, you cannot remove that hazard and you cannot protect the worker against it. What do you do? You give him a safe method of lifting. You show him how to lift without hurting himself. One of these three things can be done with each hazard.

In practice, then, a foreman lists the steps in the job and checks each step against the 5 hazard spots, namely, the work area, the materials, the machines, the tools and the clothing, noting any hazard on each step that appears from this analysis. Thus, he locates all the hazards on the job. Next he takes each hazard in turn and asks, "Can I remove this hazard? If not, can I protect the worker against it? If not, what is the safest way to do this without getting hurt?" In this way a systematic habit of making safety analyses of jobs is formed.

We wind up the conference by outlining in our last session the broader aspects of a foreman's safety responsibilities. He has four major responsibilities, we say, with regard to safety. One is to instruct his people. The second is to follow up on safety instruction and practices. The third is to see that all safety devices are kept in proper use. The last is to set a good safety example to his people. Through the conference method the men learn how a good foreman discharges properly these four safety responsibilities which are his.

This has been a very successful training package for safety work, but it isn't the only approach to the problem that could be made. For example, I have been very much interested in seeing the work that has been done by the Corps of Engineers, in their Southwestern Division. They have an accident-prevention training program and they have packaged it. They have a little card, the traditional card of package training, and they have an interesting approach.

Their package is designed to tell you what to do if you run into a safety problem. They are working in the field of accident-prevention, and if they see a problem, they want to know what to do about it. All right, what can you do about it? They say, first of all, determine the facts, review the records, inspect the machinery and equipment, observe the working meth-

ods, the practices and housekeeping condition. Review the rules and see if they are adequate. Talk with the workers. That is the first step. Determine the facts in this accident problem.

Their second step is to weigh and decide. You fit the facts together. Then you check over the hazard spots, the work area, materials, machines, tools, clothing, hazardous working practices and wrong attitudes. Then decide on the proper corrective action, and think of the effect of this corrective action on the group, on production and on economy.

The third thing is to take action. Decide whether you are going to handle it yourself, whether you need help in handling it, or if you must refer it farther up the line. Then you must watch the timing. Finally you check results. You plan to follow it up. You determine how frequently you are going to do it. You make sure that you use the services of the safety department, the inspection committee, visual education committees, etc., and then you watch for changes.

What they have done very obviously is to take the four steps of JRT and a little bit of this safety training package of the Office of Chief of Ordnance and weave them together. Fine! That is the way to go about it. There is no sin in borrowing this stuff and recasting it to suit your own needs, if it is done intelligently, and if it ticks the problem you are facing.

It does have one very useful result, one which I have begun to think is the most valuable, in view of the difficulty that you always have with follow-up of any of these programs. That is, it does make the foreman safety conscious. It does get him to be observant about safety. There is no question in the world but that lots of people are not observant. They work on a job but they don't see any of the hazards on the job. That is due to lack of education rather than laziness as is often suspected.

I spent a very frustrating Saturday afternoon one time at a football game with a football coach. He would sit there beside me and say, "See that end playing a little bit out of position? They are probably going to make a pass over into the flat zone." When the game was over I

wondered whether I ought to get some glasses or give up football. I apparently didn't see anything. This fellow was seeing everything. Of course, the truth of the matter was he knew football and I didn't. I could see them pass the ball through the air or kick it or do a few obvious things like that, but I missed the fine points that were obvious to the trained football expert.

Just so a foreman can see something on fire or something broken or falling in the air, but he does not notice all of these other hazards, because he doesn't have enough knowledge about them. If you can make a person observant as far as safety is concerned, you have done a great deal. This procedure of having jobs analyzed from the point of view of these hazard spots has done that.

That kind of safety training is the sort that we need now that we are over our tooling-up period. The procedures for setting it up are as simple as those that we have outlined here. It seems to me that one of the greatest difficulties with safety training or any other kind, has been the reluctance of people to roll up their sleeves and make their own packages. They wait for experts like the government's Training Within Industry Group to develop packages and hand them to them.

This, of course may be due to the fact that we are all under great work pressure these days, and I know that many people feel that they haven't the time that it takes to put such a package together. Such a viewpoint shows a lack of acquaintance with this type of procedure. Actually package programs can be put together both quickly and easily. It is only necessary to try it once to discover how true this is.

It is in the hope that some of you, who are thoughtful and serious about your safety training problems, will make this effort that I have spent this time in outlining the method of doing it. I know from experience how useful package training can be, and I know how little difficulty is encountered in developing such a program. If you who have training problems will tackle them from the point of view

of the four steps we discussed yesterday, and will follow the suggestions I have made, using the safety program of the Safety and Security Branch as a working example, I know your efforts will be successful.

Furthermore, you will be making constructive and perhaps far reaching contributions not only to the immediate problem of winning our production war, but to

the more enduring goal of providing keener tools and richer knowledge for the use of those who will carry the profession of safety work into the years of peace to come.

In closing let me again thank the National Safety Council for the honor and opportunity of appearing on these early morning programs, and to thank you for your interest and attention.

Safety Training

THURSDAY MORNING SESSION

October 7, 1943

A PANEL DISCUSSION

Presiding: L. S. HAWKINS, Director, Vocational Training for War Production Workers, U. S. Office of Education, Washington, D. C.

CHAIRMAN HAWKINS: I am very glad to preside at this meeting because I am here to learn. I would like to know more about what can be done to concentrate the united efforts of industry and vocational schools upon the improvement of training for safety of persons who attend these vocational schools.

You are all well aware of the fact that the Office of Education does not conduct any schools. The Office of Education does not, from its own appropriations, pay for the training of any people. The Office of Education does act as a certifying office for appropriations which are made by Congress to the states. The Office of Education cannot spend one dollar of the money appropriated by Congress for the use of the states in the program of vocational education which receive aid from the Federal Government. The Office of Education does have a modest sum for the payment of the expenses incident to the ascertaining of whether or not the states are entitled to receive monies appropriated by Congress to those states.

There is a mistaken idea in the minds of some laymen concerning the relationship of the Office of Education to these vocational training programs, and those people should understand that there is a decided limitation to the extent to which the Office of Education can or should control the details of the operation of these programs for which Congress appropriates money to the states. Naturally, the Office of Education, occupying the position it does, has a great deal of influence in setting up desirable standards, procedures, and methods of operation, but

it does not attempt to control the details of operation, rather dealing with standards of operation.

In general, in the vocational field there are two rather distinct types of programs fostered through appropriations made to the states by Congress. First, what is known as the regular program, which has been in operation now for twenty-five or twenty-six years under a basic act known as the Smith-Hughes Act and later supplemented by the George Dean Act, under which the appropriations made are solely for the purpose of assisting the states and local communities in the payment of salaries of teachers and the preparation of teachers.

Since 1940 there have been three programs known as the War Production Training programs. One is for training for industrial occupations in war industries, concentrated pretty much in the larger communities and of secondary rather than college grade. Another is the food production program, pretty largely centered in rural communities, and known as the Food Production War Training Program. The third one is carried on through the colleges, offering short courses in college classes, operated on a short-term basis specifically for this purpose, in the fields of engineering, chemistry, physics, and personnel management.

I have asked each member of the panel if he will take about five minutes, to express himself concerning the general setting of the question or the problem which is up for discussion. The first member of the panel is Mr. R. P. Blake. Mr. Blake

represents the United States Department of Labor, the Division of Labor Standards. He is an author, and I am assured on good authority that his latest book on industrial safety, or at least the part of the book which he wrote, is already considered an authority in that field. He is interested in the program of war training which I mentioned a moment ago, namely, the engineering science and management program that is being carried on by the colleges, and prepared the safety material that is in the course, offered in that program.

MR. R. P. BLAKE: It seems to me that safety training in the vocational schools, the shops and schools where we are teaching our young folks for their vocations, is one of the three or four absolutely vital problems that we people in the safety game must solve if the national total accidents are going to be greatly reduced. We are going to reduce that waste in so far as we are able to get not just the larger employers but all of the employers to understand what accident prevention is, how accidents occur, how to prevent them, and at the same time get the same kind of knowledge to the fifty or sixty million American workmen.

The place to start, or one of the places to start, is certainly in the school system and in the vocational schools. I don't want you to interpret what I say as criticism. I am merely trying to tell you the situation in so far as I have been able to see it in the schools I have been in. Remember that when you take any young person into a shop and teach him how to use a machine or to do any work—an ordinary table saw, a circular saw—he learns the way he is taught. He gets certain habits and carries them through life. If, for instance, you teach him in a shop where practices do not represent good safety performance, he is taught and believes that such practices are proper.

As Mr. Hawkins explained to you, the United States Office of Education has very limited control, practically none, over that sort of thing. Therefore, safety performance in the vocational schools of the country has to be a local job. We safety men must go back to our own communities and bring that kind of information to the educational authorities, because the

educational authorities have not been against this safety problem in any way that has caused them to take the kind of action and the kind of interest that the average large employer takes. They will do it only in so far as we bring it to their attention properly.

Put yourself in the place of the head of a vocational school. You would think of the safety of the children taking the training, and if you were able to carry it on in a way in which injuries were infrequent, you would think that was good enough. But the average school shop can operate without much chance of injury to students themselves, or without many injuries to students, under conditions which if taken over to the production or commercial shop would produce a perfectly horrifying stream of injuries. Do you see the point? In other words, the conditions and the practices exemplified in teaching trades in our schools should express the absolutely best safety performance. That is the only way in which we are going to lick that end of the problem of general promotion of interest in and knowledge of sound accident prevention.

I quarrel vigorously with the loose term "promoting safety-mindedness." We are all more or less safety-minded—nobody wants anybody hurt. But there is a great difference between a sympathetic attitude toward safety, a desire to keep people from being hurt, a willingness to do anything reasonable to prevent injury, and the actual know-how of doing it. We must go back to our communities and find ways of getting that safety know-how into actual performance. Safeguarding is more than just guarding the work in the vocational training schools.

CHAIRMAN HAWKINS: In connection with what has been said, I should like to point out to you that of some 12,000 teachers in vocational programs, particularly the war production training program, over 6,000 of those teachers were workers taken off of the job for which training was to be given and trained in a short time to teach. If those men were from shops in which proper safeguards were provided and in which proper safety precautions were observed, then those precautions were observed in the classroom in which they taught for the

most part. On the other hand, if they had not had that training through experience, it was difficult, if not impossible, to get them to habituate themselves to safety precautions in the short teacher training course which was given to them.

Although he is from the Division of Labor Standards of the United States Department of Labor, our next speaker represents industry. He started in as a machinist apprentice. Mr. George S. Thompson.

MR. GEORGE S. THOMPSON: I have realized for a number of years the very important factor of preliminary instruction before induction to the job. We have been very lax about that. Because we have had such an enormous amount of manpower, there has not been much difficulty in operating by the trial and error method. It is very expensive, but we are still using that method. We are buying humans from the neck down and endeavoring to develop them from the neck up after we get them.

This nation is what it is today largely because of one factor—compulsory education. But even with compulsory education we cannot say that we have eliminated illiteracy. This is merely because we haven't reached out far enough—some day we shall. The same is true of safety education.

Here is a record of what the Fisher Body Division of the General Motors Corporation has done with their female employees since March 1, 1943. After the employees are hired they are put in a school for five weeks. For five weeks they are trained along these lines in safety: Discussions of safety, the necessity for safety and the appreciation of the employee that the employer does not want his employees injured. The latter is the first and fundamental thought that is pounded into the minds of those employees. They teach them the plant rules and regulations under which they are expected to operate.

Next is the job training. I wish we were able to reduce to dollars the amount of energy that is absolutely lost, first because of lack of analyzing the job and second, not putting the proper man into it. Industry is going to have to put down on

paper what each job needs. You certainly wouldn't buy a milling machine to do a punch press job, nor would you buy a milling machine to bore holes in iron, but you go out and get men, push them in and say to the foreman, "There they are. Help yourself." He says, "Do this, that and the other. Good-bye." He is thinking about production. It seems to me that it is time for the educators to step in here and do something.

This is what has happened in the Fisher Body program. A total of 3,706 women have gone through a five-week training period, and have been paid for it, before they went out on the job. We have at the present time 415 still in training. The man hours of training from March, '43 until September 18 total 1,424,995 hours. In all this period, there has been only one lost-time accident. A girl tripped over a cord and broke her ankle. The frequency for those one million and a half hours is .76 with a severity of .018. I do think this is a recommendation for training.

CHAIRMAN HAWKINS: I am very glad to present at this time Mr. Roy R. Van Duzee, who is the Director of the Allis Vocational School, West Allis, Wisconsin.

MR. ROY R. VAN DUZEE: I asked Mr. Hawkins before the meeting how we could separate the instruction that is given in the regular vocational classes from the work that is being done with war production workers, because one day a student is in school and the next day he is working on the production line. My own idea is that we cannot separate these problems, and that it is an important job for us in vocational education to help clear up the safety situation. It is appalling to go into some school shops and see the conditions under which young people learn to work.

I was interested in the four questions that were raised in the program, and I thought that it might be a good idea to find out what some of the people with whom I work, both in industry and as a school director, think about some of these topics. I posed the questions to the directors, and found that in the case of the first one (Is industry satisfied with the safety knowledge of the average war worker and vocational school training?) about half of the industrialists with whom

I work are not satisfied with the work that is being done in the schools in the matter of safety training. I believe that the number was more than one-half, because some of the answers were qualified. Many of them said, "Progress is being made. We are satisfied with the progress, but we are not satisfied that we are doing enough, because nobody can be satisfied as long as there is work to be done."

On the matter of checking through our directors—there are 50 of them in Wisconsin—about half of them were satisfied with the cooperation that was given to them by men in industry. I personally feel that where there is not satisfactory cooperation between the school and industry, it is pretty much the responsibility of both of these groups. I do not think we can say that the schools are not willing and able to do their job, and I do not believe that we can say that industry isn't interested or isn't competent to solve its problems.

In answer to the question, "What can industrialists and educators do?" I have put down three or four things. The first is that I believe that industry should recognize that there is a safety training problem, recognize it seriously enough to do something about it, to put somebody in charge of the safety training job, making him responsible for it and seeing that the job is done. It isn't enough to run men through an induction process, showing some pictures and telling them by pictorial and lecture methods that you want them to learn to be safe workers. That isn't enough. I think everyone learns to work safely by learning to work correctly, and when he works correctly, usually he works safely. Technicians are learned on the job, and habits are learned by doing the job over and over in the correct manner. Maybe I am presumptuous in raising some of these rather elementary points, but I am going to risk raising them anyway.

Another thing that might well be done, I believe, is that the industrialists could get a great deal of assistance from the schools if it was gone about in the right way. I know that it could be done, because it is being done in several areas in Wisconsin. Sometimes industrialists think that they are self-sufficient and can do

the job themselves without help. But as has been explained, the training job starts before these people come to the gate for employment, and I know that much can be done if management, through its representatives, will work with the schools in setting up a training program that can be carried on in the schools. I think we can do a great deal more with the extension of the training of these people after they have been put on the job.

In Wisconsin, or at least in West Allis, we have an industrial safety council which has been making considerable progress in working with safety engineers, plant superintendents, foremen and others who have a safety responsibility. This is not done through gathering these people together and having a fine show and a talk, but it is done through an absolutely instructional plan, set up by industry and the schools working with the public agencies, such as the Industrial Commission, the Army and the educational institutions at the state capital and locally, to promote the program.

We started three years ago to set up an educational program in the vocational schools in the state. We knew it was of concern to everybody, and decided to work in four areas: Safety in the home, safety on the highway, safety at work, and recreational safety. The industrial safety being the largest part of the safety-at-work program, it is well along the way. We have a general industrial safety program, which has been developed particularly for a trade extension program in the evening for workers. We have under way, and well along, six units which are to be taught as a part of various crafts in vocational schools, namely, welding, machine shop, woodwork, printing and foundry practice. Two of them have already been accepted by the state department and are being used at the present time.

If time is available later on, I should like to give an example of the very fine cooperation that has been received by our particular school from the industrial firms in our area in the promotion of this evening extension work for workers. The plan has been worked out not only by the local people, but it has been given tremendous impetus and assistance by the Wisconsin Industrial Commission, by the

Wisconsin Highway Safety Division and by other public agencies that are interested in safety. We have this policy in the Wisconsin Vocational Schools—that we are a training agency. There are in the state other agencies that are interested in promoting safety. The Wisconsin Industrial Commission is one. Those people know where the needs exist. They know through their records and studies what those needs are. We are a training agency. It is our job to assist in eliminating these accidents and making a better safety record. So we say to those people, "We will cooperate with you in this job."

CHAIRMAN HAWKINS: They say that what is everybody's business is nobody's business, and I think that perhaps one of the things that the National Safety Council and the Bureau of Labor Standards, Department of Labor, have done is to make concrete the realization and awareness of the need for more attention to safety. The schools are aware and industry is aware, but I think it takes some push to utilize this awareness and interest. I think that is what the Bureau of Labor Standards and the National Safety Council have done in getting some concrete moves toward improvement in industry and the schools with regard to safety devices on machines and the training of workers in safety habits. It does not do much good to furnish goggles, if the worker does not wear the goggles. He is more likely to wear them if every time he steps up to a grinder he puts on his goggles as a matter of habit.

Mr. Hughes, Field Representative in Vocational Safety for the National Safety Council, is the next member of the panel.

MR. WAYNE P. HUGHES: In arranging this program, it was our hope that by getting together representatives of industry and of schools, we could clear up any possible clouds of misunderstanding that might now exist between those two agencies and, of course, that can be done only if there is free and active participation in any discussion that comes up after I am through.

We know, as you do, that the key to the success of any shop safety program depends upon the individual teacher. We hope that in this discussion you of industry will tell us of the Council and the

representatives of schools what needs to be done in the way of safety instructions. We hope, too, that you of the schools will tell the representatives of industry how they can help you. The group in Wisconsin, under the guidance of Mr. Van Duree, and in three or four other states, have the right idea—having an advisory committee in the War Production program as well as the regular vocational training program, a board of directors upon which are represented members of industry and of labor.

We believe that a large majority of the teachers of the nation believe that they are doing a good job of safety instruction. We have been told that safety engineers believe differently. Somewhere along the line there is a point of demarcation. We need to know where that point is. We need to know just how far these teachers are going in the way of an adequate safety education program.

The term is confusing. Let me illustrate it by this typical example that I ran into as I travelled all over the nation. Invariably I ask the teachers with whom I am working, "What type of safety education program do you have?" Too frequently this is the answer that I get: "I have not had an accident in my shop for five, ten, fifteen years, that is, an accident of any consequence." My answer then is: "Congratulations, but I should like the answer to my question."

My point is this: The absence of an accident may be the chief reason for lowering or decreasing the amount of safety education that goes on in that shop. In the beginning there may be a good instructional program in safety. The first year no accidents occur. There are only so many hours in the school day, and those of you in school work know that the demands upon that time are increasing constantly. Something has to give way. Now, we had no accidents last year, so we can devote less time to that this year. That goes on until finally the instruction program is down to a minimum, and it will then take an accident to bring this teacher back to earth to review that diminishing amount of education that has been going on.

I also run into this: Teachers tell me, after a certain amount of discussion, "If

you saw some of the industrial shops to which our people go, the absolute lack of protection and of safety instruction that are going on in those places, then maybe you would be doing your missionary work there."

My answer to them in that case is "You are not fair to yourself or to your students. Assuming that your people do go into industrial situations where the protection and instruction are lower than what you are giving, you have a greater obligation to those students than you do to the ones who are going into well-protected industries and into industries with good safety divisions, because the only safety instruction they will get will be that which you give them. It is also unfair to set your standards to the lowest level in industry; rather you should be reaching for the excellent industrial program and trying to duplicate that picture in your school situation."

I believe that the rest of the panel will agree with me that in this program you people on the floor are the people to express your needs, and we of the Council hope that out of this discussion we will get some ideas that will help us suggest to the school people the things that they can be doing better to prepare their people for industry.

CHAIRMAN HAWKINS: I would like to ask Mr. Hughes about the teaching of safety in a vocational school, whether the emphasis should be placed upon the teaching of safety as a related subject, through a course offered that parallels machine shop mathematics or machine shop drawing, or whether it should be a part of the teaching of every job or every use of a machine tool.

MR. HUGHES: Mr. Hawkins, I am going to open up the answer to this question and then turn it over to Mr. Blake to polish it off. I am doing that deliberately because he can do the thing that I want done much better than I can. I picked this up from him in a conversation a while back.

I think most shop teachers will agree that a course which introduces the safety procedures along with the manipulative skills is the better of the two. That is, in one case you have an active program; in

the other case, you may have a static program. One fits into the work that is being done. I believe that if instruction as a part of the manipulative skill is all that is going to be done, it is not enough, because we are not dealing, using Mr. Blake's words, with automata. We are dealing with human beings, and human beings like to experiment.

MR. BLAKE: In the very brief comments I am going to make and in the very brief answer I am going to make, I hope to challenge you people to do a little shooting. My point is simply this: Since injuries can occur from every type of activity that anybody undertakes, if we are going to eliminate those injuries, we must take into account safe methods, safe conditions and safety procedures in absolutely every type of activity we teach. Therefore, coming back to the operation of a circular saw, which is as good an example to use as any, you teach the person, first of all, that no operation must ever be done on that saw unless it is properly safeguarded. You first teach him the safe surroundings, the type of guard, the use of that guard and its function, etc., in relationship to the particular operation you are teaching him. You teach him to make sure of his footing. You don't want anything for him to stumble on. You don't want any slippery floor or anything like that. You teach him how to stand at the saw, how to run the wood through, etc. First of all, you teach him the right way. Then you explain to him the hazards and the things that might happen if he does the wrong things. You teach him what he should do to prevent kick-backs, if he is ripping a piece of wood or cross-cutting, because we get kick-backs on cross-cutting too. You should teach him how to stand, how to do everything he can to prevent a kick-back. First you teach him to do the thing that he should do and then you warn him against doing the thing that he might naturally do unthinkingly.

I very strongly differ with those who would stop at teaching merely the right way. That is the foundation, but that isn't enough.

Another thing I want to point out to you folks is that in the shop schools we have, primarily, to do two things. We have to get more competence, by that I

mean from the standpoint of safety teachers, and we have to get safer shops.

MR. GAFFNEY (Curtis-Wright Aviation Corporation, Buffalo, N. Y.): "I should like to ask Mr. Thompson a question concerning the people in Detroit who spend about five weeks in schools. What proportion of that time do they spend in safety instruction, in a separate course?"

MR. THOMPSON: They get five hours of safety discussion, in the three major points: Safety discussion, plant rules and regulations, which are an appendix to the safety, and then the major portion of their time is the job instruction.

MR. WILLIAMS (A. & M. College, Texas): Mr. Blake suggested a question when he said that we should have better and safer teachers than we have in the vocational schools and better safeguarding of equipment. How are we going to get them?

MR. BLAKE: I hoped for that question. I cannot answer it. I can make some suggestions that may be helpful, however. It seems to me that we safety men must carry the ball on that, and my suggestion is that in each community, the enthusiasts for safety—full-time safety engineers or anybody else who has part-time or full-time responsibility for safety—should get together and devise definite working arrangements with the vocational schools, whereby men who know the subject will be available to go through those schools, inspect them and make recommendations as to what guarding and physical conditions should be improved, bringing to the teachers the necessary information and helping them along. In some cases, perhaps they should go so far as to do actual teaching, attending classes and working closely with the teachers, so that they not only will build up the safety of the school, but will build up the safety knowledge of the teacher.

The more experience I have, the more I watch safety work going on, the more I watch the safety performance of leading firms who represent the best safety performance, I realize that it all goes back to each specific job, to what I like to call "job safety analysis," the careful analysis of work on that job, determining safe standards, safe procedures and eliminat-

ing the hazards I would go so far as to say that we won't be satisfied until a thorough knowledge of job analysis is made a fundamental for teaching in vocational schools—job analysis from the safety standpoint, I am not thinking about time study work.

CHAIRMAN HAWKINS: May I suggest that here today we have had an illustration of the kind of thing that ought to be going on in every state, namely, the setting up of specific standards for school shops. It is not enough to meet the standards of industrial shops. Safety devices and standards in school shops should go even beyond the standards for industrial shops. So far as the Office of Education is concerned, it is doing and will continue to do everything possible to get state boards to make that a requirement for receiving state or federal aid for teachers' salaries.

Second, the fundamental principle of vocational instruction is to determine the content of instruction by an analysis of the job for which instruction is to be given. An analysis of the job includes not only the type of jobs to be done or the operations to be performed, but what should the worker know in mathematics, drawing, science, and also safety precautions in connection with the performance of that job. It takes time for those things to go through, but that is a program which is being carried out.

MR. HUGHES: I should like to ask the gentleman from A. & M. College directed at his type of institution. I assume that you are preparing some shop teachers in your institution. What are you doing in the way of preparing them for safety instruction when they get out in their teaching positions?

MR. WILLIAMS: Safety is a part of the job. Safety is a part of the teacher's job. Safety should be a part of the school, and if the job is taught right, safety will be in the job when the man goes out to perform from the school.

I am going to ask this question: What is the mission and purpose of educational institutions except to train people how to live and for living?

MR. W. E. OUWENEEL (Commercial Solvents Corp., Terre Haute, Ind.):

This discussion has been confined quite entirely to occupational problems. I have always taken the attitude that a man cannot be safe on the job unless he is safe off the job. In other words, it requires a safety attitude toward living. I should like to ask Mr. Van Duzee: Are the schools preparing students for living safely all the day around? As you realize, my particular object is for industrial purposes. We have heard a lot about off-the-job accidents lately, which involve accidents other than occupational, and even as far as industry is concerned, we know that they are more serious to industry than on-the-job accidents. Are the schools teaching accident prevention as a sort of package training, or are they teaching it as a tool for living? Regardless of material which is given to students, is there an atmosphere being prepared in school life which gives the student that safe attitude toward living? Are the schools inspecting their plants as industrial inspection committees inspect their plants, with the idea of creating safe conditions and with regard to the pupils acquiring a safe attitude toward living?

MR. VAN DUZEE: In going into the matter of setting standards for Wisconsin vocational schools, we found that some of our teachers did not know that the Wisconsin Industrial Commission has codes and orders which instruct anyone how to guard machines. Many of our teachers, who were supposed to be competent in their particular craft, did not know of the safe practice pamphlets of the National Safety Council.

I think one of the things we should do as school administrators is to buy equipment subject to the approval of the Industrial Commission or the commission in the state that says whether the machinery is properly guarded. It ought to be bought subject to the electrical code, and it ought to be tested by the state and local authorities before it is used. I have never seen a school board that would not put in the money required to safeguard equipment properly that is put in the schools.

With regard to what we are doing in the schools for general safety, I mentioned before that we have four areas of safety: the use of highways, home safety, recrea-

tional safety and safety at work. It is very true that if you get killed going to work, you cannot work; so one of the first areas that we worked in in our vocational schools was to have a driver-education program adopted. In the Wisconsin schools, it is taught in connection with the social studies work. In all the shops and laboratories, every place where students work, there is also the specific instruction being given with the activity that is being engaged in. The program also calls for the teaching of courses in the evening schools on a trade extension basis, which is related instruction for those men who are in industry.

MR. ROTHMAN: By and large, the problem of every vocational school deals with some particular area. You are aiming at one particular area and, in many cases, one particular industry. I think that probably vocational schools could do a better job by finding out what the specific hazards are. In other words, you have a general course, but the industry that you are aiming at has specific hazards that the schools do not pay enough attention to.

CHAIRMAN HAWKINS: Your proposal is that students be given some warning about what they are going up against when they get out into industry?

MR. ROTHMAN: That is right, because in the school you have ideal, or at least favorable, conditions, and in industry you cannot always have them.

I have a second question I would like to ask. I think most men will agree that one of the great problems is the fact that workers will not report minor injuries, and I think the gentleman on the right here was getting at one of the sore spots when he said that general safety education will help along those lines.

CHAIRMAN HAWKINS: Am I right that you are saying there are some points about safety in industrial plants which could be taught in the schools by requiring the trainee to report a minor injury in the school, the same as he would report it in a plant?

MR. BLAKE: In the vocational school, or in any school shop, of course, you should teach the safe way and you should warn against certain hazards.

Among the fundamentals is the importance and necessity of getting immediate attention to every minor injury. Throughout industry there is a great deal of difficulty in getting minor injuries reported. I find that with the right kind of foremanship, which is the basis of good safety performance in any industrial operation, that soon ceases to be a problem, but it could be tremendously helped by our school children learning the importance of taking care of all minor injuries.

CHAIRMAN HAWKINS: I am asking Mr. Hughes if he won't take over at this point, because I must rush to keep an appointment for a radio broadcast.

... Mr. Hughes assumed the Chair.

CHAIRMAN HUGHES: We will continue this discussion to suit your pleasure, of course. We want to answer all the questions you wish to ask.

MISS MARY MAY WYMAN (Louisville Public Schools, Louisville, Ky.): I should like to ask Mr. Hughes to clarify that point about accident reporting. You are not minimizing the importance of considering accidents in formulating a program, but you are warning against self-satisfaction. Do you think that the teacher should not only consider the accidents that are serious, but should include in his program of study those near accidents and minor accidents?

CHAIRMAN HUGHES: By all means, the answer is "yes" of course. Just by the grace of God and a movement that went this way instead of that way might have resulted in a minor injury, a scratch, in one case, or in the other, a lost finger, a lost eye or even a fatality. Only by seriously considering the minor injuries along with the major ones do we get any chance to analyze the things that led up to the act which in one case resulted in a minor injury and in the other case in a major injury. I think everybody in the room agrees with Miss Wyman on that point.

Michigan has an excellent program, especially in the city of Detroit, and the responsibility for that lies with Gordon Graham, from whom you are going to hear in just a minute.

The State of West Virginia, in its war production program has a state su-

pervisor of safety. In Portland, Oregon, they have a supervisor of safety in their war production program with eight assistants. In Vermont, one of the smallest programs in the country, has a state supervisor of safety in their war production program. I commend those states to the rest of the nation.

Now we are to hear from Gordon Graham about their program in Detroit.

MR. GRAHAM: The thing that I was a little bit anxious about when I was listening to Miss Wyman's comment was the fact that I think that we are very likely in school shop safety work to think in terms of the accident which occurred in the school shop as the sole index by which we should set up our program of safety education. I think we should get on our biscuits, as it were, and look into the industrial picture of the future and see just what hazards are going to confront this boy or this girl, when he actually gets out into the working situation, and that we should train for the avoidance of those hazards rather than confine our activity simply to the accidents which occur in the school shop. I think that is a very important point that is very frequently overlooked by many vocational people.

There is, of course, a big difference between the complexities of activities in industry as contrasted with the situation that we have in the school shop. It is impossible for us in training work to duplicate the myriad of intricate operations that these people will later be expected to perform out in industry itself. How can we bridge that gap? Of course, we cannot do it 100 per cent, but I think that we can make some approach to it, first by discussions within the shop itself as to some of these somewhat more complicated processes that are going to confront these people, so that they will have some idea as to other types of machines that are a little more specialized perhaps, but have in many instances the same general, fundamental characteristics as the machines which they may be operating. Second, I think that it is advisable, wherever possible, to arrange for visits by groups of students from our shops to the various industries in the community, so that they have a direct contact with the

sort of thing that they eventually may be doing to earn their living.

There seems to be an almost perfect isolationism existing between the educational people in the vocational field and the people in the industrial field. Many of our school shop teachers throughout the country have had at one time or another in their experience some actual industrial employment, they know something about the industry involved, but in many cases they haven't been inside the door of an industry for twenty or thirty years. Processes have changed considerably in industry not only in the last twenty years but in the last two years. It is a responsibility on the part of the instructors in vocational education to keep themselves abreast of this constant change in industry and the processes that industry has.

Second, there is an isolation that industry has maintained from the schools. I do not think there is any deliberateness about this thing at all on the part of either the schools or industry. Industry has felt that the schools were a long way off. They do not mingle in the same circles and come in contact with each other. I think there is a responsibility on the part of both industry and the schools to get together. I should like to suggest to the industrial people who are in this audience that you go back to your communities and make a direct contact with the superintendent of schools in your area and suggest that you would like to make some arrangements for setting up a regular contact with the people in the vocational department. You could arrange for a little luncheon at your plant to which the vocational teachers in your community might be invited, and these teachers could be taken around through the plants so that they could get some idea of the thing I spoke of a minute or two ago with reference to students.

Similarly, I would also like to suggest to the vocational school people here in the audience that they do the same sort of thing. Go back to your communities and get in touch with some of the leading industries, talk to their safety engineers, invite them to your school for a visit through your school shops, and at the conclusion of that visit, ask the safety en-

gineers to say to you very frankly just what they think, not only of the physical condition of the shops and laboratories that you have but of the observed safety practices or lack of them as they may have seen them in going through the shop.

I hope that in that way it is possible to bridge the gap that seems to exist between the educators and the industrialists. After all, you who are industrial people are buying, if you please, the product of the vocational schools. If you buy any other product for your own personal consumption, you are interested in the quality of that product, and certainly you should be interested in the quality of the product that comes from the school shops. If the quality of a product that you buy for your personal use is not right, you protest. Do you protest if the people who come through your employment office and stand in front of your machines can't, as we say in the vernacular, cut mustard? I think that you have a responsibility as industrial people, and you, as school people, also have a responsibility to get in harmony with each other from the standpoint of instruction in the field of safety.

MR. JAMES A. ODUM (Huntington Trades School, Huntington, West Va.): As to the gap that Mr. Gordon talked about, how far should the school go in dipping into plant training? Should we wait for industry to ask us or should we go in and sell ourselves?

MR. THOMPSON: Once before today I talked to you about a job analysis. It has been my privilege to have supervision over a lot of people. In one plant I had 3,000 people and we had more square pegs in round holes than you could find anywhere in existence. That was merely because of the fact that the propensities of the man and the analysis of the man had not been given due consideration.

My contact has been this: Job analysis for what you want and then human fitting for that job. I have contacted 873 concerns in the last fifteen months, and only two of those concerns have analyzed their jobs and have a record of them, and only one of them is practicing what they have found through their job analysis. Here is the result: We have a normal frequency in Michigan of approximately 30,

which is way out of line with what it should be, and yet this one concern that has practiced job analysis and has 5,800 people at work in that industry has a frequency of 1.2, with a compensation cost of less than 11 cents. It isn't up to me to say whether we are trying to run industry with a left-handed monkey-wrench or not, and it is not up to us to try to run industry. Far be it. Mr. Gordon is on the right track. We compliment him in Detroit for the job that he has done, and we compliment the public school system of Detroit for realizing and visualizing this picture. In answering your question, unless you can fit that man to that job, you are not going anywhere.

There are a lot of men in industry who would be ace high farmers and there are a lot of farmers today who would be, ace high industrial men. The thing is to get them together and to correlate them by using some yardstick of measurement. We have a lot of things that could be put together.

MR. ODUM: I suppose it is the same everywhere. They come and get these boys from school before we are through training them. We have already lost 42 per cent this year. We haven't finished with them. There is your round peg in a square hole. Should we go into your industry and finish the job or should we let you finish it? That is what I want to know.

MR. BLAKE: I think the plant should take over the plant training. That is my opinion. I would rather ask Mr. Van Duzee to answer you.

MR. VAN DUZEE: I think the question that is bothering you is one that all vocational schools must decide. The in-plant training is taking over the job. There was a time when we had preemployment people for months, and we could do quite a lot with them. In the last year we have sifted down so that we got them for a week, then we got them for a couple of days and now we don't get them at all. Now the question is, what is the school's responsibility relative to in-plant training? We had to decide that question. "Are we going to run a vestibule school?" we asked. In our area we have gotten quite

a number of instructors in plants. They are paid with War Production funds. They are local vocational board employees and go in on the basis of instructors. They instruct these people on the job. They are not in any sense straw bosses under the foremen or doing anything but teaching these people how to do the job better. We are putting these people in plants as fast as we can get competent men to do the job.

MR. BLAKE: I think I will make my position clearer in this way. I wasn't thinking about whether the person being trained was physically in the classroom or whether he was in the shop. It seems to me the preemployment school should aim at giving the student the fundamentals, that is, he should be taught the way to operate on the instruction basis whatever machine he is operating. It should be in the safest possible surroundings. He should be taught the importance of good housekeeping, the right use of the right tool, the importance of getting first aid injuries treated—all the fundamentals. Then in the plant, whether it is a teacher from the vocational school who continues his instruction or whether he is taken over by somebody in the plant, it is solely a matter of convenience. In the instruction period you should set up a system of training whereby a student coming into a school, particularly a young person, is thoroughly grounded in the safe ways of doing the kind of things he expects to do. He should be grounded in the fundamentals of safety so far as they seem to apply to him. His aptitude should be measured, so that when he is turned over for employment, his employer has the maximum possible knowledge as to what he can do and where he will fit best. Then if he has his jobs properly analyzed, he will know exactly where to place him and how to carry on his instruction.

I am one of those who believes that by the proper marriage of the job safety analysis technic and the use of aptitudes in the training courses, whether it is in the school or in the plant, we are going to make the biggest contribution to safety that has ever been made during the entire period of the organized movement. That is the next big step.

Seeing for Safety

WEDNESDAY MORNING SESSION

October 6, 1943

Presiding—A. S. Regula, Vice-Pres., General Time Instrument Corp., New York City.

Maintaining a Lighting System to Top Efficiency

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Good lighting—both natural and artificial—is rapidly becoming accepted as an essential “must” for war industry because when a workman falls, stumbles, or bumps something in the dark or semi-gloom, it is quite obvious that better lighting at the scene of the accident might have prevented its occurrence. To many, however, a much less apparent but more important correlation is the way in which good or poor lighting, through its influence on the seeing ability of a workman, affects his entire attitude toward his job and particularly his proneness to accidents.*

A short time ago Alfred M. Cooper in an article “Employee Training”** discussed the underlying causes of accidents and gave relative weights. His list is given below.

Underlying Cause	Weight
1. Negligence	339
2. Haste	265
3. Over-confidence	217
4. Lack of knowledge	214
5. Worry	208
6. Thinking of things foreign to the job	192
7. Improper supervision	168
8. Physical defects of men	160
9. Fear	150
10. Defective equipment	144
11. Lack of cooperation	142
12. Wrong mental attitude toward safety	140

*“Industrial Hygiene and Plant Efficiency Through Good Lighting”—U. S. Dept. of Labor.
**“Employee Training” Engineering for Safety, February 1943.

13. Horseplay	106
14. Misunderstanding of orders	91
15. Disobedience to orders	61
16. Lack of emotional control	56
17. Poor judgment	51
18. Bullheadedness	42
19. Lack of interest	36
20. Recklessness	25
21. Outside interference	15

Eyestrain brought about by poor seeing conditions very definitely affects items 1, 2, 4, 6, 7, 8, 9, 10, 11, 12, 14, 16 and 17. Thus, poor seeing conditions may contribute to approximately 75 per cent* of the causes of accidents which Safety Engineers normally attribute to lack of proper employee training.

Lighting, whether natural or artificial, is only as good as the care which it is given. Since the greatest thief of light is dirt on reflecting or transmitting surfaces, if the lighting in a plant is to be a definite aid in its safety program, it must be given adequate maintenance. While this is normally the responsibility of the plant engineering department, it has frequently been neglected because the need for it has not been adequately stressed.

The maintenance of artificial lighting** in pre-war days usually was a minor consideration of the plant electrician. This was true since most plants operated a single shift and (usually ill-advisedly) placed their main dependence for seeing upon natural light. The artificial lighting was a make-shift which provided standby lighting on dark days, early mornings and

late evening hours in the winter time, and for the very occasional intervals of night work. There is considerable evidence that this mediocre type of artificial lighting should assume a large share of responsibility for the poor night-shift programs which characterized many pre-war multi-shift operations. Needless to say, artificial lighting of this description frequently was neither efficient nor particularly useful, yet the attitude toward lighting of a great many industrial executives is founded on precisely that type of installation.

Today, war industry is operating on two or three shift schedules. In well-lighted plants, artificial lighting is the main reliance for good seeing conditions both day and night. For example, the plant engineer of a large blacked-out plant which has been operating for four years under a good artificial lighting installation, has this to say about his plant.

"Because employees like working under uniform operating conditions in this type of factory, we have probably experienced less difficulty than others in manning our second and third shifts. Furthermore, our production and spoilage do not vary with the shift, which fact more or less proves the theory upon which this plant was planned."

The very dependence upon artificial lighting has increased tremendously the importance of proper maintenance. When one also considers the much longer hours of use, lighting maintenance becomes one of the key procedures in the plant. It is an operation that, depending upon the size of the plant, may require the part time or full time effort of a number of men. If proper maintenance is neglected, the efficiency of transformation of electrical power to light it decreased, due to the absorption of light by dirt on reflectors and by lamps which have lasted beyond their most efficient life with a consequent economic waste of power and lamps. Such waste may total several times the relatively minor cost of a proper maintenance program, and yet may be only a small portion of the indirect loss due to the decreased efficiency of the workmen.

*Weighted average.

**Primarily relamping and cleaning of lamps and reflectors.

On the basis of actual surveys, it is estimated that the average plant can obtain at least one-third more light than it now is receiving with conventional maintenance methods, without any additional outlay of critical materials or power. The cost of a program which will achieve this and will average not more than 10 per cent to 15 per cent of the total annual lighting cost. With the war shortage of critical materials and the definite need for better lighting in most plants, any program which can achieve these results should be adopted.

The principal requirement of a maintenance program is the manpower necessary to carry it out. Unfortunately, manpower is just as critical or perhaps more critical than many of the materials which are being conserved to the greatest possible extent. However, deciding whether a man's time can be justified in cleaning lighting equipment instead of working at a lathe is not difficult. While averages may not fit a particular plant, it was estimated in one case that one man could continuously re-lamp and clear fluorescent reflectors that provide light for approximately 360 workmen. Thus, if the increased light which the maintenance man makes available through his services, increases the personal effectiveness of these 360 men (only 1/360 or 0.28 per cent), his time has been accounted for. Wherever men have been observed trying to see under some of the poor plant lighting conditions which exist compared to seeing in a well-kept environment the answer is obvious. For example, in one turret lathe department lighted with tungsten filament lamps, the average illumination was recently increased from 6 to 18 footcandles by simply cleaning the reflectors. The man hours necessary for a maintenance program can certainly be amply justified.

Numerous plants have solved the manpower shortage problem in lighting maintenance by using women for this work. For the most part their efforts have been confined to reaching lighting equipment not over 15' above the floor with ladders or similar devices. For greater mounting heights and cranesways, so far as is known, men are used exclusively. In selecting

women for this type of work, care must be taken to obtain people with steady nerves and particularly ones who are not subject to vertigo or faintness. In several plants cleaning women have been taken from their normal tasks and set to cleaning lighting equipment with success.

How Frequently Should Reflectors Be Cleaned?

The frequency of cleaning reflectors can be determined from an economy study of the various costs involved. If one operates a lighting system there is a basic cost of lighting which includes the owning cost (depreciation of original investment), the energy cost, and the lamp cost. This basic cost goes on, although whether one gets much or little light depends upon how rapidly the lighting system becomes dirty and how frequently it is cleaned.

The relative cost of providing light depends upon the period between cleanings and the rate of depreciation due to dirt collection.

When one considers the basic cost of light, the variable of cleaning cost affects the period between cleanings very little. For example, with 8 per cent per month depreciation due to dirt collection, which seems to be a fairly good average in many industries, the period between cleanings for maximum economy should be one month with a cleaning cost of 10c. However, if the cleaning cost is as much as quadrupled, reflector cleaning should still be at intervals of something less than every two months.*

Practical Aspects of Cleaning Lighting Equipment

From a practical viewpoint, cleaning lighting equipment is primarily the problem of getting together the 3 main items—the cleaning man, the lighting equipment, and the cleaning material. It is also necessary to satisfy three conditions, i.e., this meeting must be accomplished safely, conveniently, and economically. In many cases the floor is the best place for cleaning reflectors. This is particularly true for

the common 10-12 foot mounting height installations. All reflectors mounted at this height should be equipped with disconnecting reflectors to simplify cleaning at the floor.

Cleaning Materials

There are many cleaners and detergents on the market that are suitable for cleaning lighting equipment. In general, since porcelain-enamelled, mirrored glass, and prismatic glass reflectors all have glass surfaces, the strength of the cleanser in most cases will not affect the surface. For example, alkaline detergents are frequently used. However, care must be taken in cleaning aluminum reflectors since an alkali will tend to attack the metal. Neutral detergents are recommended or special wax or wax emulsion cleaners which have been developed specifically for cleaning aluminum. These effectively remove the dirt, and have the added advantage of leaving a thin film of wax on the surface which helps to retain high reflectivity.

Several companies which manufacture commercial and industrial cleaners have field representatives who are well acquainted with the best products for specific cleaning applications. One such representative recently advanced a suggestion for cleaning reflectors (mounted 12 to 15 feet above the floor) by using a high pressure portable steam nozzle manipulated from the floor. It is urged that the plant engineer or lighting engineer interested in maintenance, contact such representatives and ascertain which of these products and methods will do the best job for the particular plant conditions being checked.

It seems probable that if such a group of men became interested in lighting maintenance problems, a much better job of maintenance might be accomplished. Unfortunately, the lighting industry has little or no direct contact with an installation after its completion. For this reason, maintenance has seldom been effectively stressed by the lighting man, particularly with relation to its importance in providing continued seeing satisfaction.

Practical Methods of Reaching Lighting Equipment

The following outline has been prepared

*Lighting Maintenance in War Industry Plants, Nela Park Engineering Dept., General Electric Co., March 1943, Page 6.

as a guide to aid in the selection of suitable means for maintaining lighting equipment under various conditions. The equipments are described in the following paragraphs.

Type of Lighting Maintenance Equipment and Service to Which Each Is Best Suited

Type of Equipment	Mounting Height			
	Up to 12'	12' 18'	30'	Above 30'
Catwalk or Truss Mounting	—	—	X	X
Cranes, where available	—	—	X	X
Disconnecting hangers	—	—	X	X
Portable ladders	—	—	X	—
Portable maintenance platforms	—	—	—	—
Forms	—	X	X	—
Relamping bridges	—	—	X	X
Stepladders	X	—	—	—
Straight ladders	—	X	—	—
Telescoping platforms, elevating towers, etc.	—	X	X	—

Catwalk or Truss Mounting

Several recent high-bay installations have been designed with the lighting equipment mounted near trusses or specially designed catwalks. The reflector is then pulled in toward the catwalk with a short hook and held by a pair of hinged stops located at each end of the reflector. The maintenance man can conveniently clean and relamp the unit with perfect security.

It is important that the hanger be designed so that the maintenance man can perform his work comfortably with a minimum of physical effort in order to work at high efficiency throughout the shift. For example, some such catwalks have been designed with the turned-over reflector at the floor level of the catwalk. This would doubtless result in excessive fatigue, and increases the possibility of dropping cleaning materials or lamps. The kick plate minimizes the possibility of objects being dropped from the catwalk.

It is also desirable to place the reflectors in their normal operating position so that the edge of the catwalk is above the cutoff of the reflector. Then the catwalk will intercept a minimum amount of light. It is felt that this is an extremely safe and relatively inexpensive method of mounting the lighting equipment.

In some cases the lower chords of the steel trusses are in such a position that they can be utilized for maintenance instead of a catwalk. The same procedure is followed, the man merely standing upon the lower member of the truss instead of on a special catwalk. It is necessary, of course, to provide guard rails. If the truss is less than 2 feet wide, it is also suggested that an auxiliary platform be built upon it to give the man adequate space in which to do his work, carry lamps and lamp cartons past the truss members, and otherwise get about safely.

Cranes

Cranes have long been utilized for lighting maintenance in high-bay areas. Here again attention should be given in planning the original lighting layout and crane design to permit convenient access to the reflectors. If the crane is designed to pass just under the lighting equipment, it is desirable to place an auxiliary platform below the maximum elevation of the crane so that the units are approximately 6 feet above the platform. Thus the maintenance workmen can either conveniently clean the reflector or get at the wiring and ballasts if these require attention. If the roof is a considerable distance above the crane, the reflectors should be dropped to a position approximately 6 feet above the crane platform upon which the man will stand.

Disconnecting Hangers

Disconnecting hangers offer many advantages for safe, economical maintenance of the lighting equipment. With such hangers the lighting equipment can be lowered to the floor level by means of a chain which is fastened permanently to the reflector. Usually the chain is carried over to some convenient location where it is out of the way until needed. At the time the reflector is lowered the electrical connection is broken, making the unit absolutely safe to handle during the cleaning. After it has been cleaned and relamped, it is pulled back into place where it automatically locks into position, reestablishing the electrical circuit to the lamp.

Lamp Changers

Lamp changers are simple grips mounted on poles that permit lamps (primarily filament) to be changed from the floor. Such devices are particularly useful where it is necessary to replace a lamp where it is necessary and the delay normally associated with obtaining a ladder and cleaning the reflector cannot be tolerated. However, since reflector cleaning is desirable at least as frequently as relamping intervals, the lamp changer cannot be depended on for the entire maintenance program.

Portable Ladders

Portable ladders are specially mounted ladders attached to truck bodies and used widely in the past for street-lighting maintenance. However, with the advent of large plants with relatively wide aisles, this type of equipment has been adapted to interior lighting maintenance. Trucks (either hand or motor driven) are designed with a short wheel base and short radius of turning, and it has been found that a man on the ladder can reach all the units in the entire lighting installation one way or another. One advantage which this equipment shares with the double-tower movable platform described later in the article is the ability to reach fixtures which are located over machinery. In this case, the ladder merely swings out over the side or the back of the truck, and permits the man to get at reflectors directly above machines. Hooks and clamps should be attached to the ladder (see discussion of Stepladders) to hold the spare lamps and cloths that are required. Extremely high ladders of this type have been built which are relatively safe since the maintenance man is located on a very secure platform and can, of course, strap himself to the ladder.

Portable Maintenance Platforms

Where there are a great many reflectors at any given mounting height up to perhaps 25 feet as a practical limit, portable maintenance platforms are widely used. These platforms are equipped with castors and are sufficiently light that one man can handle the smaller ones without difficulty.

The use of such platforms, particularly with continuous-row fluorescent installations, permits a man to reach several fixtures safely without changing the position of the platform.

Relamping Bridges

In many plants today cranes are in operation continuously. In still others there are monorails but no traveling cranes of the usual type which could be employed for reflector maintenance. One company has solved this by the construction of relamping bridges. These are light structures that span the crane way or are mounted on two monorails and towed into position under a row of reflectors. The bridge is left here until the reflectors have all been cleaned and/or relamped, and is then moved to the next position. This leaves the crane free, and, particularly in a crane way where there are two cranes, results in a minimum of interference with the work. This type of equipment also is well suited to group replacement of lamps.

Stepladders

For relatively low mounting heights, stepladders are extensively used because of their convenience and portability. Even here, however, it is possible to adapt special clips, hooks or containers to hold spare lamps and cleaning rags which will enable the man to do the entire cleaning and relamping job with one trip up the ladder. Nevertheless, in many instances, plants have installed disconnecting fixtures, particularly of the filament-lamp type, which permit the fixture to be easily removed and brought down to the floor where it can be more thoroughly cleaned. When a man is on a ladder he is primarily interested in staying on the ladder rather than in cleaning the reflector. Where the reflectors are removable it is suggested that a spare reflector be cleaned and carried up the ladder. The dirty reflector is replaced by the clean one and then is brought down to the floor where it is thoroughly cleaned and used in similar fashion at the next outlet.

A stepladder designed primarily for lighting maintenance has recently been

announced. This unit is equipped with containers for lamps, cloths, starters (where used), etc. It can be folded and rolled through the plant on wheels which are an integral part of the device. This is an extremely convenient method of maintaining units of relatively low mounting heights.

Telescoping Platform, Elevating Tower, Etc.

Telescoping platforms, elevating towers and similar types of equipment are frequently used for lighting maintenance. These have the advantage of relatively small size, when the various extensions are nested together, which permits passage through low doorways, facilitates storage, etc. They can be designed to reach nearly any desired height and to provide added stability by means of outriggers which are folded into the frame while in transit. However, even though telescoping platforms designed for extensions above 25 feet become relatively bulky and difficult to handle in many factory areas; for these and lower mountings they can serve admirably.

Use of Cleaning Trucks

In many cases where the entire installation is cleaned at frequent intervals, specially designed cleaning trucks are used. In one plant a portable push truck has been developed which has three compartments: one for the cleaning solution, one for the rinse water, and one for the clean rags. Both the cleaning solution and rinse water are kept hot with immersion heaters connected to convenient outlets at various locations throughout the area.

It is strongly urged that wherever possible the reflectors be cleaned on the floor because a more thorough job can be done, greater safety assured, and there is less possibility of the cleaning solution or rinse water splashing on expensive materials which are being processed.

Voltage

The circuit voltage must be at, or close to, design value to obtain an efficient lighting system. Filament lamps are most affected by poor voltage as a 5 per cent

decrease in voltage will cause a 16 per cent reduction in the light output of the lamps. Mercury and fluorescent lamps lose approximately 1 per cent in light output for each 1 per cent decrease in circuit voltage. Thus, efficient operation requires good voltage regulation.

From a safety standpoint, mercury installations particularly must be protected from momentary voltage outages or even dips in the circuit voltage of more than 10 per cent. The latter condition frequently occurs with many irregular loads such as welders on already loaded lines. If it should occur, the mercury lamps are likely to go out and not restart for a period of seven to eight minutes. They do not regain full output for another seven to eight minutes.

If such conditions are apt to occur, mercury lamps should be used in combination with filament lamps, which will provide light during the period the mercury lamps are off.

Lamp Replacement

There are two general methods of replacing lamps in installations—group replacement and individual replacement of burnouts. The latter method is recommended where (1) the unit cost of lamps is high, (such as the 3KW Mazda H Mercury lamp), and (2) where there are relatively few lamps in the area lighted. Where the lamp cost is low and there are a large number of lamps (for example a 40-watt Mazda F Fluorescent lamp installation) it will be found that the cost of the time to get to an individual burnout is frequently considerably greater than the saving that one obtains by permitting all of the lamps to run to the end of life. In such cases the group replacement method frequently will result in lower overall maintenance costs.

Group replacement essentially consists of foregoing the use of a certain portion (usually not over 20 per cent) of the useful power-light transformation value of the lamps in order to reduce labor costs. The saving in labor cost in many cases is considerably greater than the value of the lamp life which is discarded. However, under today's war conditions, it is believed

that the conservation of critical materials requires that each lamp be operated to burnout even though it results in some increase in overall plant cost and, in general, in a less satisfactory lighting installation.

Summary

Lighting maintenance is an important and integral part of efficient plant operation. It has not received the forethought and attention in the past which it should have for efficient operation of the lighting system. For example, a survey of industry

in general indicated an average maintenance of approximately 66 per cent. However, a southern textile plant has reported a maintenance of 88 per cent of the initial value over more than a two year period. They are thus obtaining one-third more light for a given investment in lighting equipment, lamp and power costs than the industrial average, for an extremely small investment in maintenance cost.

This is a subject in which every safety director is vitally interested because of the direct effect of good lighting upon accident prevention.

Eye Strain—The Top Occupational Hazard of Industry

FABER BIRREN

Industrial Color Consultant, New York

Abuse of vision is directly associated with fatigue, physical debility, neurasthenia and accidents—and probably with heart disease and cataract. Like any other occupational disease it calls for good therapeutic measures, chief among which is color.

I know a man who had a mean case of stomach ulcers, a bad pair of eyes and threats of cataract. Not to mention a nasty disposition besides. And all, so the doctors said, from working at his job in a factory.

This man got over most of his troubles, including his bad disposition. Strangely enough, color played an important role in his recovery.

Need for Intelligent Approach

I hate to write a scare story. However, I feel it is time for some authoritative and intelligent evidence to be given on this important subject of color in industry. Neither its purpose nor its technique is too well understood. Because color is strongly emotional in its appeal, many are inclined to look upon it in a rather occult way and to credit it with powers at once abstruse and mysterious.

My experience with color covers some fifteen years. I am frank to admit that I have not been primarily concerned with safety. My job, however, has always been related to people—how to speed production, relieve eye strain and fatigue, promote higher standards

of workmanship and improve morale by creating factory environments conducive to the best of human efficiency and welfare.

I have devoted much research to the subject and have checked all available scientific data in an effort to separate pure hokum from reasonable fact. I have done extensive research of my own. You will hear of this now as I tell you about the man with the stomach ulcers.

In the study of color there are two approaches, one direct and one indirect. The first concerns good scientific practice in establishing ideal seeing conditions. This has nothing whatsoever to do with art, with appearance, esthetics or emotional pleasure. The study calls for straightforward analysis, and the problems are solved through very direct methods. The second approach is more intangible and concerns things psychological—the gratification of human moods and fancies. Yet even here good research may dictate over so-called "feeling" in the use of color. Sure answers may be found which are functional, purposeful and are therefore practical before they are artistic.

Causes of Eye Abuse

My man with the stomach ulcers, the bad eyes and the signs of cataract, had been a victim of eye abuse. I can tell you what was wrong, for I know the details of his case. In writing about him, however, I'd like to gen-

eralize on the subject of color and eye strain and at the same time quote a few impressive facts about the medical aspects of color.

Here are the chief causes to be considered in industry:

Inadequate or insufficient light.

Low visibility due to wrong color contrasts.

Glare.

Distractions caused by excessive brightness and motion on the boundaries of vision.

Severe adaptive changes of the pupil from light to dark.

Continual changes in the accommodation of the eye from near to far.

Prolonged convergence of the eyes on near objects or fine details.

Lack of convenient and agreeable areas for visual relaxation.

Most of these troubles have to do with color and may be corrected by a right application of it. Yet, as I hope to point out, eye strain is far more than a mere annoyance, bother or petty thing. Aside from its interference with good production and safety, it may have rather tragic consequences.

Results of Eye Strain

Now to review the results, here are some physical and psychological manifestations.

The pupil of the human eye shows severe dilation after periods of work.

The lids of the eyes blink more rapidly.

There may be a collapse of the "visual form fields"—the outer nerves of the retina growing less sensitive to brightness and motion.

Specific fatigue of all muscles controlling the eye.

General fatigue and increased nervous and muscular tension throughout the body.

Headache and nausea.

Psychological irritability.

I am convinced that eye strain deserves far more attention than it has received in the past. For I doubt if most people in the field of safety properly recognize its dangers. Just as dust, for example, is a hazard leading to chronic catarrh, pleurisy, tuberculosis and what not, eye strain also has its pernicious

effects. In a good many respects it may be classified as an occupational disease. And probably with further advances made in social legislation it may some day be accepted as such.

In my personal opinion, good safety practice ought to look upon color and light as *actual medical and therapeutic aids to the health and well being of the individual!* For the use of color and light to correct a bad seeing condition is essentially the same in principle as the use of antiseptics in cutting oils in order to prevent skin irritation—and probably far more vital in terms of human welfare.

Heart Disease a Possible Consequence

M. Luckiesh in his "Science of Seeing" writes: "A recent study of occupational morbidity and mortality by the United States Public Health Service revealed that in one company, with approximately 6,000 workers doing precision assembly of small parts, almost 80 per cent of the mortality cases in five years involved heart trouble. The trend with the rest of the 59,000 industrial workers whose occupational and illness records were studied was quite similar. It is conceivable that the reflex effects of critical seeing and the prevalence of mortality cases from heart trouble in occupations demanding critical seeing may be related. Certainly heart failure is a common cause of disability and death. Its cause or causes must also be commonplace. The subnormal conditions under which unnaturally critical and prolonged seeing is performed over the course of years and even lifetimes are worthy of the most serious examination, particularly in the light of the present scourge of heart ailments and failure."

This, of course, is something to ponder over. While many in safety work are deeply solicitous over laborers exposed to organic and inorganic dusts, to treacherous fumes and vapors, and busy in the invention of ducts and exhaust systems, how many among them feel equal determination to set up colors, backgrounds and seeing prescriptions to prevent so many ailments, diseases and hazards (with heart disease a likely one among them) in the thousand-and-one apparently harmless occupations where the worker does no more than use his eyes?

Stomach Ulcers

Don't let me forget my man with the stomach ulcers. His trouble was aggravated by a wretched seeing condition which exposed him to a combination of glare, excessive contrast, low visibility and very discouraging environment. What may happen under these circumstances has been explained by many authorities. Cataract, for example, is attributable to difficult efforts at accommodation. In other words, where the eyes are strained to see, a bad train of conditions is set up—"alteration in the secretory part of the ciliary body, defective and deficient secretion, nutritional troubles and finally cataract." (Dr. Neville Schuler.)

The human eye is a sensitive organ. Where vision is handicapped, any number of reactions are to be observed: nausea, lowered heart action, nervous and muscular tension and a host of other symptoms to be described in the vernacular as jitters. Where these physiological and emotional disturbances persist, the whole vascular system of the body may be affected. Ulcers may grow fertile in the stomach.

The advantage of color (plus good light and plus eye glasses where necessary) is that the seeing effort may be effectively eased. The curative technique is not too complicated. For lack of space in this article, let me epitomize the most important of all principles in two brief statements.

"General fatigue from any cause, either physical or psychological, predisposes the subject to discomfort under marked brightness contrasts." (H. L. Logan.)

"Investigations of the most diverse kind show that a human being sees best and visual fatigue is reduced to a minimum when the entire field of view is approximately the same luminosity as that to which the fovea (center of the eye) is adapted." (Parry Moon.)

New Science to be Learned

The cause of safety has a new science to learn—that of color. Few today recognize its widespread importance, the fact that seeing is one of the most vital of all human tasks. Few are aware that imperfect vision promptly wreaks havoc in the body, breeds a long list of human ailments, knocks human efficiency down far below par and is unquestionably

one of the most serious, though indirect, causes of accidents.

My man with the ulcers and bad eyes needed glasses, more light and a better seeing environment made possible through a finer use of color and more uniform levels of brightness within his field of view.

As to improvement in his disposition, in a booklet of the U. S. Department of Labor on Occupational Hazards, Louis I. Dublin and Robert Vane write, "Eye strain contributes to neurasthenia." In case you're not well up on the word, neurasthenia may be described as functional nervous weakness, nervous debility, a general let-down or upset in the nervous system of the body. The field of safety has another term for it: occupational neurosis.

Here perhaps is where color plays a star role. But before I go too far let me gainsay a few bromidic statements current among safety men today:

"Ninety-eight percent of industrial accidents are preventable."

"Most accidents are due to carelessness or unsafe acts."

"The best safety device is a well trained employee."

In my opinion, such statements as these are rather ambiguous. Carelessness and so-called unsafe acts presuppose a well ordered plant and a staff of employees who will keep alert. Yet, from the standpoint of appearance, of interest in environment, of a decent place in which to work, what is safety practice to expect from labor under the conditions found in most plants today?

Drab Conditions Responsible for Accidents

If slums are responsible for crime, then the drab and ashen surroundings of many plants are responsible for accidents; and no manner of training, discipline or even guarded machinery will effect an ideal safety record until a thorough job of rehabilitation is done. Surely, unsafe acts are not to be discouraged if the worker has no heart for the place in which he is obliged to earn his bread. Good table manners are hardly to be expected among the starving.

To create a bromide of my own, "Ninety-eight per cent of industrial accidents are as natural to men as their moods." Guarded

machinery, careful instruction and insistent training are necessary and helpful, of course. But color, and an encompassing regard for the physical appearance of the plant itself, will do a mighty important job. Above all it will help to bolster human moods, to give a man pride, to stimulate a spirit for neatness, order and caution.

After all, everything seen by the human eye is colored. The bad disposition of my man—the neurasthenia or occupational neurosis of any other man—is largely at the mercy of what he sees within his view. Good plant appearance, I insist, is basic to safety. It is the thing that makes training easy, that keeps the spirit and the enthusiasm up, that even holds the guard in place.

However, lest this endorsement of hue lead to extravagant notions, and perhaps to a liberal but thoughtless application of color, let me speak out for a purposeful and functional attitude.

In color there are many tangible and measurable facts. Today, however, little of this evidence has been organized and put to use. Only a beginning has been made. A lot of research is needed and undoubtedly will come as the values of color are better comprehended and as statistical data is further assembled.

Because the medical and psychological aspects of color are of broad interest let me summarize a few findings and conclusions. While this material has yet to be thoroughly coordinated, either for the purposes of industrial production or for safety, I am sure the possibilities will be clear enough.

Effects of Color

Light and color have many definite though curious effects upon the human body—reactions which are quite aside from the emotional.

Listen to what a few scientists and doctors have to say. Illumination of one eye will increase the sensitivity of the other eye. Optic excitation of one eye will likewise produce a tonic condition (muscular tension) in the corresponding half of the body. Feré found different muscular action and tension under the influence of different hues—high for red and low for green and blue. Dr. Gilbert Brighthouse found muscular reactions

quicker under warm hues than under so-called cool hues.

Ehrenwald demonstrated that when one side of the face and neck was illuminated, there was a muscular reaction toward the stimulus when the light was red, and away from the stimulus when the light was blue. Hoffman found reason to believe that the skin has a radiation sense, different hues having moderately different actions.

S. V. Kravkov of Russia, and more recently Frank Allen and Manol Schwartz of the University of Manitoba in Canada, have studied the effect of sound upon vision. "The cone sensibility to the rays of the green-blue parts of the spectrum rises under the action of a simultaneous sound, whereas the sensibility to the yellow-orange-red parts of the spectrum decreases." This means that the eye sees color differently when the ears are thrilled with noise, similar phenomena also taking place when the other senses such as taste, smell and feeling (cutaneous) are excited.

T. A. Brömback has noted a collapse in the "visual form fields of the eye" following several hours of factory work. This may run as high as 30 percent, the eye growing less sensitive on the outer boundaries of the retina. He associates this with accidents, particularly strike-against hazards and flying parts, which literally may not be seen by the worker due to break-down in the range of his vision.

In research of a more psychological nature, tests have shown that a person tends to overestimate time under the influence of red, and to underestimate it with green. Red light will likewise cause weights to seem heavier; green light will cause them to seem lighter.

As to emotional reaction, the value of color is all too obvious. Dr. Felix Deutsch, a psychiatrist, writes: "The influence of mood, psychic disturbance, fear, happiness, sadness, and impressions from the outer world make themselves readily noticeable in both subjective and objective changes referable to the vascular system. Changes in pulse frequency and rhythm as well as fluctuation in blood pressure are objective expressions of the psychically influencing factors which have taken place."

Working with color, Dr. Deutsch has achieved unusual and definitely therapeutic results. "Every action of light has in its influence physical as well as psychic components." The magic of color? A person experiences "sensations and psychic excitations, which, through the vegetative nervous system, boost all life functions: increase the appetite, stimulate circulation, etc."

I am still thinking of the man with the ulcers and the nasty disposition. With more color in industry, wisely used along functional lines, with research techniques and formulas developed to relieve eye strain, I am sure there will be less ulcers, better eyes, measurably fewer accidents; and certainly more compatible and cheerful humans will dwell securely within the walls of industry.

Visual Efficiency and Accidents

HERDWIG S. KUHN, M.D.
Hammond, Indiana

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There are two aspects, not one, of "Safety and Eyes." Almost universally, mention of the phrase "Safety and Eyes" calls to mind Safety to Eyes. First of all, one considers the problem of preventing physical injury to the eye itself by the use of protective appliances. Goggles of varying types—for fumes, flying particles, ultra violet rays—are used. Also, attention is paid to the elimination of the elements of so-called strain. This strain may be caused by poor illumination, unnatural work distances, producing breakdown of binocular coordination with pain and headaches, or improper refractive corrections.

In passing, mention may be made of the fact that the word strain covers a multitude of sins. It is a very vague and inadequate term which could well be dropped from our nomenclature and our thinking.

Secondly, one studies the various individual functions of the eye. These functions can be thought of as visual skills which are essential in securing efficient and safe seeing. Without the proper combination of visual skills on some jobs accidents occur. Such accidents are caused by eyes.

The classic example of such a case is that of the man with three fingers off, who, due to lack of depth perception, was unable to judge properly where to put his hand in the operation of a feeding machine. This is an injury caused by eyes. It is proper to designate the physically awkward person as unsafe whether

it be clumsiness of hands or feet or posture. So too, it is proper to think of the visually awkward person as being an unsafe person.

The same mistakes which are made in judgment of movement that may precipitate an accident, also may produce spoilage, waste and retard production. Unless one scientifically attempts to eliminate known sources of visual inefficiency, it usually is a matter of pure luck and the nature of the job, whether such mistakes result in damage to stock, to the almost finished product, to equipment, to a production schedule or the persons.

Everybody who has had any degree of experience with industry knows that production control is becoming more and more visual control. Gauges, dials, meters, signals, stop watches, blue prints, specifications, instrument sheets, stock records, surface inspection, graphs, reports, work orders, cost analyses, color differentiation, crane operations, tractor and truck manipulations—all these basic procedures call for some phase, or phases, of visual function.

Through time motion studies we have acquired a minute account of what our hands do on many fabricating and assembling jobs. We have, as yet, no such detailed studies of what eyes do, although we do have some. Bottle inspection, for instance, holds many similar motions. For instance, following with one's eyes a bottle on a conveyor belt—left to right, up and down, often with constant interference from peripheral stimuli, sometimes with

glare due to improper (though not necessarily inadequate) illumination.

Securing the proof whereby the relationship between vision and industrial accidents can be established has been handicapped by two factors in the past:

1. Wholly inadequate and inaccurate tests for vision in industry.
2. Inadequate and inaccurate recording of facts of accidents in industry.

Both of these factors must be properly and fully evaluated and made consistent before any relationships can be calculated. They form the basis of any blue print. No safety program can be organized properly nor can corrective procedure be set up without proper tests and proper records.

It is important, therefore, to thoroughly understand these two basic factors. First, what do we consider adequate and accurate visual tests for industry? On the basis of information obtained through research work as well as practical experience, we can now say that knowledge of the visual functions is essential:

1. Unaided acuity for distance and near.
2. Working acuity for distance and near.
3. Depth perception.
4. Muscle balance for distance and near.
5. Color appreciation.

Given this information for each payroll employee and for each applicant, we have sufficient data with which to determine "eyes for the job." Such job classification is of value for production and efficiency. It is of equal value as far as safety is concerned. Few of us these days would knowingly put a totally inexperienced man on a crane, or assign him to operating a truck or tractor, unless he had depth perception. We know from the experience of aviation what inability to judge distance may mean.

Few of us would knowingly allow a one eyed man to work on scaffolding, or in mills where on every side, white hot steel was being poured or rolled. None of us would knowingly put control levers, the

guiding of which were dependent on reading intricate dials, in the hands of an individual with an acuity less than 20/100 in each eye.

The second factor—obtaining adequate and accurate data in accident reports lie mainly in the hands of safety directors, insurance companies, and management. Here, in order to establish proper relationship we need to know:

1. Visual data (as outlined above) of all participants in any accidents.
2. Illumination at point of accident by meter reading.
3. Housekeeping conditions.
4. Exact description of who, what, how, and where.
5. Full information as to functioning of safety appliances, belts, guards, signals, goggles.
6. Condition of the machinery itself. Was it oiled; was it in need of repairing, etc.
7. Time of day, beginning or end of shift.
8. Age and other physical factors.
9. Past safety record, equally exact in detail.

The old phrase of "20/20, 20/20", as sum total of eye findings or the stereotyped, "Cut on thumb of right hand," as the sum total of an accident report is no longer tolerated. Carefully planned and laid out accident reports will include all necessary information. Where a foreman must be careful and complete in his report, that every fact will in itself send that foreman out in a search for danger spots. He replaces a broken light bulb in a dark spot, or he puts in order a pile of material stored in the wrong place. The insistence on full and accurate reports also has a nuisance value. If there are fewer accidents, there are fewer reports.

While making a visual job analysis where those visual functions needed for a specific job are checked, it also is possible to include the checking of types of hazards—flying particles, radiation, splash, danger where job requires stereopsis. Thus by tying the safety elements di-

rectly in with the elements of skill, a much more complete concept of exactly what a given job consists is realized.

One accident vision study was made in a plant of 3500 employees. In each of the five basic visual elements, a greater percentage of defects was found in the group of men who had had lost time accidents over a year's time than were present in the plant average. Of special note is the decided increase of defects in working acuity.

Another accident vision study, where the same five basic visual elements were secured, showed 28% of the employees failing to meet the standards in one or more of the visual tests. If accidents occurred to workmen in this plant regardless of their visual skill, we would expect this sub-standard group to account for only their share or 28% of all accidents. Instead, they actually accounted for 35% of all first aid injuries and 39% of all loss time injuries. One can surely infer, therefore, that sub-standard vision was a definite factor in these accidents.

In this plant prior to any visual program the payroll employees showed percentages considerably higher than three years later, when care in hiring had been exercised:

	1939	1942
Working acuity defects.....	33.3%	21.3%
Depth perception.....	22.9%	17.4%
Color	9.2%	8.3%
Muscle Imbalances.....	19.2%	16.0%

It does not seem out of place to indicate here the special visual problems which occur in higher age levels. These problems have necessitated an intensified and more effective rehabilitation program. We find the following:

1. Visual defects in 1940 compared with 1943 indicate a much greater percentage in all the 5 elements of both payroll employees and applicants in 1943 than were present in 1940.
2. The visual defects in people over forty are greater in all 5 categories than among those under 40.

Refractions and corrections for the job bear a very close relationship to top production and to accuracy where vision is important. It must, by deduction and by fact, bear a similar relationship to accidents where seeing is important.

It is "eyes for the job" to produce material and "eyes for the job" to conserve life and limb.

War Conservation of Personal Protective Equipment

WEDNESDAY MORNING SESSION

October 6, 1943

Presiding—R. H. Ferguson, Mgr. of Safety, Republic Steel Corp., Cleveland.

Safety Equipment In War Production

H. C. MESCH

Chief, Safety Equipment Section, War Production Board, Washington, D. C.

The industrial safety movement has established itself, in this war, as an inseparable part of our American industrial system. It has been demonstrated beyond doubt that accident prevention programs not only are economical but indispensable in maintaining war production schedules. Moreover, as a corollary to this fact, I believe that industrial safety programs are ineffective without safety equipment.

The function of the Safety Equipment Section in the War Production Board is to see that enough safety equipment is produced so that war workers can be provided with the personal protective equipment they need in their occupations. This we must do with the consumption of a minimum of critical materials and in line with the over-all war production program. In addition, we must channel the distribution of the finished items of safety equipment so that the most urgent needs are satisfied first.

It is my personal hope that enough safety equipment can be made available, not only to protect workers engaged in so-called war industries, but to protect all workers everywhere in America. Unfortunately, this hope cannot be realized at present. There is simply not enough industrial safety equipment available.

Many Factors Limiting Production

There are various and significant factors limiting the production of this vital equipment. First is lack of manpower, a problem which you have to contend with in your own

industries. Second, there is a shortage of such critical materials as copper, aluminum, alloy steel, rubber, plastic, and certain chemicals. Finally, there is the limitation imposed by the lack of facilities necessary to increase production, such as machinery and equipment.

On the demand side, we see millions of newly trained people who, working under the stress of emergency in war industries, cannot get along without safety equipment. The influx of women into war industries has necessitated certain changes in design and sizes. Furthermore, our allies in Latin America and in the far-flung corners of the earth need safety equipment for the efficient operation of their industrial systems. And there is a most important demand source, the military, which is purchasing items of safety equipment in ever increasing quantities for the fighting fronts, a demand which must be met in full and on time.

Because supply and demand in a war economy are not in balance, it is imperative that effective programs of conservation be promulgated. Everyone interested in safety, the safety of our country and the immediate problems of industrial accident prevention, is faced with conservation and all that it implies.

Responsibility for Conservation

The first responsibility in this matter lies with the government. It must have over-all information as to supply and demand, and it

must establish an over-all policy and program. It must devise tools to implement the established policy and program. These tools comprise the priorities system. Various techniques are employed such as limitation orders, allocation orders, and priority regulations. In addition, advisory and compulsory means of effecting substitution, simplification and revision of specifications are planned.

The second responsibility in conservation is with producers. The safety equipment industry has been very adaptable in this situation. Manufacturers, in the main, have been successful in revising designs, sizes and shapes of safety equipment so that less critical material is consumed. Today the major problem, from the safety equipment manufacturer's standpoint, is conservation of manpower and machines.

The third leg in the conservation tripod is the consumer of safety equipment. You have a responsibility to take care of your safety equipment, to make it last longer. This means you must not neglect repairs and must observe general rules laid down for care and maintenance of the specific product.

Danger of Over-buying

Your responsibility in conservation of safety equipment does not end with care and maintenance, however. There is a more subtle obligation that consumers of safety equipment have. That is not to over-buy. In normal times it would be natural for safety engineers to take pride in the fact that their plants had a well stocked inventory of safety equipment. Today, however, if you have in your plant safety equipment that is over and above your current needs, you may be depriving some war workers of the protection they need. This admonition is particularly significant because safety equipment is generally purchased as operating supplies and the machinery for purchasing safety equipment is relatively simple for war plants. There is a tendency, too often, to use your high rating to get as much safety equipment as possible. This tendency must be abated.

The means for implementing the required war production programs and equitable distribution of raw materials, finished war goods, and essential civilian goods are embodied in what we call the priorities system.

"First things first," the slogan of our defense program in the days before Pearl Har-

bor, is the basic principle of the priorities system. Safety equipment is relatively high on the scale of urgency.

Substitutions in Equipment

Safety equipment has undergone many changes since Pearl Harbor. This fact will become apparent to you as you visit the various booths in which safety equipment is displayed in this National Safety Congress. Gone are the aluminum helmets and respirators, the solid rubber headbands in goggles, aluminum in footwear and shin guards. You no longer see on display aluminum salt tablet dispensers and rubber safety mats. Here are some of the substitutions we have made:

In Safety Clothing: plastics for synthetic rubber; steel for copper base alloys.

In Safety Shoes: zinc for copper; reclaimed rubber for crude rubber.

In Safety Cans: steel for copper base alloys; terneplate for copper base alloys.

In Salt Tablet Dispensers: plastics for aluminum; steel for copper base alloys; steel for aluminum; ceramics for critical plastics.

In Respirators: plastic for aluminum; steel for copper base alloys; reclaimed and synthetic rubber for crude rubber.

In Gas Masks: terneplate for tinplate; steel for copper base alloys; plastics for critical metals; reclaimed and synthetic rubber for crude rubber.

Shifting Conditions

The state of criticalness of raw materials changes from time to time as our war economy moves forward. Requirements by the armed services for material varies as new designs and types are developed and as military operations shift. Concurrently, improvements are made in the supply of particular raw materials. With specific reference to safety equipment, we make available certain materials which have become relatively less critical.

For instance, we have recently amended the Safety Equipment Limitation Order to permit the use of aluminum in certain parts of respirators, as well as in some other items. The reason is twofold: (1) the supply of aluminum has increased relative to military demand; and, (2) the supply of some types of plastics, formerly used as substitutes for aluminum, are now themselves extremely

critical. As the critical materials shift along the scale of scarcity, we make the necessary adjustments in allowing their use in the manufacture of safety equipment.

The materials conserved by substitution have helped to build more tanks, more ships, more guns, and more planes. Some of the nickel saved in the manufacture of safety goggles has gone into the production of surgical instruments that are saving the lives of our fighting men in field and other hospitals. America has learned in this war to go without; and to do with less in many materials and products we believed were absolutely necessary. In the safety equipment area, despite materials restrictions, we have produced, and are producing, good products in ever-increasing quantities.

Production Quotas

When I tell you how much safety equipment is being produced today, many of you will be amazed. These estimates include only personal protective equipment such as goggles, respirators, gas masks, safety clothing and safety shoes, and do not include items not defined as safety equipment by the War Production Board, such as dust collector systems, first aid kits, safety ladders, and handling equipment; nor do they include military safety equipment items. In 1943 the production of safety equipment sold to industry will be around \$100,000,000. It is estimated that in 1943 we will produce approximately 9,000,000 pairs of industrial safety goggles; 4,000,000 respirators; 1,750,000 safety hard hats; 1,000,000 welding helmets and shields; 6,000,000 pairs of safety shoes; and over 1,000,000 face shields.

In the spring of this year, the War Production Board conducted a survey of requirements for safety equipment in war industries and essential civilian manufacturing industries. I shall disclose here, for the first time outside of official government war agencies, some of the results.

Expenditures for Equipment

We learned for the first time, as a result of this survey, how much money manufacturing industries spend for safety equipment. All industries surveyed spent on the average of \$3.80 per capita employment in 1942. For individual industries the range varies from six dollars in the steel industry to

sixty-one cents in the tanning and leather industry. Here are employment per capita expenditure figures for safety equipment for each of the following major manufacturing industries:

Chemical	\$6.00
Merchant ships	5.75
Aircraft manufacturing	5.22
Iron and steel	5.11
Mining	4.53
Stone, clay and glass	4.40
Petroleum	3.98
Machinery, not transportation	3.50
Paper	3.19
Lumber	1.93
Rubber	1.76
Food	1.75
Construction	.97
Textile	.91
Public Utilities	.75
Tanning and leather	.61

When you compare what each of these industries spend for safety equipment with their frequency rates, you will note the significant fact that a close correlation exists between expenditures and frequency rates. For example, while the chemical industry spends the most, it enjoys one of the lowest frequency rates of the major industries. On the other hand, the lumbering industry spends a relatively low amount for safety equipment and has the highest frequency rate.

Problem of Demand

Enormous as safety equipment requirements are for American manufacturing industries, they do not by any means present the total requirements picture. Industrial safety equipment is purchased in considerable quantities by the army, navy, Maritime Commission and other war agencies. Naturally, I cannot state these military requirements, but you can readily understand their impact on the supply of safety equipment. Military requests often upset normal industry schedules and create shortages. This will explain, in part, why sometimes it is extremely difficult for you to get even fair delivery on some items.

For example, for some months prior to the invasion of North Africa, the army drained the supply of industrial respirators. Chemical Warfare Service personnel got in touch with all known manufacturers of in-

dustrial respirators and placed orders with the highest possible ratings. It was, of course, necessary and desirable that the army should have first call on these respirators. Yet, you can readily see that it was impossible for us, under the circumstances, to advise you, the consumer of respirators who clamored for delivery, the reason for the temporary shortage. Another example is the shortage of industrial goggles which has been plaguing everyone concerned with industrial eye protection. One of the principal reasons for this shortage is the fact that the Army and Navy have exerted a heavy demand on goggle production facilities because

of their urgent need for aviation goggles, tank goggles, ski goggles, eye shields and sun glasses.

The safety equipment industry has kept pace with the industrial safety movement. Extraordinary attention has been focused on the so-called personal factor in accident prevention programs; not enough on *Safety equipment*. Safety engineers, supervisors, foremen, management, labor and others concerned with the industrial safety problem will undoubtedly agree that to the three "E's" of safety—Engineering, Education and Enforcement—should be added the all-important "E," *Equipment*.

Rationing of Shoes and Other Safety Equipment

By WM. A. MOLSTER

Rationing Executive, Office of Price Administration, Washington, D. C.

When shoe rationing went into effect it was considered of utmost importance to properly control and distribute safety shoes to make certain that people who needed them would be able to buy them. It was necessary for us to find some equitable half-way ground between a loose rationing system which would not properly protect the supply of safety shoes and a tight rationing system which would bring about unnecessary inconvenience to the wearers of safety shoes.

Cooperation in Setting up System

The Army Safety Council, the American Association of Railroads, the National Safety Council, and many others, including innumerable safety engineers, were called into conference. As a result, we issued the amendment to our order which permitted workers to get safety shoe stamps without surrendering all the stamps in their family. In other words, we found that the greatest single objection which we could recognize was the one that workers should surrender their family stamps for safety shoes.

This action did not end our investigation into the matter, and further inquiry proved to us that a great deal of time could be lost due to the fact that the workers had to go to local boards, or had to arrange

for someone else to go to local boards for them. Accordingly, we amended the order to permit the various plants to issue stamps for safety shoes upon proper application by the workers.

Responsibility of Safety Men

This action on our part is very important to safety people: we have given to you a tremendous amount of responsibility. We feel that this responsibility has been delegated under proper and adequate controls. This responsibility carries with it a challenge to see that the objectives of rationing are accomplished. Every abuse of the privilege will result in the loss of a pair of safety shoes, for the replacement of which material and manpower are not available.

When this privilege is accepted by plants, an administrative responsibility is accepted to see that neither of two very bad effects results: (1) that workers are not required to purchase shoes from any specific source or outlet. (2) that workers will not spend stamps issued for safety shoes for some other type shoes. This is very difficult to control, but, we need every bit of educational work on your part to show workers that the stamps issued must be used by them for safety shoes.

Women's Safety Shoes

The next step taken by the rationing authorities was to include plastic and fibre toed shoes made for women in our definition of safety shoes. This step was taken because at that time there were no steel cap shoes available. We could not put ourselves and you in the position of saying to women that they had to have safety shoes in the face of the fact that none were available. The sensible thing for us to do was to make it possible for women to acquire the best shoes available in the most expedient manner possible.

A great many complaints were received that workers were getting the idea that because they filled out an application and were issued a pair of safety shoes without ever actually handling the stamp, they thought it was not necessary to spend a stamp for safety shoes. In other words, the plants made the mistake of not carrying out the full intent of the order, so the workers were under a misapprehension as to the necessity for using a stamp to purchase safety shoes. This brought about the amendment which makes it mandatory that safety shoes are not sold by the same person or in the same locality that the stamp is issued.

Critical Materials Necessary

Safety Shoes require the most critical of shoe making material. Good quality upper leathers, good quality soling materials and critical steel are required. The critical nature of these materials is far more acute today than when rationing was announced. You have probably heard that reclaimed and synthetic rubber for man-

ufacturing shoe soles has become available to the extent that the supply of this basic material seems adequate. This does not mean, however, that the supply of rubber soles is adequate. There are important elements of manpower and mold equipment to be resolved before reclaimed and synthetic rubber can be developed into shoe bottoms.

Many industrial plants working on war contracts are authorized to issue priorities for safety shoes. These priorities cannot be extended by the shoe manufacturer and do not result in increased production of safety shoes. They merely have a tendency to divert safety shoes being produced to the buyer with the highest priority. During recent months many things have happened to reduce the shoe manufacturers' production of all types of shoes, especially safety shoes. The availability of hides has decreased. The need for leathers for purposes other than shoes has increased. The manpower for producing shoe materials, as well as for shoe making, is more critical today than at any time since Pearl Harbor.

Cooperation Necessary

Our interest and yours are the same, we are partners. We call on you for your full cooperation in doing everything in your power to see that the provisions of rationing are properly applied to the extent that the people who need safety shoes will have them and the people who do not need safety shoes will not be permitted to wear them; and that the total shoe supply will not be reduced through the mis-use of rations issued through your plants.

How to Conserve Existing Safety Equipment

CLINTON W. DREYER

Assistant Safety Director, Moor Dry Dock Co., Oakland, California

Injury resulting from a lack of use of personal protective equipment on the part of the employee is one of the greatest single problems a safety director has to solve.

Our war production program has increased this problem in two ways—an expansion of industrial personnel and a lack of critical materials on the part of the manufacturers to meet the increased demands. Many of our industrial personnel today are untrained and unfamiliar with the mechanical aids designed to assist them in their problem of self-preservation.

The safety director must see that all employees are instructed and supervised on the proper use and wearing of equipment. He must also help the manufacturer by conserving all equipment possible, thus lessening the demands on the source of supply.

Methods of Conserving Equipment

An abundance of good material has been written about the conservation of personal protective equipment and on proper cleaning and sterilizing methods. A bibliography, prepared for presentation with this paper and available upon request to the library of the National Safety Council lists many of the sources of obtaining this prepared data. It is my chief purpose to describe the actual process and mechanics of setting up a conservation program rather than reiterate some of the techniques which have been time-tested, proven, and are in use daily in many industries throughout the nation.

There are many ways of conserving equipment:

1. Proper selection.
2. Centralized control of issuance for occupational use.
3. Adequate maintenance and sterilization.
4. Adequate inventory or replacement parts and new supplies systematically stored.

5. The training of the supervisor and the wearer in proper use and care.

Part of Safety Director

Among the first steps a safety director should consider are:

- a. First, determine the amount of personal equipment now on hand, if any.
- b. Second, he should make an occupational or job analysis to determine what type of equipment is necessary.

In making his job analysis, he should consult the records of the company's first aid station or hospital. An analysis of these records will indicate the type of injury occurring, the craft involved, and the location or place of occurrence. Contacting the crafts involved in the field and learning their particular hazards will enable him to know the approved types to purchase.

He should contact the craft supervisor or the department head concerned and explain exactly what he is doing and enlist his cooperation. It should be kept in mind to limit the different types of equipment necessary to do the job to as few standard styles as possible. The purchasing department must be equally convinced.

In ordering equipment, be sure to conform with standards adopted by approved testing agencies, such as U. S. Bureau of Mines, U. S. Bureau of Standards, Underwriters Laboratories, National Board of Fire Underwriters, American Standards Association, etc.

Type of Control

It would be well, at this point, to discuss the organization of the distribution and maintenance agency as to centralized or de-centralized control. Naturally, the type of control will depend upon the size of the organization. I am going to think of control in terms of a typical expanded war production plant of several thousand employees, rather than a peace-time plant operating at a normal capacity.

Many concerns issue equipment through the supervision of the warehouse. This is good, because warehouses usually keep excellent inventory records and have standard forms for the issuance of all material. Warehouse control normally, is not planned to include service features such as fitting goggles, respirators, hats, and necessary maintenance and sterilization. The maintenance and sterilization is usually farmed out to some other department; perhaps the tool room.

In other plants, it may be the tool room that issues the personal protective equipment. This is a typical example of de-centralized control. The faults of de-centralization include:

- (a) Need of executive inventory.
- (b) Lack of a planned issuance procedure.
- (c) Lack of standard maintenance procedure.
- (d) Duplication of sterilization equipment.

The old system of passing out goggles, respirators, hats, etc. over a counter, like any other tool, should be eliminated. Goggles should be fitted for wearing comfort and sustained use, the same as a pair of shoes.

Specially trained personnel is essential in either centralized or de-centralized control. The conservation of personal protective equipment should be through a separate centralized section of the tool room, preferably located in that part of the plant having the highest concentration of personnel. Goggles carts can be used to supplement the fitting and maintenance program throughout the plant, if desirable. From our own experience, we have found qualified personnel in the tool rooms because they are trained in the techniques of the maintenance and repair of equipment.

The program should be supervised by a person responsible only to the head of the tool room. We have a registered optometrist in charge of that phase of our program. He has been able to train specialized personnel in the correct fitting of industrial goggles. This includes, in ad-

dition, the adjustment and alignment of personal prescription glasses, which improves visual efficiency on the job. This man was selected on the basis of his background, safety engineering, optometry, and optician training qualifying him to effectively repair broken industrial goggles, hats, respirators, etc.

We have been able to salvage better than 90% of all broken equipment, which means our equipment is available for use; and we can operate on a low inventory with adequate protection. The result has been excellent coordination between the tool room and safety department.

Indirect Control by Safety Department

I am of the opinion that the safety department should exercise indirect control in the following manner:

- a. Order or approve the purchase orders for all personal protective equipment.
- b. Determine the policy of distribution and issuance on a basis of the injury experience and job analysis.
- c. See that management and employees are educated in the proper use of and enforcement of the personal protective equipment program.

A job analysis should be prepared to outline the duties of the personnel participating in the program of the conservation of personal protective equipment. After determining the central location of this division of the tool room (a suggested name might be safety dispensary), it should contain some of the following features:

- a. Large enough to allow for an efficient layout to include all necessary operations and inventory of equipment.
- b. Should be painted white and have incorporated in it all the features of cleanliness of a hospital.
- c. The personnel of the safety dispensary should be clothed in white medical smocks.
- d. The appearance of the personnel should denote cleanliness and personal tidiness.

Distribution Duties

The distribution duties of the safety dispensary should be as follows:

1. Includes the administration of rules formulated by management, assisting in operation of effective labor relations.
2. Includes the careful fitting and adjustment of personal protective equipment to the individual, instructions as to proper care for most effective protection and, in the case of respirators, making the time limit for use thoroughly understood.
3. Includes issuance of new and reconditioned equipment, the re-issuance, after repair, of items broken or inefficient because of wear or damage in normal use in the plant.
4. Includes accurate records of equipment in use in the plant, adjustment of records for changes of craft and/or occupation.
5. Includes clearance of charges for equipment, acceptance of transfers and changes in classification.
6. Portable distribution for saving of production time on items requiring frequent replacement and re-adjustment — respirators, cover lenses, cleansing program.

The maintenance program shall consist of the following duties:

1. Reconditioning—that group of operations necessary to effectively prepare protective equipment for distribution; and includes cleaning, sterilization, and aligning.
2. Repair—includes such operations as soldering, replacement of broken integral parts, renewal of badly worn parts, etc.
3. Inspection and assembly of essential parts, packaging, and labeling for distribution.

Layout of Dispensary

The layout of a safety dispensary should incorporate provisions for its two main purposes: one is to provide facilities to fit equipment; the other to provide adequate facilities for the program of maintenance and sterilization in order to obtain

a maximum of efficiency and production with a minimum staff. We tried to group our facilities into four distinct areas of operations; they are issuance and records, stock room, recondition and repair, and cleaning and sterilization. In this arrangement, confusion is eliminated. Every employee has his area to work in, requiring specific operations to be performed that do not duplicate or overlap, rather, everything flows in an orderly procedure.

Optical suppliers or opticians should be consulted for techniques in the use of tools in the mechanics of fitting goggles.

The mass fitting of goggles, hats, respirators, etc. can be properly fitted over a counter not more than 40" high or 20" wide. The counter should also provide bins for the systematic storing of goggles and respirators for immediate and convenient issuance. The issuance of equipment involves certain records and forms. Before any equipment is issued, the employee should have a requisition from his supervisor.

Inventory Records

Issuance record forms can be designed to incorporate, in a glance, the complete list and history of equipment issued to any one employee. The issuance records should be cross indexed by either the social security number, hire number or badge number. The badge number is usually subject to change and, therefore, is less reliable; however, in many firms it is a key to his craft designation.

Tool tag charges for each piece of equipment issued requires accurate filing, which involves additional time and does not give a complete record of the equipment charged out by any one individual. Unless all tool tag charges are contained in an envelope or on a peg for the individual, they are easily lost or misfiled. In addition, in a de-centralized tool crib issuance, there are delays in clearing the tool tag charges through a central record control. The record case should be located as close to the counter as is practicable, so all that is necessary is to turn around and refer to the proper record drawer. Records filed alphabetically on the large 5" x 8" cards have been found to consume a minimum of time for reference.

Personal protective equipment is for the individual; and the staff is being instructed in the best methods of fitting the items to the individual. Such careful fitting definitely assures better care but makes the distinction between the dispensary and the tool rooms even more apparent. Items cannot be of universal size or application for the varied occupational needs in the building and repair of ships. Many items have flexible or adjustable parts which, with careful fitting, will be acceptable within a given occupation or craft.

The ability to improvise and make quick repairs is also part of the training of the staff. Loss or damage of such personal items are charged against the person. Our record forms are planned as an open contract to buy or pay for any loss or damage on termination.

The stock room handles the inventory of all supplies. Inventory records are kept on a card filing system. A separate card is kept of every item carried in the safety dispensary, including necessary repair parts. As supplies are needed, they are charged off the inventory records and placed in the supply cabinets near the work benches. In the event a large shipment of supplies comes in at one time, the excess inventory is stored in the main warehouse until needed.

Cleaning & Sterilization

The next area we shall examine is where the cleaning and sterilization takes place at the back of the room. Equipment returned by employees is segregated by types and placed in the cabinets or bins to be sorted later. A table is provided to sort and break down equipment into two groups:

1. Equipment requiring only cleaning and sterilizing.
2. Equipment requiring re-condition or repair.

I have appended bibliographies and references on obtainable data of sterilization methods. A sink is located at the far end of the room with long drain boards on each side and three basins, 18" long by 18" wide by 18" deep. The basins were made this size to accommodate hats. A two and

one half gallon hot water heater is able to furnish all necessary hot water.

The first basin contains a warm soap and water solution for the scrubbing with a stiff hand brush of all equipment made of rubber, rubber composition, metal, plastic, textile, leather, or fiber. The equipment is then rinsed in warm water provided in the center basin; after being rinsed, it is placed in a dryer and sterilizer. The dryer is equipped with a blower and heating unit that supplies warm air at a maximum temperature of 90° or less. A germicidal tube provides light ray sterilization. The dryer has drawers that pull out, permitting ready access. After the equipment is dried and sterilized, that group requiring only cleaning and sterilizing is inspected and packaged, with instructions, in cellophane bags for re-issuance; the other group, requiring re-conditioning or repair, is taken to the repair area.

Maintenance of Safety Hats

Hat maintenance to be effective must be planned in terms of:

1. Inventory in excess of immediate needs, quantity and sizes.
2. Number of plant personnel and their stability.
3. Decals to designate craft and rank.
4. Cleansing and drying facilities.
5. Re-paint and re-assembly plan.

To clean and sterilize hats, they should be washed in a strong suds solution containing naphtha having a low concentration of alkaline powder. This operation is done in hot water, using a fiber bristle brush for hat bands and a cloth for the exterior. Craft marking should be soluble in this solution and easily removed. The proper brush will facilitate removing all hair, oil, and dirt.

The hat is rinsed thoroughly then air dried in a controlled environment. Should the base paint still be adequate, the exterior of the crown is given a thin coat of marine spar varnish before the hat is placed in the dryer. After drying, it is carefully inspected and the band is given a treatment of alcohol to remove any

traces of varnish and excess oil that may not have been removed. Should the crown show that most of the base paint is worn off, all the paint is removed in a strong alkaline solution in very hot water, rinsed, air dried, and given at least two coats of base color and a coat of spar varnish. The lining, which has previously been removed, is laundered separately.

The cleansing program above is satisfactory for leatherette linings; but leather linings need special treatment with saddle soap. Care must be taken to plan all operations so that the hat will not be in the water for too long a period (not over ten minutes). Drying space should be planned to allow one and one half cubic feet for each hat. We clean an average of forty hats in a group, renewing solutions at least twice during the operation.

All equipment to be repaired is first washed, sterilized, and dried. After it has been repaired, it is taken back to the sink, re-sterilized, dried, inspected, and packaged for issuance.

The following points must be considered to effect a maintenance program that will conserve equipment and keep stock inventory to a minimum. It is essential to recognize that certain parts can be expected to break during normal usage. A quantity of goggles, hats, and respirators are kept on inventory for replacement purposes while repairs are being made. It is, therefore, important that a proportionate stock of repair parts and jigs to repair such broken equipment is maintained.

It is important, in order to maintain the fit, for goggles to be periodically re-adjusted. This re-adjustment should be at the direction and approval of the supervisor. It will serve to check the individual's attitude toward goggles and his participation in the cleaning of his own goggles. The carelessness of the employee in handling his goggles will be evident; slag and pits on the inside of the lens indicate either an unsatisfactory fit and/or wearing them under duress. It is unwise to be too frugal with replacement goggle lens. Pits caused by slag burns, grinding operations, and blows will change the stress pattern and nullify the protection qualities of the lens.

An electric soldering machine, using silver solder, is used to solder broken frames and detached pad arms. It is also effective on metal respirator parts.

To facilitate the sterilizing and cleaning program, respirators must be in use for only certain periods of time, governed by the concentration of dangerous agents in the working environment; therefore, there should be a regular replacement and re-conditioning schedule. It is the normal policy to issue a face cloth to absorb skin oils which may deteriorate rubber. It is also evidence of cleanliness; and it provides for a better seal between the respirator and face.

It is essential to have a special program for air line respiratory equipment:

- (a) Special re-conditioning program depending on the kind of equipment.
- (b) There should be a thorough understanding of the quality of protection possible and adequate instruction of supervisors and employees as to how to best use this equipment to secure the maximum amount of protection.

The following is a list of tools necessary to effect proper repair:

1. Assorted screw drivers of different sizes.
2. A small punch and rivet set.
3. Several pairs of end cutting and side cutting pliers.
4. Snipe nose pliers.
5. Padded pliers.
6. Sheet metal snips.
7. Goodall electric soldering machine and 18 gauge soldering wire.
8. Harris staking tool.
9. Two bin vises or tab holders.
10. Taps for screws as per manufacturers specifications.
11. Handy high speed power tool with assorted attachments.
12. Assorted flat, half round, and rat-tailed files.
13. Optical hammer and assorted small chisels.
14. Refer to any good Optical Suppliers Catalogue of tools and equipment.

15. English bristle bone handle brushes for scrubbing.

Racks to hold lenses and small compartment boxes to contain screws and other small parts should be provided. Also, a rack for the holding of tools for quick access for fitting should be provided. Work benches properly constructed, with adequate tools and close proximity of supply cabinets, can allow one person to repair many items of safety equipment per shift.

An industrial program must be designed to reach all employees, from top to bottom. Safety directors recognize the importance of safety minded supervision in the plant program. Therefore, the educational program should be planned to impress all employees, irrespective of rank, of the hazards and safe practices of his job.

Educating a new, inexperienced employee cannot be accomplished by one injection in an orientation program; knowledge must be acquired over a given period of time and checks made, to be sure that the desired safe practice is thoroughly

understood. Training should be visual, auditory and illustrated by examples. Rules must be established and agreed upon by craft operation leaders and it is well to remember that *example is always better than precept*. Educational methods can be accomplished through lectures: by the safety director; by his staff members or others; in the trainee program; in J.I.T.-J.M.T.-J.R.T. classes at the orientation program; in safety committee meetings; and at other special events.

Some visual methods are:

- Safety films.
- Bulletin poster boards.
- Equipment displays.
- Drop-ball test of lenses, hard hats, and safety shoes.
- Photometric tests of filter lenses.
- Instructions issued with safety equipment.

If the safety director will capitalize on every opportunity in getting over every possible educational method, he cannot help but put over his program.

Wartime Fire Protection

WEDNESDAY MORNING SESSION

October 6, 1943

Presiding—James J. Duggan, Dir., Process Dept., Carbide & Carbon Chemicals Corp., South Charleston, W. Va.

Special War Time Fire Protection Problems

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The subject assigned to me is a problem in itself, a problem of selecting from among the hundreds of possibilities those items which are deserving of special attention. This paper will, therefore, be confined to the waterfront, to ships, and shipping facilities. The material in it is gleaned from activities of the Coast Guard in its work of safeguarding ports, waterfront facilities, and vessels in harbors.

It is a platitude that all war materials for the global war we are waging must be directed through our sea ports. These ports have been labelled the funnels into which the products of our war industries are poured, the bottlenecks of our supply lines, or the approaches to the bridge of ships.

Handling of Hazardous Products

For peacetime operations, our port facilities were probably reasonably adequate. In time of war, they are being strained to the utmost. Some additional facilities have been built but, for the most part, we have had to rely on commercial facilities already existing; and the fact is well known that the average pier or wharf leaves much to be desired in the way of resistance to fire. Not only have the quantities and values of cargoes handled immeasurably increased, but the hazards involved have likewise increased. Hazardous products: explosives, oxidizing materials, incendiary compounds, which may have been of only academic interest to fire protection engineers, now assume very im-

portant status. The speed with which vessels must be loaded is also a factor of no small importance.

It is necessary to have rules and regulations for the safe handling and stowage of explosives, ammunition, and other dangerous articles. Such rules have been formulated by experts who have spent years in this work. But the mere existence of laws and of rules of good practice is not enough. There is always the temptation to take short cuts with a mistaken motive of saving time; and to indulge in unsafe practices in the belief that the careful handling stipulated by the regulations is not necessary.

In attacking the fire protection problem, the Coast Guard endeavors to fortify itself by keeping closely informed on conditions in the field, as an army depends on its intelligence and reconnaissance units. A complete record of all waterfront fires is kept, originating from weekly reports by the captains of the ports. Some of the facts brought out by this record are worth mentioning.

Two Common Causes of Waterfront Fires

As might be anticipated, the two most common causes of fire on the waterfront are smokers' carelessness and welding or cutting operations. Smoking is now prohibited on piers and wharves, except in specially designated locations and considerable effort has been made to control this hazard. Surreptitious smoking in

hazardous occupancies and locations has always been difficult to control; but all agencies concerned with safety of the waterfront are now cooperating closely toward that end. Credit for constructive effort is due local law enforcement authorities, labor organizations, and employers for their whole-hearted cooperation with the military in this respect.

With the increased use of gas welding and cutting as a means of fabricating steel products, fires from this source are quite common. Every spark or slug of molten metal is, obviously, a potential source of ignition, a source which cannot be eliminated without discontinuing this entire process of fabrication. The remedy lies in removing combustible materials from the vicinity, so far as possible, and in providing fire watches to extinguish such incipient fires as still occur. Both these methods are used. Clearly, it is impossible to remove or insulate all combustible materials and ignition cannot be entirely prevented. A fire watch is, therefore, stationed in the vicinity of each welding or cutting operation, provided with a pump can, extinguisher or other suitable fire-fighting equipment. So far, we are glad to say the record has been good and most fires are caught very quickly.

Welding on Board Ship

The problem assumes its most difficult character on board ship. The steel bulkheads and decks of a vessel readily transmit heat of the torch to any materials in contact with them. With hot work operations going on in one corner of a compartment, it might be necessary to watch seven other compartments. Even with no cargo on board, ship's stores, sheathing, insulation, electrical equipment, oil fuel and the like provide possibilities for a destructive fire. Thick paint coatings also cannot be ignored. Such a simple product as a kapok life preserver was a contributory cause to one of the heaviest marine losses in history. Incidentally, this same kapok life preserver is not being neglected, but every effort is being made to develop a treatment that will eliminate its highly flammable characteristics.

Welding operations on a ship under construction containing a minimum of combustible material are a simple problem. At the other end of the scale, is the ship fully loaded, practically ready to sail, but with a deck cargo that must be fastened in place. The problem of protecting against fires, due to welding of cleats or padeyes to the deck for the purpose of lashing down this cargo, is a serious one. There is no one solution to the difficulty, and such steps must be taken as the circumstances require. If space below deck is available for a man to crawl into, tarpaulin or asbestos blankets are placed above the cargo underneath the spot where the welding is to take place. If this is not possible, cleats may be fastened to the side of the ship.

Damaged ships sometimes offer totally unexpected fire hazards. In one case, a ship that had run aground on a rocky bottom was brought into drydock for repairs to the hull. Unknown to the repair company, the fuel oil tanks had been punctured but the oil was held in the tanks by water pressure from the outside. The vessel had been shored up in the drydock and pumping out of the dock had started; as the water level receded, the oil tanks suddenly disgorged their contents over the surface of the water. It requires no imagination to realize the danger to the repair crew already on board, surrounded by a flood of oil. Prompt action was necessary; pumping was stopped, all hot work and smoking forbidden and other precautions taken to eliminate sources of ignition, until the spilled oil could be skimmed off and the remaining oil drawn out of the tanks through the regular pumping equipment.

Transportation of Gasoline and Oil

Normally, large scale transportation of gasoline by water is accomplished in bulk by tankers especially designed and built for the purpose, with all the safeguards that the fire prevention engineer can devise. The needs of troops in outlying bases and in the field have necessitated a decided change in this method of handling inflammable liquids. Gasoline must be furnished in drums or in five gallon cans or even in smaller containers accord-

ing to the demands of the field units. They are shipped on ordinary cargo vessels without the compartmentation, fire extinguishing equipment, explosion proof electrical equipment, and other appurtenances of the regular tankers.

To complicate the problem still further, the drums and cans employed are usually single trip containers with thin shells, quickly susceptible to corrosion effects and not capable of resisting rough handling. They cannot be piled or stowed in deep tiers or the containers will burst under excessive weight. When this occurs or leakage takes place for any reason, we have gasoline vapors seeping through the hold of the ship, not only while it is being loaded but, more especially, when it is being unloaded; perhaps under very adverse conditions. This means extreme precaution in ventilation and the elimination of sources of flame or spark.

The hazard of gasoline in light weight containers is not confined to the ship. We have storages, along the waterfront, of thousands of drums awaiting shipment; there is also a great deal of gasoline cargo handled by barge on our rivers and harbors. This entire subject of safe handling of gasoline and other low flash petroleum products in drums and cans has been given a great deal of study. Storage patterns have been worked out which make possible the rapid detection of leaks, unravelling of piles, and the control of incipient fires.

Fire Boats Provided

One of the major deficiencies in the municipal fire protection of coastal cities has been the lack of fireboats which could attack a pier or wharf fire from the water-side. Such boats are expensive to build and costly to man and maintain and, as a result, in the early part of 1942 there were not over fifty municipal fireboats in service throughout the country.

The Coast Guard has remedied this deficiency to a large extent. Our present fireboat fleet includes approximately two hundred and fifty vessels allocated to the various ports and on duty day and night, fully manned and well equipped. Distribution has been such that one fireboat has been provided for approximately

each mile of closely built waterfront area in ports of vital importance to war shipping; which, theoretically, places a fireboat within one half mile of most of these facilities.

A word about these fireboats, they are of two general types. One type consists of a steel hull boat, especially built for the purpose, containing four pumping units of five hundred gallons per minute each. The other boats are of the converted type. As the name implies, vessels of suitable kinds including tugs, trawlers, fishing boats, and others that could be adapted to the service, were purchased and rebuilt to the extent necessary.

From four to eight five-hundred-gallon standardized gasoline driven pumping units were mounted on the deck, pump discharges manifolded together to supply monitor nozzles, and the boat otherwise outfitted for fire duty. In some parts of the country, the supply of boats suitable for conversion was found to be limited and, on the West Coast, we found it necessary to employ barges to some extent. These are of standard design, 50' or 60' long by about 20' beam, powered by two marine tractors and equipped with eight of the five hundred gallon pumping units.

Pumping Capacity and Equipment

Coast Guard fireboats have a total pumping capacity of 2,000 to 4,000 gallons per minute each. They carry a suitable amount of hose and a good complement of fire-fighting appliances. Each fireboat and fire barge carries on board foam equipment of the liquid type, foam producing nozzles and sufficient foam compound to produce about 1,500 cubic feet of foam.

Fog nozzles, cellar pipes, distributing nozzles, oxygen breathing apparatus and other necessary equipment is also furnished. For some of the ports which have large marine terminals, additional equipment in the form of dry foam powder generators is provided, intended to be used with such supplies of foam powder as are available locally.

In addition to its fireboats, the Coast Guard has purchased and allocated more than two hundred trailer pumpers to cap-

tain of the port duty. These are two-wheeled units of 500 gallons per minute capacity, carrying 500 feet of $2\frac{1}{2}$ inch hose and a limited amount of fire-fighting appliances. Trucks or jeeps are made available for towing them and the trucks usually carry extra equipment.

In all this work, the Coast Guard considers itself an auxiliary force, supplementing the established fire department of the municipality. It is the Captain of the Port's endeavor to operate his equipment and to dispose his forces in full cooperation with the local fire chief, who has the underlying responsibility for extinguishment of fires within the city.

Inspection of Construction

Fire fighting is, however, only one phase of Coast Guard port security activity; one that is essential, it is true, but not the endeavor that receives closest attention. The type of construction and the lack of fire resistant qualities in the average pier or dock structure is well recognized by all fire protection authorities. We realize that fires can occur in some of these immense concentrations of wooden docks and buildings which cannot be controlled by any amount of equipment and men.

For these reasons, the Coast Guard is emphasizing fire prevention to the utmost. In each Captain of the Port organization there are men, trained in this type of work, who make periodic inspections of all waterfront facilities searching for fire hazards, checking the condition of fire extinguishing appliances, and enforcing rules of good practice in handling and stowage of cargo.

These inspections are made with sufficient frequency to provide good control over operating conditions. Unsatisfactory conditions are followed up promptly by the Captain of the Port. To provide legal backing for his efforts, complete regulations for the security of vessels in port have been issued and now have the force of federal law, while a parallel set of regulations, governing the security and protection of piers and wharves, is in the making.

In all the ports, there are bad structural conditions which never should have

been permitted in the original design and construction. We cannot insist on the rebuilding of piers and wharves; but every opportunity is taken to urge upon the owners such improvements and modifications as they can accomplish.

Training of Personnel

No program of this kind, national or local, can be successful without a properly trained personnel. Although the Coast Guard has enrolled in its ranks a great many men with years of experience in fire fighting, fire prevention, or police work, nevertheless, many of them were specialists in a very narrow field. While making the best use of their past experience and training, it was still found necessary to instruct them in the broader aspects of port security work.

A training station has been set up at Ft. McHenry, Baltimore, for this purpose; the instruction staff consisting of officers who are experts in their particular field. The full course of training is of six weeks' duration, during which time the trainees are given instruction in such subjects as the legal aspects of port security work, powers of the Captain of the Port, fire prevention, fire fighting, anti-sabotage measures, guarding, vessel security, ship construction, making of investigations, and handling of explosives. All methods of instruction are used: lectures, demonstrations, reference material, motion pictures and actual participation in the operations being taught.

Fire fighting training has assumed a very prominent part in the instruction program. The station is equipped with a fire-test building, simulating the hold of a ship, in which fires are built and extinguished by the trainees, using the equipment with which they are provided in the field. A 15-foot oil tank is provided for practice in extinguishment of oil fires; and a small pier, for practice in evolutions employed in attacking pier and wharf fires. Emphasis is placed on the extinguishment of vessel fires and the results obtained, with appliances and methods now used, is decidedly encouraging.

Based on experimentation carried on in the fire-test building—experiments which

are on more than a laboratory scale—a fire in the boiler room of a vessel is not quite the problem it is ordinarily considered to be. By introducing fog nozzles into the burning space through ventilators or other deck openings, it is quite possible to cool down the interior of the

boiler room to the point where fire crews can safely enter and complete the extinguishment. Not only are port security men given instruction at Ft. McHenry but the same fire-fighting training, so far as time permits, is given to the damage control crews of Coast Guard cutters.

Organizing and Training the Plant Fire Protection Crew

RICHARD E. VERNOR

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Nobody can win a war from a succession of smoldering ash heaps. With all that has been written, said, and done about fire safety, we may as well face the shocking fact that fire losses have substantially increased in 1943 over 1942, and now constitute a back-lash of over one million dollars a day on our war effort. That is the equivalent of burning one ten thousand dollar house every fifteen minutes.

While many industries have done a remarkable job in protecting themselves against fire, the shameful record of this year indicates the woeful lack of understanding and action necessary to fire prevention and control on the part of many others.

Fundamental Principles

Sometimes I think we unnecessarily complicate our approach to plant protection by starting out with all of the detailed ramifications of the problem in very large industries. In order to get at the fundamentals involved, suppose we first take a look at a very simple problem of fire safety; for the fundamentals found there will apply anywhere.

Suppose, for example, that I own and operate a small shop and I have no help. Nobody else has any responsibility. If I expect to have a safely operated shop, the first requisite is an understanding and an appreciation of the menace of fire and what I must do to make reasonably certain that my shop can continue to produce its product. Without that understanding, the fire safety of my plant will be pretty unpredictable.

If I had good sense, I would appreciate the flammability of my building and its contents, as well as fire hazards of the place. I would be constantly fire-conscious and would frequently inspect the premises to see that no unnecessary hazards existed. I would be alert for possible trouble and be prepared to cope with it through proper extinguishing devices, which I would learn how to use effectively. If I could afford it, I would provide automatic protection. I would certainly know how to summon what municipal or outside aid was available, and I would make sure that I had more than one means of escape if that became necessary.

You will note that I said I would do these things, provided that I had an understanding and an appreciation of the fire problem and remained aloof from the attitude that nothing could happen to my shop.

If my business prospered and I finally hired someone to help me, I would feel that the only safe thing for me to do would be to try to create the same understanding and preparedness upon the part of my helper. I would be similarly concerned if my plant grew to number hundreds or thousands of employees, none of whom would cherish the idea of reporting for work and discovering only a great pile of ashes where the plant had been but a few hours before.

I could scarcely expect these employees of mine to take a really vital interest in fire safety unless I gave them the proper leadership; all of which brings me to the statement that a fool-proof fire safety pro-

gram must begin with our commitment; and, no matter how large the plant, the fundamentals of the program are those I prescribed for my one-room shop.

Variables in Organization and Training

It would be quite hopeless, here, to outline the organization and training procedure for a plant fire protection crew which would fit all cases; any more than a single dose of medicine could be prescribed for everything from house-maid's knee to the quaking ague. There are too many variables.

The crew itself is a variable. There may or may not be a special safety department. If there is one, the fire department may come under it or it may not. The protection may be organized by divisions of the plant or there may be a full time plant fire brigade, or both. The inspection work may be the responsibility of watchmen, guards, firemen, safety engineers, or others. The important thing is that each specific problem be carefully analyzed and then a crew organized and trained to cope with emergencies. This is fully as important in a small plant as in a large one. Many a small plant has been destroyed because of a philosophy that what was everybody's business was nobody's business.

Generally speaking, no industrial works, warehouse, department store, or office building is too small to arrange for a private fire brigade; or, at least, a system whereby a certain select group of employees may be rapidly assembled, at the time of a fire, to carry on fire fighting and rescue operations.

Organization Must Be Well Trained

The plant chief must not only train his brigade to hold a fire in check until the arrival of the public fire department; but he must have an organization so well trained that it will size up, attack, extinguish, overhaul the fire and carry out the necessary salvage operations without the necessity of help from outside forces under extreme wartime conditions.

Here I would like to inject two very practicable paragraphs from a recent publication of the War Department entitled, "Plant Protection for Manufacturers."

"The development of the plant fire fighting organization should start at the points of greatest fire hazards, the operating departments. Every operating department should have a fire squad trained in attacking and extinguishing fires which may start within its area. Beyond this, most plants need a well organized fire brigade composed of trained men from all departments who are fully familiar with the plant fire fighting equipment, and who are able to assemble quickly to take over from department fire squads any fire which threatens to go beyond their control.

The fire brigade will not be a success unless recognized by the management as a highly important department. The chief of the fire brigade should report and be responsible to an important executive in the plant organization. He should not be under the direction of the production superintendent or others to whom production necessities may suggest short cuts which sacrifice safety. The strength of the fire brigade, the amount of equipment, and the frequency of drills will depend upon the size of the plant and the nature of its hazards. In plants having fire pumps, the plant engineer or his chief assistant should be a member of the fire brigade. An electrician familiar with the power circuits should also be a member. It is desirable to include watchmen or maintenance employees on duty when the plant is not operating. Plants operating more than one shift should have a trained fire brigade for each shift."

The detailed organizational structure of a private fire brigade has long since been carefully studied, published, and amended; and is available from The National Board of Fire Underwriters. Its title is, "Suggestions of The National Board of Fire Underwriters for the Organization, Drilling and Equipment of Private Fire Brigades," as recommended by the National Fire Protection Association.

Opportunities For Training

No matter what kind of a fire protection crew setup you may have, training is essential. Training is frequently available for the mere asking. Most municipal fire departments now are not only capable

of doing so, but are anxious to assist in the basic training of industrial brigades. In most industrial areas, competent state training instructors can also be secured through various agencies. Contact should be made with your State Director of Trade and Industrial Education or your State Fire Marshal for further information.

Inspection of the plant by the officers of the municipal fire department should be invited, in order that they may familiarize themselves with the general construction of the buildings as well as occupancies, hazards, exits, special protective installations, and the yard arterial system.

The industrial chief should know the contingency of apparatus which normally responds to first alarms at the plant. This information has a very direct connection with his own plan of attack. In fighting a fire, just as in fighting an enemy on the battlefield, the knowledge of reserve power is a definite contributing factor to the plan of battle.

For a comprehensive picture of this training, I refer you to a recent publication of the National Fire Protection Association. It is called, "Industrial Fire Brigades Training Manual."

Other opportunities to learn training methods are presented in various state fire colleges, firemen's short courses, and such gatherings as the Annual Fire Department Instructors Conference at Memphis. A number of plant fire chiefs will always be found at these meetings.

You will note that some of the things I mentioned in my one-room shop problem have not been given further treatment in these remarks. I have not discussed specific fire hazards or specific protection devices. I have not touched on inspection procedures, apparatus or water supplies; neither have I dwelt upon exits, fire drills, alarm systems or education of employees, all of which and many others are vital parts of a plant protection system. There are already authoritative publications or other information available upon all of these things and there is little object in a re-hash of them before this audience. Anyhow the topic assigned to

me has to do with the protection crew itself.

The simple point that I want to emphasize is that every plant, today, should go the limit to prevent fire; that a plant should be organized, equipped, and trained to cope with fire should it break out; and that I recommend for your study 3 publications as helpful guides to the active implication of the organization. These are:

Private Fire Brigades—NBFU.

Plant Protection for Manufacturers—War Dept.

Industrial Fire Brigades Training Manual—NFPA.

Plant Protection Bibliography

Passive Protection for Industrial Plants O.C.D. Pamphlet 3031.

Plant Protection Fact Sheet O.C.D. Pamphlet 5214.

(Both of the above may be secured from your State Defense Council).

National Fire Protection Association

Crosby - Fiske - Forester Handbook of Fire Protection (9th Edition) \$4.50.

Industrial Fire Brigades—a Training Manual \$1.50.

Employee Organization for Fire Safety 25c.

National Board of Fire Underwriters

(Single copies will be sent on application for same to Mr. George Tatnall, Chief Engineer, 222 West Adams Street, Chicago, without charge).

N.B.F.U. Pamphlet No. 10—Installation, maintenance and use of First Aid Fire Appliances.

N.B.F.U. Pamphlet No. 11—Foam Extinguishing Systems.

N.B.F.U. Pamphlet No. 12—Standards for Carbon Dioxide Fire Extinguishing Systems and Inert Gas.

N.B.F.U. Pamphlet No. 13—Standards for Installation of Sprinkler Equipment.

N.B.F.U. Pamphlet No. 14—Standpipe and Hose Systems.

N.B.F.U. Pamphlet No. 15—Water Spray Nozzles and Extinguishing Systems.

N.B.F.U. Pamphlet No. 20—Standards for the Installation and Operation of Centrifugal Fire Pumps.

N.B.F.U. Pamphlet No. 22—Gravity and Pressure Tanks.

N.B.F.U. Pamphlet No. 23—Fire Department Hose Connections for Sprinkler and Standpipe Systems.

N.B.F.U. Pamphlet No. 24—Standards for Outside Protection.

N.B.F.U. Pamphlet No. 25—Standards for the Construction and Equipment of Hose Houses for Mill Yards.

N.B.F.U. Pamphlet No. 26—Standards for the Supervision and Care of Valves Controlling Water Supplies.

N.B.F.U. Pamphlet No. 27—Private Fire Brigades.

War Department

Pamphlet No. 32-1—Plant Protection for Manufacturers. (Prepared jointly by the Army and the Navy).

The Penalty of Neglect

JOHN PLANT

Chief Fire Prevention Engineer, Chicago Fire Department, Chicago, Ill.

When the record of disastrous fires causing thousands of lives to be lost and millions of dollars worth of irreplaceable property to be destroyed is known, one is justified in saying that the problem presented by fire has not been solved by modern man.

This is most surprising, when it is realized that all fires are preventable fires. Not a single fire has ever occurred that could not have been prevented, or at least controlled, before lives were lost or serious damage resulted. Many times, the only thing necessary to prevent a disastrous and costly fire is to know how to call the fire department promptly when the fire starts; not to wait 20 to 25 minutes until the fire has a good start and then, in desperation, call the fire department.

The Congressional investigation of the burning and capsizing of the magnificent ship "Normandie" shows that there was from 15 to 20 minutes delay, between the start of the fire and the calling of the fire department. There were 400 Navy officers and men on the ship when the fire started. There were 300 Coast Guard officers and men and 3,000 workmen, yet for more than 15 minutes, no one called the fire department. The record states that many other glaring and serious faults were on the ship. These faults

caused the fire, and other faults permitted the fire to get out of control. In fact, the record continues, there were so many absurd and ridiculous omissions with reference to fire that, if the results were not so tragic, all the settings for a perfect Hollywood comedy were present. Oh yes, we can out-produce any one of the nations of the world; but don't forget, we can and do destroy by fire more wealth than all the nations of the world combined.

Often, all that is necessary to stop this loss is to exercise common sense. Let me cite one instance of a disastrous fire in an airplane plant in this city.

A fire started on the roof of one of the large buildings. Not one of the many guards at this plant saw the fire. This failure was not their fault. These men were posted too close to the 50-foot-high brick wall of the building to observe the roof. Guards should have been stationed on the roof.

There was an adequate number of fire hydrants around the building but a wire fence, with barbed wire at the top, had been placed around the building and the fire hydrants were outside this barbed wire fence. This caused a serious delay in getting hose lines into the building and up on the roof.

Some eight large fire pumps were on the premises but only one pump was

working. The remaining pumps were not turned on. Very little water was available to fight the fire. This disastrous fire loss, just like most fires, resulted from a series of almost child-like errors.

Another large airplane engine manufacturing plant in Chicago suffered a disastrous fire loss because the size of openings and the threads on their water system did not fit the 2½-inch openings on the Chicago fire hose. This concern had been told, verbally and in writing, of this serious defect in their defense against fire, but because of their lack of knowledge of the potential destructiveness of fire, they failed to correct this. A loss of 10 million man-hours and \$250,000 was the penalty of neglect, in this instance.

One might go on analyzing all fires, but the result would be the same. The study would always show the cause of fire was some apparently insignificant factor, which could have been corrected with a minimum of expense and effort. So too, the fire could have been discovered while still a small fire; or it could have been controlled before disastrous loss of

life or property had occurred, if simple rules had been followed. Did you ever realize that 60 per cent of all fires are caused by accumulations of rubbish? How can all these fires be prevented? By not letting rubbish, papers, rags, old furniture, and kindling wood accumulate in attics, closets, on stairs, porches, roofs, in basements and in sheds. Remove and dispose of the rubbish and you will eliminate 60 per cent of all fires.

Everyone should prepare a plan of battle to include the common sense rules for the prevention of fire. It should include a program to follow in case fire occurs in the home, store or factory. When the enemy fire strikes, there is no time to plan action then. Fire gives no quarter, permits no delay and takes advantage of every hole in your defense.

Failure to have a well laid out plan of battle against fire means that you will act just as the men aboard the Normandie, when she began to burn from an easily preventable fire. Set up your defenses now!

WEDNESDAY AFTERNOON SESSION

October 6, 1943

Presiding—Judge Floyd E. Thompson, Chairman, Public Affairs Committee, The Chicago Association of Commerce, Chicago.

The War On Fire Loss

A Report of Progress

Address by

PERCY RUGBEE

General Manager, National Fire Protection Association, Boston, Mass.

It is an ill wind that does not blow some good. For many years that comparatively small band of people devoting time and attention to the reduction of loss of life and destruction of property by fire in the United States despaired of any fundamental change in the almost universal public indifference. America, perhaps because of its huge resources, has always been careless about conserving its resources. America has more tele-

phones and more automobiles per capita than any other nation, but America also has more accidents and more fires.

Individual Responsibility Not Felt

It has sometimes seemed to me that the American public generally maintains a "let George do it" attitude about fires. The idea seems to be to let the fire departments and the fire insurance companies take care of fires and fire losses.

Few people seem to realize that fire departments can not prevent fire losses nearly as effectively as the individual property owner, or that the fire insurance companies collect the money to pay fire losses from you and me and everyone concerned. A rather strange part of this public psychology towards fire is that many businessmen spend money and thought on the protection of their place of business against possible fire loss but neglect even the most elementary precautions against fire destruction of their own homes.

Perhaps our huge total of loss of life and property annually from fire destruction never made a serious dent on public consciousness because fires are scattered and the average person may encounter a serious fire involving himself, his family or his property only once or twice in a lifetime. Only the great fires such as the Fall River rubber fire in the fall of 1941 and the Normandie and Coconut Grove fires in 1942 seem to really reach the public attention. Such fires bring about specific reforms and improvements in the fields in which they occur. I think that the Coconut Grove night club fire, horrible and disastrous as it was, may in the long run serve to bring about a net saving of lives because of the wholesale clean-up of fire hazards in places of public assembly brought about because of that disaster.

The War as an Aid

All of this brings me back to my opening remark about the ill wind. The war is changing public psychology towards fire. In the first place, fire has been a principal weapon of war in this conflict. Widespread use of the incendiary bomb has given to the American public an object lesson in the destructiveness of fire that is unsurpassed. Millions of Americans are participating in various civilian defense activities, and the importance of fire prevention and control is well understood stressed by civilian defense authorities. The conservation program, while not designed with fire losses in mind, has nevertheless had a far reaching effect in removing fire hazardous material of every kind from not only our factories, but from the attics, cellars and closets of our homes.

Another factor is the practical one that a building destroyed by fire today cannot be replaced very easily, if at all. This makes people more careful and, in fact, what the underwriters call "moral hazards" is practically non-existent today. You have probably heard from the F.B.I. and others that there has been little or no sabotage, as yet, in this war. It is also true that there has been little or no arson in the war period.

A most heartening result of this present situation is the substantial decline in fire losses in dwellings. If we can hold this gain in the post-war era, it will be a lasting accomplishment for the welfare of the country in reduced human tragedy.

Broad Public Education is the Most Important Factor

Let me emphasize at this point the great value of the education of school children in at least the fundamentals of fire loss, fire prevention and fire protection. As in any other great movement for the public welfare, broad public education is the most important factor of all. The great majority of all fires are due to a relatively few, easily understood and elementary causes, such as, accumulation of flammable rubbish, careless smoking, dirty chimneys, poorly protected heating appliances, improperly installed electric wiring, careless handling of gasoline, use of wooden shingle roofs, etc. Knowledge of these things can and should be taught in the schools. I am glad to pay my respects to Chicago in this field, because Chicago has been a leader in fire prevention education among the school children, thanks to the progressive work of the Chicago Fire Department and of the Chicago school authorities.

There is another important gain in the war against fire destruction; that is in the farm and rural field. We are beginning to see substantial reductions in farm and rural fire losses for the first time, and great progress is being made in educating farmers and in organizing rural areas for fire protection.

Increase in Industrial Losses

There is a dark side to our present picture. Since the outbreak of war, there has been a steady and, in fact, alarming

increase in industrial losses, with serious effect upon our whole war production program. Much vital material has gone up in smoke. Many explanations have been made as to why this situation exists. Of course, in this period there has been a tremendous increase in the value of goods produced, production has been speeded up, untrained workers without safety and fire protection knowledge have been rapidly inducted into industry. The urge for speed and production has brought about the erection of buildings of huge area and of inferior construction and, in many cases, with lack of adequate fire protection facilities.

I think that most important of any of these factors, and perhaps the underlying reason for most of them, is the "take a chance" philosophy that war seems to engender. I have heard that theory expounded by important people that should know better. Their reasoning seems to be—"We are in a war; life and money is cheap; we must take a chance." I think you will all agree that that is a false philosophy. It is of little avail to spend untold energy and wealth in producing war supplies, if those supplies are destroyed by fire before they reach our armed forces. I have predicted before, and will predict again, that we have many situations in this country where a fire could destroy enough war goods to affect

the length of the war. Such a fire or fires can happen. They are overdue.

Organizations Should be Maintained

A very healthy development has been the great increase in the number of organized fire brigades in industrial plants throughout the country. The development will prove of permanent value after the war is over. Measures for fire safety taken in wartime are just as effective and valuable in peacetime.

Every plant, store, office building, hospital, theatre and the like should maintain an organization to protect the property against fire loss and to prevent panic and loss of life in case of an outbreak of fire. Over a long period of years, the control of fire waste has been brought to an exact science. The National Fire Protection Association, fire underwriters, fire departments and industrial fire protection men have developed accurate and sound information on almost every conceivable fire control problem. Ignorance is no longer a valid excuse for fire loss. Carelessness or indifference to simple measures of fire control bring bitter experience.

We have at the present time and in the post-war period, a golden opportunity to perform a true public service in saving life and property against one of its greatest menaces, fire destruction. Let us take full advantage of that opportunity.

What Makes a Safety Man?

THURSDAY MORNING SESSION

October 7, 1943

A Panel Discussion

Presiding: C. B. BOULET, Director of Personnel, Wisconsin Public Service Corporation, Milwaukee, Wisconsin.

We have a terrific question to answer this morning, "What makes a safety man?" You remember when we were children there was a story about what makes a little boy—"Rags and tags and old paper bags, that's what little boys are made of." And little girls were made of "sugar and spice and everything nice, that's what little girls are made out of." Somewhere between that, perhaps we can arrive at what makes a safety man.

On my left is C. A. Boughner, Director of Safety, Gary Sheet & Tin Mills, Carnegie-Illinois Steel Corp., Gary, Indiana. Next to him is Major Lawrence B. Tipton, AUS, War Safety Training Supervisor, U. S. Department of Labor, Division of Labor Standards, Washington, D. C.

At my right is A. Burton Metzger, Director, Health and Safety, Western Electric Co., Inc., Baltimore, Maryland. Next to Mr. Metzger is another gentleman who has been outstanding in the work of training safety engineers in the past few years, John I. Yellott, Chairman, Safety Training Committee, Illinois Institute of Technology, Chicago, Illinois. Over at the other end is David Kaye, Chief Safety Engineer, Kaiser Co., Inc., Richmond, California.

My name is Boulet. It is on the program so you will know how to spell it. Now I guess we are ready to go. The question we are trying to solve is, again, "What makes a safety engineer?" As one of my pals said in answer to the question of "What makes a safety engineer?", "A girl in a red dress."

Now, have you any question on what makes a safety engineer?

MEMBER: Define a safety engineer.

CHAIRMAN BOULET: In other words what is a safety engineer? Define what is his business. Who will try it?

MR. A. BURTON METZGER: I often hear people say that it is necessary to be a graduate engineer in order to rate the title of safety engineer. I don't agree with that in its entirety. I do feel that an engineering background is very, very desirable but I don't feel that it is essential.

I feel that a man should serve a certain apprenticeship, if we may call it that, of safety inspector or in safety work before he assumes the responsibility of a safety engineer. We have our war training courses offered by the government which are very complete. Those afford an opportunity for men to get a very good background in safety engineering and technical knowledge. Wherever acquired, it will help because the safety engineer must be able to speak the language of the production, planning and other engineers.

The definition of an engineer does not necessarily mean a technical, or a highly technical man. Briefly, it is that of a manager. I feel that these fundamentals are essential to a safety engineer. The safety engineer must first of all be sold on his own subject. He can't go up and battle his cause with the management unless he is definitely sincere. I feel that

a safety engineer should be able to present to management the cost of accidents, direct and indirect. He should know the statistics. He should know how they are compiled in order to answer any questions that might come from that.

Don't say, as I have heard so many people comment when they have heard of a good safety program in an organization, "That is all right with you folks for your management is sold." That is your job as a safety engineer to sell your management. Don't blame it on the management. Blame it on yourself. There isn't a management in this world that isn't only willing but anxious to increase production, to reduce operating costs, and a successful safety program will definitely do both of those things.

If the safety engineer is doing his job he can get across to management the worthwhileness, if I may coin a word, of the safety program.

MEMBER: I would like to ask someone how they train a safety engineer?

MR. DAVID KAYE: Safety is no longer a hit or miss proposition. It is highly specialized and a safety inspector must be a trained man. He must be able to conduct a continual educational program among the employees who do not realize that they are more important than their jobs.

Our experience in training safety engineers—I don't like that term "safety engineer," I prefer to use the word "safety inspector"—has been to take the new man following his employment, and turn him over to a trained safety inspector. The new safety inspector is given a pamphlet containing the information that we wish that man to have; such things as company policy and the responsibility he assumes as a member of the safety department. He is given the various forms, the method of completing these forms and the reason for the completion of the forms and why they are completed. He is also given the general safety rules and the specific safety rules of each craft in the yard and is advised at the end of two weeks that he will be given a short examination.

During the first three days the trainee is taken around to the various shops. He

is introduced to supervisors and foremen. He attends safety meetings. He hears the discussions of hazards and the solutions for these hazards that are presented by the men in those particular crafts.

At the end of the second week he is brought into the office and is given a short examination and a conference, finding out whether he is beginning to get the picture of the things that he is supposed to see out on the job.

We have in our department some who are specialists in their line. For example, we have one man who has spent five years with one of the largest optical companies and his knowledge of the optical business is being conveyed to the other employees through the weekly staff meetings. We have three men who formerly were compensation men and know how to investigate an accident and how to present recommendations for the prevention of that type of accident. We have one man who was formerly a stage rigger and he is our authority on staging. We have another ship fitter, and through this means of developing specialists in certain lines in our department we are gradually learning the necessary things to become good safety inspectors.

MR. C. A. BOUGHNER: I don't know who put that word "engineer" on the back end of this thing "safety." I certainly don't believe it belongs there. For many years I was a labor foreman, then eventually went on up through the line to a safety inspector and now am director of safety. Never yet have I found anyone that qualified entirely for the title of safety engineer.

In my opinion, one of the first qualifications of a good safety engineer is imagination, because if you can't see and imagine what may happen, you are not going to be very good as a safety man. One of the second qualifications that is very necessary is diligence. This is one job in which you have to be diligent. In other words, don't sit back in the chair and say, "We did pretty well yesterday. We won't have to worry today." You will find that every day does bring its problems and, above all, you must be on the job. The thing you may overlook today may be the lost-time accident of this afternoon.

The third qualification is judgment. It is a pretty big word. Judgment is really a big word in the safety man's language. He should be able to differentiate between a right and a wrong way, for a good teacher can only teach what he knows.

I am reminded of the saying about the hen: I don't know anything about laying an egg but I can tell whether it is rotten or not. The same thing is true of the safety job. You may not know a hundred per cent about the job you see, but still in your judgment you may be able to find a flaw in the way that particular job is done.

The fourth is sincerity. I think you must be sold on the idea that you have a good job to do and you are going to try to do it right. As you approach the man on the job, you must be sincere. If he feels that you don't feel right about it, you are not going to get very far with your comment. Be sincere in your comment. Don't treat it lightly. After all, you have a responsibility for the life and limb of the men that work in your plant.

Tied in with that, of course, is forcefulness. Any safety inspector or director of safety not backed up by such power from management is as useless as last year's income tax. Any management which isn't sufficiently interested in its plant personnel to back up their safety organization a hundred per cent isn't safety minded. You must have that support and you, in turn, have to reflect it. You have to be a proper trouble shooter and you have to know that management is on your ball team.

The sixth, and I think probably the most important one is diplomacy. There are a great many ways to say some of the things which you are forced to say. There are a good many ways to do the thing that you are forced to do. There are many roads you can travel to accomplish your objective. You have to learn how to travel them right. Anybody can take a club, but that day is over. You must now learn how to accomplish the things that seem insurmountable to you sometimes by a diplomatic approach.

CHAIRMAN BOULET: That was fine. I noticed a lot of fellows making

notes of qualifications of safety engineers. It is not a bad idea when you get home to check those over in a sort of self-examination and see how closely you match up to that given by Mr. Boughner.

MEMBER: Our friend from the Kaiser people told how he got the second generation of inspectors. I would like to find out how he got that first fellow. We want to find out where we can get some of these fundamentals. I know there is an International Correspondence School course but some of us would like to know where to get the beginning.

MR. DAVID KAYE: This may sound funny, but the answer to this question is that the man walked into the office looking for a job.

CHAIRMAN BOULET: I think we need a little better answer, because that is one of those things that just happen once in awhile. I think this gentleman in all seriousness is stumped. He asks where you start. One of these experts has to have the answer to that. Major Tipton, will you try that?

MAJOR LAURENCE B. TIPTON: I will be glad to. Before I begin I would like to state my requirements for a safety engineer. I think a safety engineer or safety inspector must have six basic qualifications. He must have, first, the courage of a bull. Second, he must have the tenacity of a bull dog. He must next have the determination of a taxi driver in Washington, D. C. He must have the stubbornness of a jackass. He must have the enthusiasm of a high school pep-cat listening to Benny Goodman, and he must have the diplomacy of a wayward husband, plus a minimum of five years practical experience in industry, and a 96-hour ESMWT on fundamentals of industrial accident prevention.

If you will abide with me I think I can answer a lot of questions that might be in your minds. In 1939 Congress approved an act which set up in the U. S. Office of Education funds for subsidizing classes in recognized colleges of engineering, then known as "The Engineering Defense Training Program." In every year following that Congress has set up additional funds for the carrying on of that particular type of training through the

colleges of engineering in the entire nation, and any college of engineering can offer these courses within the plant on a part-time basis, within the plant on a full-time basis, during the evening or afternoon, or on the swing shift. These courses are now ESMWT courses, Engineering Science and Management War Training. This is a very definite war activity.

There certainly is a shortage of safety engineers. We all agree on that, and there must be a beginning of this particular work, as you have stated, sir, and my recommendation is this: that you know more about this type of training, know of convenient locations to your particular locality, and know whom to contact in that particular locality. Before this session is over, possibly I can give you the names of those people and see that you are taken care of in your area.

MEMBER: I am from Saginaw, Michigan.

MAJOR TIPTON: Contact Mr. McCarthy, the Safety Director for the Fisher Body Division of General Motors, Fisher Body Building, Detroit, Michigan, who is state chairman of the National Committee for the Conservation of Manpower in War Industry. He will contact the nearest college setup. If you and at least fifteen other people, properly situated would like training at no expense to you, it can be arranged in that way.

CHAIRMAN BOULET: I don't know if we have gotten to the bottom of this question yet. It seems to me the question still remains of where you get this first man. How do you find him? Who is he? Has someone an answer to that?

MR. JOHN I. YELLOTT (Chairman Safety Training Committee, Illinois Institute of Technology, Chicago, Illinois): It has been our experience that many people have taken the 96-hour course and then have gone back to their companies fired with these various personal characterizations that have been described, only to find that while the management is interested it is not going to do anything about it.

Each of the colleges in which these men have been trained in these part-time

courses, has the list of those men who have taken the courses and I would have no hesitation to go into our lists and see if we have a few zealous young men or women that we can lift out of companies where their work is not used at the highest level and move them to another war industry where they can put that skill to more immediate and practical use.

I think the best thing you can do is to contact the state man in the NCCMPWI and the nearest college. I am sure they would have among their graduates of the 96-hour course some individual who would be willing to put into practice that which they have learned.

An engineer has been defined in a vast multitude of ways. One way that I think is very satisfactory is this: An engineer is one who applies in a scientific, analytical manner the laws of nature in the management of men, machines, material and money in the achievement of some useful end.

That, so far as I know, covers virtually everybody who thinks he is an engineer. If he is going to become an engineer a man must apply the laws of nature. In one way, certainly, a safety engineer has to apply the laws of human nature in the highest possible degree. Then in order to do effective work in safety he has to have these characteristics of diligence, imagination, judgment, sincerity, forcefulness, diplomacy, courage, determination, etc. I don't know of any college in the country or in the world that would endeavor to teach these things if the student didn't have them.

On the other hand, industry has thousands of people with those qualifications. Some of the folks in industry are just beginning to learn the real stuff their people have in them. I feel that your safety inspector can best be made by taking a worker with these qualifications and give him the scientific training he needs. See that they get some kind of organized training; the 96-hour course, the continuation course, if sufficiently schooled to business, and in any case, the 20-hour course will give them the fundamentals for real safety engineering.

We in the Engineering College have come to the conclusion he should be a

graduate engineer. Perhaps your safety engineer should get his hands a little dirty, then be sent back to one of the few selected colleges for post graduate work for a year or so. He should learn the management and labor laws. I think we need honest-to-goodness safety engineers and they can be gotten this way.

MEMBER: Mr. Chairman, I would like to ask the Major if he feels that the five years of practical training which he mentioned, coupled with one or two engineering degrees would waive the 96-hour course?

MAJOR LAURENCE B. TIPTON: I certainly do not. You can take the finest graduate engineer in the country and, unless he has a basic knowledge, or the basic qualifications that I outlined, plus the fundamentals of industrial safety engineering, he will make a rotten safety inspector or safety engineer.

MEMBER: Excuse me, Major, I didn't say to waive all of those specialized qualifications; I only asked about waiving the 96-hour course.

MAJOR TIPTON: I still think the man who is a finished mechanical engineer, without any material in the field of safety engineering wouldn't make one. He should have at least a basic understanding of the techniques, so I will still say no.

CHAIRMAN BOULET: I would agree with Major Tipton that inside information on how to approach the problems that you are bound to run into from a personnel standpoint in safety engineering is absolutely necessary.

MEMBER: One of the courses that has not been mentioned is the E.S.W.M. course. It seems to me that would be of value to a safety engineer for one of the things in that is industrial psychology.

I would like to have Mr. Yellott present his ideas of the value of industrial psychology.

MR. JOHN I. YELLOTT: I have steered clear of all that in the administration of our war training program in which I have spent something like two million dollars of your money in the last year. I have steered clear of industrial psychology because it is too often a cloak for a lot of

very vague and general meanderings in the theories not immediately applicable.

On the other hand, if that particular subject is followed as it should be in the type of work which the gentleman has in mind, it can be extremely useful and an absolutely essential part of the safety engineers' equipment. However, I would rather take off that title, and in a course such as industrial management, give the essentials of industrial psychology.

In other words, it is absolutely essential to know how the other fellows work; how they tick; why they think as they do. No one wants to get hurt. He gets hurt because he is stupid or does it inadvertently, and unless some of you men can figure out how the other fellow thinks, you are not going to be effective. Your course in psychology must cover that.

But it should not go over into a wide variety of vaporings. We are just about to put on our first course of that kind and have chosen Dr. John H. Hazlehurst, who is conducting the early morning classes at this Congress, to teach. I think he will go down the right line with it.

MEMBER: There are two questions I would like to ask. One is for Mr. Yellott and the other is for Major Tipton. First, the Major: Does he believe that ninety-six hours are enough, or whether four hundred hours would be more adequate? Second, it doesn't seem to me in with the government in regard to qualifications and background to take ESMWT courses when Mr. Yellott claims they should have at least four years of an engineering course in a qualified college, plus another year or two on top of that. What are the qualifications the government sets up before you are able to take the ESMWT course?

MAJOR TIPTON: Before I repeat the question, I would like to add my bit to the answer Professor Yellott gave on industrial psychology.

I agree with him one hundred per cent. I would like to state further than in the 96-hour course today eighty per cent is human engineering. Industrial psychology is nothing more than human engineering. Industrial safety is eighty per cent human and twenty per cent mechan-

ical. I think you will agree with me on that.

In answer to the question that was posed to me, I should like to say that because of the necessity for speed in training we cannot give a four-hundred hour course even though we might think it effective. In the second place, we believe that in ninety-six hours we can only give the fundamentals of industrial safety engineering. We do not contend nor have we ever contended that you can produce a man well grounded and who knows the complete picture of safety engineering with that amount of training. It merely gives him the background and material with which he can proceed.

We are at the present time permitting the colleges to give a continuation course. It is the same course given in ninety-six hours with an additional ninety-six hours. This reaches back into the localities where graduates form their own study clubs and are given charts, assignments and other activities so they can carry on their own discussions.

However, to give four hundred hours, what men would have the time and what industries could permit them to take four hundred hours? We have to do the best we can in the time we have because we are at war.

MR. JOHN I. YELLOTT: To reply to this very good question, I have not ventured to define a safety engineer. I don't think anyone could. You mentioned the question of government qualifications in certain fields such as mechanical engineering, electrical engineering, civil engineering, etc. There are state licensing bodies that prescribe what you have to be in order to qualify for engineering in those particular fields, but I don't know of any state which has a specific qualification for the term "safety engineer."

I look upon this thing as a pyramid, as all industrial structures are. The largest part of the number of people engaged in safety inspection work are not in my opinion full-fledged safety engineers. They can, however, be reasonably well trained if they have a high school education or its equivalent and have the qualifications mentioned. This plus the basic knowledge which we can give him

in ninety-six hours enables him to do a very useful job as a safety inspector.

If, on the other hand, he has been sufficiently bitten by the bug and if the company has given him sufficient responsibility, he will then go on his own accord and study. If he is lucky enough to be in a large city he can take a continuation course and if he is lucky enough to be in Chicago he can take a course in industrial hygiene, if that is in line with the type of responsibility he has.

However, the 96-hour minimum is up to him. He can go beyond that but he must have that minimum. That is the basic knowledge he must have. The rest is on his own responsibility.

I hope in the postwar days will come a realization of the qualifications for honest-to-goodness safety engineers. I think he should be a fellow with the equivalent of graduate training in engineering, plus specific training in the techniques of safety.

MR. A. BURTON METZGER: My good friend, Mr. Boughner, disagrees with me on a safety engineer. I don't mean by any means that every man is a safety engineer or should be a safety engineer, but I do mean that there are many competent and able safety engineers in safety work today, doing planning and layout. When you are planning a layout, that is safety engineering.

I want to bring out the fact that our safety profession has not degraded to the point where we don't have any safety engineers in it. I want to bring that out because it has always been a very sore spot with me. I don't like the title "safety man."

If you don't give your own job the prestige it deserves by its proper title and elevate it to the level where it belongs, how in the world do you expect your management or the rest of the world to do it for you?

CHAIRMAN BOULET: This next question is from a young fellow who wrote it out and sent it up here. Here it is: "We are talking about selecting people from our own plant for duty as a safety inspector. Since these people will be selected one or two at a time, the

training of these men will rest largely with the safety engineer in the plant. What system is recommended. Will this be 'on the plant' training?"

REPRESENTATIVE OF OHIO BELL TELEPHONE COMPANY: It has been our policy to direct our efforts to the people in the organization, and when the time comes to select a safety man, that man is selected on the basis of how well he has reacted to our training processes. Our training processes are based on three particular factors. The first is the incentive. What is the incentive to be safe? What is the incentive to be a safety man? The second factor is: What is the motivating factor behind this whole thing? The third, of course, is inspection. Those are the three basic fundamentals which should underlie any safety program.

When it comes to selecting safety men, it seems to me that the individual who is thoroughly sold, who has the qualifications outlined a few minutes ago, is necessary, and you cannot develop those things in a week. Over a long period of time I have found the best safety men in any organization, and I have contacts with many outside of my own, are those fellows who have been motivated by a keen desire to do something about a problem which has emerged today as one of the major problems of civilization.

CHAIRMAN BOULET: There is an in-plant training course that follows up the 96-hour course. I am going to ask Major Tipton to discuss this briefly.

MAJOR TIPTON: We have a plan that is being conducted on a nation-wide basis, part of which we have discussed this morning, but the over-all structure is not brought together so you get the picture. Before the war got under way, we had only about two thousand men in the entire country experienced enough and capable enough to become instructors in the 96-hour course.

Those two thousand men, for the most part, taught training techniques and were employed by the colleges to teach some fifty thousand lay men from industry in the 96-hour course. The men who finished the 96-hour course then would go back to their own plants and carry on the

plant training. In order to provide them with material based upon what they had in the 96-hour course, the National Safety Council, in collaboration with the National Committee prepared a ten-slide instruction kit which is the 96-hour course boiled down to twenty hours.

This is for foremen, assistants, etc. With these are instructors' manuals with questions and answers on the slide as to what to do. The men who have had the 96-hour course are going back into their own plants and teaching every foreman, assistant and lead man the twenty-hour course—the things that apply to their particular job. Then the foremen are expected eventually to take the J.I.T. program, which Professor Hazelhurst talked about at the Congress Early Morning Classes and is the job safety training course which teaches the foremen how to teach the individual on the job the hazards in that particular operation.

That is your practice: two thousand instructors, fifty-five thousand graduates in the 96-hour course, six hundred and twenty-five thousand foremen and assistants, and twelve million, five hundred thousand workers on the job.

CHAIRMAN BOULET: Here is a short one: "Is there a placement bureau for safety engineers?"

Of course the answer to that is the National Safety Council Personnel Bureau. To find any available safety engineers, that is where to go.

Here is another question: "Why are the colleges so jealous of their credit courses that they distinctly specify all the ESMWT courses are non-credit courses? Lots of men would like the prestige of having earned some college credits."

MR. JOHN I. YELLOTT: When the engineering defense training was first started it was definitely specified as on the college level but in highly restricted and very specialized fields. It was not the intention to try to give the equivalent of a college education. It was rather to fulfill the needs for just such things as we have seen in safety. We have not duplicated in our war training courses the type of work a man can get if he wants to be on the way to a degree.

There are a lot of technical, academic questions, such as the matter of prerequisites, for example. To remain as an accredited college, you have to have people coming in from accredited high schools before taking physics, calculus, etc. When you think of going back to a factory and applying physics to a test of a two thousand horse power question, you will not find one out of twenty-five high school students qualified from the college standpoint. However, they are qualified to take and do profit from the ESMWT course. Another aspect is that the colleges do not make any money out of this course and, in fact, are lucky if they break even.

There are some courses, specifically, one, in ultra high frequency techniques in the pre-radar course where college credits are given. Many courses are of such college levels, and by taking examinations most colleges will be willing to give credit for some of their courses.

However, by and large, these courses are set up to do one specific job, that is, train a man or woman in the shortest possible time in one particular technical skill and not to give a general college engineering education.

CHAIRMAN BOULET: I think some of the colleges are living in the past. I think we will see a change before long, after the war is over.

MEMBER: Mr. Chairman, I would like to ask if we haven't left out an important qualification—personality.

CHAIRMAN BOULET: I think in selecting your safety man that is one thing you have to take into consideration.

MEMBER: When you want to take a man out of industry in order to make a safety man out of him, the superintendent frequently says, "I need him myself. I have to have this man where he is."

You are faced with the problem of getting men with five years' experience or training, but where are you going to get them? I would like to see that question discussed.

CHAIRMAN BOULET: When I want a safety man, the president of the company says, "He is yours." But I will

turn this question over to the panel, Mr. Boughner, will you try that?

MR. C. A. BOUGHNER: I can only answer it by starting off to say that most rates of pay are much more interesting in the operating divisions than they are in the safety divisions. The reason for that is that most managements have been derelict in their responsibilities to the safety profession. Very frequently it has been a dumping ground for old employees.

We made a lot of safety engineers before Pearl Harbor, and we didn't have any 96-hour courses or any accredited college course to make them. And we made good safety records prior to Pearl Harbor. I have been an instructor in the ESMWT courses, but I hope nobody gets the silly idea that you can make a safety engineer out of any theoretical book. Safety is a hard racket and you have to get out in the mill and work at it.

It is a tremendous job today when you consider the over-time rates of pay that are involved as against the straight rate of pay given in the safety divisions. With that in mind you wonder how you could ever interest anyone that might be working in the operating division of your mill. You are just going to have to get busy and comb your material and find someone with enthusiasm.

I will admit that training is necessary and desirable, but not every man that takes one of our Department of Education courses—and I do believe they are well-founded—is a qualified safety inspector or engineer. Chase him out in the mill and give him the rest of his experience the hard way, and you will give it to him right. He should get the rounded experience of the whole mill.

I believe these courses have some very meritorious ideas, but a great many men have gone into them because they figured when they came out of them they were going to be qualified safety inspectors or safety engineers, and you don't make them that fast. They are made with many, many years of training.

Unless the safety man becomes imbued with safety consciousness—and that in my opinion is one of the prime requisites

that these courses do accomplish—and unless something is done to correct the attitude of some of these people, we will not accomplish as much as we would otherwise. I think that is their greatest worth, and that has been one of my biggest talking points in conducting these courses.

CHAIRMAN BOULET: That was all fine, Mr. Boughner, but I don't think you hit the question. The question is: "How do we get a man out of the plant when the superintendent says that he can't let him go?"

MEMBER: In defense of Mr. Boughner, I say that he answered the question; it is the rate of pay. That is why you can't bring the man in.

CHAIRMAN BOULET: I don't think he answered the question. The superintendent won't let him go. The man is willing to do it, but the boss says no.

MEMBER: Is the superintendent the boss? What is the matter with the management? Have you sold them?

CHAIRMAN BOULET: Now we are getting the answer. I agree with you a hundred per cent. The safety man has the job of selling the top management. If he wants the man, he must sell the top management that it will be for the best interests of the company to transfer him to the safety division.

MAJOR TIPTON: I would like to ask this: During the thirty-two years of the national safety movement prior to Pearl Harbor, I would like to know how many men have been recognized as industrial safety engineers? Can you answer that for me, sir?

MR. C. A. BOUGHNER: I don't know.

MAJOR LAURENCE B. TIPTON: Then I can see how you can say with justification, frankness and sincerity that for years prior to Pearl Harbor you did all of those things, when there was only a total membership of some twenty-seven hundred and we have trained fifty-five thousand men in the last nineteen months.

I can't compare the two if it takes thirty years to train ten thousand men who call themselves safety engineers, when in less than two years we have

trained fifty-five thousand of which eighteen thousand have assumed full-time responsibilities back in their own plants for safety. The training is doing the job.

MR. C. A. BOUGHNER: I admit there have been fifty-five thousand men who have taken ESMWT. I will not admit that any of these men, because they took that training, are qualified safety men or safety engineers. I do admit that they have been given a background which basically may help them. I do feel very definitely that some of them have gone on from there, because the percentage of people that have taken these courses who have advanced into safety positions does not thoroughly indicate to me that that was the fundamental reason for their advance. We would have to take into consideration, in my opinion, the fact that industry has very definitely multiplied the number of men employed, and quite naturally the number of safety inspectors has equally increased.

Colleges have been making a definite effort to take part in the war program and are trying in their way to promote safety education. I think that the greatest thing is the fact that the courses have developed a feeling of safety consciousness and in that way have helped us change the attitude of our men. We both have our lines of attack. Mine is built on a practical basis and Major Tipton's is partly built in that way and partly from the training angle. I hope that you, in the consideration and judgment of this program, will look at it from the same two viewpoints.

MAJOR TIPTON: I did not say that a 96-hour course offered by a college of engineering was sufficient to make a safety engineer. The first remark I made about it was that a man must have six basic qualifications, which I gave to you, plus five years of practical experience on the production line, plus the 96-hour course.

CHAIRMAN BOULET: I think if I asked for a show of hands on how many needed practical training, I think I would probably get a hundred per cent. I think, too, if I asked for a show of hands on how many thought we ought to have the 96-hour training, we would get a hundred per cent. I think that settles it.

MR. BORHORST: Coming back to the very first question of the safety engineer, I am inclined to think we have kicked around the two titles already rather profusely—that of inspector and that of safety engineer. I think most of our industries have grown to such size that we can bring into practice both classifications.

I believe there are many men who have the right consciousness to make a safety inspector, and a safety inspector can be trained rather rapidly, along with our governmental help.

In my own organization I have found that quite necessary. I use the two classifications. My safety engineers are graduate engineers. I have an electrical man, a chemical man and a mechanical man. The rest of my organization are termed safety inspectors. There are problems that the safety inspector can't handle because of lack of technical knowledge. That goes to the safety engineer to answer. In many of the small plant branches you can't have such an elaborate organization. Your safety inspector in those places will have to turn over his problem to someone else in the organization to handle. But in those organizations which are large enough, surely the most effective way to have your safety program is to have the technical men right in the organization.

CHAIRMAN BOULET: As I understand Mr. Borhorst's statement, he thinks you should have a safety engineer with an engineering background, but with the safety inspector that is not so necessary.

MR. ED. HULSEMAN (Wagner Electric): A gentleman back over in that end of the room called the attention of the experts that they had forgotten one point in the attributes of the safety man. There was a point I had in my mind to answer the gentleman's question on how to get the general superintendent to agree to give him a man.

To me salesmanship in safety is one of the greatest parts. The very fact that a general superintendent is the head man of his factory makes a prima facie case that he is good enough to show a profit for his company. If the safety engineer cannot convince the general superintendent that he is going to show a profit on

changing a man from a production man to a safety man, then he has not prepared his case effectively enough and should go back and show the general superintendent wherein he can benefit in money as well as humanitarianism in changing that man.

MEMBER: What conclusion do you come to about the base pay of a safety engineer?

SECOND MEMBER: There is a paper out of Cleveland or Cincinnati which contains a statement that they are preparing to set a base pay for safety men.

CHAIRMAN BOULET: I don't know that there is any answer. It depends upon the size of the plant and how much profit the company is making.

THIRD MEMBER: Keeping in mind both the large and small industries, because I think we sometimes overlook the little fellows, whom should a safety engineer report to—the personnel director, the works engineer, or top management—and equally as important, why?

CHAIRMAN BOULET: Rather than give you a chance to answer individually, I am going to ask for an answer with a show of hands on who thinks you should report to the personnel director, the works manager, or the plant engineer, or top management.

How many feel that the safety director or safety engineer should report to the personnel department?

... Five indicated they thought the safety director or safety engineer should report to the personnel department...

CHAIRMAN BOULET: How many feel he should report to the plant engineer?

... No one voted for this form of report...

CHAIRMAN BOULET: How many think he should report to top management?

... Practically everyone indicated that they felt the report should be made to top management...

MEMBER: There is more or less of an argument on the merit of a word that has been used this morning. It is the word "inspector." In a production plant, an inspector is one usually who either approves or rejects and as a result the

workmen begin to connect that word "inspector" to one who is judging their work.

I am wondering if it isn't possible that word "inspector" might not be the wrong one to use in connection with safety. Remember you are talking about psychology now. Isn't that entering into the psychology of the safety setup throughout the plant?

MR. DAVID KAYE: Mr. Chairman, I believe the gentleman, perhaps, has a good point. We do kick around these terms, safety engineer and safety inspector, and I believe that if I had my preference of being able to give a title to a man in a safety organization who would not, perhaps, be top man, I would like to have that man called a safety supervisor or a safety adviser.

MEMBER: This isn't a question but it is in reference to scale of pay. I can give you what it is in the department of the Port of Embarkation in charge of safety. The War Department has not bestowed the title of safety engineer, although our name plate reads as such. They classify all men according to their qualifications.

They start with what they classify as a junior engineer. That depends upon the qualifications compiled by the individual and although the individual may be in safety work or in some way attached to the job, he is only a junior engineer with a P-1 grade. He gets \$2,300 a year, plus overtime, which makes the pay approximately \$2,700 annually.

The next step is assistant engineer, and he probably has a little more practical experience, particularly in construction or fire prevention. There must also be some college education in order to acquire the title of assistant engineer. That pays

\$2,600, plus overtime, which is usually a forty-eight hour week. That makes a gross of approximately \$3,120 annually.

The next step is one in which you qualify to the title of P-3, or associate engineer. That pays \$3,200, plus overtime, which brings it up to about \$3,800 a year, or, perhaps \$3,900.

The next step is where we get into the real engineering status. A man has to be a graduate engineer. He is what they call a P-4 grade and is usually associated with the Division Safety Engineer. Then it goes up to P-5, and P-6, depending upon the accomplishments made by particular individuals. These are based on government specifications or requirements, but, as you notice, they don't use the word "safety engineer." When they give you the title it is only the different graded steps.

MR. A. BURTON METZGER: I want to throw this in the ring if I may: I don't believe that as far as a definite scale of paying a safety engineer is concerned we could set anything as such. I believe the safety engineer, himself, is going to determine how much money he is going to be worth by the manner in which he presents his ability to top management.

If a man presents to management regular, consistent, accurate, unexaggerated reports of the experience of the plant as far as accidents are concerned and shows to management that safety does pay and the amount of money it does return in dividends, he will make his own way. Don't exaggerate. Tell the truth. Let your figures bear investigation. A man who can show figures like that is one who is going to show that he is worth good money to the company.

Women in War Industry

THURSDAY MORNING SESSION

October 7, 1943

A Panel Discussion

Presiding—D. A. Moore, Safety Director, Western Electric Co., Inc., Hawthorne Works, Chicago.

CHAIRMAN MOORE: First of all, I would like to introduce to you the various members of this panel. Starting at the far end we have Dr. Chivers, Medical Director of the Crane Company. The next gentleman is Eric Guilbert, the Safety Director of the Republic Drill & Tool Co. of Chicago; next, the lady is Dorothy Barker, the Assistant Safety Engineer of the Sacramento Air Service Command, Sacramento, California; next we have Miss Purpura, the Safety Supervisor of Women, Houston Shipbuilding Corp., Houston, Texas; and Mr. Mathewson, who is next to me, is the Assistant Chief, Safety Branch, Air Service Command, Army Air Forces, McClellan Field, California.

The first point under consideration: Are special safety training techniques needed for women?

MRS. MAFALDA M. PURPURA: Since the majority of women coming into industry are unfamiliar with problems and hazards with which they will come in contact, even to the extent of terms generally used in teaching the average man the demands of a craft, it requires a different technique in training of women along safety lines.

We learn the new in the light of the old, and in training women it is necessary that the beginning be on an elementary basis, more than that required for the majority of men employed for the first time. The technique must conform to the pattern of their limited experiences and knowledge. Oftentimes, for best results in safety, it is advantageous to appeal to women's vanity.

DR. CHIVERS: The first question in my mind is whether or not there is a woman problem in industry, and confining that question to the problem of safety, is that problem any different than it is with any other employee?

I think that if we consider women as employees we should accept them with some caution, with some uncertainty as to their ability to do the job and their physical ability to carry on without damage to themselves.

When it comes to the question of special safety training techniques, the technique of any training that is effective depends on how well it is accepted, how much of an impression you make on the individual. A man coming into a job, who is somewhat familiar with the job, doesn't need the training technique. A woman who comes in more or less foreign to the job, foreign to the environment, foreign to the methods and restrictions of industrial activity, certainly needs a different technique, a different method of approach.

Then, again, there is the temperament of the individual. I think we must realize that the temperament of women is different from the temperament of men and the technique of approaching the problems of industry as it relates to women has to be patterned to conform with the variations that you find in women.

MISS DOROTHY BARKER: I agree with Mrs. Purpura that women are unfamiliar with tools and with their terminology and therefore they must have certain extra training in learning the terminology, becoming familiar with machines

and tools. Beyond that point, I feel that safety training should not be particularly specialized for women over and above what men get.

In most of our classes the men who are coming in are almost as green as women. In handling simple tools like chisels, hammers and that sort of thing they are more familiar, of course, but on the whole I feel that their training should follow right along with the men.

MR. J. H. MATHEWSON: For a good many years we have had coeducational schools in this country, but some people prefer to send their daughters to schools solely for young ladies while others prefer the coeducational schools. Yet the fact still remains that women must work and live with men, and if they are going to do the same kind of jobs I think they have to have the same training.

It is quite true that there are certain jobs for which women don't seem to be fitted by their physical structure. On the other hand, having women in industry is not something new. Before the war we had women in many different kinds of jobs, especially such machines as power presses, and in many places where manual dexterity, quick finger movements and the like were necessary, they excelled men. Mr. Moore comes from a company where they found that to be true.

There is a feeling in some places that women are less apt to pick up the nomenclature of tools and such things, but the fact remains today—and I am speaking now solely from the standpoint of the Army Air Forces—that we are getting in probably as many men, at least in the same ratio or roughly the same ratio, who know just as little about those tools as do the women. Many of them never saw an industrial plant before. They are entirely new. They need the same orientation, the same introduction to industrial activity that the women do.

I am therefore of the opinion that, except in rare instances, the women should be trained with the men.

MR. ERIC GUILBERT: Shortly before the war began I went into a plant in which women employees predominated. There were 1400 of them. It is a lot of

fun working with them because I find that they have more sense than men have. You can tell a woman something about safety and she will listen to you. She is going to learn and she wants to know the program and the job.

* I don't believe that there is a particular problem with women in safety. You have heard it said that all safety is, is common sense, and I think that if you give a woman a little sympathetic understanding and explain the job to her, tell her definitely what you want her to do, work along with her and help her with her problems, you will get somewhere with her. For my part, I would much rather work in a woman's plant than in a man's.

DR. CHIVERS: Mr. Guilbert said that safety was largely a matter of the exercise of common sense. Who is the judge of what is common sense? If they are not hurt I presume they are operating with the exercise of common sense. If they do get hurt, then they didn't operate under common sense. It seems to me that a safety program has to set a limit, a pattern, a threshold beyond which it is unsafe for women to do jobs or operate certain techniques and below which it is perfectly safe. The question is, who shall set that and should the setting of that pattern or of that threshold be different for women than it is for men?

MR. GUILBERT: I don't profess to have all the answers, of course, but I am a great believer in asking women themselves.

There are some things, however, that you must settle for them. For example, I don't think you can ask a woman how much she should lift. A lot of them don't know. You can't expect them to know. That is where your medical department should set the limit. In our plant we set 35 pounds as the maximum load.

MR. TIMMERMAN (Western Electric Co.): I would like to ask the last speaker what happens when the weight is over 35 pounds. What do you do then?

MR. GUILBERT: We get a man to pick up that load and take it back where it came from. We tell the foreman of the department where it originated that we

won't take that load. He has to change it so that it weighs less than 35 pounds.

I am in a little machinery manufacturing plant. We don't have heavy loads. We feel that it shouldn't be heavy for either a woman or a man. If you have heavy loads for men, you should have proper lifting facilities. In our particular place 35 pounds is the limit. We do in some cases go over that, but we wouldn't permit a woman to lift it.

CHAIRMAN MOORE: Mr. Mathewson, would you like to say something on that point?

MR. MATHEWSON: I think I understand your question very thoroughly. There are many times when there is a load to be lifted that exceeds 25 pounds. In California that happens to be the state law, and we have found, in many, many instances, that the woman will do just what the man would do in a similar situation. She will go ahead and lift the weight. We find it out when a back or other strain develops.

We try to limit the weights that these women will lift. We tell them: "if the weight is too heavy, get help." Usually the help we want them to get is to secure some man that is working around the establishment. Many times, however, there isn't a man, and in many instances when there is, he isn't able to lift any more than a woman can.

The whole thing is this: The women are just as anxious to make a good showing as the young greenhorn who used to come into the plant and, unless you trained him properly, anchored him down and dampened his enthusiasm enough, he would get into trouble. You know that. You have all experienced it.

MRS. PURPURA: In my particular industry, which is shipbuilding, our women team up where there is a heavy load to lift, such as probably 25 or 30 pounds, and our women are very independent. They do not ask the men. They will call on another woman to help them.

MR. C. H. McCALL (Humble Oil Company): I would like to know the maximum age limit in some of these war plants where they are hiring these women.

CHAIRMAN MOORE: Is there a maximum age limit in your plants?

MRS. PURPURA: Not in mine.

MISS BARKER: We set a tentative maximum age limit of 45, but they usually go over that, depending on the woman's capabilities, experience and background.

If the woman is healthy, in good nervous condition, without children to care for and she is over 45, able to stand on her feet and carry through an eight hour day, the line is usually stretched. We have many women working in our departments who are 50 and 55 years old that work out satisfactorily. In the shipyards we limited their ages. We tried to keep them down. It is a much more rugged work and much harder on the women. There are some exceptions to that rule, but our air field work is much lighter. There are many sitting-down jobs that older women can do very successfully.

DOROTHY LUMMER (Texas): We have an age limit of 60. However, we have found that our older women are our better workers. Our best workers are our older women because they, I think, are really more sincere than a lot of our younger women. We have a good deal of trouble with our younger women who think about things other than the job.

However, going back to the question of specialized training for women, I have found, at my particular installation, that I get quicker results by segregating my women. I don't segregate them entirely—just for some training. I have women safety committees because all women are not aggressive. Women have a tendency to think that safety is a responsibility of the men and something for them to worry about; therefore, when you segregate them, give them a sense of importance and show them that it is something for them. Get them thinking about it, talking about it and worrying and working in safety. Then bring them back for combined effort with the men. I have found that in my particular installation I get quicker results in both the training and in their activity from this method.

In the training, of course, you have the advantage of appealing to a woman's emotion. After all, they are essentially emotional. You can appeal to their patriotism and, also their vanity. For instance, if you talk to a woman about

the possibility of losing a finger it works better than such an appeal to a man.

MISS MOORE (Department of Labor): I would like to ask to what extent you think you can solve such problems as that of how much a woman can lift in the original placement and selection of the women? It seems to me that the problem of placement at the original time of employment is the point at which a good number of questions can be settled.

CHAIRMAN MOORE: I am inclined to agree with you that the training probably should begin at the time of application, when originally examined at the medical department for placement.

DR. CHIVERS: I assumed from the questions that there was some doubt as to the physical ability of a woman to lift certain loads and there were variables with the women relating to age. Someone mentioned a maximum age of 45. From the medical point of view it occurred to me, as we all know, that from probably 40 or 41 to 45 and 46 there are definite psychological and neurological changes that women have to contend with. I think that they present problems in many instances that have a bearing on the ability of a woman to do a job.

If I were asked to set an age limit on the employment of women, I think I would either set that limit at 40 or possibly at 55 or 60, because there is no doubt that many women, after they have cleared through these psychological and physiological changes which are peculiar to their sex, are more sturdy, more stable and more settled in their life. I think those are all factors which have a definite influence in employment and in safety.

When it comes to the question of lifting, there is no doubt but what there are individual variables and considerations as to whether a woman who has borne children can work. Behind the whole question is the problem of physical injury to the individual. I don't think that there is a real answer to the question yet. There are committees of the American Medical Association and the Gynecological and Obstetrical Association that are making very sincere studies of the whole problem of women's physiology and physique as it relates to employment in the heavier

industries. That takes in, of course, the question of pregnancy, the question of the menopause, the question of lifting and certain types of jobs that have a direct bearing on normal physiological activity of the female.

CHAIRMAN MOORE: I think we can summarize what we have said here by quoting the National Committee for the Conservation of Manpower. Their statement is:

"Stripped of sentiment and glamour, women can and should be protected by the same safety education and shop practices that have been proven essential in the case of men they have replaced."

I think the discussion here has brought out that that is essentially how we agree, with a few modifications.

The second point to be considered here at this time is, do we need special safety posters for women? Mr. Mathewson, would you care to lead off on that one?

MR. MATHEWSON: I believe we do need them—not very many, but a few. I believe they should be limited entirely to the matter of dress.

We have trouble getting women to put their hair underneath caps. We have trouble getting them to wear the proper type of shoes, dresses, etc., and the education of a woman to come into an industrial plant properly dressed for work, so that she can perform her tasks safely, can be promoted through safety posters designed especially for women.

MISS BARKER: I agree with Mr. Mathewson except on this one thing: I don't see why they should be limited to dress. Why shouldn't they show a girl driving a truck loaded with boxes improperly and falling over and off? Why shouldn't it be a woman just as well as a man shown falling down the stairs, failing to use a handrail, failing to use proper safety equipment? Why shouldn't it be a woman? Why shouldn't the woman be represented on this poster just as well as the man?

I do feel that particular emphasis should be made on clothing—hair, jewelry, shoes. Those are our problems, as Mr. Mathewson has said, and posters

have a strong eye appeal to women, particularly in color. A picture of a safety shoe for a man would have little meaning to a woman who looked at that poster. She would perhaps fail to apply it to her own personal problems; whereas a picture of a girl's foot with an open-toed and open-heeled sandal and the safety shoe for women really impresses her. She is much more clothes-conscious. She is used to reading ads in the papers; shopping news pictures have particular appeal to her. I think it would be a very strong form of safety education, a way of appealing to women perhaps more strongly than to men.

MR. MATHEWSON: When I said there should be special safety posters for women and I confined it to dress, I meant that those posters would play exclusively to women, I was not thinking of limiting general posters solely to men. The National Safety Council for years has produced posters which showed women handling various types of equipment, and that should continue. There isn't any reason why we should limit it to men in that case.

THE CHAIRMAN: Comments from the floor?

MAJOR IMMEL (Army Air Forces): Of course we should have safety posters for women. When we started our visual education program we went to Sid Hicks, the famous cartoonist, and told him to develop two cartoon comedy characters. I hope all of you will some day meet Lulu Drip. She is our glamour girl, and she appears on special cartoon comedy posters with jingles which we are using throughout the Air Service Commands to splendid effect. We put those two characters into a technicolor sound film, and we have found them extremely effective.

One thing, however, that I would like to emphasize is that such posters should be soundly based on particular hazards. There should be a very careful study made for this. Of course, we do need to have women wear protective head covering, but your statisticians, who carefully analyze accidents, will find that there are very few cases of head injuries from entanglement of hair in machinery.

Don't get me wrong. We need that sort of protection, but we know, in the Air Service Commands, that our foot injuries, which could be prevented by wearing safety shoes, are far in advance of any other special type of injury which we meet. Therefore, we especially stress the hazards of lack of protection for the feet. But women have a right to have themselves represented on safety posters, particularly in the case of our industry, where their numbers are speedily approaching 50 per cent of our total employment.

MR. MERCURE (General Electric Co.): While we are talking about posters, I have a very definite opinion, but I would like the opinion of the group here on this: Do they prefer a poster representing the horrors of an accident or do they prefer a poster of a humorous vein that will have the person come back and look at that poster the second time for a second smile? Many think it ought to be a horror story. I would just like to have an expression of opinion on this subject of posters.

THE CHAIRMAN: You would like a general expression of opinion by the raising of hands as to whether they favor a poster in which horror is depicted or whether you favor one in a more humorous vein? I guess that is the question.

On the first, the negative type, how many favor the horror or the negative type?

... One hand was raised ...

THE CHAIRMAN: I assume the rest of you favor the humorous or the positive type.

MISS OLSON (Liberty Mutual): On safety posters, has anyone given any thought to personal hygiene, dermatitis, etc.?

MRS. PURPURA: I believe I mentioned before that special posters were necessary for women in regard to personal hygiene. We have our special posters and, also, posters issued by the National Safety Council.

CHAIRMAN, MOORE: The next item is: Must women be kept away from certain types of machines, such as circular saws, plate bending rolls, portable grinders, etc.?

MISS BARKER: It has been my experience that many women are subconsciously afraid of machines. Some of these machines, heavy operations, circular saws and plate bending machines, are not machines that women should be operating. I have seen a woman lose four fingers and half her hand on a plate bending machine. That accident happened about 8 or 9 months ago but she will probably bear the scar of that thing, psychologically, the rest of her life while a man could possibly get over it and go back to the machine and carry on.

I have seen women in our air force, on our field, working on circular saws. I don't approve of it. They are very few in number and are highly skilled and have no fear, but I don't think that is the average run of woman. I do feel that there are many operations, especially in wood working, for instance, that should not be used by women.

MR. MATHEWSON: In the Air Service Command, which is one branch of the government in which more women, probably, are employed in an industrial capacity than in any other branch, we have many women who handle every type of machine. We have no machines that I know of in our establishments which are not operated by women in some of our plants. From a utility standpoint, then, woman can do any of these jobs in so far as aircraft work is concerned.

It has, however, been pointed out that psychologically and socially we have to look at these things from another angle, and I think it is up to each individual in his own plant to decide whether or not the cost is worth the value received. If it is involved in winning the war, I don't think you can pull any punches.

MR. GUILBERT: I am in a plant that was designed for women before the war began. Of course, we have grown considerably, like all of you. We have made every definite attempt to modify, adjust and change the machines for operation by women, so that they are simpler and safer. For example, a machine at which a girl stands is being loaded. We ask the girl to stand off while it is loaded or unloaded. We put handles on the machines so that the girls don't have to bend around the machine in order to

stop the machine. She simply presses the handle to stop it. Where the girl sits and uses her feet on levers, we adjust the pedals according to the height of the girl.

We have found that by making these machines simpler for women, that is, designing them for women as far as we possibly can, we make it safer and we get more production.

CHAIRMAN MOORE: There seems to be a slight difference of opinion here. However, all agree that the women should be protected either by not putting them on this sort of job or by redesigning the machines to accommodate the women.

MR. H. F. SMITH (Eastman Kodak Co.): I would like to ask the group how far women have been placed on fire fighting work. Are they being trained for fire fighting?

MR. MATHEWSON: On first aid fire fighting, yes. But we have not put women on the larger pieces of equipment as far as I know.

CHAIRMAN MOORE: That checks with my company also. Are there any other comments or questions on this subject? If not, we will go to point number four: Is it more difficult to get women to cooperate with safety departments?

MR. MATHEWSON: In general it is easier.

MR. GUILBERT: I think it is a simple job for a safety man to get women to cooperate. If a safety man is handling women in a plant and can't get them to cooperate on the work there is something the matter with him.

MISS BARKER: I know they are very cooperative and safety-minded. They are very eager to do the job and do it the right way.

MRS. PURPURA: I find the women most cooperative and willing in every way. They are new in the shipbuilding industry and they are training-minded and open for suggestions at all times.

CHAIRMAN MOORE: Well, we covered that one pretty fast. Does anyone on the floor have any comments?

MEMBER: I want to ask how many people have women on their plant safety committees?

... About fifty hands were raised ...

CHAIRMAN MOORE: It looks like a majority. Someone else?

SECOND MEMBER: A lot of foremen are afraid of the women that they are supervising and they don't enforce the safety instructions. The women show a lot of opposition to the supervision of the foremen, especially in regard to safety caps. They want their glamour. It isn't so easy to make the women cooperate, and it isn't so easy to convince them that they should cooperate.

MR. PECKETT (Lumbermen's Mutual): Women going into industry are using machines of the hazardous type, such as punch presses, etc. I wonder if they are told of the possibility of losing fingers and other serious injuries which may come while working on these machines?

CHAIRMAN MOORE: Answering for my company, I can say, "Yes." I assume that many more here have these instruction talks either at the time of employment or shortly thereafter. I would like to have a raising of hands on that. How many of you have instruction or induction talks where such points that this gentleman has raised are covered?

... About thirty-five hands were raised ...

CHAIRMAN MOORE: I think, sir, that answers your question to this extent: They are told the danger of these jobs in the beginning of their work at a good many plants.

MR. BETZEL (Carnegie-Illinois Steel): I feel that perhaps our panel was too much one-sided on this thing. For that reason I would like to suggest a problem that we had in our plant, and perhaps I can have a suggestion returned as to just the best manner to approach this particular problem.

It goes back to some discussion that went on before but perhaps you will excuse it because it does come under cooperation. In this particular case we have a package that is of pretty fair weight, and we have attempted to split the weight by means of a tong system whereby two women can handle the package. This was given to them very definitely as a part

of their job. The thing that we have run against is that supervision is not always present at the place and the women prefer to handle this package independently, with just one woman on the package instead of using the tongs which would split the weight.

I would appreciate some remarks on how to approach that. In other words, we have asked their cooperation very definitely and yet we find, in cases, that they still want to handle it independently.

CHAIRMAN MOORE: I think the crux of the question is, how do you handle an employe or employees who have been told the proper way to do the job and still persistently fail to do so in the absence of the supervisor? Would any of you ladies or gentlemen care to answer that up here?

MR. MATHEWSON: I hate to get into the social aspect of this problem because that can result in just a wrangle or argument that wouldn't be advisable here. However, when it comes to cooperation between women working in the same department, where teamwork is necessary, the cooperation is frequently poor. Again, the question of ages of women comes into the picture. One of the common complaints from the older women is the partiality shown by the supervisor, if he is a man, to the young good-looking one. They come to us and tell us some of these things. There isn't a thing we can do about it, because that is a problem we have been living with ever since there have been people in this world.

As far as getting two women to cooperate in lifting a box or some kind of weight, it does require teamwork and one of our biggest problems in industry has been to get teamwork from men.

I also hate to inject this next point, but the truth of the matter is that today we have a large number of so-called foremen or supervisors who never would have been supervisors had there not been a war.

In getting women to lift, I believe you will get more compliance with safety rules under a woman supervisor than you will under a man supervisor who allows other things to creep into the situation.

CHAIRMAN MOORE: I subscribe to what has been said, and I hope that that answers your question, sir.

MR. TIMMERMAN: Mr. Guilbert has made a charge that I think a few of us will take issue with. That was on the complete cooperation—he didn't quite put it that way—of women in the wearing of safety equipment and the fact that any safety man who didn't have that was slightly off the beam. I would like to find out what kind of subtle charm he uses to get the girls to put that front batch of hair, that curl, under a cap.

MR. GUILBERT: I know it is a job, and I am not trying to kid you that I have all the answers, because I haven't. I am very fortunate, however. We only have six jobs in which a safety cap is required. We have the girls wearing the caps on the drill presses. We had one minor accident where a small portion of hair was pulled from the head of the girl. We took a photograph and put the picture up. I got the girls together and told them about it. I asked for the aid of the women's council on each shift. All the members of the safety department worked with me, I talked to the foremen and we have it licked.

As I say, though, it is a very small problem with me. I realize that if I was in a plant with a lot of belts, gears, etc., I would have a job. I don't know what the final answer is, except to keep plugging away at it.

MISS BARKER: I was too hasty when I spoke previously of complete cooperation. I had forgotten our main problem of hair covering. We have just as much trouble as most of you, I am sure. How many of you have hair-covering problems?

... A majority of hands were raised ...

MISS BARKER: Has anyone found any means of solving this problem other than using a police force?

CHAIRMAN MOORE: The answer to that is pretty important.

MR. MERCURE: We have about 4,000 women replacing men. We talk to them about the need for doing the work right. Wearing a cap that completely encloses the hair is a condition of employ-

ment. That is understood. The first time this is neglected—OUT. This works.

CHAIRMAN MOORE: I think that is a good answer.

MR. BROOKS (Kentucky): The cap idea is all right, but not so glamorous. We have a half-cap with a bill on it and a snood. The girls like that because they still can show their tresses.

MISS MARY NICEWUNGER (Inland Manufacturing Company): We have over 2,500 girls in our factory. During the hot days—which were extremely hot—we found considerable trouble with the felt, which has a bill and also a snood. We solved that problem by getting in another hat which is neat and the bill is right, and we have no trouble. We give the girls a choice of either hat, and any girl in the factory that wishes to wear a hat, whether around moving machinery or not, may do so.

We tell them on induction that it is necessary for them to wear the hat. We tell them that they should be just as proud of that hat as any girl who is a WAVE or a WAC or a SPAR is proud of hers, and they are very happy with it. In fact, they are so glad to wear it that they wear it downtown, on the streetcar, and also to the picture show. We give them the hat and dry clean it for them.

MISS BARKER: That is a very important feature.

DR. FARRIS: I would like to raise the question as to whether you can do more in an attempt to glamorize a safe hair-do or safe style of hair. A lot of these girls wear their hair pinned on the back or over their eyes simply because Veronica Lake or somebody else is doing the same thing. It seems to me that, if you want to get the hair fixed where it would be safe, you could try to have them make a hair-do on top of the head and cover it with a cap and make it stylish. It might be a partial solution.

MISS BARKER: The hat mentioned already, with the bill and the rayon or net snood, is very attractive and we are emphasizing in our field that the smart thing to do is to wear trim, neat safety clothing, to come to work dressed smart-

ly. It has style appeal to the girls. We show them in posters and we work with the store people who cooperate very nicely with us in showing clever attractive advertisements of women dressed in smart war work clothing. It has had a tremendous effect in helping our problem, in getting the women dressed right to begin with.

MAJOR IMMEL: I would like to emphasize that if you will go back to your statistics you will find an infinitesimally small number of injuries occurring from lack of head covering. As I said before, certainly we need to get head covering, but here are the foot injuries which, in several of our installations, have amounted to almost 50 per cent of our totals in a month. The wearing of safety shoes is, I know, certainly as much of a problem as getting the cooperation of the girls in wearing head-coverings.

I just want to take this opportunity to say to all of you that you must have a sound statistical program on which to base your application of safety. I am afraid, from the extent of this discussion on this one small item, that that is not the case with many of us.

MR. JOHN GRAHAM: I think we have left out one point, that is, management's obligation. It was brought out that one company furnished a snood and dry-cleaned them. I think that when you take the women into consideration in the adoption of the safety shoes and the adoption of the hat and make it compulsory, you then have something.

MR. EPSTEIN (Western Electric Co.): I wonder how many people in this room have taken into consideration the guarding of spindles on their drill presses? When an accident happens, usually a head injury, you will find that it is at the spindle point and not at the drill point. I believe that accidents will be avoided by guarding spindles.

CHAIRMAN MOORE: I think that is a very important point.

MR. CHANEK (Western Electric Co.): On safety shoes, Major Immel had something that was really worthwhile. We at Western Electric issue a letter to the ration board to furnish safety shoes for the employees. We find

that the latest improvements in women's safety shoes are very good. They are good-looking and acceptable, and with a little effort on the part of supervisors to put on the pressure, saying, "They will be issued to you through the ration board and you will save yourself a coupon," women will be more interested.

CHAIRMAN MOORE: They would use them as auxiliary shoes. They have too few nowadays.

MEMBER: The one disadvantage, I think, with women's safety shoes is the trouble with the larger women. You will find a lot of the larger women employed in the factories now, and the safety shoes do not give adequate arch support.

MISS THEODORE: I have had that same problem come to me in a number of cases and have advised a separate arch support. This has proved more than satisfactory.

MR. GIBBS (Pullman-Standard Car Mfg. Co.): We have had quite a bit of difficulty with women on the wearing of shoes. Our trouble is also with the arch supports. We get them to wear men's safety shoes with the arch support. Over 50 per cent of the women are wearing them in our shops.

MRS. PURPURA: I find that the women feel that the man's type of shoe is too heavy. However, we now have a special heavy boot that they are wearing, a high-top shoe, but they find that the men's shoes are too heavy for them.

MISS BARKER: I don't feel that our manufacturers have caught up with our needs yet. They offer us only two styles; the arch support is not sufficient for our heavier women. I feel that we ought to make a plea to them to get out the type of shoe that is good-looking as well as serviceable and which would give us protection.

CHAIRMAN MOORE: I hope that all shoe manufacturers here will take note of that.

Do any companies keep separate records for men and women. Company frequency, severity and lost time accidents? How many keep such separate records?

... About 20 hands were raised ...

I think we ought to get to point number 5. That is: Do women need elaborate rest rooms and locker rooms to maintain morale?

MRS. PURPURA: I do not think women need elaborate rest rooms and locker rooms to maintain morale. All I think they would require would be sanitary conveniences and adequate facilities. As you increase your employment of women increase their accommodations.

MR. MATHEWSON: I believe the word "elaborate" is a little out of place. They ought to have rest rooms that are clean and ample in size, light and airy, but men need the same thing, the only difference being that the women's rest rooms ought to be a little more attractive.

MISS BARKER: In the shipyards we had facilities for men only. Women started coming in, and it was pretty rugged and difficult for them. Facilities were provided but they were very much on the minimum scale. This was an old yard and a new yard combined. In the old yard things were in very bad shape. Morale was low. The women complained incessantly. Absenteeism was an acute problem, and it was partially due, I know, to bad rest room facilities. In the new portion of the yard a rest room was built. It was barren, large, and had a number of day lockers that were adequate.

We put a matron in there who took charge and kept the place clean and tidy. Two or three weeks later I went in and found that this girl had added her artistic touch to this place. She had brought little bits of oil cloth, added these strips of oil cloth to the window and made it bright red. She had begged, borrowed or stolen nail kegs that she had painted white herself in her spare time. She put on blue oil cloth strips and dressed the room up.

The girls began to take interest. They brought plants. They brought a mirror. They brought vases for flowers and kept the vases filled. It was wonderful to go in there. Those girls never overstayed their ten minute rest period because they enjoyed the room and they didn't want to have any privileges taken away from them. It did a great deal in maintaining high production and a high morale in that shop.

CHAIRMAN MOORE: In the time remaining, I want you to feel free to comment or ask questions on any of these five points or other points that you may have in mind that are not covered by our agenda.

MEMBER: Women are not allowed to smoke in our rest rooms, but they are allowed to smoke at the machines, with the result that we not only have tidy rest rooms and locker rooms, but we also are saving a great deal of money for the corporation because the girls don't have to take time out to smoke. If you figure 15 minutes for four times a day it amounts to a lot of money for 200 employees.

CHAIRMAN MOORE: How do you find it working out?

MEMBER: Fine.

MISS JACKSON (Pullman-Standard): I think that would be too distracting to the worker to be smoking at the machine. I think the proper place is in the wash-room.

MISS MOORE (Department of Labor): At the beginning of this meeting the question came up about the fact that women, being new in industry, should have their certain special problems taken into consideration. In relation to their behavior in rest rooms, running in and out, etc., I think that is part of the same thing. This is a matter of properly inducting women into the responsibilities of the job. It certainly is true that a lot of women have come into the plants without realizing what their responsibilities in a regularly arranged, systematic job of that sort are. If that can be taught to them it seems to me they will not present any more of a problem in the matter of lounging than the men will.

MRS. BOWMAN: We have a plant that is less than a year old and we have stressed accommodations for women. Yet I am wondering if we should start stressing discipline instead of morale.

MR. WURMAN: I think a lot of us are missing a point. I am connected with an organization whose normal employment carries 5,000 women—not war employment but peace-time employment. We never have felt that women are a problem. I don't think you handle women any differently than you handle men.

DR. SAPETSON: This has been a most instructive session and I think Mr. Moore and the panel are to be congratulated. Believing that you want to have more information on this subject I want to call your attention very briefly to a recent study which was just completed by the Industrial Hygiene Foundation of Pittsburgh on women in industry, a plant to plant survey. It took approximately 6 months and covered a considerable number of plants in which women were employed entirely on war material.

A summary of this was given at the annual foundation meeting, November 11th, at Pittsburgh. The title of the study is "Health Problems of Women in Industry," but it contains a great deal more information than the title indicates. The Foundation will publish this very shortly.

One of the interesting things we found was a great need for more women safety engineers, more women counselors and more women physicians.

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WEDNESDAY AFTERNOON SESSION

October 6, 1943

Presiding: General Chairman, R. B. Carter, Chief Safety Engineer, Consolidated Vultee Aircraft Corp., San Diego, Calif.

Predominant Types and Causes of Lost-Time Injuries in the Southern California Aircraft Manufacturing Plants

JACK F. HATTON

Chief Safety Engineer, Lockheed and Vega Aircraft Corporations, Burbank, Calif.

Several months ago, the West Coast Aircraft War Production Council organized and set in motion a safety subcommittee made up of the supervising safety engineers of Consolidated, Douglas, Lockheed, North American, Northrop, Ryan, Vultee, and Vega. This group meets monthly for the purpose of assisting the war effort through the reduction of on-the-job accidents in the aircraft plants. The council acts as a central clearing house or pool for safety exchanges, accumulation of accident statistics, etc.

At one of the early meetings of the safety panel, a desire was expressed by all members for a uniform method of keeping records and compiling lost time accident statistics. Accordingly, a special subcommittee was formed and, after a series of meetings, they presented an outline for recording and classifying lost time injuries. It was adopted by all member companies and put into effect prior to January 1. It was further agreed that the council would compile the information and release it to the member companies every three months.

The Aircraft War Production Council has released its initial statistical report for the first quarter's injury experience covering the period from January 1, 1943, to April 1, 1943. At present, the council is in the process of accumulating the data on the second quarterly period but at this writing, it has not been released.

Predominant Types of Injuries

I would like to point out to you some of the predominant types and causes of lost time injuries in the aircraft manufacturing industry in Southern California,

this information being obtained from the council's initial report.

The data for each lost time industrial injury are recorded in each of five broad classifications, namely: 1. Pertinent information on the person injured, 2. Tabulation of the cause of the accident, 3. Effect of the injury, 4. Part of the body affected, and 5. Management and worker responsibility. Each broad classification is then broken down into as many categories as is necessary to properly classify the accident and injury.

Under classification 1 on general "pertinent information on the person injured," records are being kept, not only as to name, identification number, department, and date but also on age by ten year groups, hour of injury, and sex.

Figures accumulated for the combined eight member companies show 37 percent of all lost time injuries occur to the age group between 21 and 30 years of age. Next in line, comes the group between 31 and 40 years of age with 26 percent. Those between 41 and 50 accounted for 16 percent. Those between 51 and 60 accounted for 9 percent. Under 20 years of age, 8 percent, and those over 61, only 4 percent. To utilize this information to its greatest value, we should be in possession of the combined percentage by identical age groups working in the factories but so far we have been unable to obtain this. Nevertheless, we do know that the age group between 21 and 30 are the chief producers, as a group, of lost time injuries.

Time of Injury and Sex of Injured

As to hours of injury, the combined totals show first that more people receive

lost time injuries between 3:00 and 4:00 P. M., than any other time of the day or night. This is the hour of the day shift near quitting time; and injuries may be due to efforts to hurry up and get the job done before quitting and to the element of fatigue manifesting itself in less coordination between the hand and eye. The next poorest hour on the day shift is from 9:00 to 10:00 A. M., which is about in the middle of the morning portion of the shift. On the swing shift more people are seriously injured between 7:00 and 8:00 at night, which is also about in the middle of their first 4 hour period. On the graveyard shift more people are involved in serious accidents the first hour of the shift than in any other hour of the shift. We thus see the pattern by shift is not uniform and is somewhat confusing. There are probably many factors that must be taken into consideration when attempting to explain or justify these predominant hours of injury. However, we do know the hours at which most of them occur and can concentrate our safety efforts accordingly.

Careful records have been kept on the lost time on-the-job injuries occurring to men and women. Company A, for example, had a working force 35 percent of which were women and they suffered 45 percent of the lost time injuries. Company B had a working force of 46 percent women who suffered 51 percent of the injuries. There was considerable variance in this respect, and a few companies reported women as doing a better safety job than men on some shifts. However, the combined totals show that women in the Southern California airplane plants for the first quarter of this year suffered about 15 percent more than their pro rata share of the injuries.

This is not altogether surprising when we stop to consider a good many of these women had never worked in an industrial plant before. Most of them have been recruited rapidly and in large numbers from homes, stores, and offices with no industrial experience. They were placed on the production lines to replace men and do men's work without extended training periods and a store of industrial experience to draw from.

My limited experience with women in the aircraft industry has convinced me that, inherently, they are more careful about avoiding injuries than the average man. Most of them are very careful not to nick or scratch their hands, while some men don't particularly care. I find they are less liable to discard a safety device than the average man. They want to work safely, but the trouble has been they do not know how as well as men.

With continued attention to proper placement coupled with adequate and complete instruction on how to perform their work safely, the frequency rate of injuries to women is improving, and I feel they will equal or better the frequency rate of male employees in the near future.

Causes of Accidents

Examining classification 2 on, "Tabulation of the cause of the accident," which includes some 29 items, the combined totals indicate the greatest offender in this group is "striking against." This item accounted for 13 percent of all lost time injuries. Next in line is "falling objects" with 11 percent. Third place goes to "machinery" with 9 percent. The attack on the "striking against" injuries needs more concentration in the form of less haste, less congestion, improved housekeeping, wider aisles, and planned safety education. It is interesting to note that this item as a cause of injuries varied considerably in the different companies and ranged from 0 percent to 22 percent.

"Falling object" injuries should and can be reduced by requiring the use of more safety helmets, especially on the multiple story jigs and while working below the high portions of large airplanes. Expanding the safety shoe program will appreciably reduce toe injuries. Improved layout involving wider use of tool receptacles for such hand tools as hand drills, bucking bars, rivet guns, etc., will do much to eliminate the hazard of these being dropped or pushed off, injuring workers below. More pointed safety education to supervision and workers alike on this subject is called for.

Accidents Involving Machinery

While machinery occupies third place in the list of accident causes in these plants, I would again like to remind you it is responsible for less than 10 percent of our lost time injuries.

For purposes of tabulation we have listed every power-driven machine used in these aircraft plants. Accurate records are kept on every machine causing an injury. Only 2 machines out of the entire group are causing any appreciable trouble. They are squeezers and hand drills. Together these 2 machines are responsible for about 52 percent of all machine accidents, squeezers having the worst record with 28 percent and hand drills running a close second with 24 percent.

The squeezers include both the portable and pedestal varieties. To date the plants have not developed a satisfactory point of operation guard that can be used on all of them. After several serious finger injuries at one company, resulting from inserting Dzus fasteners in one of these air-operated squeezers, the company developed an automatic feed for the machine which not only eliminated the hazard of injury to the operator but substantially increased production as well. Drawings, photographs, and an explanation of this safety device were prepared and distributed through the Aircraft War Production Council to all member companies, most of whom, I believe, are adopting it. One phase of the trouble has thus been removed.

Part of our squeezer trouble, I believe, has been due to the fact that the machine in operation does not look hazardous. Because the machines do their work with such apparent ease, the danger is not appreciated by the average individual, although some of the larger machines exert a pressure of over 18,000 pounds.

For the present, at least, I believe the the approach to this problem essentially lies in education. No worker should be allowed to operate a squeezer until he has been thoroughly instructed in its use. He should be made aware of the hazards of the machine and the tremendous pressures involved. This might be followed up by showing the prospective operator

just what happens when a piece of soft wood is pinched in the sets.

Grinders are third on the list of machine causes with 6 percent, followed quite closely by circular saws. Machine accidents varied from as low as 0 percent, with one company to as high as 18.5 percent with another.

Point of operation injuries accounted for 71 percent of all machine accidents; drive mechanisms, 21 percent and other moving parts, 8 percent.

The combined figures on, "Effect of injury," classification 3, reveal that first, strains and sprains are the most troublesome. Next, are bruises, and lacerations are third.

Parts of Body Affected

In classification 4, "Parts of body affected," it was a little surprising to learn that injuries to the trunk were the most common. These have been manifesting themselves, primarily, in the form of sprains and strains. Corrective action involving more education in the correct method of lifting, furnishing additional help where necessary, and more widespread use of mechanical moving and lifting equipment. Next in line were injuries to the fingers and third, injuries to the legs.

The airplane industry has always been regarded as one with pronounced eye hazards. This is an inherent characteristic of the business because of so much drilling, burring, and small aluminum shavings floating around. That considerable improvement has taken place in eye injuries, is evidenced by the fact that out of each 100 lost time cases, only 7 of them are eye injuries. This has been accomplished through improving the goggle program; primarily, through individual fitting and expanding prescription goggle activities.

The combined totals of classification 5, "Management and worker responsibility," show that most of the injuries are attributable to the inability of the employee reflecting itself in inattention, with over one-fifth of all lost time injuries being cataloged as such under this item. Second are violations of safety practice; a man-

agement responsibility manifesting itself in lack of discipline. Third, are injuries due to unnecessary haste; again an inability of the employee.

Placing Responsibility

This classification, dealing with management and worker responsibility, is probably the most important of them all, because it deals primarily with the basic reasons for the accident and should be followed up, where possible, by determining the unsafe personal factor which resulted in the unsafe act.

This, admittedly, is not always easy to do. The sequence of events which ultimately results in an injury often starts in the mind of the employee. Perhaps he is worried over domestic difficulties or financial matters. To determine these things, which are often the fundamental cause of the accident, is sometimes difficult to do

and, as practical men, we must confine our investigations to tangible facts as we are not equipped to deal with psychological phenomena.

Careful and thorough investigation, however, will often bring into focus the basic reasons for these unsafe acts and will do as much, I believe, as anything I know of to get at the core of a lot of our present difficulties.

Our most troublesome accident characteristics have thus been revealed and we have geared our efforts and are concentrating our attack on these items. Such information is enabling us to do first things first and intelligent and planned positive action along these lines is helping to reduce needless accidents and injuries. As an industry, we are not going to be satisfied with anything less than some of the best frequency and severity rates of any industry in the land.

THURSDAY AFTERNOON SESSION

October 7, 1943

Presiding: Maj. H. D. Immel, Chief, Safety Branch, Headquarters Air Service Command, Fairfield, O.

Fire Prevention in the Aircraft Industry

By E. W. WILLIAMS

Fire Chief, Douglas Aircraft Company, Inc., Santa Monica, Calif.

There has never been an industry in the history of the United States which has been challenged by its government and people to expand its facilities and personnel more rapidly than have the aircraft manufacturers. In accepting this challenge and fulfilling its patriotic duty, the aircraft industry has, by necessity and production pressure, violated almost all sound fire safety building codes and standards. The production methods employed when the industry was new are a sharp contrast to the modern assembly line producing large quantities of planes in factories covering millions of square feet of floor area.

Contrary to popular opinion, ships of practically all metal construction do not mean that fire hazards in their manufac-

ture cease to exist. The same problems confront the Fire Department now as when the industry first began. As the industry expanded, new problems of fire prevention were not created—the old ones were merely magnified and intensified. If the industry had been permitted to grow at a normal rate, many of the problems which confront the Fire Department would never have arisen. However, since it became necessary to increase its production many times, sound fire protection principles which would have been incorporated into the design of buildings have been drastically curbed. The result is that the Fire Services have been forced to improvise rules and procedures. Just as the experimental engineers stand by on flight tests of a new model and wonder if the plane

into which they have incorporated radical new ideas will fly; so the Fire Department stands by when innovations of untried procedures in hazardous operations are adopted, wondering if fires or explosions will result because of errors in judgment or unforeseen conditions.

Production vs. Fire Protection

Due to the character of aircraft fabrication and assembly, particularly since the start of World War II, demands on the engineers have been so great that production has taken precedence over recognized fire protection principles. Prior to the war, the typical factory buildings of aircraft plants on the West Coast were constructed mainly of metal, steel frame and corrugated iron walls with a two-inch tongue and groove roof. Because of the shortage of critical building materials, manufacturers have been forced to adopt frame construction with large undivided areas. In addition, they have been forced to lease locations in surrounding communities for storage purposes and sub-assembly work. These decentralized locations served the dual purpose of removing large values of vital materials from the target areas and of giving additional space for the development of sub-assembly feeder plants. These outside locations have been an additional responsibility on the Fire Department for they have increased the amount of substandard construction to be protected, and many of the communities in which they were located could not meet the demands for fire protection and emergency conditions in a munitions plant.

Management has expressed a desire to use fire protection engineering designs and equipment prescribed by the National Fire Protection Association, Underwriters Laboratories, Factory Mutuals, and other recognized authorities, but has been handicapped by the shortage of critical materials and time. In many instances the building materials, fire cut-offs and fire extinguishing agents specified by design engineers could not be obtained. Many times, Construction Engineers and Plant Fire and Safety Departments have been forced, against their better judgment, to substitute material and equipment of sub-

standard design to expedite the completion of facilities.

You may be under the impression that because of the part airplanes are taking in the War and the fact that the aircraft industry enjoys a high priority rating, recognized fire protection standards could be maintained. On the contrary, many requests have been denied in the fire protection field. Recognition should be given the efforts of the Army Air Forces, Internal Security Section, and the Bureau of Yards and Docks who have been most cooperative in reviewing requests of the aircraft companies for fire protection. With the aid of the War Production Board and Bureau of Aeronautics the industry as a whole has been successful in maintaining and extending automatic sprinkler protection in the main facilities and additions to the plants, which, in our opinion, is the backbone of the entire industrial fire protection program. We believe this protection has materially reduced the fire losses in aircraft plants.

Problems of Fire Protection Personnel

Let us review some of the problems confronting fire protection personnel, beginning with the receiving and storage of raw materials. Aluminum sheet stock and its alloys, bar and tube stock, bolts, rivets, accessories, and miscellaneous small assemblies are received for fabrication and assembly crated and protected by light wooden boxes and cardboard containers, packed with excelsior and shredded paper. This packing material must be separated into salvagable scrap and waste, and the latter properly disposed of as the raw stock is being stored and routed. The major problems here are good housekeeping, adequate supervision, immediate disposal of waste and the isolation of highly combustible materials.

It is not unusual to discover that a comparatively small area of 20,000 to 30,000 square feet of floor space will house values in the millions of dollars. This high value of vital and strategic material requires, as minimum fire protection, automatic sprinklers with adequate water supplies and pumping facilities. We have not always been successful in securing regular fire

cut-offs, but in most instances division walls or draft curtains have been allowed.

These metal parts must be protected against mechanical injury, corrosion and deterioration, which means that each piece of aluminum sheet and extrusion or magnesium casting, which form the component parts of an airplane, must be heat treated and dipped or sprayed with a highly volatile and flammable substance before it is routed to saws, shears, punches or presses and assembly lines. This operation is no small problem as most paint spraying is done by the use of automatic equipment with a conveyor system which in most instances release flammable and explosive vapors to the atmosphere.

Special ventilation and automatic fire extinguishing units are given particular consideration and the utmost precautions taken to guard against the hazards, inasmuch as this process contributes to the start and rapid spread of fire. Vapors and gases from the heat treat baths used in the process of hardening and plating of sheet stocks, extrusions and castings are corrosive and, in certain processes, toxic. Therefore, mechanical ventilation of individual tanks of the area involved is necessary from a safety as well as fire protection standpoint. Wherever practical, gas fired appliances, used in connection with the heat treatment operation, have been equipped with automatic fuel shut-off and heat control devices.

Heat treating processes require the handling of large quantities of acids, crystals and other chemicals. These materials are stored in specially designed fireproof buildings with special cut-offs and enclosures equipped with floor drains, shower baths and individual compartment ventilations, and are handled and dispensed only by experienced personnel who issue the material on requisition to designated employees.

Inflammables are received in manufacturers' drums, and are stored in steel or fire resistive buildings in isolated locations. Paint mixing and dispensing operations are usually housed in the same structure as the paint storage, and for that reason, a recognized standard cut-off is provided between the two occupancies.

Mixing equipment and drums of inflammable liquids in use in the paint mixing area are adequately grounded and bonded against the accumulation of static electricity. Deliveries of these materials to paint departments, paint spray booths, doping rooms and other locations have been limited to quantities which will not exceed the demand for such material on any day. The transportation is by electrically powered mule or train, the superstructure of which is non-ferrous or non-sparking material, which is grounded and protected against the excessive accumulation of static electricity. It is required that all such material be dispensed and transported in Underwriter's labelled containers. This particular operation requires constant inspection and supervision, as well as the services of a maintenance inspector to maintain the containers in a good state of repair and safe condition.

The conventional wet sprinkler system or deluge system is a minimum requirement for storage, mixing and doping rooms. Major doping, either by hand or spray methods, presents a serious fire problem even with proper building construction and ventilation. All possible precautions are enforced, including the limiting of the quantity of materials on hand, grounding and bonding of tables and racks, and the use of explosive and vapor proof motors, lights, light fixtures and other electrical or spark producing equipment. Periodic inspections are made by the personnel of the plant Fire Department.

Besides the doping and paint spraying operations mentioned, aircraft plants are compelled, by the pressure of mass production and limited space, to conduct some spraying and doping on the final assembly line. On a minor scale, the same precautions are taken as mentioned previously. Portable fresh air blowers with flexible tubes are provided, and an attempt is made to ventilate all compartments of the ship. To safeguard this operation a fire inspector is stationed on the ship to halt any other activity during the painting and spraying of the interior of the plane.

Gasoline Hazards

Another fire prevention and protection problem which demands constant inspection

tion is the handling of large quantities of high test gasoline during the testing of fuel lines, fueling and defueling of planes, pre-flight and flight tests. The inherent hazards involved are increased by the carelessness and ignorance of employees who persist in treating gasoline as though it were water. In this operation, more than others, the problem of inexperienced personnel is apparent. Many employees completely disregard the hazards of gasoline, and seem unaware of the fact that the ship on which they are so carelessly working represents an investment of more than a quarter of a million dollars and thousands of man hours of labor. Although an experienced fireman is assigned to the area on each shift to enforce such regulations as disconnecting battery terminals, power driven machinery and equipment, checking for leaky fuel lines, valves and fittings, proper electrical connections, vapor proof lamps and power supply systems, we have not been entirely successful in controlling the human element in these flight operations. Further, we are not satisfied with the progress made in educating the personnel. Until such time as experienced employees again perform this operation, we can only take the precautions of isolating the ship a minimum of 50 feet from other aircraft and stationing a fireman who has at his disposal mobile fire suppression equipment and who is authorized to stop operations when safety rules are flagrantly violated.

Other inherent hazards that prevail are cutting, welding, and wood-working operations. A valuable procedure in reducing the number of fires caused from welding and cutting has been the practice of not permitting any welding and cutting until a plant fireman with proper extinguishing agents has been assigned to stand-by and to inspect the location to be sure all combustible and highly inflammable materials have been removed or protected against slag and falling sparks. Management has also issued strict orders that all portable gas cylinders used in welding operations be securely anchored to prevent accidental overturning, thereby controlling both a fire and safety hazards. Proper type blowers and discharge systems are accorded major wood working machines. An

effort is also made to maintain electrical installations in strict conformity with the National Electrical Code and to rework substandard installations as soon as critical materials are available. Particular attention is given to the location and maintenance of transformers. Experience has proven that periodic inspections, cleaning, maintenance and the prohibiting of overloading of motors and circuits are the best safeguards against electrical hazards.

The problem of proper disposal of oily waste and rags, waste paint and thinner, paint residue and waste gasoline and oil has been controlled successfully by providing appropriate containers; insisting that employees use them; and checking on the daily removal of the containers from the plant.

Contrary to the wide publicity given the risks involved in the grinding and milling of magnesium extrusions and parts, we have experienced comparatively little difficulty in this operation. The instructions furnished by the magnesium companies regarding safety procedures have been strictly adhered to, and to my knowledge there have been no major fires in the aircraft plants on the West Coast as a result of this work.

The Douglas Aircraft Company, Inc., pioneered the idea on the West Coast of permitting two ten minute rest and smoking periods on each shift for production employees, with the purpose in mind of giving the employees a few moments of relaxation and of improving management-employee relations. Each department was furnished receptacles for cigarette stubs and matches, and each department supervisor was required to see that these containers were placed in aisles or convenient locations for employees during this smoking and rest period. Smoking is prohibited in certain areas at all times. Many predicted that this privilege would be abused by the employees, that numerous fires would result, and the practice would be discontinued. On the contrary, these smoking periods have increased production, reduced the amount of time wasted, and improved employee-management relations. Supervisors and their volunteer fire brigades have kept the situation under

control, and no fires have been reported as originating from this source. The success of the scheme has been reflected by its adoption in all other major West Coast aircraft plants. We believe that supervised smoking periods present a lesser hazard than unauthorized smoking by employees who sneak off to remote or restricted areas.

Volunteer Fire Brigades

I mentioned the assistance given by the volunteer fire brigades in controlling the smoking periods. Their value can not be estimated. The factories now occupy such large areas that it is not possible for regular plant firemen to maintain a complete surveillance of the entire plant. The industry realized long ago the need for organizing and training volunteer fire brigades to cover the plant on all three shifts, and has collectively instructed thousands of employees in the use of first aid fire extinguishers and equipment and fire prevention pertaining to good housekeeping methods. The volunteer fire brigades assist Plant Protection in checking unsafe, substandard conditions and operations and reports to the Fire Department. The brigades contribute in many ways to the maintenance of closer industrial relations between the employees, the supervisors of departments and the Plant Protection Division. Naturally, to maintain the high standards of a volunteer fire brigade to cope with the war emergencies and conditions requires regular drills and instructions which are given by a competent fire protection man assigned this duty.

We would like to cite the fire record of one major aircraft plant on the West Coast for the year 1942. There was reported a total of 78 fires in this plant, of which 72 were extinguished by the volunteer fire brigade without the opening of a sprinkler head. The loss reported to the insurance carriers in material and labor amounted to a total of \$1,100, out of an insurance coverage of many millions of dollars. We believe this small loss ratio can be attributed to the alertness and prompt action of the volunteer fire brigade in using the equipment available to extinguish fires in their early stages. During the first half of 1943 there has been a

decided increase in the number of small fires reported in this particular plant which we believe are due to the increased number of inexperienced employees and mass production demands. An intensive educational program will be necessary if the 1942 record of small fire losses is to be maintained.

Personnel Set-Up

Prior to our entry into this war, little consideration had been given to fire protection in the aircraft industry, and the first and greatest problem encountered in the expansion of the fire protection program was securing personnel familiar with industrial hazards. The field of industrial plant protection has always been limited, and the demand for Fire Department personnel in all industries, together with losses to the Armed Forces, created a serious shortage of trained men. The experience of personnel trained in public fire fighting has proven of little value in industrial inspection and fire prevention. It, therefore, became mandatory for Fire Chiefs to select employees from other fields to serve in the plant Fire Department, and to originate a complete training program to teach them the duties of plant firemen. This educational training has proved a satisfactory substitute for personnel with prior experience, and has given the Fire Chief an excellent opportunity to educate his men in the basic fundamentals of the highly specialized field of industrial fire prevention and protection.

Even though the plant Safety Engineers are not a part of the Plant Protection Division, their suggestions and experience have proven of great value in assisting the Fire Department in general protection matters. By presenting their mutual problems to Management, they have been successful in obtaining more prompt action. While it is not expected that the Safety Engineer should become versed in all fire protection problems nor the Fire Chief in all safety problems; a general knowledge of the specialized field of each is invaluable in understanding the mutual problems of the related departments.

Through cordial relations and friendly contacts with Plant Engineers, many fire

and safety problems encountered in proposed new construction, expansion and rework have been eliminated by incorporating protective features in the preliminary design. Plant Engineers are often prone to design and construct buildings omitting basic fire and safety features. In such cases, immediate rework becomes necessary which involves the expenditure of additional labor and material. Many times, industries are located in communities not protected by strict county or city fire ordinances so that fire protection and prevention must be sold to Management and Employees alike. We have tried consistently to sell them on the idea that it is cheaper to fight fires with forethought than with extinguishing agents.

Most aviation Plant Protection Divisions are headed by an individual who is a specialist in police and criminal investigations. Since he is not fully informed regarding fire protection problems and procedures, it is incumbent upon him to vest full authority and responsibility for its management in a competent and capable fire chief. The burden of responsibility for fire protection placed on the Fire Chief is lightened when he knows he has the full support and cooperation of his superior in obtaining immediate and favorable action by Management on his recommendations.

Relations With Management

At this point it might be mentioned that all Fire Departments face the same problem of having their recommendations overruled by Management. I would like to cite a case where 150 bales of sisal were stored against the wall of a warehouse. The Fire Chief during one of his inspections requested that this highly combustible material be removed to a location which would not expose the building should the sisal become ignited, and remained there until his request was carried out. The Plant Manager later ordered the sisal to

be returned to that location beside the building. Less than a week later a fire of undetermined origin occurred in the sisal which resulted in considerable damage to the building.

Another similar instance of the Fire Department's recommendations being disregarded occurred recently when material and parts were uncased in a fire lane. Protests were made but the operation continued until a large quantity of paper, excelsior and cardboard boxes accumulated against the wall of a manufacturing building. A construction employee working on the roof carelessly dropped a lighted match or cigarette into the excelsior which started a flash fire. The prompt action of the plant and public Fire Departments prevented an extremely serious fire which would have destroyed vital and critical materials.

Although I have touched on a few of the more serious problems of fire prevention and protection, there are many processes and operations peculiar to the aircraft industry, particularly in projects of an experimental nature, which are at present restricted information and can not be discussed.

In conclusion, however, I would like to repeat that the automatic sprinkler system remains the backbone of the industrial fire protection program, and it is imperative that this protection continue to be accorded the industry. Then, by keeping fire protection on a par with production, maintaining an educational program for employees, insisting on sound engineering designs and good housekeeping practices, together with the services of a well trained, efficient Fire Department personnel and inspection service, the industry may continue to operate with its low fire loss ratio, and will produce—without interruption from preventable fires and explosions—the planes which will hasten the destruction of our enemies.

Safety on Aircraft Assembly Lines

A. D. CADDELL, Safety Engineer

Curtis-Wright Corporation, Airplane Division, Columbus, Ohio

The tremendous expansion of the aircraft industry has brought many difficult problems to management, industrial relations experts, supervisory and safety staffs. Well in the forefront of these problems we find provisions for the control of plant, machinery, fabrication and processing to the end that the lives, limbs, health and well being of the employed personnel will not be exposed to undue or unnecessary hazards.

That progress has been made in these endeavors may be attested by reference to the published records of the U. S. Department of Labor in a press release dated July 18, 1943, which indicates the average frequency of lost time accidents in the aircraft industry for the first four months of 1943 is 10.8. This is further borne out of the following recent release of the National Safety Council: "Manufacturers of military aircraft were especially effective last year in protecting the safety of the workers who built the essential machines that deal death to our enemies. Of 31 war industries studied, the aircraft manufacturing industry was among the top five for 1942 in accident severity and among the top six in accident frequency."

In the building of planes, beyond certain departmental activities, we find our job is pretty much one of assembly; that is, we begin the manifold operations of assembling the component parts fabricated in sub-assembly operations which, when brought together in the final processes of the assembly line, become the completed product. At this point, let us hurdle the problems of sub-assembly and concentrate on the final assembly lines.

Hazards Due to Elevations

First, let us consider the hazards arising from the various elevations at which the final assembly operations must be performed. Mounted in mammoth jigs or dollies, we bring together the fuselages, cabin assemblies, landing gear assemblies, center panels, outer panels, stabilizers, cowl, engines, propellers and so on, working at elevations ranging from zero to heights of 10, 12, 14 or more

feet from the floor and presenting hazards involving stands and platforms on various parts of the fixtures.

Much can be done to control these hazards if good coordination exists between the safety and planning and designing departments, so that continuous platforms, jigs and fixtures have safety features inbuilt—such as standard railings, toe boards, friction treads, all of which enable workers to safely operate at varying elevations without endangering workers below or being exposed to injury from slipping or falling and without the necessity of employing floor stands or makeshift devices.

In the modern plants employing conveyor lines, much can be accomplished in overcoming or eliminating tripping and stumbling of workers passing between the dollies by high-lighting the conveyor line, tracks and electrical buss ducts with alternating bright colored striping. We have also found that outlining the edges of the different elevations of the continuous platforms is quite helpful in preventing stumbling and falling.

Moving Materials

Next, I would touch upon the hazards of moving materials onto the assembly line. Cranes, monorails, hoists and varying forms of mechanical lifting and carrying devices are employed. Large pieces and frequently completed ships must be moved over-head; therefore, if inherent hazards are to be avoided, consideration must be given to the installation and operation of hoisting equipment—slings, cables, chains, etc.—all of which should be subject to rigid control, constant inspection and maintenance. The operation of hoisting equipment and, particularly, traveling cranes should be placed in the hands of experienced operators only. To permit indiscriminate operation of this type of equipment is to invite disaster.

Another point in connection with moving of overhead loads, which seems to be elementary but nevertheless should not be overlooked, is the question of persons passing, standing or working below suspended loads.

With the introduction of vast numbers of workers unfamiliar with hazards of this type, supervisors must be firm in not permitting undue exposure to the dangers of shifting or falling loads.

On the final assembly line, as in sub-assembly, the industry employs vast numbers of high cycle electric extension tools which often must be placed in the hands of workers of limited mechanical experience. Unless they are carefully instructed and closely supervised, continuous use and sometimes careless handling will make a hazardous instrument out of this type of tool. In addition to close supervision and frequent tool crib servicing, continuous on-the-line inspection by competent electrical maintenance men offers the best safeguard to this type of hazard.

Safety Clothing For Women

Then there is the hazard of electric drills in connection with hair covering for women employees. There have been altogether too many instances of severe scalping or partial scalping to women employees because flowing or loose hair has not been completely covered and, either through direct contact or static attraction, the hair has been wound around the smooth shaft of an extension drill. The answer to this hazard is obvious; but some managements have felt that enforcement of competent hair covering cannot be accomplished.

Of course, this controversial subject of safety clothing for women has been disturbing to safety men in all industries. However, progress seems to be being made toward universal adoption of proven safe apparel. Making safe clothing a condition of employment would practically eliminate this hazard but requires heroic measures to make it effective.

We have the ever present problem of eye protection. Wherever operations such as filing, reaming, drilling, etc., produces fine metallic particles of light weight metals such as magnesium or aluminum, there is need of protection against eye injury. The question of varying elevations tends to increase this particular hazard, in that the operator working on the lower levels is subjected to fine particles from operations overhead. Many effective devices are available and a combination of one or more, best suited to the given job, should be adopted

following a survey of each job. The wearing should be strictly enforced.

Hydraulic Controls

Depending on the type, kind and purpose of ships coming off the assembly lines, we find varying mechanical safety problems arising out of hydraulic controls, folding or trailing wing sections, bomb bay doors, spilling of hydro oil and many others too numerous to mention. Specifically, the adequacy of guarding against unwarranted hazard from these agencies is dependent upon close coordination between supervision, engineering design and the safety engineers.

The hazard to the employees working in the bomb bay area is great. First because the controls are located in the cockpit. Second, workers in the bomb bay area or workers in the cockpit cannot see or communicate with each other; therefore, positive means of guarding must be set up so that inadvertent operation of controls will not subject the employees in the bomb bay to terrific hydraulic pressures, with grave or possible fatal results. Means of control of this hazard can usually be found in guards on controls which must be manually removed before the moving parts can be operated, supplemented by visual guards in the bomb bay area itself so that the workers may have the assurance that the protective devices are in operation.

Testing and Adjusting

When the ship finally rolls off the line into pre-flight for adjustments and final inspection, a new set of hazards immediately are presented—the introduction of high octane fuel, the whirling propellers, the taxiing of ships—all of which call for alert and forceful supervisory control rather than dependence upon manual or mechanical safeguards.

After a ship has been on the ramp and gauged and there is need of re-work, care must be exercised to see that only air driven tools are used. Electrical motors should be prohibited and the added precaution of adequately grounding the ship against static sparks should be made.

When engines are started, a standby man with fire extinguisher is a must item. Other musts are: wheel chocks must be in position when motor tests are made; ships grounded when fueling; check brakes before

taxiing ship; don't speed while taxiing; never leave switches turned on in any ship; be sure everyone is in the clear before starting engine; be sure the switch is turned off before turning over the propeller; don't walk under propeller at any time.

One of the most timely suggestions to all aircraft workers is: "Do every job as if you were going to fly it yourself."

Human Failures

Up to this point, we have enumerated largely physical conditions carrying with them hazards which, everything being equal, are subject to control. It would be easy to continue to enumerate many others similar in character but, since statistics which are now taking form in the industry indicate that human failure is responsible in a larger than average degree, it would seem we should turn our attention in this direction.

It has been pointed out many times how the airplane industry expanded from a comparatively few employees to hundreds of thousands, in a brief space of time, and the fact is undeniable that many of these men and women are now gaining their original industrial experience. Therefore, there is imposed upon supervision the job of instruction and training, calling for the utmost patience and ingenuity in guiding these comparatively untrained hands and minds in safe and productive channels.

Competent safety instruction during pre-employment training and on-the-line training will go a long way towards enlightening new employees in the proper use of equipment and in safe work practices; but this kind of training should only be looked upon as supplementary to competent supervisory instruction and supervision.

The greatest safety control, either on or off the assembly line, in the airplane engine or propeller aircraft plant is in the training of the workers to recognize the hazards and to work in safety. This is especially true in assimilating the juvenile workers appearing in industrial plants in increasing numbers.

These conditions impose greater responsibilities upon the foreman, who in the final analysis is the person who can logically incorporate safety instruction in teaching the new employee the requirements of the job.

A great deal depends upon the manner in which the foreman breaks down the job and in his willingness to respond patiently to the questions involving the how and why. He is in a preferred position to teach the new employee that he too has a responsibility for his own safety.

Repetition Necessary

This is not a lesson which can be imparted in one session and be expected to last for all time but must be repeated time after time, bearing in mind that most workers want to do a good job and much depends upon the confidence they have in their immediate supervisor. If he is careless in his presentation of the hazards, the method of procedure, the handling of material and equipment, you may expect poor safety records. On the opposite side of the picture, you may be assured that in the department where the foreman is enthusiastic and thorough going in his safety instructions and willing to assume the responsibilities which go hand in hand with authority you will have fewer accidents and corresponding quality and quantity production.

It seems to me that safety directors or engineers can well afford to concentrate on selling the foreman that safety is a part of his job and a job that must be done. A job outranking in importance any other consideration before him.

After all reasonable precautions have been taken, when facilities are constructed with safety factors incorporated, we will arrive at the same place as any other branch of the Aircraft Industry or for that matter any industry; namely, the control of hazards and the promotion of safety and accident prevention will be dependent upon the earnestness, enthusiasm and determination of management in support of a sane safety program.

Air Transport Section

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†As elected by the delegates in Congress session

TUESDAY AFTERNOON SESSION

October 5, 1943

Presiding: Jerome Lederer, Director, Airlines War Training Institute, New York City.

Why Top Management Should Initiate and Support Accident PreventionW. A. PATTERSON, President
United Air Lines, Chicago

A good many of you in this audience have devoted years to the study of industrial safety in all its phases. A considerable number of you have contributed specifically to the science of safety in air transportation. All of you, as evidenced by your presence here today, have an absorbing interest in the subject of accident prevention.

Certainly, I am not going to attempt to tell such an audience about the fundamentals of good safety practices. Rather, I am going to review with you some of the things which we have done together, with an emphasis on our experiences in air transportation, in an effort to clarify our aims as they pertain to accident prevention today and as they will influence our actions in this direction tomorrow.

Improvement in Record

No industry ever has achieved a perfect safety record, nor will air transportation. But today we can look back over the record with real gratification. We have, in the period of just two decades, seen scheduled flying transformed from its crude, rough-and-tumble beginnings to a highly scientific business. We have seen airline safety readily improve to the point where it compares favorably with that of other forms of transportation. We have, I believe, at last come to the point where we have won general public confidence and acceptance as a safe, reliable means of transportation and communication. One proof of this has been the attitude of leading insurance companies in underwriting air travel insurance at rates equivalent to those which apply to surface transportation.

Analyzing the record, what do we find as some of the things which made it possible?

A prime factor, in my opinion, was the attitude of airline management backed by

employee loyalty and enthusiasm. We who had the responsibility of making air transportation go, so to speak, knew well that safety had to be a main objective.

Management's job was that of establishing the goals, then enlisting the whole-hearted support and cooperation of employees. Safety had to be sold to everybody on the airline system, from the pilot to the mechanic, from the traffic man to the passenger agent.

A second factor in making our record possible certainly was the faith and support of those outside the industry. Many a stockholder and many a customer stood by us at times when their moral and financial assistance meant a great deal. Here again, I think that management's attitude helped. We had to demonstrate our own belief in what we were doing before we could hope to convince others.

A third, highly important factor was the mutual cooperation of all airlines toward the common goal of safety in scheduled flying. Lessons learned by one airline were passed on to others. Experience was interchanged. New developments were made available to the industry generally. The managements of all airlines sensibly worked together. Aircraft, engine, propeller and accessory manufacturers worked with them, too.

Change in Approach

During the development era, airline safety was conceived as something largely concerned with flight operations. The accent was on safety aloft—safety for passengers. Then, gradually, as we grew older and more mature, we began to think of safety on the ground.

The influence of ground safety upon flight safety certainly had much to do with our new attitude but the thing went deeper than that

Program Developed

Employee participation became a keynote of our safety activities just as it had of other company programs. We knew that employees could not just be told; they had to be given an opportunity to help.

The whole program was placed under the direction of our vice president in charge of operations. We then named an executive safety committee to act as his advisory board. This consisted of various department heads and the safety director.

Next came the appointment of accident prevention committees at our key stations, consisting of representatives of all the various departments at those stations.

Employee participation was introduced through the appointment by supervisors of one or more employees as safety patrolmen. It was specified that these patrolmen would serve for two months, then be replaced by others so as to rotate the work among as many employees as possible.

Within the last two years, we have built up our safety organization to include the safety director and three other full-time safety men, twelve part-time safety men and 225 safety patrolmen. In addition, all station managers and supervisors are safety leaders.

Aided by the National Safety Council, our safety department has conducted extensive employee education work with such tools as sound slide films, safety instruction cards, safe practice pamphlets, data sheets, posters, safety rule books, a foreman training series and material on safety in the home.

A systematic method of investigating and reporting accidents of every nature has been established. Such reports aid materially in studies to determine what might be done to prevent a recurrence of such accidents.

Work of Committees and Directors

Our executive safety committee in Chicago must meet periodically to review reports and act upon the recommendations of accident prevention committees at stations along the system. It must consider large expenditures for accident prevention, must approve any major changes in our safety organization and activities and must keep abreast of new legal developments concerning safety.

There was the recognition of safety for employees as one of our social responsibilities. Safety for the individual employee certainly had a bearing on such other things as his job security and the welfare of himself and his family. It had something to do with employee morale as well as with more efficient airline operations. There were a lot of intangible gains to be had from an intelligent, vigorous safety program—gains which couldn't be counted on the cash register but which could add materially to the invisible assets of our organization.

Management Must Take the Lead

Speaking for my own company, I can say that United Air Lines already had made some progress in the matter of management-employee relations. We recognized that, as in all other management-employee matters, it was up to top management to take the lead if our safety program was to be successful. We had to sell our chief executives on its advantages if we hoped to have them, in turn, sell their supervisors and if those supervisors were to sell the employees. In other words, management had to provide the incentive and follow through with its whole-hearted support, moral and financial.

I am pleased to report that we achieved results. We already had a fertile field in which to work, for, as I have shown, we had been making safety one of our chief objectives for many years. Our top executives already were sold to the bill on the importance of safe operations. It remained for us to show them what could be accomplished by safety on the ground, both from the standpoint of still further improved operating efficiency and employee welfare.

We launched our intensified safety program in the fall of 1941 with the appointment of Mr. Jack Curtis as our safety director. He proceeded to plan the campaign and to get together an organization which could carry it out.

We told Mr. Curtis that we would give him all necessary financial support to do the job and that we would back him to the limit in making the program click. At our general headquarters in Chicago, we proceeded to enlist the assistance and cooperation of every department head. They carried the message to their supervisors and it was handed on by them to the employees.

Our accident prevention committees at the various stations discuss major accident-producing conditions and circumstances; recommend corrective action, review the reports of safety men; review and act upon suggestions for the improvement of unsafe conditions; study and act upon accident investigation reports submitted by supervisors; investigate all serious accidents and recommend corrective steps; approve or reject any new construction, equipment installations or change in procedure from the standpoint of safety; and recommend methods of assuring safe conduct on the part of all employees.

Our safety men and safety patrolmen make periodic inspections of company premises and report any irregularities; conduct educational meetings of employees; handle poster and other safety material; solicit safety ideas and, generally, work as the final link between top management and the employee on the job—a link which not only enables management to talk to the employee but which also permits the employee to give his safety ideas and recommendations to top management.

Painting for Safety

Just recently, we adopted the new three dimensional system of painting for machines in our maintenance shops and hangers. We found that, by using various colors of paint on various parts of machines, we could produce the best light reflection qualities to emphasize safeguards and to spotlight points of operation.

It was a pleasant surprise to see what difference the use of this system made in just one of our shops—the machine shop at our central maintenance base at Cheyenne. What had been rather a drab and dreary place was completely transformed by the intelligent use of paint. Horizon gray, international orange and white paint had been employed to real advantage in dressing up the machines. A non-skid paint had been applied to the floor. Everywhere, light colors had replaced dark ones to give the shop an entirely new, airy appearance. We complimented the shop foreman but asked how the light buff paint on the machines was going to be kept clean.

"There's a psychological reaction there," he told us. "Machinists are mighty proud of these new paint jobs and, actually, our

machines are much cleaner than ever before."

The effectiveness of our safety program is evidenced by the fact that, during the last six months of 1942, there was a decrease of 18 per cent in the average frequency rate although the number of company personnel increased 35 per cent in that same period.

Suggestion System

A major aid in the conduct of our program has been the operation of our suggestion system. Approximately twenty per cent of all suggestions which come into our Chicago headquarters—and some 500 are received each month—have to do with safety. To encourage suggestions of this sort, we have an annual safety award in addition to the War Savings Stamps and Bonds which we regularly give to employees for worthwhile ideas throughout the year.

Some exceedingly valuable safety suggestions have come from this source. They have ranged from such simple things as ideas for placing "in" and "out" signs on office doors to elaborate plans for improving flight operations.

I long have counted the suggestion system as one of the most important features of our management-employee partnership program. Here, in tying in with safety, it again has demonstrated its extreme usefulness.

Responsibilities of Management

I have contended, in many another talk, that business too frequently has failed to recognize its social responsibilities and that it must accept these as part of the cost of operation if private enterprise is to endure.

It seems to me that management must accept safety as one of these responsibilities—and without regard to the dollar value of returns. Certainly we have a responsibility in providing the proper environment for our employees—proper lighting, proper ventilation, sanitation, the right kind of equipment and so on. Just as certainly, we are derelict in the administration of our responsibilities if each such item has to be justified on a dollar and cents basis.

We have a responsibility, first, in seeing that we place employees where they can best develop themselves. There is, perhaps, nothing

more potentially dangerous than the right man in the wrong job. Let's try not to make mechanics out of accountants or vice versa. Let us so conduct our pre-employment "screening" and so watch the performance of our employees on the job so that we keep the round pegs in the round holes.

Let us provide proper medical attention for our employees so that ill health, mental or physical, will not reflect upon the efficiency and safety of their work. A sick mechanic can be more of a hazard than a sick pilot, and a stenographer who is ill can cause trouble all along the line.

Let us think in terms of the employee's welfare at home as well as at work. Worry can be one of the greatest causes of accident. Let's be certain our employees aren't worrying about the security of their jobs and of their future. Let us help to assure that security, to all reasonable limits, at the same time assisting our employees to grow with us so that they can take part in the big air transportation developments which lie ahead.

Let us, at all times, be aware that air transportation is more than just a plane in the sky—that there are 54 of our people on the ground for every plane aloft and that the

welfare of those people can have everything to do with the safety, efficiency and dependability of the service which we furnish the public.

Must Continue Efforts

We have come far in air transportation in a relatively short time. We have learned a great many of our lessons the hard way—by trial and error, by experimentation and failure. We have steadily gained ground in winning public acceptance. We also have made considerable progress in the field of management-employee relations.

Air transportation has a long way yet to go. We in the business know that the Age of Flight is just around the corner; that our greatest opportunities lie ahead. We know that the airplane has only begun to make itself felt as an instrument for social and economic advancement.

Let us resolve that we will lose none of the ground which we have so hardily won. Let us cherish those precious intangible assets which help to make any business great. By so doing, we can assure ourselves that our industry will operate safely and efficiently, to the fullest extent of its usefulness, in our great and busy tomorrow.

Safety Education in the Army Air Forces

COL. S. R. HARRIS

Army Air Forces, Winston Salem, N. C.

Last June at Randall Island, New York, your president, Colonel John Stilwell, presented the Distinguished Service to Safety Award to the Army Air Forces.

In acknowledging the award, General Arnold said, in part:

"In the midst of our sudden and vast expansion, aircraft accidents presented us with a grave problem. In attacking that problem, we resorted to methods of the National Safety Council itself, flooding our airfields with posters and educational literature. We used every possible means, every known expedient, to minimize the possibilities of mishaps, to preclude the hazards and dangers resulting from human errors."

Cornerstone of Program

As always, the General knew what he was

talking about. Safety education is one of the cornerstones of our entire safety program—a program which, as of today, has produced an accident rate nearly 30 per cent below our prediction for this same date.

In other sections of his speech, the General sketched the importance of prevention and investigation, flight control and other components of the Office of Flying Safety—all of them essential weapons in our offensive against aircraft accidents.

Each of these phases of our work, by the way, is a subject in itself. You people who are familiar with the "three E's" of safety will be interested in knowing that accident prevention in the Air Forces follows that familiar pattern.

Our regional safety officers operate in much the same manner as do the safety en-

Read by Lt. Col. R. L. Steindle. Comments by Col. Steindle in file in NA 21cs 1943.

gineers of the great insurance companies, the safety directors of our great cities, or the safety managers of our large industrial plants.

In its broadest sense, flight control and related units of the organization function as the second E—enforcement. In its present phase this unit lays down no laws and inflicts no penalties; however, it is the traffic cop on the corner who says, "O.K., go ahead," or, "better turn around and go back, Brother, there's trouble ahead."

But I have been asked specifically today to expand the General's references to that third E—education.

80 Per Cent of Prevention Due to Education

In my opinion, education in its broadest sense is responsible for 80 per cent of the saving in lives and equipment that we in the Office of Flying Safety have been able to make. I am speaking now, of course, of the reduction in the accident rate under what we expected it would be.

When I say education in its broadest sense, I mean not only the posters, booklets, movies and other materials produced by our safety education division; I mean, too, the suggestions and advice our regional safety officers give to mechanics, pilots, operations officers and all the others with whom they come in contact.

Education is defined as "the systematic training of the intellectual faculties." To the layman, that sounds simple enough. In a country where the value of education has been recognized and appreciated from the first days of its history, the systematic training of the intellectual faculties of intelligent, receptive young cadets along the lines of flying safety would appear to be a matter of routine.

You gentlemen who know the psychology of safety education in other fields and who also know the thought processes, the temptations and the temperament of a twenty-year-old American boy, will realize that safety education in the Army Air Forces is about as far from routine as Hitler is from victory.

Average Cadet

The boy is the starting point of the AAF program of safety education. Just what is he like?

Well, he is a smarter-than-average 18 to

20 year-old American boy with an A-1 bill of health. He is like many of our young automobile drivers—just about that age, too. He has supreme self-confidence, a tremendous amount of natural ability, an almost total lack of fear. By comparison with a settled 40-year-old pilot, he is almost rockless. But by comparison with other young men of his age, he is serious about his job and anxious to do it well. Oh yes, there are exceptions. There are those among these lads who are irresponsible, devil-may-care in their attitudes toward everything. These few are conspicuous and are the cause of more than their share of accidents.

In short, the average cadet is an above-the-average young American, the finest and looniest type of lad in the world. This is the material we must work on. We dare not scare him (even if we could) because conservative flying will not do the job at hand.

Accent on Aggression

In the cadet training of today, the accent is on aggression. It is vastly more so today than it was a year ago, or even six months ago, because reports from battle areas indicated its necessity. This does not mean that pilots are educated in the technique of foolhardiness and suicide flying. It does mean that safety education, however insistent, however effective, must be subtle. It means that pilots must graduate with the realization that the end product of their skill is the destruction of enemy men and material, not safety in theater of operations flights. It is as valid in the air as on the ground that the best defense is a good offense.

The burden on safety education is made heavier by the fact that training for this war must be done at a tremendously accelerated pace. Cadets are on the jump from morning until night. They have a thousand and one things to learn and there is a terrific competition for their attention.

So far I have given you a brief description of some of the considerations that enter into the shaping of our safety education program; some of the factors that make it unique and perhaps a bit difficult at times. With this background we can take a look at accident statistics to find out where safety education fits along with the other E's of safety.

These statistics concern aircraft accident causes. Through the media of fiction and

widely circulated scare stories, some of them Axis-inspired, no doubt, the reading public too often assigns the more dramatic causes to these accidents: sabotage, structural failure and even bureaucratic meddling. The indisputable fact is that almost four out of every five Army aircraft accidents in training in the United States are caused by personnel errors: error of technique, error of judgment or error of carelessness. These errors cannot be corrected by closer inspection of manufacture or assembly. They cannot be corrected by doubling the guard at plants and airfields. They can be corrected by education.

Two Point Program

There may be those who feel that education as applied to safety is a separate little package from which an item or two may be selected from time to time and tossed in the face of those to be educated. We don't feel that way about it.

We believe that flying safety depends on two things: knowledge of flying in all its phases and use of that knowledge in every detail of the job of flying.

On this basis, we believe the best kind of safety education is to instill in cadets a desire for knowledge and then help them get it. For example, without any attempt to teach instrument flying, we can and do produce movies which will show in dramatic fashion the importance of learning thoroughly and well all there is to know about flying on instruments. We can dramatize in booklets or posters the importance of knowing about and using oxygen equipment.

Every cadet has the chance to learn all he needs to know. Part of it is pretty dull by comparison with acrobatics. It is our job to cultivate a desire for all the information and not just those parts which naturally appeal to red-blooded young Americans.

After we have cultivated a desire for knowledge, we help young pilots get it. Men long-skilled in the writing and illustrating business reduce technical information of the experts to easy, simple terms. Right now, a group of safety education writers and illustrators are preparing 8 new flying training manuals in cooperation with the Training Command.

Constant Reminder Necessary

Now, it is one thing to know how to do a job correctly but another to do it that way.

All pilots know that airplanes will not run without gasoline; yet pilots will take off too frequently without checking gasoline supply.

So, once we have taught the young pilot, we must constantly remind him to practice what he knows. Posters, short pamphlets and camp paper cartoons are some of the ways we go about doing that job.

Possession and use of sound flying knowledge are fundamental to flying safety. Conversely, lack of knowledge leads to all kinds of trouble. Rumors about airplanes or other equipment are deadly. They destroy confidence, lower morale and frequently produce a ripe case of the jitters. Almost always such rumors are based on downright misinformation or what is worse, half-truths. How many accidents are thus caused I do not know, but we take it as one of our responsibilities to quash them by obtaining and spreading the true facts about American equipment, training and tactics.

A motion picture for which we are responsible, "How To Fly the P-38," does more to build up confidence in this airplane than it can possibly do to actually teach the technique of flying one.

One of the first projects executed by the division was a brochure called "Lessons That Live." Working on the tested formula that experience is the best teacher, pilots in the Army Air Forces were asked to submit an informal narrative of their most narrow escapes. From the mountain of material produced by the request, our men selected anecdotes to illustrate the fundamental principles of flying safety. These were edited, illustrated and assembled along with a message from General Arnold to make up a pamphlet with a real punch. Every cadet receives one at the proper period in his training.

We have exploited the power of posters from the outset. A study convinced us that these intelligent, somewhat cocky youngsters could be reached with pointed humor; so we produced several series of comical posters which assailed cadets from walls of their operations offices and orderly rooms and hid them into checking their brakes and adhering to the traffic pattern. Other safety posters follow the graphic reminder technique.

Scare Formula Not Used

It may surprise some of you to learn that we have not employed the scare formula, en-

tailoring the circulation of picture posters of piles of wreckage and other gruesome illustrations. I know that this method has produced favorable results in other fields, but I am likewise convinced that it would be unwise to try to frighten a young man into flying with safety. Our cadets don't need grim reminders that flying military aircraft is a dangerous business. The Training Command gives them lesson after lesson which emphasizes the importance of regarding our fighters and bombers as precision instruments that demand constant, undivided attention. To insert these morbid pictures would offend some of them and insult others. By planting fear in their minds, we would be running the risk of damaging the magnificent daring that is spelling victory in aerial combat over the Jap and the German.

Safety education in the Army Air Forces would be sadly remiss if it didn't take advantage of one of the most effective training methods yet devised—the motion picture. We are particularly proud of a movie we produced in conjunction with the Army Air Forces First Motion Picture Unit called "Learn and Live." The picture is nearly an hour long, so I can't show it for you here. If there were time, you may be sure I would let it speak for me.

Method of Presentation

Most of the action takes place in "Pilots' Heaven," an ethereal sort of place, roosting on a cloud, guarded, of course, by St. Peter in the person of Guy Kibbee. His bailiwick is populated by pilots shuffling through an eternity of innocuous recreation—ping-pong, target practice with B-B guns and pool with 15 eight-balls. The plot thickens when St. Peter summons Joe Instructor, a handsome composite of Air Forces training personnel, and complains to Joe that he must relieve the housing shortage in "Pilots' Heaven." Joe explains that his instruction isn't to blame, that these boys are up there because of a boner here, a careless act there. In the next frames, which constitute the bulk of the movie, Joe narrates their mistakes while the screen depicts them.

The film is a perfect example of one of our fundamental guides, safety education must be garnished. Looking at the problem realistically, we know we cannot expect a young American learning how to pursue the highly roman-

tic occupation of combat flying to be enthusiastic about a subject as relatively dull as safety. We have learned, however, that our commodity can be sold if it is presented attractively. By this expedient, we who have knocked around hangars for many years can advise young cadets without having them think we belong in museums and history books.

Rewrite Technical Data

An outstanding contribution which safety education has made to training in the Army Air Forces is this 240-page, loose-leaf book: the "Pilots' Information File." It takes its name from a massive compilation of technical data bound in a score of thick binders, which used to be required reading for every pilot in training. Since regulations required that every pilot be familiar with the contents of the drab, bulky file, the boys made a conscientious effort to read them. It was like trying to digest the contents of an unabridged dictionary. Realizing that too many vital facts were being left to chance or the super-ingenuity of a flyer, the safety education division buckled down to the task of condensing, rewriting and illustrating the file so that these all-important facts would be inescapable.

This streamlined "Pilots' Information File" will not teach anybody how to fly, nor will it replace the "Transition Flying Index." Technical orders in minute detail are still essential as reference to specific pieces of equipment. However, this book guarantees that every pilot in training will have simple access to such important information as flight instruments, taxiing spins and stalls, icing, parachutes, night vision and first aid in flight.

We have a few recurring publications. One is "Accident Facts" yes, we even borrowed a National Safety Council title. It is our statistical bible, pointing to sore spots needing quick, corrective action. We have our monthly publication "Accident Experience," aimed at supervisory forces.

Gentlemen, we are reasonably proud of what we have done and your Distinguished Safety Award has given us a mighty inspiration to do even better. We are preventing accidents in training; and, by so doing, we are speeding the day of victory. Safety education, in a very positive way, is actually delivering aircraft and, more important, airmen to the front, fully equipped for battle.

The Safety Program of Air Service Command

By MAJOR HARRY D. IMMEL, A.C.
Chief, Safety Branch, Air Service Command, Army Air Forces

Among the unsung heroes of the first World War are those men and women who patriotically faced the industrial hazards of that day in order that our armed forces might receive the materials needed to bring us victory. How many were injured or killed, or sacrificed health, in the workshops of America in 1917 and 1918 we can never know. There were no nation wide industrial accident statistics that long ago. Workmen's Compensation Insurance was an inadequate thing in the few states in which it existed at all.

Looking back, we realize how much more efficiently war production could have been attained twenty-five years ago had factory conditions taken more into account the health and safety of workers. That we would largely have been spared an aftermath of physically handicapped workers to add to the vexing problem of post-war social readjustment, is of only slightly less importance.

How different is the picture today. The very fact that I am here addressing you is evidence of that. You know how well industry generally, your airlines specifically, are safeguarding their workers in this war period. I am here to tell you a little something of how a great branch of our War Department, operating mainly with civilian employees, regards and is applying safety in its operations.

Air Service Command of the Army Air Forces is the service agency which maintains and supplies our aircraft. Its depots, sub-depots and other installations are scattered all over America. Civilians, several hundred thousands of them, operate our shops and warehouses and perform our clerical tasks. They face a great variety of hazards. In Air Service Command we have a safety organization which undertakes to protect our workers from needless exposure to harm.

The ordinary problems of setting up and administering an industrial safety program are greatly magnified when applied to an establishment so far-flung as ours.

We followed the obvious method of establishing a central administration at our headquarters at Patterson Field, with units of organization in each installation. We allow full scope for application of initiative, but we maintain a careful over-all direction and coordination.

Our safety procedure is of a pattern with which you all are familiar. It is that adopted by most private industries. We have safety directors in all of our units, with safety committees, and an educational and enforcement program. The actual direction of safety is generally left to a civilian safety engineer, supported by a commissioned safety officer. Let me emphasize, however, that in every installation the safety organization acts only as an advisory or consulting agency. Responsibility for actual application of safety remains, as it should, with management and supervision.

We operate from Headquarters under a directive establishing our safety function, through a commissioned safety administrator, a commissioned assistant, a WAC officer assistant for minors and physically handicapped and an assistant for women. Nearly fifty percent of our civilian employees are women. Seasonally, we employ many minors, both male and female. Three safety experts on our Headquarters staff are stationed at strategic locations in the field.

As a part of our Headquarters organization we employ a statistical unit which undertakes standard cause coding of all of our accidents, and makes a variety of analyses which gain importance as our volume of data increases. Two reports are required of each unit. One is an individual lost-time accident report on a card adaptable to key sorting. The other is a monthly report of totals of injuries, both temporary and permanent, and of man-hours of employment. From this latter report we obtain and record our frequency and severity rates.

In establishing our safety organization

in Air Service Command we accepted an offer from the National Safety Council to assist us. I wish to acknowledge publicly the invaluable aid received from that source.

Each of our units has been provided with the basic industrial service of the council. Each furnished with a bound and indexed volume of the Council's "Safe Practice Pamphlets" to amplify our own manuals. We, of course, pay for all this but, in addition, the council loaned us Mr. Joseph C. Stennett of its Engineering Staff as a consultant, arranged to have the War Production Fund to Conserve Manpower share the expense of producing a new type of sound film strip, and put us in the way of obtaining a coast-to-coast radio broadcast of our safety program. Mr. Stennett, at Council expense, has accompanied me all over the country, assisting in special studies of our accident problems and participating in safety conferences of commissioned and civilian personnel.

Our civilian personnel comes to us mainly through on and off reservation training schools. We greet our new workers with safety from the time they enter our schools. They come into our shops and warehouses prepared to wear protective clothing because they have been required to wear it in the school shops. They come prepared to employ mechanical safeguards because the school machinery is so guarded. They apply safe practices because they have been so trained.

We are, rapidly as possible, making safety engineers of our foremen and supervisors. Only they can effectively apply a safety program.

We use all of the various educational devices, safety meetings, contests, display boards, posters, etc. We have some features all our own. I already have mentioned our sound film strip. This will be shown at the conclusion of my talk. We have had a famous cartoonist draw posters of two cartoon comedy characters, Hank Fizzle and Lulu Drupp; they are becoming well known to all Air Service Command employees who follow their misadventures much as comic strip fans do their newspaper favorites.

Air Service Command comprises a number of large depots, controlling widely scattered sub-installations. The first response to our accident attack came from the large depots. This was to be expected. It is always harder to apply safety to smaller units of industry. But we are showing satisfactory progress.

In making your appraisal of our frequency and severity rates we ask that you keep in mind that our program began only last January. Prior to that time a few of our installations had more or less active safety organizations, but only a few. We had to start almost from scratch with a great army of workers to whom safety meant little or nothing; with commissioned and civilian administrators who were so frantically busy that they had no time to consider any new activities not forcefully sold to them as factors in obtaining higher output. We now are doing that selling and here is the result.

Since January our large control depots have shown a healthy reduction in accident frequency from 16.13 to 10.27. Our sub-depots and miscellaneous installations, on the other hand, continued a slight rise which we finally checked in June. Our over-all frequency held practically a straight line through the earlier months of the year but began to dip when our drive on sub-installations took hold. It was 14.23 in September. The program produced a decrease of 36 per cent in lost time accidents for control depots through September. In that period, for all of Air Service Command, there was an estimated saving of 283,520 man-days through safety.

This is the appropriate place to say that I consider our statistical set-up to be the very keystone of our safety program. In anticipation of its importance we consulted the leading industrial injury statistical agencies of the country in its preparation, the Bureau of Statistics of the U. S. Department of Labor and the National Safety Council. I don't think that there is a better industrial injury statistical unit anywhere.

We consult our figures and out goes a call to concentrate on sub-installations because, with 40 percent of our employees, they are experiencing 56 percent of our injuries.

We note that our Supply Departments employ 30 percent of our personnel and contribute 40 percent of our accidents. That calls for special attention to supply. There is no guess work about it. We know what we are doing.

Why do we stress the importance of a campaign to promote wearing of safety shoes? Simply because 14 percent of our recent lost-time injuries in our Maintenance Departments, and 20 percent in Supply, have been foot accidents.

One aspect of our safety program in Air Service Command, which I like to consider, is its possible benefit to our national economy after the war. Our installations employ many thousands of women. Private war industry employs many thousands more. The scientific statistics we are accumulating in Air Service Command will permit us accurately to determine the extent of women's accident proneness in industry. This will be an important consideration of private industrial employers when they are called upon, as they certainly will be, after the war to face squarely the problem of so what extent they will be warranted in continuing employment of women in the many new jobs which they are doing under stress of the emergency.

Air Service Command is employing thousands of physically handicapped men and women. We are making a study of their accident proneness. Inevitably, from overseas, after the war, will come many of our nation's heroes who have sustained permanently disabling injuries fighting for their country. We dare not contemplate their wholesale relegation to institutions or to lives of enforced inaction, as so often was the fate of those who returned thus from the first World War. We must plan for their rehabilitation and return to useful occupations. Our studies in Air Service Command of the accident proneness of our physically handicapped workers should, along with reasonable revision of Workmen's Compensation laws, en-

courage private industry to welcome these unfortunates.

In concluding this description of the safety program of Air Service Command, I feel that I can do no better than quote the words of Major General W. H. Frank, our Commanding General, on the occasion of a recent coast-to-coast broadcast dramatizing our program. He said:

"Air Service Command, which services, repairs and rebuilds our army airships and keeps our Air Forces supplied and equipped at home and abroad, is literally the agency which 'Keeps 'em Flying.' So closely is our function geared to action on the fighting fronts that any failure of ours may well mean the prolonging of the war, with consequent needless sacrifice of lives and property.

"In this aspect, our thoroughly practical program of accident control in this vast service organization of the Army Air Forces reaches the highest humanitarian conception of the great national safety movement, which is being conducted by the National Safety Council at the request of President Roosevelt.

"Air Service Command is realistic about safety. We must take measures to keep civilian employees from getting hurt because we desperately need their maximum services. Every available man and woman must be utilized to the utmost in our production drive. Our workers are not expendable.

"Even above and beyond this, we know that unsafe industrial operation is inefficient operation. We know that orderliness and right method of procedure which produce safety, produce also the best and most work. We dare aim at nothing less.

"The assistance of the National Safety Council in our program of accident control has been invaluable. Our many thousands of civilian workers are becoming more and more safety conscious. Accident prevention is our watchword and will remain so until Victory is finally won!"

First Aid and the Visiting Nurse

By HODGES McKNIGHT, M.D.

Medical Director, American Airlines, Inc., New York City

The present war has forced industry to approach, as nearly as possible, the conception of "All-out Effort." Unfortunately, we cannot claim that the goal has been achieved. However, the war is not yet over and improvements are still in order. Many factors have had adverse influence in the attainment of a hundred per cent effectiveness in converting us, as a people, from peacetime accomplishment to a sustained wartime effort under pressure of war survival.

At this time only one problem is attempted and that problem has arisen from the shortage of manpower. It is well recognized that with the shortage of workers a further cut in effectiveness has grown out of increased absenteeism.

Four Main Causes of Absenteeism

The cut in production due to absenteeism adds up to a significant figure. It has been estimated conservatively that upwards of four hundred million man-days were lost last year from reported sickness alone, and from all causes at least eight hundred million man-days were lost. Dividing the causes of absenteeism into four main groups we have:

1. Reported illness.
2. Reported non-industrial injury.
3. Industrial injury.
4. Other causes.

We suspected that the first group might be a very important one and perhaps it could, to a large extent, be decreased. Too many times it has been noted that following pay-day men and women were absent who were needed to get important work done.

Time of Return to Work

Also it was noted, in industry as a whole and even in school children, that people returning to work following reported illness usually did not return near the week-end, especially on Friday and Saturday. Instead, Monday or the first of

the week saw the greatest number coming back to work rather than later in the week. The tentative conclusion was that even though the employee might be physically able to return to his job on Friday noon or Saturday morning apparently he thought that the effort was not worthwhile.

One unnecessary day lost by fifty million employees means fifty million man-days lost to the war effort and is unnecessary waste. This great loss adds up to an important figure, yet to the individual it is safe to assume that practically all are patriotic and to them an extra day lost seems, at times, insignificant. The same might be said of the attitude of the family doctor whose peacetime feeling of solicitude for the comfort and well-being of his patient makes him forget sometimes that any unnecessary time lost is of tremendous importance in the over-all picture.

Sick Leave

Another factor that is involved in this group of people reporting sick by message sent to their department heads is the policy of our company to allow twelve days a year sick leave with pay, in addition to vacations. We found that there was a tendency with some individuals to look upon sick leave as something similar to a vacation, and in the majority of cases no real thought of dishonesty was involved and no conception of the grave loss in total man-days lost occurred to him, because he did not picture that there might be fifty million people just like him, patriotic citizens, who might decide to take just one day off unnecessarily by reporting illness. The illness might be fancied or possibly preventable.

We recognize that a large number of our employees are new to the company and strangers in the community and frequently have not received prompt and adequate attention. Doctors are getting scarce, and also a stranger hesitates to call in a doctor he does not personally know.

Program Instituted

In order to get accurate information on the types of sickness our people were having and in order to facilitate them in securing medical or hospital attention, the idea of a full time visiting nurse was thought to be worth at least a trial. We believed that our employees were above the average and as a group were dependable, loyal, and patriotic, although some might be thoughtless at times in appreciating how important each individual is and how badly each one is needed to be on the job. Therefore, in April of 1942 a registered nurse was assigned to the duties of visiting nurse in the New York area. She was selected on the basis that:

1. She should be acquainted with the streets and able to use a car proficiently and find addresses without unnecessary loss of time.

2. She should have a wide acquaintance of doctors available in the vicinity of homes and should know a good deal about the professional background of general practitioners and specialists.

3. She should be tactful and should be primarily concerned with being helpful so as to render a real service to sick employees.

It was recognized that very little if any bedside nursing could be done in individual cases. However, a small first aid kit was provided. Also, the visiting nurse carries a supply of C-2 Compensation forms and application blanks for insurance benefits.

Duties of Visiting Nurse

Her professional duties are limited to first aid, and when a doctor is needed to aid in securing one. All departments were requested to notify the Medical Department promptly when an employee was reported absent because of sickness and to give the necessary information as to correct name, address, telephone number if any, nature of symptoms, and the name of the doctor if one has been called.

When urgent symptoms are reported the visit takes priority, and telephone contact is established at once, if possible, and a visit made unless the case is already

adequately covered by medical or hospital attention.

In the absence of urgent need for the visit, the reported sick calls are tabulated by the Medical Department from the telephone calls from all other departments over the entire twenty-four hour period including Sunday. Each morning the visiting nurse groups the calls according to localities and those with the greatest number are given priority.

The work covers:

1. Immediate follow-up of all emergency hospital cases with reports to:

(a) Medical Department.

(b) Personnel Department, for the purpose of notifying nearest relatives in cases of severe injury or illness. Also, when employees are found whose financial status does not permit proper medical attention, the information is given.

2. Calls are made on all reported sick absentees as soon as possible. Where illness is found advice is given to call a doctor except in obviously minor illnesses. However, care is taken to get a history, record of symptoms and temperature before the nurse feels free to suggest home remedies. In any doubtful case the services of a doctor are advised. When necessary, physicians are contacted, hospital arrangements made and insurance benefit routine is started.

3. Physicians in charge of hospital cases are contacted for diagnosis, prognosis and length of disability.

4. Upon request, a list of physicians and dentists is made accessible to the employees.

5. Friendly, or "hello," calls are made in appropriate cases in hospitals or homes.

6. Absenteeism is curtailed by urging prompt medical attention when needed; cooperation in the control of minor illnesses; and the proper handling of contagious diseases so as to prevent an employee from returning to work while still a hazard to others.

Decrease Shown

After reviewing figures covering the first twelve months in which we had a visiting nurse we found a gratifying de-

crease in absenteeism from sickness. We found the lost man-days decreased from 5.4 before the visiting nurse was employed to 4.1 in the comparable months. Beginning April 1, 1942, thru March, 1943, was the first year the visiting nurse functioned. The percentage of decrease is twenty-five per cent. The annual reduction of lost man-days, based on 3,250 average employees as of March, 1943, is 4,225. These figures are given in table form.

This improvement was sufficient to make the departments most vitally concerned, especially General Maintenance, very enthusiastic about the service.

Incidentally, as a by-product of the original objective, which was primarily to help relieve the manpower shortage, we found that the money saved by the company was sufficient to pay for all of the

expenses of the visiting nurse, including the use of the automobile.

This improvement is even more significant if we take into consideration the fact that before the institution of the visiting nurse our absenteeism rate from reported sickness was not excessive as compared with concurrent figures available applying to the nation at large.

Also, new employees were being added rapidly, and they included a large percentage of inexperienced people new to the company, some rejected by the armed forces, and also an increasing number of women who had never worked in the shops before. The general experience has been that women in the shops lose more time than men.

The visiting nurse service, in our experience and as outlined, has been very much worthwhile.

AMERICAN AIRLINES, INC.

Man-days due to Illness of Employees in New York, N. Y.

April 1941—March 1943

Year Preceding Institution of Visiting Nurse Service

	Number Employees	Lost Man-days Illness	Lost Man-days per Man
April-June 1941	6,037	2,870	.46
July-September 1941	6,308	2,047	.32
October-December 1941	6,449	2,671	.41
January-March 1942	6,744	3,977	.59
Monthly Average	25,538	11,565	.45
Annual Average (12 x .45)			5.4

1st Year After Instituting Visiting Nurse Service

	Number Employees	Lost Man-days Illness	Lost Man-days per Man
April-June 1942	6,969	1,945	.28
July-September 1942	7,357	2,092	.28
October-December 1942	9,184	3,064	.33
January-March 1943	9,152	4,114	.45
Monthly Average	32,662	11,215	.34
Annual Average (12 x .34)			4.1
Per cent decrease (5.4 : 4.1)			25%
Annual reduction of lost man-days, based on 3,250 average employees as of March 1943			4,225
5.4 x 3,250 = 17,550			
4.1 x 3,250 = 13,325			
4,225			

*Sum of the number of employees in each month.

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†As elected by delegates in Congress Session

TUESDAY AFTERNOON SESSION

October 5, 1943

Presiding: General Chairman, WILLS MACLACHLAN, Department Head, Hydro-Electric Power Commission, Toronto, Ont., Can.

Annual Report of General Chairman

WILLS MACLACHLAN

Over thirty years ago some engineers interested in the prevention of accidents organized the A.S.S.E. and about the same time another group of engineers in the National Safety Council, organized the Engineering Section of the Council. As time went on it was quite apparent that these two bodies had much in common and amalgamation was carried out. Since that time added strength has been given to the work of the engineers in the prevention of accidents. On behalf of the Section and officers, I wish to extend to the officers and staff of the National Safety Council sincere thanks for the full co-operation that has been afforded to the Section during the past year; without this help much that has been accomplished could not have been done. During the year reorganization of the staff of the Council increased the duties of R. L. Forney and he resigned as Secretary of the A.S.S.E. The Association owes much to this able executive, and I extend our sincere thanks. We feel gratified that it has been possible to obtain the services of Joe Stennett as Secretary. Mr. Stennett is no stranger to the A.S.S.E., and we feel sure that the office of secretary is in capable hands.

The formal annual report was presented to the Executive Committee of the Section and adopted. Any member wishing a copy will receive one on applying to the Secretary. I wish, however, to make a few general comments.

Some few years ago the Section appointed a committee under Professor C. W. Breese of Purdue, to investigate the possibility of more adequate training in the prevention of accidents for engineers in the colleges. About a year ago Professor Breese presented his report which was adopted. It was quite apparent that the most effective way to put this into action would be by obtaining the co-operation of the Society for the Promo-

tion of Engineering Education. At the meeting of the S.P.E.E. last June, the recommendations of this Section were thoroughly discussed and tentatively approved. The Society appointed a committee to work with the committee of this Section in the developing of this most important work.

The U. S. Department of Labor has also become very much interested in this subject, due among other things to their 96 hour courses under the E.S.M.W.T. Safety Training Courses. Arrangements are being made whereby a committee shall be set up representing not only governmental bodies but also organizations like our own and the S.P.E.E. to thoroughly review the whole situation in an endeavor to make sure that the young engineer appreciates that the efficient design of machine, plant or system presupposes a design safe to manufacture, install, operate and maintain.

During the year there has been a very considerable increase in the membership. The membership at the present time stands at approximately 3,300, an increase of over 30 per cent during the year. We are very happy to welcome into the membership a number of the officers of the armed forces. These men have done much to carry forward the prevention of accidents on major construction projects in munition plants, army and navy camps and air fields and it is hoped that they not only will gain from the Section, but also will be able to contribute materially to the work of the Section.

Projects in research have been developed. Literature such as safe practice pamphlets, data sheets, cards, etc., have been developed. Work has been done on codes, and cooperation has been extended where effective to various governmental bodies.

A new development in the Council activities has been instituted during the year, and

this Section has been most happy to co-operate with the other Sections in Section conferences. Much good will come from these conferences, where it is possible for the various general chairmen to get to know each other and know the problems that are facing the various Sections and extend mutual help.

From the start one of the main strengths of the Engineering Section, almost the backbone of the Section, has been the chapters. I am glad to be able to report that the chapters have been extended from twelve to fifteen during the year, the new chapters being:

Portland Chapter, Portland, Oregon

Central New York Chapter, Syracuse, N. Y.

North West Chapter, St. Paul, Minn.

A number of other chapters are in the process of being organized. Groups of engineers interested in the prevention of accidents in various communities, with advantage to themselves and to the community, should investigate the requirements for forming a chapter. These requirements are not complicated. The chapters can be of great assistance to the community councils in presenting the engineering viewpoint in the solution of problems. They can also be of great assistance to the community and assist in the developing of local engineers to be more proficient in preventing accidents. Some chapters have held joint meetings with other engineering organizations. This is particu-

larly desirable with local sections or branches of the founder engineering societies.

The engineer in his training, whether taken in college or in industry, has received the mental discipline afforded by the study of mathematics and that of the properties of matter and the laws governing the various reactions of natural phenomena. The properties of matter and the laws of nature are based on truth developed from facts. The engineer, if he is to direct men, must know the reactions of men under varying conditions. Hence, this training has not been limited to physical matter but also has extended in recent years to those subjects relating to: "Why we behave like human beings." He has also learned methods of doing things and of solving problems.

The Right Honorable Winston Churchill in a recent address said: "The price of greatness is responsibility." If the engineer is prepared to accept the responsibility for which he has been trained and prepared, then the engineer's place in the world of the future is in his own making—not only as a technician, but also as a clear thinker, basing his premises on facts and accepting only truth as his guide.

The A.S.S.E. Engineering Section has proved that it has a place to fill in the Council and in the engineering fraternity. A good groundwork has been laid but this is only a start. Engineers are eminently equipped to do the job. Go forward then, assuming that responsibility for which your training as professional men fits you.

Luminescent Materials—Aids to Tomorrow's Safety

SAMUEL Q. HIBBEN

Director of Applied Lighting, Westinghouse Lamp Division

Since the beginning of man's existence he has lived under the illumination provided by light sources which, like the sun and stars, were uncontrollable and lay outside of the regions of the earth. During at least the eons when living and seeing organisms have inhabited this earth, nature has also provided earthly illuminants—thousands of varieties of them, in fact—which are almost entirely different from the lamps that hang in the sky. Those remote sources are "hot

body" lamps radiating a profligate mixture of heat and light of all colors, whereas Mother Earth's lamps are economically confined to the emission of cold light, to largely the one central color of the spectrum most fitted for exciting the retinal nerves to vision (having neither heat nor ultraviolet), and most generally concentrated into spots of low brightness but where even a slight glow would be effective. The synthetic production or duplication of nature's glow-lamps

and uses of such luminescent materials to promote safety are our concern in planning for tomorrow.

New Importance of these Illuminants

These latter illuminants—the fireflies, glowworms, micro-organisms on decayed vegetable or animal matter, luminous marine animals, glowing mineral ores, etc., have suddenly become consequential to man's safety. Although we can produce artificial illumination from miniature suns imprisoned in glass bottles and through the medium of converting heat into luminous radiation, yet we are intently studying the fluorescence and phosphorescence of nature's lamps and are thereby developing luminescent materials which promise to be valuable adjuncts to electric lamps, especially in the promotion of night-time safety.

Usually the cold lights of nature depend upon slow oxidation of animal secretions, whereas the luminescent materials now being manufactured depend upon the absorption of outside energy—usually luminous and near-ultraviolet radiation from either daylight or artificial sources. Then follows the retention of a part of that energy and its more or less slow emission at a longer wave length. Thus the materials we are now discussing have been termed "storage batteries of light."

Two Types

Parts of the electron arrangement in the outermost orbits of the atoms, of which these materials are composed, may be warped or dislocated by the impinging "shots" of light or by the photons of illumination falling on the luminescent material. Returning to the normal arrangement, these atoms emit light. If the disarranged atomic particles or charges quickly return to normalcy after the excitation or bombardment, i.e., if this secondary emission of light occurs only during irradiation or excitation, then we call the result fluorescence. Long ago, this phenomenon was discovered in the mineral fluor spar, hence the name. If, however, the return to normalcy is slow, and extends usually over several hours, then the phenomenon is phosphorescence. This has nothing to do with the element phosphorus, rather taking its name from the Greek appellation of the morning star.

These two kinds of luminescence are brothers and may often grade into one an-

other but are nevertheless sufficiently different for each to have its own peculiar field of application. The uses we are mostly concerned about depend upon making objects visible when ordinary lighting does not exist. We should know just how these storage batteries of light or transformers of radiation can become important adjuncts to normal artificial lighting in the process of providing signals, markers, warnings and all manner of legible devices that particularly enhance the safety of individuals.

Fluorescence

In connection with fluorescence, we can generally say that the color of the emitted light is likely to be different from the impinging light and that, depending upon the materials, the responses may extend over the visible spectrum and far out into the ultraviolet. One of the important applications of short wave ultraviolet in fluorescence is the disclosure and analysis of mineral ores or, in line with safety, the analysis of certain drugs or of adulterations and contaminations in many foods and medicines. However, practically all of the safety applications of fluorescence are built around the responses of fluorescent organic dyes to the so-called black light or the invisible ultraviolet lying very close to the short-wave end of the visible spectrum.

An interesting example of this is the greatly increased daytime brightness of fluorescent dyed fabrics that have developed under the incentive of war. These include signal flags with utmost daytime visibility and range; fluorescent chrome yellow markers usable against the background of green foliage in jungles or on land; the neon-red fluorescent fabrics that aid in locating life rafts or any objects at sea and all such applications where fluorescence occurring in full daylight measurably enhances the normal reflections of the visible light. The most brilliant of these organic dyes are not fast, so when not in use should be shielded from strong light. They are successfully waterproofed and non-toxic.

Effects in Water

An important safety use of one of the fluorescent dyes, sodium fluorescein, is to facilitate rescues at sea through the development of a highly visible spot upon the

water. A few grains of dry powder sprinkled on the water quickly dissolves and spreads to a circle with radius of a dozen feet or more. In calm weather this persists several hours with a bright yellow-green fluorescence which in daytime can usually be seen 8 or 10 miles from an altitude of 10,000 feet. We remember laughing at the fisherman who put a chalk mark on the side of a boat to locate a position on the lake! Today we employ one of the luminescent materials to mark the spot directly on the water itself.

Because of its unusual brilliancy this dye is also employed to locate leaks in a water system or to trace seepage through soils, etc. Even though extremely diluted it will fluoresce quite visibly, especially if the observer uses a small portable projector lamp emitting black light (chiefly in the wave length region of 2800 to 3200 Å).

Used for Identification

Another application allied with safety is the impregnation of clear sheet plastic with a normally invisible fluorescent dye, the markings or special designs being distinctly visible under black light but totally invisible at other times. This provides a means of detecting counterfeits or illegal devices somewhat like the silk thread in paper increases the difficulty of producing counterfeit paper money. The luminescent markings on clear plastics, aside from a manufacturer's trade-mark, can also serve for extra identification when laminated between two layers of safety glass as in a vehicle window, or in the plastic covers of identification badges and property markers.

An interesting sidelight of the same nature is the use of an invisible fluorescent ink which is stamped directly on the body, usually the back of the hand, in order to temporarily mark an individual. In one usage this takes the place of the pass-out check. To be identified, the subject merely places his hand beneath the beam of a small black light lamp when re-entering. This material is not harmful to the skin and is quite persistent but can be washed away by thorough scrubbing.

Traffic Signs

In some foreign cities as an adjunct to blackouts, fluorescent signs were used on

which the letters would be comparatively bright depending upon the amount of black light projected on them. Thus, the exciting source could be filtered light from small mercury lamps or from tungsten filament lamps burned over-voltage, or more conveniently from the recently developed commercial fluorescent tubular lamps with the special phosphors known as the Mazda 360 BL type. These lamps comprise the most practical means of developing black light, since the 360 BL lamps are interchangeable with standard lighting fluorescent lamps.

Since the black light or the invisible radiation alone is needed, the unwanted visible blue light may be screened out by glazing the reflector trough with a strip of ordinary pot-blue glass, or else wrapping the lamp tube itself with one or more layers of purple gelatin or colored cellophane. Such sources, themselves nearly invisible, have been suspended over a street intersection and the traffic officer standing beneath would wear gloves or other parts of his uniform treated for fluorescence, these being distinctly visible when he stood within the black light beam but becoming invisible when he merely stepped aside.

Phosphorescence

Of late, more interest has developed in connection with phosphorescent materials because these do not depend upon any unusual or special exciting radiations. They can be "pumped up" repeatedly by ordinary daylight or by any quality of interior illumination, although in the latter case the full excitation or charging will be much more rapid if the impinging light is rich in short-wave radiations. Two minutes or less is sufficient time for full charging.

The commercial materials or pigments are usually the sulphides of zinc or cadmium, and of strontium or calcium, or mixtures thereof. The first group, designated as the Class A pigments, is characterized by being comparatively bright initially but losing their brightness with a slightly more rapid rate of decay so that after three or four hours they may be nearly invisible. The phosphorescent color is usually light yellow green. The Class B materials usually have a light lavender tint; maybe slightly less brilliant when fully excited but possessing a slower

decay rate and visible even after a full night-time in darkness. The limit of usefulness, or the point where recharging is needed, is when the brightness has fallen to about 0.1 microlambert, equal roughly to white paint in good starlight.

Many Uses of Self-Luminous Materials

It would be impossible to list all of the uses of these self-luminous materials. Among them, however, are the following:

1. Impregnated fabric tape with an adhesive backing for quickly marking temporary objects outdoors at night, such as paths or unusual obstacles, danger points, etc.
2. Coatings on the insides of transparent flexible tubing such as made from synthetic resins and which, sealed away from moisture, become useful to be tied or stretched like rope between posts, to quickly hand dangerous objects, to mark such places as the edge of a dock or to rope off the open shafts in buildings.
3. Safety signs of all types for close viewing in complete darkness. Among these are stencilled and printed jobs on water proofed fiber board; inlaid lettering in hardened fiber; silk screen printing on fabric; and temporary spray or brush applications on about the same types of backgrounds as would take ordinary paint. However, in this connection it should be noted that filling of the surface enhances the brightness and impregnation or lacquering to exclude moisture will prolong the life of the luminescent material.
4. Phosphorescent pigments may be baked into enamels or on metal, which opens a vast safety field in connection with structural parts of automobiles, street surface markers, bases of curb poles and lighting fixture reflectors.
5. Phosphorescent coatings directly applied to electric lamp bulbs make it possible to secure an extra glow from the bulb in the event of power failure. Such lamps would obviously be useful at exits or to indicate a safety route, etc.
6. Phosphorescent pigments may be hot molded into plastics which are fairly permanent and which retain their brightness capacity for many months, if not years. The number of cycles of charge and decay seems

to have no influence upon the brightness, i.e., when properly protected the phosphorescent pigment does not wear out nor burn out. Obvious uses would be the handles of electric switches or wall switch plates, instrument panels, control knobs, handles of tools used outdoors at night, door knobs, stair risers and rails, buttons of uniforms or special insignia, first aid cabinets and fire extinguisher parts, and innumerable portions of structural materials.

7. Where some device such as a marker button is to be used continuously in a dark place or where little if any daylight or outside illumination can be called upon to charge it, such as within a submarine, then the phosphorescent sulphides are mixed, with a small percentage of radium salts so that they are continuously excited and remain luminous indefinitely. Coated flexible tubing, marker buttons, coated tapes, etc., of such mixtures are commercially practical.

8. In crime detection an invisible luminescent powder may be dusted on any objects likely to be touched with the fingers and of which the culprit may be totally unaware. However when inspected under black light the tell-tale stains appear on the skin or the garments, and thus any contacts can be traced quickly. This same powder dusted over the face of a printed map and viewed under black light will develop a brightness sufficient for legibility but not bright enough to disclose anything to the observer distant say 100 yards or more.

9. In the case of aircraft pilots, locomotive engineers, bus drivers, bridge officers, etc., there is a large element of safety in keeping the driver or the pilot dark adapted, hence the use of both phosphorescent and fluorescent printing on instrument dials, bomb-sights, charts, etc.

10. The transmission of secret messages is quite commonplace, using devices that mark invisibly on ordinary paper. The messages may be easily read when these are exposed to a peculiar type of black light. The invisible laundry mark is another example of the same application.

11. Fluorescent threads woven into rope or textiles provide easy means of identification, and fluorescent wool comprising patterns of carpets make these softly visible in

darkness, hence their use in the aisles of motion picture theaters, etc.

Thus, in the safety plans for tomorrow we need both suns and fireflies—regular hot body illuminants for the work-seeing jobs but also the supplemental glowing low-brightness sources emitting cold light that guide

us toward a needed object or warn us away from the danger point. Thus the dangers that lurk in the dark can be driven further back. Especially through phosphorescence or the self-contained property of storing and emitting light, the otherwise invisible object can be made to say, "Here I am."

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† As elected by the delegates in Congress session.

TUESDAY AFTERNOON SESSION

October 5, 1943.

Presiding: General Chairman, C. E. Woollever, Personnel Manager, Buick Motor Division, General Motors Corp., Melrose Park, Ill.

Safety in the Armed Forces

MAJOR RALPH W. APPLEGATE

Industrial Safety Branch, 6th Service Command, War Dept., Chicago

This discussion, logically, divides itself into two principal components: combat safety, namely, protective equipment, training and tactical procedures, and the many devices employed to guard our combat troops, and the army safety program as it applies to production.

Personal Safety of Fighting Men

It is, of course, evident that the primary function in combat safety is to acquaint our troops with the handling of guns, planes, tanks, and other equipment in order that they may insure their own safety from attack and from accidents. Safety in the construction of these weapons is also vital. In order best to bring these factors to your attention, I shall turn to the combat soldier himself and cover his personal safety, including the training, the supplies, the weapons and the protective devices designed specifically for him.

The Army first requires the prospective soldier to undergo a complete physical examination to determine whether or not he is qualified to withstand the rigors and hardships of modern warfare. He is then sent to an induction station, where mental and aptitude tests scientifically determine the branch of service for which he is best suited. The illiterate and those having questionable physical or mental traits are carefully screened out and detailed to special training camps where they are further analyzed to determine whether or not they are qualified at all for the Service.

The next procedure is to harden these men physically, train them in the methods of warfare and condition them mentally so that they may use, during actual combat, the safety they have been taught. This is accomplished by a thirteen-week basic training course given at different training

centers located throughout the United States.

Training The Individual

Since today nearly all of the trainees are former civilians who have led a more or less sheltered life, the course must start slowly. Needless to say, particular emphasis is placed on sanitation and health conditions. Safety is stressed at all times, especially in the handling of machinery, firearms, explosives and other hazardous equipment or material. As the course progresses, the tempo increases.

Let us look at some of the safety measures which are taken during this thirteen-week course. The men are properly outfitted: extreme care is taken to see that shoes fit properly, thus minimizing blisters; shirts and pants are designed so that they do not bind or look sloppy, yet give the soldiers the freedom of action required; raincoats to keep them dry and field jackets and winter coats to keep them warm are provided; and properly balanced meals are well cooked and served in generous quantities. Their health is constantly checked by the Medical Corps. They are taught to detect poisonous and other war gases and the correct use of the gas mask, gas shelter and other protective equipment to combat these gases.

One of the largest jobs during the training period is to condition the soldier mentally for his own safety during combat. In other words, the trainee must be acclimated to actual battle conditions so that he will act safely and not become confused by rifle shots, explosions and other battle sounds. To do this, a number of battle conditions are simulated. For example, sound producing equipment is used that will give the same sounds the

soldier may experience in actual combat. He is taught to hear his commander's voice and whistle in spite of all other disturbing influences and to act accordingly. He is taught the sound of approaching bombs or shells and how to take cover for his own safety. He is taught to dig fox holes properly for his protection against tanks and shells. Mock village battles with live ammunition are staged in order to teach the soldier to take such villages building by building, using all possible natural protection.

Extreme safety measures are taken at the infiltration courses, where trainees must traverse open terrain under machine gun fire. The machine guns are locked in place by steel guards so that they cannot overfire, underfire, or shoot outside the impacted area. T. N. T. blocks are placed inside log barricades which are so designed that the explosion is confined within the barricade and the force of the explosion directed skyward as much as possible. Care is exercised so that the T. N. T. blocks will be properly detonated in order that the men traversing the course will not be injured by the explosion. Trained officers are stationed in the control towers at all times to see that all prescribed safety measures and precautions are followed. For their safety, men must be taught to keep their bodies as close to the earth as possible when they are under fire.

Handling Weapons

Every soldier is taught that the only way to use the rifle or machine gun which he is issued is the safe way, and safety is the order of the day on the rifle or machine gun range. He is instructed never to point a weapon, regardless of whether it is loaded or unloaded, at any one unless he intends to shoot that person. He is taught how to set the safety lock and how it operates, as well as how to inspect the rifle and how to remove jammed ammunition. During dry practice, safety is constantly stressed: bolts open, gun properly pointed down the range, protection of barrel from dirt, snow or other foreign material are only a few of the safety measures. The range itself consists of a large, restricted area with guards posted at all times to see that no one is allowed to

enter. Guards are also posted in fire towers to ascertain that everything is safe on the firing line and at the pits before the command "Commence firing" is given. Every man on the firing line is supervised by a coach to see that he carries out all safety regulations. The pits themselves are huge, concrete barricades with extending concrete butts and soft earth back-ground to protect the scorers and markers. Every safety regulation and precaution is carried out to the limit.

Another important safety training course is conducted to acquaint the soldier with all types of booby traps and mines. This training is invaluable in the detection and destruction of these hazards. His training also includes such courses as traffic safety, air raid tactics and precautions, fire drills and first aid. Upon completion of the basic course, the soldier is either sent to a tactical unit or to a specialized school for training in other lines. Regardless of where he is sent, safety is the fundamental component of all training activities.

You will be interested, I am sure, to know something of the safety equipment and devices used by our fighting men. Our soldiers are supplied with such protective equipment as helmets, gas masks, sand goggles, sun glasses, snow glasses, respirators, leggings and first aid kits. In addition to these items, the soldier is given asbestos gloves to protect his hands when handling hot shells or other hot objects. Engineers stationed on construction work are supplied with hard-toed boots. One-piece fatigue suits, designed for safety around moving machinery, are supplied to all mechanics. Camouflage clothing, designed for jungle, desert and Arctic use, is supplied to all combat troops in those areas for personal safety. Yes, even the soldier's personal wearing apparel is designed with safety in mind, namely, handkerchief, underwear, etc., are made of olive drab material to minimize the possibility of detection on clotheslines or elsewhere by enemy reconnaissance flyers.

Ammunition and Safety

The number of safety devices employed by our Army runs into millions. For the sake of brevity, let us look at a few of these items now employed in actual combat. Ordinarily, when one speaks of shells,

projectiles and other forms of ammunition, one thinks primarily of destruction and unsafe conditions. The number of safety factors, however, that are incorporated into the construction of such ammunition is amazing. Every lot of ammunition has a ballistic sample taken to determine that the correct velocity requirements are present. The shell must not fall short of its intended target, thus inflicting casualties on our own troops, and its velocity must be such as not to overshoot its target. Ammunition is tested to determine the amount of pressure exerted in the barrel or breech of the fire weapon. Here again, this pressure must not exceed a given value or it is apt to rupture the breech or barrel, or both, thus presenting a distinct hazard to the soldier firing the weapon.

Fuses of large shells are equipped with special safety devices so that the fuse will not be energized while the projectile is still in the barrel. To accomplish this safety objective, the fuse is usually designed with a centrifugal force arming device. The projectile must reach a rotational velocity of a certain minimum number of revolutions per second before this device is thrown to the outside surface of the fuse by centrifugal force and locked in place. As a general rule, the projectile is quite some distance from the gun before this action occurs.

Aerial bombs are provided both with an arming wire and an arming vane. The bomb must drop from the rack before the arming wire is disengaged and it must also fall through free space for a given distance in order that the arming vane will make the prescribed revolutions before the bomb can be detonated. Utmost cleanliness is exercised in filling the bombs with amatol or other explosives so that the explosive does not cover the fuse threads. This safety measure is carried out in order that, on removal of the plug on the field and insertion of the fuse, the pressure exerted by the contact of the male and female threads will not detonate any explosive that might be between them.

All small arm ammunition used on airplanes is tested for "bang fire." In other words, the propelling charge must be detonated within a given period of time after the firing pin has struck the initiat-

ing primer, otherwise the delayed firing would cause the projectile to shatter the propeller or miss the intended target. All ammunition and guns used by our Army are fired under extreme cold and hot conditions to determine the effect of all temperatures on their operation.

Tanks

All of you remember or have seen pictures of the cumbersome tanks used by combat forces in the first World War. To compare our present-day tank with that of World War I would be analogous to comparing our present streamlined automobile with one of the vintage of 1917. As in all other Army equipment, safety begins on tanks with the material inspection. All armour plate used in the construction of tanks is proof fired to determine the strength of the particular lot.

In World War I, the tanks were constructed with a small slit through which the driver could glance at the rising and falling terrain. A well aimed shot or flying fragment could, and often did, render the driver a casualty. Present-day tanks are equipped with a 180-degree revolving periscope, which gives the drivers a complete view of the surrounding landscape, thus protecting them and at the same time allowing full vision. The old-fashioned football helmet worn by the crew has been replaced by a steel helmet with rubber protective lining. The driver is provided with an adjustable seat and an automatic transmission to minimize physical fatigue. The modern tank is equipped with an inside exhaust fan, to eliminate carbon monoxide, obnoxious aldehydes and other exhaust fumes; it is also equipped with an interior ventilating fan to minimize heat exhaustion. Sharp corners and other hazardous spots within the tank are protected with crash padding. Cannons within the tank are equipped with recoil guards which prevent the injury of the crew by recoil action. Interphone and intertank communication systems assure communications, either inter or intra tank, at all times, thus providing the greatest degree of safety while in actual combat.

It is interesting to note that the Medical Corps is conducting extensive fatigue tests on tank crews. Particular attention is being given to their diet habits and the

amount of physical punishment they can be expected to endure. As a result of these tests, new equipment is being designed daily to increase the safety of tank personnel.

Plane Construction and Pilot Training

"Coming in on a Wing and a Prayer" is a song made famous by the fact that today our combat planes are designed with more safety features than those of any other planes in the world. All of you have seen pictures or have read about our famous Flying Fortresses that have flown back to their home base with one or more of their engines knocked out and the fuselage, wings and rudders shot full of holes. In our airplane construction, safety is stressed, even over combat. Everything possible is done to protect the pilot and the crew in order that they may complete the combat mission and return safely. Complete, thorough and regular physical examinations are constantly given. Prescribed amounts of exercise must be taken to keep such men physically fit. Courses of instruction are conducted to acquaint flyers with all physical flying disorders.

The "Pilots' Information File" is published monthly and acquaints pilots with up-to-date safety information and new methods of achieving operational efficiency. This publication comes complete with numerous illustrations and it is a "must" for each pilot. So far as aircraft construction and safety devices are concerned, parachutes, automatic self-inflating rafts, signal flares, devices for converting sea water into drinking water, and protective armor are but a few. Fire extinguishing systems are built in the planes themselves and are semi-automatic in operation.

Other safety features include the automatic pilot, inter-plane communication, plane-to-crew communication, de-icing equipment, self-sealing gas tanks, oxygen breathing apparatus, special landing flaps to permit slow landings in restricted areas, feathering devices which permit pilots to eliminate engine vibration which might rip the engine from the plane, identification lights, exterior heating systems to bring the motors to flying temperature, minimizing the possibility of engine failure, and interior heating systems to protect the crews.

Industrial Accident Control

The U. S. Army recognizes the tremendous effect of industrial accidents upon our available source of production manpower and, consequently, upon production itself, and has activated a safety program to apply to manufacturing plants which are considered vital to the war effort.

Control of accident prevention work was placed in the Office of The Provost Marshal General by the War Department, largely because that office had been charged with the Internal Security Program in which several hundred inspectors were already visiting war production plants. To make full use of that inspection force, which is operated by the nine Service Commands, schools were established for preliminary training in industrial safety to permit of recognition by this inspectorate of unsafe conditions. Safety engineers and officers were added to the staffs of the nine Service Commands—men who have been recruited from private industry and from insurance companies and who are experts in this field.

As a pattern, the Army has developed what is known as a "Minimum Safety Program." However, where necessary, this minimum program is expanded or modified to meet the requirements of the individual plants. The Army is concerned with such items as safety organizations, safety direction, safety inspection, pre-employment safety training, proper selection and placement of employees, adequate shop supervision, physical safeguarding, the provision, use, and maintenance of protective equipment, employee work practices, provision for prompt and efficient handling of first-aid and medical cases, and proper maintenance of accident records to permit adequate analysis and prevention of recurrence. A statistical system has been established which will measure accident prevention progress in the country's prime war plants from month to month. War Department, Adjutant General's Office, Form No. 502, is a simple but practical report which is completed monthly and returned to the Service Commands by the individual plants. The information contained therein is carefully screened and analyzed and the efforts of such plants along safety lines

is directed, where necessary, toward improvement in their safety programs.

Other Problems Requiring Cooperation

While this program of the War Department is far reaching in its attempts to increase production through the elimination of unnecessary and wasteful accidents, it cannot cover the entire accident prevention field. There are a great many manufacturing plants with which we have no contact—plants which are important to the war effort. There are other fields concerned with industrial accident prevention and with the maintenance of continuous production in which we in the Army can assume no responsibility, for example, traffic control, which affects industrial workers, housing for workers, off-the-job safety and health, nutrition, increased employment of women and minors, rehabilitation of injured workers and other affiliated interests of the Army safety program. There are hundreds of thousands

of American homes in which is needed a consciousness of this all-important problem and of the part each individual must play in effecting its solution. Activities in these fields, however, must be a matter of cooperation with outside agencies, such as the National Safety Council, local councils, the different governmental and state agencies, health departments, police and traffic departments and others already recognized as providing leadership in industrial accident prevention and health.

We, in the Army, recognize that only by working closely with those already established in industrial accident prevention work can we obtain the maximum efficiency and best results in our Army program. With this policy in mind, the Army requests the active assistance of you who are here today in the development of its industrial safety program and offers in turn to give you the fullest cooperation in every way possible in your efforts.

Safety on the Home Front

M. A. CLARK

District Director, War Manpower Commission, Detroit, Mich.

In my position as State Director of War Manpower for Michigan, I know that in our state, and in most industrial states of the Union, we have about reached the end of the manpower pool. We are scratching the bottom of the barrel of actual human beings who can take their place in the industrial field. And yet, there is a call for more and more production because of the needs on the fighting front, and more and more replacements of those men who have to be withdrawn from their daily labors to serve in the armed forces. This means, therefore, that we will have to secure more production from those already in productive fields and to induct into industry thousands of people who up to this time have not, for various reasons, found it necessary to take their places in industrial operations.

Record Deplorable but Understandable

Our records of accidents in industry so far this year are deplorable, but nevertheless understandable. It is my opinion that a large

volume of these accidents occur among those who have never previously been engaged in the industrial field, including men who have been in other types of occupations, women, and possibly some minors.

The tremendous expansion and conversion of our industries and the creation and development of new industrial enterprises have brought into the labor force masses of people who, in the past, have had no sense of safety protection for themselves or others because the necessity had never presented itself. Therefore, I believe it is highly probable that we have either failed adequately to train them in safe practices as well as we have trained them in their occupational work, or that we may have used the wrong technique in such training.

I have no doubt that the safety engineers are just as busy and even busier than they ever have been, and that they have tried, and probably successfully in many instances, to operate safety programs, including the

usual committees, posters, etc. But I am also sure that the number of trained safety directors has not increased in the same proportion as has the number of workers and, therefore, there must have been some cutting of corners and speeding up of programs to cover this extensive expansion of labor forces. No one can be blamed for this—it is inevitable with the tremendous surge in activity. Yet, with all the desire and energy on the part of the safety directors, it is a physical and a mental impossibility, with the shortage of trained manpower in the safety field, to have done completely the most desired type of job.

Need for Indoctrination of New Workers

It behooves us to take inventory of the present situation and see what can be done from here on out. The new entrants into industry will be undoubtedly from the thousands of women in our population who in the past have been housewives, engaged in commercial work, etc., and it cannot be expected that they will have any concept of safety in industry. They are coming into our industries filled with patriotism, but patriotism and a desire to make a contribution to our war effort is, of itself, not sufficient. They can be quickly discouraged. They can become quite hysterical over the possibilities of hazards in a job where none actually exist.

I do not believe that a safety supervisor can handle these cases personally; it is a physical impossibility. I am equally sure that the training and the adjustment of such people cannot be accomplished by safety committees alone.

We are left with two major forces to assist in the induction of this type of personnel; namely, the supervisory force and the working force. The foreman, the supervisor, is the key man in all activities in any factory. He is responsible for production output, for maintenance, for management-labor relations and, of course, for the safety of his own people in his own department. In the past, we believed we had given him some tools with which to work; but I fear at the present time, with the rapid promotions of men who have not previously borne such responsibilities, we may have failed sufficiently to inculcate into this new leadership group all the important values and techniques of a safety

program dealing in particular with the new type of personnel.

Should Enlist Old Employees

Foremen no longer have three or four assistants—they just aren't in existence. Consequently, therefore, the present supervisory force has even less opportunity than they have had in the past to do much planning or give much deep analytical thought to the problem which confronts us in safety today. If that is true, then another agency must help them do the work. That agency must be the regular employees who have been on the job for a number of years.

I am inclined to believe that much of our safety education can be conducted by and through this nucleus of old-timers. I think that the existing committees or supervisory force, under the guidance of a safety engineer, can inspire this group of employees to an acceptance of the responsibility for directing the efforts of the new force in their safety performance. If our present stabilized nucleus of the working forces can be inspired to the extent that they are willing to teach and guide the safety movement, I believe we will have made a magnificent stride in our safety effort and in the preservation of human life and limb.

This is not too much to expect. Employees have banded together to form unions, employees en masse have subscribed to bonds, stock purchases, pension funds; some of those things which reflect a definite and tangible gain to the subscriber. Therefore, I feel that they also will subscribe to an activity which will result in a permanent and definite gain to the whole war effort and to the preservation of our national existence. So we will go back to the old channel of giving the supervisor the tools to do the job: the tools of committees, the tools of statistics, the knowledge of economic losses, posters and publications, the tools of guidance and instruction by safety directors; and we must secure for them that last tool, the active participation and cooperation of every individual within his organization in doing the job with him.

Small Plants

There is, however, another situation which needs a different type of approach. I am thinking of that great number of smaller

war plants, businesses that never existed before; most of them quite small and yet in them we are suffering serious human losses through accident. In every state there is a department devoted to labor and its interests, that is in a position to insist upon proper standards of conditions under which human beings are expected to work. Every one interested in the safety movement should see that such departments are notified of conditions which are unsafe in industries. I am sure that such governmental departments will be willing and anxious to offer their assistance, technical knowledge and skill to the employer to see that his activity is properly controlled for the safe operation of his employees.

The people who build and operate these plants wish to do the right thing and many, probably most, do so. Yet, further away from the city, or in some side street, where there has been a conversion from a large garage to a little machine shop, I know there are thousands of places where human beings are exposed to unnecessary industrial hazards. These industrial hazards are not nec-

essarily failure to meet mechanical safeguarding standards, but rather the hazard that comes from lack of knowledge of the necessity for all-out safety practice and safety thinking.

Safety on the home front has exactly the same values as safety on the fighting front. No one knows and probably no one will be able to figure out, except by purely theoretical statistics, the losses on the fighting front caused by losses in production through accidents on the home front. But the association is there!

In this brief talk I have not attempted to show the tremendous loss of life and productive ability on the streets, in the home, or in any other walk of life than that of industry. The sum total is appalling! The life of the nation depends upon the full utilization of every human being within our borders at his maximum time, at his highest skill, and at his utmost productivity. We cannot secure this productivity so long as the toll taken of our industrial workers through accidents continues.

The Staff Type of Safety Organization

By DAVID T. MOULD

Personnel Staff, General Motors Corporation
Detroit, Mich.

It is not necessary for me to tell you that the war production program has brought on a tremendous safety problem. I feel that your experience, no matter what business you were engaged in during peace time, has paralleled that of the automobile industry, in this regard.

We, in the automobile industry, have had a background of many years in improving safety conditions in the automobile plants. It is true that each year there were changes in the cars, but there were no revolutionary changes in production methods; so that the new safety problems each year were overcome without too much difficulty, and over the years safety was brought to a relatively high degree of perfection.

Then, we changed over to war produc-

tion. We began to make products which were entirely strange to us. We had to adopt new methods and processes. We had to retrain a large portion of our older employees, to operate new equipment. We had to hire many new employees, both men and women, for the new operations on war production.

Of course, one of the biggest jobs was training the new people who in many cases had never before seen the inside of a manufacturing plant. We could no longer assume that the new employee had some general knowledge about the job. On the contrary, we had to assume that he or she knew absolutely nothing about the hazards of a plant job and the safety precautions which are necessary.

All these conditions made it necessary

to start the safety program all over again. This problem was recognized by the top executives of our company.

For many years our safety program was based on five principles of safe plant operation, which were developed by Mr. C. E. Wilson who is now President of General Motors. When the change over to war production came along, Mr. Wilson revised the five points somewhat and added a point. The new six point program was then called minimum standards for a safety program. Here are the six points:

1. Interest in safety on the part of top management.
2. A definitely established safety organization through the supervisory organization to each individual employee.
3. Adequate and capable full-time safety personnel.
4. Written safety procedure and instructions for each occupation.
5. Thorough safety instruction of new employees.
6. Stimulation of interest in safety on the part of every employee.

Each of the 105 plants in General Motors has its own particular safety problems, and the management of each plant is free to work out the details of a safety program to fit the needs of the particular organization using the six points as basic principles. For our purpose here today I am going to take a typical plant and outline just how this program works.

Top Management and Safety

Point number one is interest in safety on the part of top management. This is interpreted to mean that the General Manager is to meet at least once a month with the top supervisory staff of the plant to review the safety situation. This group is called the master safety committee. Included on the committee are:

General Manager, Factory Manager, Superintendents, Plant Engineer, Personnel Director, Plant Physician, Safety Director.

The functions of this committee are:

1. Review the safety performance of the plant.

2. Discuss major safety problems and make decisions for corrections.

3. Formulate safety policies for guarding equipment, education, etc.

Point number two is a definitely established safety organization through the supervisory organization to each individual employee. This means that each superintendent will hold a meeting once a month with his foremen and review with them the safety policies established by the top management committee, such as:

- (a) To explain the general safety policies of the division as approved by top management.
- (b) To discuss the application of these policies to specific cases.
- (c) To discuss any safety matters desired by the foremen for their particular departments.

Safety Duties of Foreman

- (a) Understand fully the general safety policies of the division.

(b) Be responsible for safety guards and safety devices in their departments. To write out all orders for safety guards or appliances; to follow up and see that the guards are installed; to consider that the supervision of safety in their own departments is one of their major responsibilities.

(c) Talk to at least two of his employees every working day on the subject of safety. The time spent with each employee should not be less than five minutes. Therefore, every foreman will spend at least ten minutes every working day in giving safety instructions to individual operators. A record of these individual talks shall be kept in the department on forms provided by the safety director. The most important part of the entire safety program so far as the foremen are concerned is the regular day-to-day discussion of safety with individual employees.

(d) Promote safety by attention to safety posters, special safety movies, etc., as opportunity affords. It is not intended that the safety program shall center particularly around safety posters, safety movies, etc. These are only incidental—it being understood that the most effective

means of promoting safety is by consultation with individual operators.

(e) Instruct new operators on safety. This is in addition to the instruction to new operators by the safety director, prior to reporting to the department for work. In particular, to instruct all new employees as to the proper operation of the equipment on his job.

(f) Instruct all old operators that have been transferred to the department in the proper operation of equipment on his job.

(g) Recognize that safety is as much a routine part of the job as production, schedules, labor relations, etc. A good foreman will work daily on safety problems the same as on production problems.

Safety Personnel

Point number three is to have adequate and capable full-time safety personnel.

This particular plant has 8,000 hourly rated employees.

The safety department consists of:

1. Safety Director.
2. Seven safety inspectors. (Approximately 1 inspector to 1,200 employees.)
3. Two clerical assistants.

The general duties of the safety director are:

(a) Promote safety by repeated contacts with the foremen and stimulate interest in safety education, safeguarding against accidents, and promotion of good housekeeping.

(b) Maintain contact with plant physician so that the danger spots in the plant may be studied and intelligent efforts made toward accident prevention and control of occupational diseases.

(c) Investigate all lost time and near lost time accidents. Make reports covering the essential features of these accidents to supervision and top management.

(d) Supervise a safety educational program for all new employees.

(e) Supervise the general safety educational program—particularly bulletin boards, posters and motion pictures.

(f) Attend safety meetings and help formulate and explain safety policies.

- (g) Make daily plant safety inspections.

(h) See that written safety procedures and instructions are provided for each occupation.

(i) Provide a follow-up card to make sure that new employees are receiving safety instructions.

(j) Suggest changes on procedures of process if hazards are involved.

(k) Furnish current subjects for foremen to discuss in their daily five minute safety talks with employees—such as horseplay, running to clock card, housekeeping, etc.

(l) Suggest types of safety equipment necessary for the job.

(m) Have a safety inspector attend the superintendents monthly safety meeting. He can assist in establishing the safety procedure for the particular type of processing.

Duties of Safety Inspectors

The safety inspectors report to the safety director. They spend approximately 90 per cent of their time in the area to which they are assigned inspecting the departments in detail for potential safety hazards. Any safety guards or unsafe practices revealed are reported to the department foreman. It is the foreman's responsibility to issue orders for their correction.

For the safety program to be a success it is necessary to have written instructions for every occupation in the plant. In a large plant with diversified manufacturing, it is a tremendous task to compile the safety instructions for every occupation. However, the foreman in each department should write the safety rules for all the occupations under his supervision. The safety director can assist him to make sure the rules are complete in every respect.

When the rules are approved for the particular operations, they can then be used in the induction of new employees and also by the foreman in his daily five minute safety talks with employees until he is satisfied that the employee is thoroughly familiar with the safety rules for his particular job.

Instruction of New Employees

Point number five is thorough safety instruction of new employees. In the present emergency many employees are now entering manufacturing plants who have never before had any factory experience. This has created a tremendous safety problem to have the employees properly instructed on safety methods in a very short period of time.

The top management of the plant recognized that it was necessary to establish a safety induction program to instruct the new employees in the fundamental principles of working safely.

After the new employees have completed their physical examination and have been given a put-on slip, they are taken into a conference room in groups of 20 to 25 and told something about the company and the war products being manufactured. Some of the pertinent company policies are explained and additional written information is given the employee to read in his spare time.

The induction meeting is conducted for 3 to 4 hours, and about one half of this time is spent on safety instructions. The safety director explains the basic safety rules of the plant and gives each employee a copy of the written safety instructions for the particular job to which the employee has been assigned. In the conference room there is exhibited protective safety equipment which is explained to the employees.

When the employees have completed the safety induction meeting they are assigned to a job in the manufacturing area under the supervision of a job setter or foreman. The foreman explains the procedure for the operation on which the employee is going to work and again reviews the safety rules before the employees

are permitted to start working. A daily follow-up is made with the employee to make sure that they are following the established procedure. When the foreman or job setter is satisfied that the employee is familiar with all the safety rules the new man is then contacted the same as the balance of the employees in the regular five minute safety talks.

Employee Interest

Point 6 is stimulation of interest in safety on the part of every employee. In the foreman's daily contact with the employees on safety promotion they are encouraged to submit safety suggestions for improvement of potential safety hazards on their particular operations. The employees are also encouraged to keep their work places in an orderly manner to get a good housekeeping rating.

Safety posters on current subjects create interest among the employees. Safety moving pictures are sometimes shown during the lunch period.

Plant publications may be used to impart safety information to the employees. Also, safety pamphlets regarding highway and off the job accidents are distributed to employees periodically.

This type of safety program is now in effect in about fifty-five General Motors plants. It is necessary, however, to work the details out to fit the particular plant according to the type of product manufactured and the layout of the plant.

In spite of the change-over to the manufacture of war products and the tremendous increase in the number of new employees hired, we have been able to establish an accident frequency rate of .43 for the first seven months of this year. In the same period of time, the severity rate is .347 which is the lowest severity in the history of General Motors Corporation.

The Committee Type of Safety Organization

By W. G. HILL

Safety Supervisor, Bakelite Corporation, River Road, Bound Brook, N. J.

Industrial establishments too small to employ a full time Safety Technician often employ the Safety Committee Organization to handle their problems.

organization doing work of a basically different nature.

Duties of the Committee

The committee is generally responsible for planning the plant Safety program to be followed. This often includes:

(a) Purchase of equipment and tools that are safely designed and adequately guarded.

(a-1) The engineer who specifies the type of equipment and tool, must be aware of the need for adequate guarding and safe design. Therefore, when he places his order with the purchasing agent or department his specifications should be complete to cover all safe design, and he should emphasize to the purchasing authority the necessity of demanding from the vendor that the Safety specifications be adhered to in every detail.

(b) Standards to be followed in the design of machinery guards, safe engineering design and equipment lay out, process, etc.

(b-1) The American Standards Association, The U. S. Bureau of Mines and the National Safety Council, etc., publish excellent standards and specifications.

(c) Planning and promoting safe operating practices and procedures.

(c-1) The Safe Practices Pamphlets of the National Safety Council can be heartily recommended for this purpose.

(d) Advising departmental committees on safety and housekeeping inspections.

(d-1) Safe Practices Pamphlets, Heinrichs, and Blake of U. S. Department of Labor are well qualified authorities to follow.

(e) Making available pertinent facts developed by some individual or department so that all may benefit.

(e-1) This can be of definite value as it often happens that someone discovers a safety "kink" or idea of great merit, these should be brought to light so that

Advantages and Disadvantages

There are advantages and disadvantages in a set-up of this nature. The most serious objection is the weakness of any organization governed by a committee instead of by an executive. The execution of such a body is frequently without backbone.

To off-set these failings it has the benefit of bringing together the viewpoints of the group and joint judgment is normally better than that of an individual. While the consensus of the group is valuable, in the final analysis the value is only digested when prompt, effective, and orderly execution is carried out and followed up. Orderly execution depends upon the placing of responsibility in the hands of one person; and with responsibility it naturally follows that this person must have the necessary authority. In the small plant it would follow that the chief executive would be the person best qualified to accept and carry out the Chairmanship duties of the Safety Committee. The great benefit to be derived from having top management in the driver's seat of Safety is obvious to everyone.

(a) It serves as a direct warning to all departments and personnel that the chief executive is behind the Safety movement.

(b) In time, the executive is educated in Safety—which eventually means that he becomes not only Safety conscious but really efficiency minded—for we recognize that Safety and efficiency are synonymous.

(c) He is the authority best able to have the recommendations of the Committee carried out promptly.

The size of the committee is governed generally by the size of the establishment and the number of departments in the

credit can be given, and even more important—so that others may avail themselves of the application.

(f) Planning and Supervising programs to:

(f-1) Arouse and maintain worker and supervisor interest in Safety.

a. Contests, bulletin boards, etc., are all mediums by which interest can be maintained. Contests to stimulate interest and arouse competition, either departmental, inter-plant, state, or national should be organized and supervised by this committee.

(f-2) Safety training—specifically twenty or twenty-four hour classes made up of 10 to 12 two hour sessions.

b. The Engineering Science and Management War Training Courses sponsored by the U. S. Office of Education and given under the direction of many of our leading colleges have had an enthusiastic reception by industry and the war services, and their contribution to the war effort is immeasurable.

(g) Decision as to the disposal of specific problems.

(h) Investigation of accidents.

(h-1) Accident investigation carried out along the lines suggested by the National Safety Council Safe Practices Pamphlets, "Blakes" Industrial Safety Subjects or Heinrichs Industrial Accident Prevention will be found to be basically sound and productive of causes.

(i) Compiling and maintaining frequency and severity records.

(i-1) Frequency and Severity rates are so well known that hardly any comment is necessary except to say that they should be based on standard procedure. When that is done the records then provide a yard stick whereby comparisons can be made.

The committee should accept the responsibility of analyzing the accident records so that hazardous departments can be aided by the committee to help eliminate the causes of a high frequency rate.

Fundamentally the Main Committee must be obligated to sponsor the three "E's" of Safety.

Education
Engineering
Enforcement

Departmental Committees

Often, in addition to the main committees, it is beneficial to have departmental Safety Committees who only handle the problems of their department.

The Departmental Safety Committee is made up of workmen headed by a Chairman capable of directing the meetings. The functions of the Departmental committees are:

(a) Report hazardous mechanical conditions

(b) Report poor housekeeping

(c) To bring into the Safety program the view point and practical knowledge of the workman

(d) Stimulate worker interest in Safety

(e) Investigate accidents

(f) To foster a cooperative spirit between employees and Management.

The inspections that they make and the discussions that they have as a group are definitely of educational value, and unquestionably promote Safety mindedness. If the members of the Committee serve for a period and are rotated with other departmental employees—eventually most employees will have served, and the results of this time on the Safety Committee are invariably gratifying.

Basic to the effective functioning of a workman's Safety Committee is the sincere desire by the Management to enlist the help of the workers and obtain their cooperation. Therefore workers committees are not advisable unless Management is prepared to accept their work as important, and give their recommendations and suggestions sympathetic and prompt consideration.

An effective method of introducing the new employee to the safety organization is by way of the departmental Safety Committee. After the new employee has been received by the foreman, and the departmental practices and policies explained to him, the foreman generally

takes the new employee around the shop and introduces him to his fellow workers. After the preliminary training and explanation of the new man's duties, he is put in the care of a member of the Safety Committee familiar with the job. This committee member instructs the new man on the Safety rules and practices (a booklet that the employee can take home and read is desirable.)

The proper type of clothing for the job should be pointed out to the new man and the use of the protective devices thoroughly explained. In particular, the man should be fitted for the type of goggles that the job required. The use of gloves, respirators, masks, helmets, and other devices that the job demands must be explained in detail, and the difference of use between a respirator, a gas mask and a fresh air supply or oxygen mask should not be neglected.

Intelligent management will encourage the departmental Safety Committees from time to time by recognizing the valuable work done by them. This can be accomplished by sending a letter of appreciation. Such a letter, if posted in the Departmental Bulletin Board, almost certainly maintains interest and enthusiasm.

When a member has completed his or her length of service the gift of a certificate or permanent membership card is invariably regarded with pride. Along this line it has been found profitable to admonish the retiring members by telling them that even though they are no longer

active members of the committee they are, by right of having served, ex-officio members, and, as such, will always be responsible for safety and safe practices at their work.

The rejection of a recommendation should be accompanied by a tactful and clear explanation of the refusal to adopt the suggestion. The chairman of the Departmental Committee must never be superior in attitude, but should function as a chairman of a committee of equals. The Chairman of the Departmental Committee is usually a member of the plant committee, headed by the executive, and, in fact, many main committees are made up entirely of Chairman of Departmental Committees—the exception, of course, being the Chairman of the main committee.

The Committee Type of Safety Organization has proven by many years of splendid results what it can accomplish, and for the small plant I know of no better method of achieving an improved accident record. However, its usefulness is not confined to only the small plant. Many large companies employing full time Safety Engineers use the departmental and plant Safety Committees as tools to get results. Any organization, in my opinion, that neglects the opportunity offered by Safety Committee work to eliminate accidents are missing a good bet. Let me, therefore, urge that those who have so far not tried the Safety Committee type of organization, do so at once; and I promise that the effort expended will be amply repaid by fine results.

WEDNESDAY AFTERNOON SESSION

October 6, 1943

A Symposium

Presiding: J. E. Moore, Safety Supervisor, Cadillac Motor Car Division, General Motors Corp., Detroit.

Safety Tools 1943 Models Records Tell A Story

Presented by GEORGE F. NUERNBERGER, Supervisor, Health and Safety Division, Industrial Relations Department, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Yes, records tell the story—BUT—if the story told by the records is not brought to a logical conclusion, the time spent developing the story will be completely wasted.

Records require a great deal of thought in developing them. Two questions must be answered in the affirmative before time is spent developing statistical information.

1. Is the information vital to an accident prevention program?

2. Will the records indicate corrective action clearly enough to justify the amount of time and expense in compiling them?

An affirmative answer to these questions is a green light to proceed in the development of the records.

Injury Chart

One of the 1943 model safety tools we have used and which has been most helpful in our work is an injury chart.

(Slide A) This shows a general layout of our plant with each department noted by its department symbol. In the lower right hand corner of this chart, you will notice the key to the various colored flags that are posted in certain departments.

When an injury occurs in our plant, a flag is made according to this key and posted in the department in which it occurs. From the various color combinations and shape of the flag, we are able to determine at a glance what type of injury occurred and in which department it occurred.

For example, the flag in VD Department as shown by the pointer is a rectangular shaped flag. Therefore, the injury occurred

to a male worker. The main body of the flag, being yellow, denotes an eye injury. The band at the right of the flag, being red, denotes second shift. The black spot in the flag means that it is a lost time injury. If there were two black spots in this flag, it would be a case which has been off work 4 or more days.

To further clarify the system, we will take the flag shown in JD Department. Its triangular shape signifies that it is a woman employee. The body of the flag, being red, denotes a foot injury. The band at the right, being yellow, means the injury occurred on the first shift.

In addition, information is posted daily on the data sheet directly above the key. Here we tabulate the doctor's cases, lost time cases, compensation cases, eye injuries, foot injuries, finger injuries and others. We tabulate the injuries that have occurred in the previous month under these classifications in the right hand column, and those that have occurred from the first of this month to date in the left hand column.

This chart is about 6 feet by 7 feet in size and is posted in the division office. The safety inspectors, foremen, superintendents or any visitors entering the Health and Safety Division office can tell in a glance what is occurring in the plant.

Analysis Procedure

In addition to the injury chart, we must also have some method of showing at a glance the causes of these accidents that resulted in injury. At this meeting's "Accident Facts Session," I went through our

analysis procedure step by step. With this analysis procedure, we use the following chart.

(Slide B) On this form the inspector tabulates daily the unsafe practices which resulted in injury, on various days of the month, in the shop where the accident occurred. Here we find a machinery accident noted by Roman numeral II. The letter "A" denotes the type of machine, in this case lathe. By the number 3, we note the specific unsafe practice, "lifting and gripping improperly," and by the number 9, the unsafe practice, "failure to wear safety shoes."

By combining the injury chart and the analysis chart of unsafe practices, every one in the division can tell at a glance the injuries and the causes of the accidents that are occurring.

Additional Information

Records can also tell additional revealing and useful stories.

(Slide C) Here we have a graph showing the distribution of injury statistics per shift for the first six months of 1943 for our company. The columns rising from the abscissa give various information. The first column of the first group of four, showing information about the first shift, gives the percentage of doctor's cases. The second column shows the percentage of lost time cases; the third column, the percentage of days lost due to accidents, and the fourth column, the percentage of employment. Likewise, the columns appear in the same order for information on the second and third shift.

A line graph relating each of these columns to the percentage of employment gives a visual picture as to what has occurred. The dark line now pointed out is the base line where the percent of cases is equal to the percent of employment.

For the first shift, the percentage of doctor's cases and percentage of days lost is below the base line. It rapidly rises for the second shift and the third shift is still greater. What does this indicate? It indicates more concentrated safety work is needed on second and third shifts to level these peaks.

Distribution According to Length of Employment

(Slide D) This graph shows a distribution of injury statistics per length of em-

ployment. Again we find the four columns rising from the abscissa covering the same information.

The continuous line graphs are developed in the same manner as the line graphs on the previous slide. The base line shows the percent cases equal to the percent employees. We find the group of employees here less than one-half year slightly above the base line. There is a rapid rise in the percentage of accidents to those whose length of service is 1 year. After the employees have been here 1 to 2 years, it rapidly falls below the base line and continues to decrease, until the employee has been here 4 years. The group that has been here 4 to 8 years again rises rapidly, reaching a peak in the group with the length of employment from 8 to 12 years, then tapers off, again falling below the base line.

What does such information mean? The group that has been in the employ of the company from one-half to 1 year should receive additional safety instruction at the end of one-half year, to level off this peak. General safety instructions should again be given after the employee has been with the company 4 years, to counteract the rising trend.

Breakdown by Sex and Age

(Slide E) Here we have some statistical information desirable to indicate the relationship between the percentage of accidents to men, women and minors. The abscissa is the months of the year and the ordinate is percent.

The group of three curves at the top of the slide are those for men: the heavy line, the percent of employment; the dotted line, the percent of doctor's cases; and the dash and dot line, percent of lost time cases. Notice that in the month of July the percent of lost time cases is falling below that of the percent of employment.

In the next group of 3 curves, those developed on the statistical data on women, we find an increasing percent of women and a similar increase in percent of doctor's, as well as lost time, cases. Notice that in the month of July there is a greater percentage of lost time cases among women than the percentage of doctor's cases.

The 3 curves at the bottom of the slide are on minors. During the month of July, we had a rapid influx of minors. The per-

centage of minors of our total employment did not increase as rapidly as the percentage of doctor's and lost time cases. Also, note that there is a greater percentage of lost time cases for minors than the percentage of doctor's cases. During the month of August, this rise continued; however, for the month of September, we have been able to bring

these rises under control and report a much better experience.

These are just a few of the stories that indicate corrective action that records can tell. If records are developed clearly and on a reliable basis, they indicate the need for corrective action. With complete records, the corrective action needed is also indicated.

Supervisors Must Know

By J. W. YOUNG

Supervisor of Safety, International Harvester Company, Chicago, Ill.

Industrial supervisors can well be termed "pioneers" in accident prevention just as those who patiently ushered in the institutions of higher learning prior to the era of the technocrat. We must view the beginning of both as having the same pattern. The secondary and the elementary schools, and the kindergartens arrived on the scene in that order. And so it is with the Safety movement of today: industry is now in the "college" or "university" stage of development in so far as accident prevention is concerned.

The hope is entertained that there will follow a transition from this present stage to the "kindergarten" stage in which the training will reverse itself, and those having in mind industrial pursuits will come to industry better prepared with the necessary fundamentals of health and self-preservation. By this I mean, future training in preventing injuries must start outside industry—in our schools where it rightly belongs. In evidence of how inadequate our present scheme of teaching accident prevention really is, a thoughtful observer and educator has wisely stated: "The kindergarten ennobles toil. It teaches the youth to work with his hands but to control his work with his head. Let this purpose and spirit pervade industrial education until the youth reaches manhood's estate and his labor will be full, not only of manly quality, but of moral quality as well. The coordination of the work-shop and the school-house would be the emancipation of labor from many of the unnecessary injuries industry today suffers."

Support for a transition of the sort advocated here is given by another neutral observer, who states, "Four years of study without labor, wholly removed from sympathy with the laboring world during the period of life when tastes and habits are rapidly formed, will almost inevitably produce disinclination, if not inability, to perform work and duties of the shop, the farm, or the mine." If we are to progress as technocrats, then certainly we cannot separate the two—the hands and the head.

Certainly we can teach our youngsters—our future industrialists—how to protect their God-given bodies from injury and what to contribute to society in the way of the worth-while things in life.

Industrial supervisors must know that the success of such a transition depends wholly upon them. The methods and techniques of today will be the foundation of this anticipated phase of scientific service for those with industrial pursuits in mind. They must also feel that they are the true pioneers in such a movement.

Now then, what must supervisors know and do until these anticipations become realized?

Each and every supervisor knows that his contribution toward bringing about the downfall of Hitler's teachings has been dependent upon the blue-print—the plan given him before production was started. Supervisors must know that Safety requires a blue-print, a tangible plan.

Previously, mention was made of the "technocrat," the one dealing with machines. Supervisors of production, depend-

ing upon the machine, must know that a machine is compared to an antagonist who is always ready to take advantage of a mistake, yet always plays fair. Professor A. A. Michelson, who devoted many years of his life to the perfection of a machine for producing accurate optical gratings, said this: "One comes to regard the machine as having a personality (I almost said a feminine personality) requiring humoring, coaxing, cajoling, even threatening! But finally one realizes that the personality is that of an alert and skillful player in an intricate but fascinating game who will take immediate advantage of the mistakes of his opponent, who 'springs' the most disconcerting surprises, who never leaves any result to chance, but who nevertheless plays fair, in strict accordance with the rules of the game. These rules he knows, and makes no allowance if you do not. When you learn them, and play accordingly, the game progresses as it should."

The streamlined machine of today protects the operators from pinch points, from gears, pulleys, belts, etc., and adds considerably to the housekeeping of a factory. However, greater danger lies ahead for all if the streamlined enclosure is not lifted frequently, the parts checked, the cables and chains replaced, and the gears disposed of if worn.

Thus, supervisors must know their streamlined machine tools; they must play according to the designer's rules. Likewise, they must relay to the designer that which they find creating hazards so that the next blue-print carries with it a remedy. Hidden hazards are as bad as hidden costs. Both, however, can be erased if organized common sense is employed.

What must supervisors know to emerge victorious over all models of machine tools?

The answer is quite clear; it is no more than "getting" and "giving" understanding to the respective operators. Too many of us take too much for granted and pay too little attention to the other fellow's viewpoint. Our verbal communications with others are generally the same; we do not weigh the individual differences

enough to ascertain whether or not we are being understood when we give out various assignments. We must first get understanding—know what is desired—before we can give understanding. For example, we are accustomed to various phrases or expressions, and we think other people are accustomed to the same. We take this for granted. To illustrate: let us recall the cool morning when little Mary was walking on the cold kitchen floor. Realizing that she might catch "cold," you told her, "Mary, put on your shoes and stockings!" Have you ever tried that—putting on your shoes and stockings? You really meant "stockings and shoes," didn't you? And so it is with our conversation generally. We must speak the language of each individual; we must give understanding.

The late Will Rogers had the true slant on this particular condition. His popularity was based on people understanding him. Some newspaper men ridiculed him for "butchering" the American language, and his reply was: "You know some people that ain't saying 'ain't,' ain't eatin'." You will agree that anyone will get the desired response if she or he gives understanding.

What must supervisors know to bring about this understanding? They must know their men, and this can come about only by contact.

A few years back we heard many proverbial, self-made of course, pertaining to Confucius. (I wonder whether we really are acquainted with the true expressions uttered by this wise Chinese philosopher.) The one I have in mind bears out another requisite of a supervisor, that is, the supervisor desired by industry. Confucius said, "Not what I am, but what I would be, comforts me."

Life without a purpose is similar to production without safety. Both will fail. Thus, supervisors must know their objectives; they should not be content with what they are but with what they might become. It has been stated that a famous football coach, upon viewing his squad during the first week of practice one fall, saw the possibilities of success for his team in one man. He walked over to him, placed his hand on the player's shoulder,

and said, "Son, you're going to make a great coach out of me!" Sure enough, this happened. Supervisors must know their men and carry the same philosophy as this coach. They must feel and think "Drill press operator, you're going to make a great supervisor out of me!" instead of "Drill press operator, I'm going to make a great drill press operator out of you!"

Successful supervisors come about only if the men employed under them produce, whether it be on the production front or on the Safety front. Even if the machine operator, or the sweeper, eventually takes the place of the supervisor, it will be only because that same supervisor is now busily engaged teaching and training others to become supervisors. In other words, there will always be room for that type of man

in our industry. This should be made known to him.

All in all, I re-state: Supervisors should know that if we are to put Safety training in its proper place—in the school house—their past and present contributions will be the foundation of the entire movement toward better accident prevention. They should know that a Safety "blue-print" is necessary to guide them to where they are going and that rule books only show where they have been. They must have knowledge of understanding—getting it and giving it. They must re-examine the significance of personal contact and utilize it day in and day out. They must know their objective in life as well as that of the men working for them.

Medical Records Help

OSCAR F. LEHMAN, Assistant Director of Personnel, Eastern Aircraft Division, General Motors Corp., Linden, N. J.

One of the first lessons to be learned by those responsible for the administration of safety problems in any organization is not to limit the safety activities to his own endeavours. The entire plant must be organized along lines that will bring every workman into contact with obvious concerted efforts for accident prevention.

Activities

The scope of activities in a well developed industrial safety and health department will cover such items as follows. There are 12 in number; and may I call your attention to the items as being suggestive rather than rigid implications.

1. The treatment and recording of industrial injuries.
2. The diagnosis and treatment of minor medical conditions.
3. The physical examination of workers and applicants for work.
4. The examination of workers resuming employment after sickness or injury, and those leaving employment because of sickness or injury.
5. The investigation of all potential safety and health hazards throughout the plant.
6. The general maintenance of satisfactory sanitation and hygiene standards throughout the plant.
7. The supervision of health education, including accident prevention, unless otherwise covered.
8. Cooperation with family physician caring for sick employees.
9. Cooperation with mutual benefit associations, where such exist, and particularly with physicians rendering services to association members.
10. Participation in the adjudication of all compensation problems, especially controversies.
11. Maintenance of adequate records for the protection of the interests of the employer and employee; and to indicate the trend and volume of medical and safety department activities.
12. The rehabilitation of employees who have been injured, either through accident or occupational illness.

Records

Since Item 11 stresses the maintenance of adequate records, this might lead to some important questions directly related to the formulation of such records and, where adequate forms may be secured already printed, to avoid the necessity of drawing them up.

Chairman Moore: One of the most frequent questions asked of safety engineers and medical departments by different industries, seeking information for the inauguration of a safety and medical policy or anxious to improve the routines already established, is regarding the kinds of forms that are required in a safety and medical department to cover the different phases of a particular industry.

Mr. Lehman: First of all, in the selection of forms to fit the problems of your own industry, it is very necessary to set down the most important information that will be required, then add only those details that are indispensable to make this information complete. Do not make the form too lengthy, as the average person is faint-hearted when it comes to answering too many questions. On the other hand, do not make the form too short, as many times in the attempt at brevity important items are omitted. A happy medium between two extremes is usually the right size.

Chairman Moore: What are some of the important items in such a form?

Mr. Lehman: First, the type should be large and the questions worded clearly, so that the desired information will be obtained.

Chairman Moore: Mr. Lehman, closely related to this first question is the one as to where forms can be secured already printed to avoid the necessity of drawing them up.

Mr. Lehman: I am certain that forms used by the various firms in the automotive industry, public utilities corporations, transportation systems, insurance companies, and many others, if obtained, could well be the basis of formulating forms adaptable to your own particular industry. I am sure that these forms can be made to fit any industry and that, with necessary alterations, they can be made to cover problems of safety and health in any industry.

Chairman Moore: Is the arrangement of questions on these forms of any particular significance?

Mr. Lehman: Yes, indeed, it should be kept in mind that the arrangement of questions should be in such a manner that one question will lead to the next. Systematic arrangement of the different subjects will enable the doctor, after he has become acquainted with the form, to cover his examination in a shorter time and with less confusion to the patient and himself.

Chairman Moore: One often hears the complaint that forms are too long, because of many unnecessary questions.

Mr. Lehman: It is wise never to incorporate in a form questions and routines that you do expect your doctor to fill in. This mistake is very often made in drawing up new forms, simply for the impression it may make. Your doctors do not answer half the questions listed, and your failure to criticize them for not filling out the form completely will encourage them to slight other orders and instructions.

Chairman Moore: We frequently hear the statement that there are too many forms used.

Mr. Lehman: To this statement let me offer the following advice: Do not hesitate to have a sufficient number of forms to cover the various work in your department, as it is far better to have too many than not enough, and you will have a written record of those things which are usually forgotten if you have to resort to memory alone. All the different forms used by your department, taken together, should give you a visual record of each phase of your safety and health policy. As an additional suggestion, it is a good plan to have your forms mimeographed until you decide on those that meet your satisfaction. In this way you will avoid the waste and expense of changing forms that are already printed.

Chairman Moore: Of what importance are first-aid record cards or slips?

Mr. Lehman: All cases receiving first-aid treatment should be recorded on some type of convenient slip or form. As it is imperative that such cases report for subsequent treatment to a doctor or the medical department, by checking up the names on the form it can be ascertained whether or not they have complied with the instructions given. Also, the cost of each treatment can be determined by the amount of materials used. No matter how trivial a wound may

appear, it must receive first-aid attention and the injured person must be sent to the proper medical authority for observation and subsequent treatment if necessary. By this method infections can be eliminated, with their resulting loss of time from work and deformities.

Chairman Moore: Since we have been discussing records and forms and have barely scratched the surface as to their number and variety, there still remains the all important question. What are the values of these medical records of employees?

Mr. Lehman: I can best answer this by describing the routine of a person coming under the observation of the medical department, either for employment, or otherwise.

First, let us consider the matter of employment. When the prospective employee is sent to the department, we can ascertain if he was ever formerly an employee; and though he may say no, nevertheless, look into the records and see if his name appears there. It is not uncommon to find a full record of such a man's previous medical history. We then use that information to determine if he is to be approved medically for employment.

Second, There is the periodical medical survey. It has been the policy of many firms to make a regular annual medical survey of all employees. In the course of these re-examinations, physical defects that are brought to light are recorded. They then have a continuous medical history of the employee from year to year. Each year these re-examination record cards are taken from the active files and compared with the previous medical history.

Chairman Moore: How about records in relation to sick and health benefit insurance?

Mr. Lehman: Medical records of employees over a long number of years can be the basis on which one is able to put into consideration the employees sick and health benefits. In the matter of filing claims for sickness, these previous medical records afford the means of determining if the condition for which the claim is made existed prior to the claim.

Chairman Moore: How about personal injury to employees?

Mr. Lehman: Again, the multiplicity of forms is a factor in determining the medical condition of each employee, as regards the filing for compensation for alleged injury sustained in the course of duty. These medical records make it possible to verify the employee's claim, or to ascertain if the alleged injury existed prior thereto.

Chairman Moore: Mr. Lehman, since time does not permit us to go into every detail of the various phases and ramifications as to the value and help which can be secured from medical records, have you formed any conclusions in your own mind?

Mr. Lehman: Yes, Mr. Moore, it is, no doubt, needless to say that where there is available a medical record of employees over the period of their length of employment, those responsible for these records have a wealth of material and data on hand from which to write upon or to talk about the ultimate results obtained from a therapeutic standpoint, or to ascertain the true value of such measures as periodical medical examinations and the benefits that accrue from them, and the best methods of treatment for injuries that are prone to occur in the daily operation of industry.

The sum and substance of adequate medical forms for record is to transcribe everything about a person that will need to be available in the future for the true determination as to the authenticity of claims arising, regardless of what nature. The form record may not have much value today, but one can never tell when one will sorely need evidence with which to combat charges that may be humiliating, if not disastrous, to the one in charge of a large industrial establishment. Do not be afraid to put the truth in writing and with a thoroughness that will not be disputed, if an occasion arises that necessitates proof of your efficiency and integrity to administer the valuable service of conservation of employees safety and health in industry.

Using Plant Protection

By E. T. ADAMS

Assistant Director of Personnel, Eastern Aircraft Division,
General Motors Corporation, Linden, N. J.

Why should we use plant protection in the plant safety program? Are not the full time efforts of safety directors and inspectors, foremen and other supervisors sufficient?

Plant protection departments constitute a set of tools which, in many plants, have not been redesigned, sharpened and applied to the fullest possible extent to the furtherance of plant safety.

The ultimate relationship of plant protection departments to plant safety departments and their activities is one that is frequently little known, understood or utilized. Foremen and safety inspectors usually comprise the activating forces behind the plant safety programs. In fact, it is not infrequent that exhaustive efforts are spent on foremen in the hope that they may carry the brunt of the plant safety campaign. The reasoning back of such effort is sound and need not be defended, but bearing down on foremen or any other limited group of employees to the partial exclusion of the full use of any other group loses part of the value of those unemphasized groups. We should use all groups to the limit of their capacity.

In aircraft making the finished product is, if improperly made, the worst hazard of all and has the most far-reaching consequences. Its defects may affect the life of that ship's pilot, his crew, the other ships and crews in his flight, and, in fact, the whole course of the action in which he is engaged. The loss of that defective plane may cause more casualties in our ground troops or battleship personnel. So safety hazard detection takes on an amplified significance in airplane plants.

Try as we may, we can obtain only a small portion of a foreman's time for undistracted and undivided application to safety. The pressure of wartime production with its monumental problems of unfamiliar products, unskilled employees, uncured supervisory help, shortages of parts

and materials, attendance at training sessions and other meetings and the many other duties and worries, combine to make safety—even to the most conscientious of foremen—just another phase of foremanship and drastically reduce the emphasis each one can give to it.

Safety is a matter for everyone's active interest and effort. It is not a matter, as it may be too often considered, of my interest in my safety and your interest in yours. I must be interested in your continuing work uninjured, and you must have the same broad interest. Only by making a person self-conscious for others is his contribution to a plant safety program of more than negligible value. We appoint safety directors, safety inspectors, safety committees; we make safety inspections, safety devices and safety rules . . . what for? For our own benefit? Of course not, except as incidental to the main purpose. All the effort is spent to eliminate injury to others.

Even if we were to succeed in making every employee so safety-minded that he painstakingly guarded himself from injury or the liability of injury, the job would be only a fraction done. He, each individual, could so easily jeopardize the safety of others while being serenely safe himself that "self-safety" obviously is totally inadequate. We need to have every employee imbued with the idea of self-safety, but we also need the services of all personnel we can recruit whose safety interest is broader and possibly more abstract or impersonal. Plant protection is such a group.

Plant Protection Personnel

In what ways are plant protection personnel especially fitted to render major assistance in the safety program?

Plant protection departments have the desired wide outlook and impersonal approach. Their normal interest is of an extremely broad nature, and their training exceptionally fits them for alertness

to conditions of actual or potential hazard to others. Their main job is the detection of irregular conditions in the plant. These irregular conditions may relate to fire prevention, to rule violations, to sanitation, waste, labor trouble or other matters. Their training and the exercise of it makes them extroverts to a marked degree, and as such they are alert to general plant conditions; to conditions that would influence others than themselves.

In other words, they are eminently fitted to assist in the broader phases of plant safety. Their training increases their imaginative powers, without which many an obvious hazard remains undiscovered and uncorrected. It permits them to visualize a situation from existing conditions and, if such a hypothetical situation is hazardous, to have steps taken so that either that particular situation does not recur, if it is to occur, it is rendered harmless.

As these men patrol the plant they are constantly alert to the recognition of such situations pertaining to fire prevention and the application of plant rules. To increase their scope of interest by the addition of safety is natural. Where it has been done, the results have been of decided value, and it has brought reports and correction of hazards which were obtainable from no other source.

Hazards Detected

You may ask why the regular inspectors and supervisors have not discovered and reported the items of hazard found by patrolmen. One answer is that a great number of conditions are made hazardous by the loss of normal plant lighting conditions, men on patrol at night with the plant "down" find many dangerous conditions that are perfectly safe and constitute no danger in daylight or in a lighted plant. Of course, that type of accident cause is not all that they reveal, but these hazards incident to darkness are of extraordinary current interest.

The necessity for blacking out our plants, the possibility of loss of lights by bombing, by sabotage or by lightning, flood or other causes is with us. New employees and saboteurs make hy-

teria probable. Sharp metal protruding into main or side aisles; shop trucks, dollies, piled materials, power or light extension cords and air hoses left in aisles at the time of light interruption; abrupt changes in floor levels; hanging cables, heaters, trolleys, air lines, angleirons or beams which present no hazard in light are lurking menaces in the dark or semi-dark. And all hazards which exist in light have their potency multiplied several times to the blinded employees of a blackout.

Another reason that patrolmen detect hazards not reported by foremen or their regular safety inspectors is the well-known and recognized truism that it is possible to be "too close to the woods to see the trees." Foremen and inspectors accept as normal and unchangeable certain hazards which an outsider, whose interest is not primarily production, may immediately detect.

Recently, in a power failure and resultant blackout, an employee was returning from the plant cafeteria as the lights were cut. He had nearly reached his place of work, an area which he probably knew as well as any person. On a pillar adjacent to his bench there was a small bench grinder which stuck out into the aisle a few inches. This employee rammed against the grinder table with such force as to cause a rupture. The moral: Clear the aisles and mark their margins.

Such happenings are not uncommon. A man recently walked off the edge of a roof of a camouflaged plant in a practice blackout with serious results. Rail exposed roof edges on patrol routes.

Injuries to patrolmen usually occur at night. Seeking a steam or other leak, with flashlight aimed away from his intended path, serious metal cuts in limbs, ruptures, stumbling injuries, head injuries, etc., have repeatedly occurred.

Most plant patrol organizations customarily report accident hazards incident to their job, such as unsafe ladders and stairs, holes in floors, slippery roofs or walks and the like. They also report machines left running; leaks; doors, windows and lights that are out of order. A little additional training and they can as easily detect and report guards off machines,

control buttons tied down, high heels, loose clothing, lack of eye or lung protective devices and many more of the hundreds of unsafe practices and conditions existing in every plant.

Changes Necessary

What changes are required to assure obtaining the best results from plant protection efforts in safety?

To gain the utmost service and value from plant protection personnel on plant safety programs as on fire prevention and irregular condition detection, it is necessary that all of them patrol in all areas of the plant at all hours of the day and night. This assures getting the observations of the alert as well as the phlegmatic, the young as well as the old, and supplies a cross section of diversified special interests which have proven to be highly advantageous.

Such department-wide expression is gained by having all, or nearly all, men rotate on posts, patrols and working shifts. That is: A regular rotation of time spent on each of the three shifts, a regular rotation of days off and a frequent change of posts and patrols during each shift. This arrangement of schedules operates to put each patrolman on patrols of plant areas under all the various conditions of production and non-production; of daylight and darkness; of week-ends; of rain; excessive heat or cold; in fact, under every condition affecting the safety of employees and the security of the plant.

A plant which had just installed such a rotation system immediately had such an increase in patrolmen's observations of irregular conditions, including safety hazards, that it was necessary to revise and simplify the method of reporting them to the interested plant supervision for correction. And it was not a flash in the pan but continued over a long period. Men who had been on nights came up with many daytime hazards not recognizable to the habitual day worker, and of course, the opposite was true to even a greater extent.

Value of Program

Plant protection can make a definite contribution to the safety program of any

plant if they are used where their time and training is available and if their special duties and training are augmented and directed to amplify their regularly established functions.

Briefly, their aid is of exceptional value due to the facts that:

1. There are several or many of them in every plant.
2. They must walk through every part of the plant property each hour of the night, and each hour when the plant is down, whether day or night.
3. Their regular training tends to make them alert, observant and imaginative.
4. Their interest is broad, impersonal and unselfish.

Best results are accomplished by:

1. Rotation of men on posts, patrols and working shifts.
2. Extra training directed so as to be correlated to their regularly established duties and functions.

What, if any, advantages accrue to plant protection by such a program of safety activity?

There is a corollary to plant protection's activity in the plant safety program that developed as a pleasant and valuable surprise. A reciprocal advantage rebounds to the plant protection from the close collaboration and cooperative relationship between them and the members of the safety department. Such relationship gives the safety men an insight into the purpose and function of plant protection, and many are the reports received from them of incidents and instances not of a safety nature but of distinct plant security nature.

Conversations disclosing possible subversive thinking on the part of an employee, flagrant rule violations, potential disruption of management-employee relations, racial feelings, suggestions for better employee and vehicular movement, parking lot changes and many other matters have been brought to the attention of plant protection by safety inspectors with resultant improvement in plant operation and conditions. This phase of the activity should not be overlooked as it is of much greater significance than generally realized.

Engineering and Purchasing

By R. D. HARVEY

Director of Safety and Education, The Murray Corporation of America
Detroit, Mich.

Since the inception of the safety movement in the nineteenth century there has been a gradually increasing recognition of the part played by faulty engineering in accidents.

Conclusions based on accident investigation has resulted in recognition of the fact that only about 15 per cent of all accident do not involve a correctable mechanical feature. As more trained men attack the problem even this low figure is questioned, and will probably continue to drop.

I do not wish to imply here that we do not believe in safety education and training. Our several training programs, ranging from apprentice's to foremen's classes, and including three-week courses for production employees, are basic in our safety policy and have proved their value in lowering accident severity.

Most accidents have a mechanical and a personal cause, the elimination of either of which would prevent the accident. Hence a balanced safety program involves both, one of which—the mechanical—we are going to discuss now.

The relationship of the safety man to the engineering and purchasing activities of his corporation must be direct, definite and emphatic. Such a relationship is vital to a successful safety program. It can be a cordial, efficient relationship if the safety man offers intelligent, sound cooperation, or it can break down entirely if he fails to do so.

There are two basic approaches common to safety men which I want to warn emphatically against. Number one goes something like this:—

"Build it this way because my experience shows this way to be the best."

In the first place, the engineer approached feels that his own experience is better than yours, and secondly, your arbitrary ruling may very well overlook pro-

duction and other problems that make your solution unfeasible.

The better approach is this one:—

"Let's change this drawing to comply with the ASA Code. Under the code there are three or four ways to do it, and I would recommend this one. Of course, if one of the others looks better to you I will approve it."

If you use this proper, ethical approach you will soon find yourself on a more informal ground where you will be called upon early in the design of new equipment, and your engineering staff will know your requirements; know them not as personal eccentricities, but as sound engineering practice that is a part of their job.

The number two "don't" applies to the purchasing authority. Don't approach him like this:—

"I want you to buy Doakse's soap for the plant because the boys seem to like it."

In the first place, you are taking over his job—that of purchasing the best material available with a view to cost, delivery and effectiveness. In the second place, you are limiting him to a single source of supply which not only hampers him, but also raises the ugly suspicion of collusion between yourself and some salesman.

In contrast, the correct approach is more like this:—

"The following list of cleansers are approved by the Safety Department for use in our wash rooms. They are listed according to our preference based on trials made in various departments. Trials made were on soaps listed by Dr. Louis Swartz, head of the Federal Health Bureau, in a recent bureau publication. Analyses were also made by our own laboratories and they concur in these specifications."

This type of specification is what a purchasing agent wants, assures you of less

soap complaints, eliminates dermatitis from that source and lets you use the time spent listening to soap salesmen to better advantage.

We have discussed actual contact with your engineering and purchasing divisions. Now comes the question as to when the safety man should be consulted and what plant facilities and purchases should require his approval.

Your guide to this phase of the problem rests primarily on the source material which we will cover a little later. If there is an ASA code for ladders (incidentally there is) which covers requirements for the manufacture of them, then by all means you should approve the purchase of ladders and inspect them or see that they are inspected in compliance with this code. In some of the more progressive states, this ladder code and others have been written into the state law, and surely it is the safety man's job to see that his company complies with factory laws whether they be State, Municipal or Federal.

Certainly then, ladders should be purchased, inspected and maintained under the close supervision of the safety man.

If you, as safety men, will provide yourselves with the codes, specifications and legal requirements, this question of what you should approve will be largely answered. There will be other cases based on your own accident experience, problems peculiar to your own plant and production methods which may make it necessary to go beyond this broad category, but they are very few—usually unimportant and dangerous to your program.

I wish I could tell you that it is never necessary for a safety man to issue his own specifications for the purchase and design of equipment, but I cannot. A courageous and progressive safety program will involve, now and then, the issuance of such requirements. They should be issued only after thorough consideration of the problem and a search of all available authoritative data to see that no standard such as you propose has been agreed upon before. Talk over your need for such a standard with everyone involved—get all the advice, objections and

data you can; then, if you are sure you are right, go ahead.

As I go into this next and last phase of this problem I want you to understand that I am making no attempt whatever to cover these sources of information in order of their importance. Each code, law and specification speaks for itself, backed by the authority of its sponsoring or legislative backers.

We have laws, regulations and ordinances which should be broken down into two classes—those issued by governmental agencies having jurisdiction over your plant facilities, and those not having such jurisdiction.

Your municipal government will probably pass little legislation relative to machine operations, and will satisfy itself with a building code, together with the adoption (usually unofficial) of an elevator code. Occasionally a city also has an electrical code. A traffic law is always among the city ordinances.

Your county government may concern itself with hygiene to some extent, but these governments seldom issue stringent factory regulations.

Your state may have anything or nothing in its laws relative to your operations. Careful study of state laws is necessary to be sure you have them all. It is not enough to obtain the usual synopsis issued by the state labor board or its equivalent. Other laws may overlap into factory operation, and some court decisions under the common law may apply to your plant. These state laws are generally the most difficult to obtain in their entirety.

Federal laws and regulations, together with directives, decisions and exceptions, form another complete list.

When you are dealing with these laws bear in mind always that your function is that of a safety engineer and not an attorney. If a legal opinion is indicated, get it through your plant attorneys, your compensation department or your insurance company.

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tions are sound from a safety and engineering standpoint and their voluntary adoption is good safety engineering practice.

Closely allied to these legal requirements are the American Standards Association Safety Codes. Many states have written these codes almost entirely into their laws, and the preamble to each code recommends it to governing bodies.

Trying to direct a safety program without the ASA codes which apply to your plant is an inefficient, bungling procedure and often a ludicrous one to the trained engineers and technicians with whom you work.

These ASA codes represent the combined knowledge of the best safety engineers and other technicians in the field today. The impressive list of sponsors on the first pages of these codes represents leaders in the field covered—practical, experienced men together with professional men and experts in all allied fields. The code that follows is their consensus after months of study.

There are other vital sources of information.

The United States Bureau of Mines approves gas masks, respirators and other protective equipment and instruments. This equipment, when approved, is stamped "permissible" for the purpose mentioned. To use a respirator for lead dust which is not stamped permissible for lead dust is to court disaster. The Bureau will supply you with lists of approvals granted and their testing methods on request. In addition to this testing, the Bureau issues publications concerning explosive limits, flash points, dust explosions and skilled subjects. Its recommendations can be followed with complete confidence.

The National Fire Protective Association issues standards on many subjects and keeps them up-to-date. If you have a competent fire marshal with a set of these on his desk, along with a few other codes and handbooks pertaining to fire prevention and fire fighting, you can offer up a little prayer of thanksgiving and depend extensively on him to correct fire hazards. If you have no fire marshal, or

a retired city fireman with years of experience, and a blissful ignorance of such things as flash points and explosive limits; then it is up to you to consider fire hazards as safety hazards—which of course they are—and take over the task of eliminating or controlling them.

The Federal Stock Catalog gives many specifications well applied to safety and kept rigidly up to date.

The Federal Printing Office issues a monthly list of its publications, and you should be on the mailing list.

Recommendations from the Federal Labor Office are numerous and, for the most part, sound. They should be studied carefully before adoption, however, as many of them concern safety along with other factors, the line of demarcation is sometimes vague.

Material from the National Safety Council should be kept and considered.

Other material consists of books, articles, pamphlets and specifications from dozens of sources. Large corporations are usually willing to give you copies of their safety specifications and rules, all of which can be used in compiling your own. A good Mechanical Engineering handbook and one on Chemical Engineering are excellent, as is a handbook on the ASA Electrical Code now on the market.

Don't get the idea that these codes will take up too much of your time—they will save your time. They are based on plant inspection, and go hand in hand with the truism that when a Safety Director ceases to be a Safety Inspector his usefulness is about ended.

For the consideration of City Safety Councils I recommend, along these lines, the formation of a technical committee such as now functions in the Detroit Safety Council. This committee does not set itself up as a group of experts, but does claim to be able to get the answers to members' questions. Incidentally, such questions are presented at regular meetings and are answered a month later so that sound engineering opinions are given, eliminating the quiz program features of the regular panel discussion, and its often wrong curbstone opinions.

THURSDAY AFTERNOON SESSION

October 7, 1943

Presiding: General Chairman, C. E. Wooliever, Personnel Manager, Buick Motor Division, General Motors Corp., Melrose Park, Ill.

At the Thursday Afternoon Session of the Automotive and Machine Shop Section, Mr. William G. Powers, Personal Representative of H. E. Holler, General Sales Manager, Chevrolet Motor Car Division,

General Motors Corp., was the only speaker. Mr. Powers presented an inspirational talk entitled "Step Out and Sell Safety." He spoke without notes and no record is available covering his remarks.

Cement and Quarry Section

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Vice-Chairman—H. F. YOTTER, The General Crushed Stone Co., Easton, Pa.

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*Past General Chairman

†As elected by the delegates in Congress session

WEDNESDAY AFTERNOON SESSION

October 6, 1943

Presiding: General Chairman, W. M. Powell, Safety Director, Medusa Portland Cement Co., Cleveland.

Recent Cement and Quarry Accident Experience

W. W. ADAMS

Supervising Statistician, Bureau of Mines, U. S. Department of the Interior, Washington, D. C.

The subject assigned is intended, I believe, to cover accidents in those branches of the quarrying and allied industries that include the production of cement, limestone, marble, granite, traprock, sandstone, and slate. It therefore embraces not only work performed inside the quarries but also such outside work as rockdressing and the manufacture of cement or lime.

The recent accident experience of the industry as thus defined is comparatively good—much better than when the records were started in 1911; better than it was in 1925 or 1930. Moreover, the past five years (1938-42) present a more pleasing picture than that furnished by the five years 1931-35. Annual rates have fluctuated, but the trend has been favorable, showing progress in the prevention of accidents.

Statistical tables accompanying this paper have been prepared from reports supplied by operating companies to the Federal Bureau of Mines. Only the principal facts revealed by these tables will be mentioned.

Favorable Record for Industry

Operating companies began to furnish accident reports to the Bureau of Mines in 1911, thirty-two years ago. For several years after the work was begun, the reports from many companies gave incomplete coverage of accidents. This fact became apparent when the accident rates for the industry were computed and were obviously too low. By 1916 the reports of injuries had improved, so that compilations based upon them produced accident rates that appeared to be trustworthy and reasonably complete.

In that year, 1916, the accident-frequency rate was 63.4. Five years later it was 62.9 and ten years later, 58.0. By 1931 the rate

had dropped to 41.0. In 1936 it had fallen to 39.5 but it rose to 40.1 in 1941. The estimated rate for 1942 shows another drop, this time to 37.6. Only in two other years has the rate been so low, in 1939 and 1940.

When we compare the rate for 1916 with that of either of the most recent two years, 1942 or 1941, we find that the quarrying industry has reduced its accident rate by 35 or 40 per cent. There is a sound basis, therefore, for the statement that the recent accident experience of the industry has been good.

Rates Vary in Different Branches

The generally favorable record of the industry as a whole has not been shared equally by all kinds of quarries. Also, the characteristic accident rates of some branches of the industry may be higher or lower than for other branches.

To consider each branch of the industry separately, it is necessary to select a period of time ending with 1941, as some companies have not yet reported for 1942. During the 11 years 1931 to 1941, the cement industry led all other groups engaged in quarrying and related work by maintaining the best safety record, meaning thereby that the accident rates in that industry were lower than for other branches of the quarrying and allied industries during each of the 11 years. Moreover, the rates for the cement industry continue to improve. Although the rate for 1941 was higher than that in the 3 years immediately preceding, the average for the most recent 5 years was better than the average for the first 5 years.

This favorable record covers the entire cement industry, including work inside the quarries and that performed at the cement mills. The comparison continues favorable

for cement when the quarry work and mill work are considered separately and compared with quarry work and outside work at other classes of quarries where the stone is crushed after quarrying.

Cement Holds Lead

First position in safety was maintained by the quarries of cement companies during 9 or the 11 years under review, while the cement mills held first position during 8 of the 11 years and second position during the remaining 3 years. If we wish to let 100 per cent represent a perfect score of unbroken leadership during 11 quarry years and 11 mill years—that is, 22 plant years—covering quarries and mills, the record shows that the proper score for the cement industry, which held its lead in 17 of the possible 22 years, was 77 per cent. If to this achievement we add credit for the 5 years when cement mills occupied second position, the score would be raised to 91 per cent.

This fine performance in safety at cement plants is particularly gratifying because of the large number of men that the industry employs. When a large industry consistently reduces its accident rate, the actual number of accidents prevented is also commensally large.

With the cement industry operating with the lowest accident rates among the seven classes of quarrying covered by reports to the Bureau of Mines, the records show that the highest accident-frequency rates were those revealed for quarries producing traprock. The reports from this class of quarries show the highest accident rates in 8 of the 11 years, leaving 1 year when the highest rate was for sandstone, and 2 years when the highest rate was for slate. The relatively high rates reported by traprock quarries as a class should not be permitted to obscure the fact that favorable rates are achieved by many individual companies within the class.

Quarries Producing Dimension Stone

Among quarries that produce dimension stone for monuments or buildings, there is no single class or group that stands out prominently and consistently over the years for its low accident-frequency rates as does the cement industry among quarries producing crushed or nondimension rock. Granite

quarries comprise the largest class of building-stone quarries and have the most employees. Marble, slate, limestone, and sandstone quarries are the other groups.

The granite group of dimension-stone quarries might be rated 45 per cent for having either the lowest or second-lowest accident rate in 10 out of a possible 22 times for its quarries and rock-dressing plants during the 11 years 1931 to 1941. This is comparable with 91 per cent for cement operations in the crushed-stone group. Calculated in the same manner, the rating of marble quarries and plants among building-stone operations was 59 per cent, meaning that marble operations have the lowest or second-lowest accident rate among building-stone quarries 13 out of a possible 22 times.

The position of slate quarries and plants shows that group only 14 per cent relative standing among the building-stone plants. The percentage for limestone also was only 14, whereas the sandstone group, with the smallest number of employees, had a relative standing of 55 per cent. Two of these five dimension-stone groups—granite and limestone—had lower accident rates during the most 5 years than during the first 5 years of the 11-year period. The other three groups—marble, slate, and traprock—had increased rates.

Summary of Classes of Quarries

To summarize: A line-up of the seven classes of quarries, based on their records during the most recent 5 years for which figures are available, shows the relative standing to be in this order: (1) Cement, (2) granite, (3) marble, (4) limestone, (5) slate, (6) sandstone, and (7) traprock. Each of these groups, with one exception, shows a favorable record when the most recent 5 years is compared with the first 5 years. The largest improvement was made by granite companies, whose accident rate was reduced about 17 per cent. A 15-per cent reduction was reported for cement. Traprock quarries, whose prevailing rates have been higher than for other groups, nevertheless lowered their rate 9 per cent. The reduction for sandstone quarries was 6 per cent. A 2-per cent reduction was reported in the rate for limestone and a 1-per cent reduction for slate. Only one class of quarries—marble quarries—reported a higher

rate, and in this instance the increase was 18 per cent. All groups combined reported a rate reduction of 7 per cent.

With the foregoing review of the industry from a national point of view, only a brief statement of the position of some of the leading states will be made:

Experience in Various States

About half of all of the employees in the quarrying industry of the United States are distributed among seven states. The leading state is Pennsylvania, in which about one-sixth of all quarry workers are employed. The six other states are Ohio, Missouri, New York, California, Indiana, and Illinois.

The latest five years for which figures are available, when compared with the earlier 5 years, 1931-35, show a 7-per cent reduction in accidents per million man-hours in the United States as a whole. Pennsylvania's rate has declined 4 per cent. The

rate for the second largest state, Ohio, and that for California both declined 28 per cent. A 19-per cent reduction was revealed for New York and a 13-per cent reduction for Illinois. Records for Missouri, the third largest state, showed an increase of 10 per cent, while a 5-per cent increase was shown in the rate for Indiana.

These percentages of change reflect a comparison between representative rates for the two 5-year periods, 1931-35 and 1937-41, by which is meant the midpoint rate when the rates for each 5-year period were arrayed according to size.

These reductions in some of the largest quarrying states and all but one of the seven different classes of quarries, plus reductions in the rates for many individual companies in all states and in all groups, combine to form a favorable and pleasing picture of the recent accident experience of quarrying and its associated activities.

TABLE 1.—ACCIDENT-FREQUENCY RATES FOR THE QUARRYING AND RELATED INDUSTRIES OF THE UNITED STATES 1931 TO 1941

Year	Cement	Granite	Limestone ¹	Marble
1931	12.46	66.91	55.05	30.43
1932	11.14	47.99	52.67	45.27
1933	11.49	49.70	61.63	33.33
1934	12.64	71.90	57.27	43.32
1935	9.53	54.57	53.90	44.07
1936	14.40	52.23	54.89	37.60
1937	12.17	54.04	54.19	50.92
1938	9.96	42.93	55.50	58.39
1939	9.02	42.98	49.32	60.91
1940	9.71	45.24	51.03	40.82
1941	11.15	49.95	58.49	46.33

Year	Sandstone	Slate	Traprock	All Groups
1931	49.53	59.02	72.14	41.04
1932	42.88	51.09	70.00	38.48
1933	68.63	62.33	73.11	42.05
1934	64.04	58.12	81.10	41.82
1935	65.89	54.89	53.60	38.19
1936	48.19	53.17	60.33	39.49
1937	75.31	56.93	75.76	40.59
1938	58.15	57.04	62.85	38.19
1939	65.31	70.98	65.95	36.51
1940	51.82	71.03	63.64	35.72
1941	60.10	57.39	69.07	40.11

¹ Includes limestone used in the manufacture of lime.

Table 2.—ACCIDENT-FREQUENCY RATES FOR QUARRIES PRODUCING BUILDING OR DIMENSION STONE AND THOSE PRODUCING CRUSHED OR NONDIMENSION STONE, 1931 TO 1941

Building or Dimension Stone										
	Granite		Marble		Slate		Limestone		Sandstone	
Year	At Quarry	At outside works	At Quarry	At outside works	At Quarry	At outside works	At Quarry	At outside works	At Quarry	At outside works
1931	72.13	54.13	39.19	25.46	77.47	37.64	80.18	33.48	45.42	22.06
1932	58.99	34.64	54.06	42.91	62.57	34.58	105.77	58.73	42.94	16.91
1933	54.70	40.82	36.54	31.74	70.91	55.83	98.21	49.96	87.88	33.74
1934	58.18	63.08	50.02	36.19	71.80	48.06	58.51	82.33	110.26	11.22
1935	52.30	33.88	53.04	35.06	98.29	23.63	90.89	67.56	61.55	19.18
1936	52.88	46.25	52.12	31.93	78.78	36.34	67.75	50.95	37.43	20.60
1937	52.68	50.37	53.61	49.50	76.02	45.08	94.72	36.83	107.67	76.70
1938	57.14	33.44	84.40	46.17	59.33	48.02	81.58	33.87	46.81	24.62
1939	46.84	36.70	96.55	41.20	94.95	59.57	64.57	39.32	66.25	30.14
1940	55.99	29.36	59.67	30.54	76.11	65.55	65.11	67.05	82.09	46.89
1941	60.10	35.02	58.20	36.51	64.09	58.04	68.70	74.85	71.55	35.35

Crushed or Nondimension Stone								
	Cement		Limestone ^a		Traprock		Granite	
Year	At Quarry	At outside works	At Quarry	At outside works	At Quarry	At outside works	At Quarry	At outside works
1931	34.30	8.23	63.40	43.85	79.44	59.63	97.28	99.80
1932	22.42	8.86	57.89	39.24	69.27	56.26	64.81	65.17
1933	18.86	10.37	70.54	46.60	71.35	60.75	106.59	24.61
1934	25.36	10.49	72.29	33.58	80.72	53.64	144.42	41.10
1935	17.53	8.28	64.80	36.60	60.57	43.26	123.73	37.93
1936	31.77	11.35	65.01	40.08	63.91	52.50	91.86	29.95
1937	28.10	9.55	64.82	39.02	92.06	40.42	78.80	27.91
1938	21.78	8.19	68.26	40.21	73.59	42.37	51.61	23.76
1939	21.68	7.14	64.36	30.81	85.58	28.47	61.00	35.89
1940	14.93	8.96	62.80	33.69	76.93	49.70	76.11	31.30
1941	16.33	10.37	69.86	42.92	78.33	54.98	68.56	38.66

^a Includes limestone used in the manufacture of lime.

Practical Application of Quarry Safety Standards to Quarry Operations

By WM. L. ROSCOE

General Mill Foreman, North American Cement Corp., Catskill, N. Y.

I do not know to what extent you gentlemen will agree with what I have to say this afternoon but there is one point on which I am certain we all are in accord; that is, the committee that worked out the tentative standards which we are to review have done a splendid job.

They have made their contribution to the cause. The next contribution should be forthcoming from top management; and, it seems, if they do their part as well we will have gotten off to a fine start.

Their major role in this is to sell their supervisors on the idea to win their cooperation. These standards are so practical, simple, and thorough that their application is merely a matter of routine, but management must convince its supervisors of this fact; otherwise, they may look upon it as a tremendous task which will surely pave the way for numerous alibis and half-truths.

They must be sold on the idea that production and safety are so closely tied in and that one is so dependent on the other that it's practically impossible to do a good job of one without doing a good job of the other.

Leadership Needed

If management will demand facts from its supervisory staff and absolutely refuse to accept or tolerate half-truths, they will have taken an all important step. "Why so important?" you might ask. Simply because half-truths can be distorted or modified to make them appear to be facts. Still, they are not facts but they can be very convincing. In fact, they can be so convincing at times that an accident may be accepted as just one of those things and no measures be taken to prevent a repetition, merely because a half-truth has led us to believe all was done that could have been done to prevent it.

For instance, suppose a supervisor gives emphatic instructions to a man to use a

life line at all times when doing a certain job and then fails to follow up to see that it's done; then, when an accident occurs, through neglect to use a life line, he insists he has been applying the rule. We must, of course, accept this as a half-truth.

I am sure you will all agree that the one controlling factor which will determine largely the extent of the benefits to be derived through the application of these standards is leadership.

The next step for management is to impress on the minds of its supervisors the fact that the penalty of leadership is continued effort; and that the accomplishments of tomorrow can best be envisioned in the record of the achievements of yesterday and today.

The responsibility, of course, rests on the operating staff to make the achievements of today a worthy goal for tomorrow; and this, most certainly, could be accomplished by each and every operator immediately adopting the particular standards applicable to his quarry operations and then applying them diligently every day, on every job, without let up, until it has become a habit. Then and not until then, will we all profit from the splendid efforts of the standards committee.

On the other hand, if supervisors continue to think that any job is so simple or that certain jobs have been done so frequently that supervision is unnecessary, the efforts of the committee will have been wasted. I am sure you will all agree that this is a common fault.

Safety Instruction a Part of Job Instruction

Before getting down to the business of reviewing the standards, I would like to make this prediction:

You will find that whatever degree of success you attain in improving your safety record through the application of

these standards will be in exact proportion to your success in getting your supervisors to inter-mingle safety instructions with job instructions.

In section one, under "Physical conditions," we find some very sound and practical rules or standard practices, which are applicable to practically all quarries. It has, however, been my experience that any set-up for a standard practice must be so planned that a minimum amount of work is involved to assure its successful application. Take, for instance, rule two which says, "After overburden has been stripped back a specified distance, it should be sloped to its angle of repose and precautions taken to prevent wash and slides from falling into the quarry." There is no doubt that the erection of baffle boards, screens, or cribbing, as suggested in rule three, would be an effective means of protection against this hazard. But let us look at it from another angle. Suppose at the time the job of stripping is completed, the supervisor has some very pressing operating problems confronting him and he is hard pressed for time and help. Doesn't it seem that the amount of work involved in this method may have a tendency to start him thinking up excuses for not complying with the rule? This is not because of any unwillingness on his part to co-operate but rather because we did not give enough consideration to the matter of simplifying the application to a point that there would be no occasion for excuses.

A method found to be entirely satisfactory for local conditions, simple in its application, and very effective in its purpose is to strip back the specified distance, leave the face nearly vertical, then haul screenings and dump over the edge, forming a windrow at the base its entire length. The only labor needed in this method of precaution is a truck driver and one man to level off to fill in the intervening spaces between the loads.

You will find it surprising how effectively a small windrow of screenings will check wash and slides of overburden, and, of course, larger ones in proportion.

Whether or not this method would be as satisfactory in its broader scope as for

local conditions, can be determined only by each operator trying it out under his own operating conditions. The suggestion is made with the idea in mind of simplifying the method of precaution thus giving more assurance of its application.

Inspection and Scaling of Quarry Faces

If we will look back and examine our past accident experience in connection with the so-called scaled quarry faces, we should arrive at but one conclusion:—and that is, the record stands as an everlasting monument to our failure to recognize the fact that there is no such thing as a quarry face made safe.

Therefore, any attempt to scale the face with the idea in mind of working men under that face is exactly the same as partially guarding a piece of machinery, which, from a safety standpoint, is worse than no guard at all.

As an illustration: Here we have a piece of machinery with gears, pinions, pulleys and belts all exposed with no guards whatever. Naturally a man working around this piece of machinery will recognize the hazards through the law of self-preservation and govern himself accordingly. He will be watchful and on the alert, and if he is injured you can be assured it was caused by a slip or a fall and not from any failure on his part to recognize the dangerous condition.

Now let us partly guard this machine, or, say we put a flimsy board around these gears. What happens? We have doubled the chances of an accident occurring, by dulling the keen edge of the self-preservation instinct inherent in all men.

The board does not in any way make the man careless; it is just a natural function of human behavior to feel more secure when something is placed between him and the danger point even though it is nothing more than a flimsy board.

The same holds true in scaling a quarry face. The knowledge that the face has been scaled will give men a feeling of security and, naturally, they will be less on the alert than if they knew no scaling had been done.

The big difference, however, between guarding machinery and scaling quarry faces is; machinery can be guarded to a point where it is practically foolproof. A quarry face, regardless of how frequently it is scaled, can never be made any safer than the machine with the flimsy board guard. The principal reason for this is; we leave the effects of the elements to combat.

Now the question is, "What can be done about it?" In the first place, let us consider quarries where three yard shovels or larger are used. If we rid the face of all projecting large rocks and any overhanging ledges, we can forget about scaling to knock down the smaller loose stones. Let it be known that no actual scaling has been done. Then, when the drillers drill the large rocks on top of the rock pile, set a deadline at twenty-five feet from the face—no drilling to be done beyond this point.

When the shovel takes the last cut near the face, it can dig from under the remaining large rocks and let them slide down the bank and away from the face, where they can be drilled in safety.

Some may argue the point that if a rock is let down in this way, too large for the shovel to cast out of the way, it would hamper production. But this can be avoided by having the shovel dig first into the bank at a point where the large rocks are located leaving the better part of the bank as a reserve to move the shovel to, in case this condition arises, while the necessary drilling and blasting of the rock is being done.

Next, let us consider quarries with smaller shovels. The smaller shovels have the advantage of movability; and as occasional rock, too large to handle, and too close to the face to drill, could be dug around and left lying until the next shot has been made. Then, when this shot is cleaned up to the point where the rock or rocks were left, they will be the width of the last shot farther away from the new face, which should be a safe distance for drilling.

However, it will be found necessary to drill some rocks on top of the rock pile near the face which cannot be let down

by digging from under without endangering the shovel and the operator. When faced with this condition, there is one effective precaution which may be taken; that is, by the use of a tarpaulin—the length to be determined by the height of the quarry face.

As a simple illustration, let us say that the height of the face is fifty feet. After firing a primary shot, say the rock pile next to the face is twenty-five feet high, this leaves a distance of twenty-five feet from the top of the rock pile to the brink of the face. Now suppose you had a tarpaulin ten feet wide by thirty-five feet long. You merely lay this roll of tarpaulin down ten feet back from the brink of the face, tie fast or lay flat stones on the one end, then roll it over the rim directly in line with the rock to be drilled. The other end would reach to the rock pile protecting the driller from falling rock. Any small stone which may work out of the quarry face would merely slide down behind the tarpaulin, being kept close to the wall, where it would land harmlessly.

On rare occasions, where small shovels are used, rocks too large to handle may be so numerous on the quarry floor that production may be seriously hampered unless drilling is done near the face. In this case, the same method of precaution could be used by having a tarpaulin long enough to reach from ten feet back from the brink of the face to the quarry floor.

The rule for scaling quarry faces must, of course, be maintained. However, we must not lose sight of the fact that the process of scaling does not eliminate the hazard. Therefore, any additional precaution such as the use of a tarpaulin would be added insurance against accidents.

In the event any of you are wondering about the cost involved of this method of precaution, a fine grade of tarpaulin can be purchased for seven cents per square foot.

Fixing Responsibility

Rule thirty-one in section three under "Rolling Stock" reads, "No person without proper authority should be permitted or allowed to ride on a locomotive or

train." It is of the utmost importance that this rule is strictly enforced.

We must, however, remember one thing; that is, any rule not enforced is a far greater detriment to the cause than no rule at all. So the question is, "Will this rule, as it stands, mean much?"

It seems rather doubtful for the simple reason that no definite responsibility is placed for its application or enforcement other than the constant surveillance of the supervisor.

Suppose we change this rule to read this way: "The locomotive engineer shall not move a locomotive or train while any person without proper authority is aboard." This would place the responsibility, which, in turn, would make the rule effective even in the event of the supervisor's absence.

Rule sixty-three in section four is another example in which failure to place responsibility on some individual would undoubtedly render the rule useless.

Let us examine this rule in its two parts carefully.

(a) "The truck driver shall not remain in the cab while the truck is being loaded with a power-shovel unless the truck cab has been specifically designed for power-shovel loading."

I would not go so far as to say that it is impossible to design and build a cab sturdy enough to withstand the blows which are possible from a four or five yard shovel, but do feel safe in saying that its ever being done is extremely improbable.

(b) "The truck driver shall not remain in the cab while the truck is being loaded if the dipper is swinging over the cab."

Can anyone here give any plausible reason for swinging the dipper of a shovel over the cab? Can you mention any operating condition which would necessitate this practice? An affirmative answer to these questions is rather doubtful. Doesn't it seem then that this rule fails to place responsibility for its application? It may even suggest dangerous practices.

Now, let us rewrite the rule in a way that one man is held responsible for its application. "The shovel operator shall

not load stone in a truck until the driver is out of the cab and in the clear."

With this rule in effect, the driver will be safe at all times; and if any supervisor permits the practice of swinging the dipper over a cab, he will only endanger the equipment, and eventually his job.

Explosives

Let us pass along to the section dealing with explosives and examine rule six, part (a), which reads: "New explosives should be placed in the rear of the magazine and the older explosives moved forward. The older explosives should be used first to prevent deterioration from age."

The reason given for using older dynamite first is to prevent deterioration. Doesn't it seem reasonable to believe that this may be a little misleading? That is, without an explanation as to just what happens to old dynamite, isn't there a possibility that it may be looked upon as just an operating rule with no safety factor involved? The object in using the older dynamite first, from a safety viewpoint, is to prevent a leaky condition developing. When dynamite leaks the nitro-glycerin settled to the bottom of the cartridge, soaks the wrapper, seeps through the container and eventually will soak through to the floor of the magazine.

In this condition, dynamite is very sensitive, unstable and absolutely unsafe to use. In the event dynamite is found to be in this condition, it should be condemned and destroyed by a qualified person. I might add, there are none so well qualified as those sent out by the manufacturer. You can rest assured these men did not get their job through any pull but as a result of long, hard experience and thorough training.

Another reason for suggesting this explanation is this: Men will invariably do a much better job and do it more willingly, when they know exactly why they are doing it.

In this same section we find rules designed for safe methods of thawing frozen dynamite. Inasmuch as all commercial explosives are manufactured on a low freez-

ing formula and will not freeze in any temperatures encountered in the United States, it seems that, if this practice of thawing prevails, there is a possibility that hardened dynamite found in freezing weather is being considered as frozen.

This mistake can easily be made. There is, however, one positive method of determining the difference; that is, by the use of a pin or the point of a pen knife blade. In frozen dynamite the pin or the knife point will not penetrate at all; but either will penetrate hardened dynamite easily.

Testing Blasting Circuits

Part (c) of rule fifty-four says, "All blasting circuits should be tested with a galvanometer before attempting to fire shot." This would be a very important rule if it weren't for the fact that some quarries, when hooking up a shot, use a parallel hook-up in preference to hooking up in series.

The object in testing a shot with a galvanometer is, of course, to determine whether or not there are any breaks in the wires which would cause misfires. So, let us consider a shot hooked up in parallel.

We might load and hook-up a hundred block holes and have a break in ninety-nine of them but the one good one remaining intact would, when tested with a galvanometer, show the entire shot to be all clear. Now, when a shot is hooked up in series, regardless of the number of holes loaded, it will not show clear if there is a single break in any of the wires.

So, you can see that unless another rule is written or incorporated in this rule forbidding the practice of hooking shots up in parallel, the rule is useless because it stipulates all circuits; and testing a parallel hook-up with a galvanometer would not tell us anything at all. In fact, there is no positive method of testing a parallel hook-up that will detect a break or a short circuit. Therefore, the rule in its present form becomes a detriment to the cause.

Toe Hole Drilling

In the section dealing with toe hole drilling, the fact is mentioned that this

work is of an unusually hazardous nature, which is very true. The committee has very ably given us about all the rules which can be applied to this work. There is, however, one thing we can do; that is, reduce toe drilling to a minimum.

There are three major causes which make toe drilling necessary.

First: Failure to clean all burden away from the face before making a primary shot. This is particularly true for the corners.

Second: Trying to shoot too much burden; that is, by drilling well-drill holes too far back from the face.

Third: Failure to drill deep enough below the quarry floor to lift a strata of rock which runs diagonally across the face and dips down below the floor.

Inasmuch as this work is hazardous under the best conditions possible, it seems the most logical procedure is to eliminate the necessity. There is no doubt but what, with a little experimenting, the necessity can be substantially reduced in all quarries and, in a great many cases, entirely eliminated.

For instance, suppose some toe is found at the quarry face. Instead of drilling it and exposing men to the risk involved, an extra well-drill hole could be drilled in line with the toe and ahead of the regular line of holes near the face. When the primary shot is loaded, only load the bottom of this hole. This will, at least, break up the toe so that the shovel could dig it out when the shot is cleaned up; but in case some of it could not be dug out, it could be drilled in safety, as it would be away from the new face a safe distance for drilling.

Each operator must more or less work out his own method for eliminating toe drilling, as operating conditions vary widely in the various quarries. There is, however, one fact we must admit; that is, whenever we run into a toe condition there is a definite reason for it. This, like all operating problems, if given a little careful study, is not so difficult but what some means of prevention can and will be found. It will, of course, require some effort on

the part of the operating staffs to successfully cope with these conditions.

Action Needed Now

We are deeply indebted to this committee for having done a splendid job of planning methods of precaution which tend to safer quarry operations in general.

We all know the form of payment which would be the most gratifying to the committee—a substantial reduction in accidents.

There can be but one interpretation of the standards as written, that is, they are entirely satisfactory and applicable to all quarry practices in general. The adoption and diligent application of these rules will undoubtedly produce results beyond our expectations.

We might say we are playing checkers with time. The committee has made the first move; the next move is ours. Move with quick decision and time will favor us. Make no decisions and time will sweep us off the board.

THURSDAY AFTERNOON SESSION

October 7, 1943

Presiding: General Chairman Elect, David Adam, Lawrence Portland Cement Co., Northampton, Pa.

High Labor Turnover and Safety

By N. M. DeBRUIN

Superintendent, Lone Star Cement Corporation, New Orleans, La.

It seems no longer fashionable to label destructive forces as "Columns" but I'm sure that if we could have foreseen the ill effects that high labor turnover has had on our safety work, it would have been ranked equally with the 5th Column. Off-hand you may think this an exaggeration, but I believe that if you will examine carefully the underlying cause of your accidents, it will be found that excessive turnover has played a big part. In the case of our plant, 66 per cent of the accidents can be traced to it.

My experience has been that the most serious aspect of turnover is not the "green man," but rather it is the effect of hasty upgrading of relatively new employees to fill the place of quits. On this premise, let us first name the causes of the present high turnover. There are only two that we now face which we have not always had. I refer to "Higher Wages in War Industries" and "Induction of Employees into Military Service." These are formidable forces and since we cannot remove them, it behooves us to examine their effects with the hope of finding some remedy.

What are the effects of high turnover? Here is a list of four which I think have the greatest bearing on safety:

1. Inadequate training of replacement.
2. Excessive working hours
3. Relaxation of Physical Requirements
4. Bad Morale.

Let's talk about these. Most of us were caught, when war was declared, without a concise training program. With the scarcity of labor that prevails, about the only feasible plan is to set up some means of training the employees you now have. You may say, "We have always done that." But have you? Hasn't it been a case of self training where you only provided the facilities? Now we must provide for a definite period of training under supervision. It is expensive under prevailing regulations but what cure to a bad malady isn't?

Most of us have experienced the necessity of working a man twelve and even sixteen hours because his relief man failed to show up. Unexplained absence has, and

is, being practiced where the employer will not give a release. Men will deliberately seek discharge so they can be free to take employment elsewhere. The only cure for this is a liberal policy in giving releases whereby employees know that they can terminate service after working out a decent amount of notice.

We have all had to lower the standard of physical requirements. The question is how far we can relax the requirements. A good plant physician can be of inestimable help on this score. A lot of us have learned that a physical defect does not disqualify a man from rendering good service on certain jobs. The trick is to place the man where the handicap will least affect his work. If there is a question of the man's adaptability, it is a pretty good plan to consult the company physician. To weigh the hazards of the job against the man's particular handicap is a good thumb rule.

Morale is a word that is kicked around no end. The saying goes that if you have it, you don't talk about it. The point is, how can the morale of your men be good when a neighboring industry is paying higher wages? The problem of morale is probably the toughest we have to deal with, yet no plant can have a good safety record without good morale. I don't presume to know the whole answer, but I believe you will agree that harmonious relations between management and the

operating force comes first. Next, your foremen should be awake to their responsibility in keeping down grievances. A Safety Director can build enthusiasm but so can a live Safety Committee.

These are but a few of the vestments of morale. You can go farther and provide outside interests for men—such as athletics, picnics and other forms of entertainment but the problem still isn't licked if there is a considerable difference between your wages and those of the plant next door. If the difference can't be adjusted, you still may be overlooking a bet if you fail to remind your employees of the hidden benefits they enjoy. Do they realize the temporary nature of a boom time job? Does that other job offer group insurance, retirement benefits, hospitalization or some other form of security that you have provided? Many will change their minds about quitting if they can be made to see that they will be better off in the long run by sticking with you. The minute an employee makes the decision not to quit, his morale improves.

One more point. Most of us have had men quit to go to a boom plant job; then, after a time, come back and ask for their old job. Make sure that word of this gets around. The example of the "Prodigal" has a sobering effect. If you publish a plant paper, make it a point to welcome him back into the fold.

Selling Safety to the New Man

By EARL G. GLESSNER

Medusa Portland Cement Company, York, Pa.

The views I intend to give you are those of the men in the mill, the men who make the products for the Companies you represent.

I feel that industry as a whole has failed to sell the new man on safety. Many times a new man has been hired and told to report to his foreman who has been in the mill for years and thinks everyone else is accustomed to the heavy machinery and noises of the mill. The foreman tells him what his duties are and says, "You'll catch on to it in a few days." He doesn't

stop to consider that this new man might have come from an industry where they had no machinery, and he can't realize the change this new man is making. A new job, altogether different surroundings, and a group of strange men who he believes are watching every move he makes.

Can you remember your first trip to a mill when it was in production? I can well remember mine. I came from a furniture factory where I was working in the finishing department where the only machinery we had was a few light fans to

draw out the fumes of the spray booth. I tell you I was very much surprised, and somewhat frightened, to see those huge hot kilns turning out their clinkers and to hear the mills grind those clinkers. I took things pretty slowly those first few weeks. While the machinery was very well guarded, I could see it was no place for day-dreaming.

Of course, we have lots of manufacturing plants which are contributing members to safety organizations, but that is as far as they go. The literature and safety posters which they receive seldom get any farther than the superintendent's office, and eventually the waste basket. And may I say here that I have yet to see my first safety poster that failed to offer a safety lesson in itself, whether it was issued by a safety organization or an insurance company, and I believe those posters should be displayed at various places throughout the plant so that every man in every department has a chance to see and study them.

I believe labor as a whole feels the same about accidents and will cooperate with any safety campaign if given the proper leadership. We all know that, not many years ago, if a man had dared to ask for first aid for a minor scratch or cut, instead of first aid he received a good bawling out and was considered a softy. I worked for one concern which had one of the most modern first aid stations in the county, but I am sorry to say it was for show purposes only. Each employee had his own bottle of iodine which was considered a cure-all for everything. While I knew that the men at the top did not want these conditions to exist, I believe they were at fault because they failed to have any sort of a safety program. Their lost time accidents and hospital cases were very frequent.

When "Selling Safety to the New Man" who should be the salesman? The first man who interviews that new man should also be one of the spark plugs of the safety organization of that particular plant. We all know that first impressions are lasting impressions. He can do much in steering the new man on the right course. If goggles and safety shoes are

required, let him make that known at that interview, and it will be much easier than to tell that man six months later that he is expected to wear safety shoes and goggles. Take the new man to the foreman of the department where he is expected to work and introduce him. Have the foreman take him through the department and make him acquainted with the men whom he will be expected to work with. Also, explain the machinery and point out the guards and why they are there. Impress upon him the importance of reporting minor cuts, scratches and bruises and having them attended to immediately. Take him to the first aid station, and make him acquainted with the men in charge there so that when he does have a minor accident he will not try to hide it for a period of days until infection sets in. When he reports to work put him on with a man who thoroughly understands the job and let him break him in on that job.

You might say that is an extra expense. It is, but it also makes an efficient and capable employee. If the man is broken in properly on the job, there will be no occasion later for the foreman to point out little jobs that the new man has failed to do. If at all possible, and the man is on shift work, I would suggest that the man be given a day with a day-man and report the next day with the night man. Of course, that would mean two days of training at the expense of the Company, but I believe that it would be cheaper to have an efficient employee than to be breaking in a new man every few days. The Company doesn't want a high labor turnover and neither do the men on the shift, because once they are acquainted they move or lose work as a unit.

Today, with the scarcity of manpower and machinery it is equally important that the new man thoroughly understands the machinery so that no harm can come to the machinery or him. At the first opportunity, when the plant safety committee meets, you should invite him to attend the meeting so that he can see just what goes on at those meetings.

If the plants which you gentlemen rep-

resent do not have safety meetings, it's high time that you start.

I'd like to tell you a little of our safety program at York, Pa. In 1936 a group of employees got together and decided to hold our own safety meeting once a month. Every employee, from the laborer in the yard to the superintendent of the plant, was invited to attend on his own time. At these meetings we try to provide entertainment and discuss accident prevention. We not only deal with accidents in the mill, but also with accidents in the home and on the highway. The men are free to discuss their problems, and their safety recommendations are referred to the plant inspection committee which gives a report at the following monthly meeting. Generally the report reads: "Recommendation investigated and suggestion carried out." Our superintendent attends those meetings, not in his capacity as superintendent, but as an employee.

At the present time, the different departments sponsor and have charge of the meetings. This creates a certain amount of rivalry among the departments, each

department trying to put on a little better meeting. Oft times the older men in the plant would rather not take part, and the new man should be contacted and given every opportunity to take part in the meeting. To date, we have enjoyed a very favorable safety record, and the credit doesn't go alone to our safety director, who happens to be your chairman. While he has provided the leadership so necessary, he has received the cooperation of the men from the superintendent on down to the laborer in the yard, and the reason he received that cooperation, I believe, is because when he makes his trips to the various mills he still finds time to go through the mill and extend a glad hand to the men who help to keep the zeros on the accident score board.

We all know that industry is on a full speed schedule, and if we want to enjoy the peace and security we always knew, we must still do better, and above all, keep pace with our safety work. The job is big, but let's prove we are equal to it. You furnish the leadership, and I'm sure you'll find the men in the mill are behind you.

First Law of Nature

By PAUL C. VAN ZANDT

Consulting Engineer, Universal Atlas Cement Company, Chicago

We have had at this session the experience and advice of men trained in making our quarries safe. There are men who are equally expert in accident prevention for all of the various occupations in which we engage who can help keep us out of trouble in each of the many confusing details we have to face. The expertness of each one of these men in his own field added to all the others makes a sum total of efficiency in safety work of great value, of which we all should take full advantage.

If we can cause men working in quarries and factories to be happy and mentally alert, if we can train them to be skillful in every way in their work and point out the sources of danger to their happiness or physical well being, we will have gone a long way toward making our industry safe.

Disregard for Nature's Law

We all know that the first law of Nature is self-preservation. Those who have been successful in obeying the law are alive. All those who have disobeyed the law are dead. So we have a very clear-cut distinction between law keepers and law breakers.

Here I believe I can give a warning that under great pressure or improper mental attitude this all-important law is recklessly disregarded or is deliberately disobeyed.

Have we in our safety program any need to recognize that fact? Definitely I believe we need to recognize the effect of discouragement and unhappiness as well as indifference and inattention or fear, worry, and incompetence as causes of accidents. This covers so broad a field

that important phases of the accident prevention program may be neglected without realization.

Incompetence

How about incompetence and the incompetent? I am not referring to lack of education or knowledge or training, but to inherent ineptness, "butterfingers," a brain function or pattern of action that is inadequate to safety and cannot be greatly improved. Too many people act first and think afterwards. I am not referring entirely to that trouble, but chiefly to the physical and mental inability to act safely.

This incompetence is prevalent in these days of man-shortage because we are trying to squeeze men into jobs they are definitely unable to fill properly. What can we do about it?

We can help a lot by endeavoring to simplify the job as far as possible or dividing it further and placing workmen where they fit best. The man slow in his responses may swing a sledge or operate a drill, and the quick response man may drive a truck safely. I am sure many within my audience are already handling well the problem of incompetence.

Worry

Worry has been covered as an accident hazard so thoroughly in the past that I shall not dwell on it except to point out that we can go further afield for our worries today, so this important cause of accidents is even greater than in more normal times.

Fear and worry go hand in hand. Worry causes mental preoccupation and prevents the alertness so necessary if men are to work safely.

Inattention

Inattention can result from many causes and is a fatal fault if we are to obey Nature's first law. The inattention I have in mind results from day dreaming and mental laziness, both bad accident producers. I also suggest that a study of mental sluggishness should accompany the analysis of every accident.

Some jobs, because of their monotony,

contribute to the day dreamer's mental inattention. If every job could have some periodical break in its monotony, calling for an effort requiring mental attention frequently enough, the day dreams would be broken into and dissipated at least part of the time. I know several such schemes in successful use. Sleeping on the job is a fatal fault. How many of you have driven through a stop light because you were mentally preoccupied, not because you didn't look?

Indifference

Indifference in one's job is a character-destroying fault that causes a very large number of entirely inexcusable accidents. I refer to the "I don't care" or "it's nothing of my concern" attitude. It comes in when loyalty goes out, and can most easily be overcome by winning the employee and inspiring him to the belief his work is important and is appreciated by his company and his fellow workers. It takes effort on the part of the employer or his representatives to inspire his workmen, but it pays big dividends from the resulting loyalty and happiness of the workmen.

Today, plant management has to meet competition for the workman's loyalty as never before, but it can and should be won and held. The employer and employee can and should be friends with mutual respect, each gaining from the other's loyalty.

Indifference is classified by the National Safety Council under "improper attitude" together with disobeying instructions, haste, inattention, distraction and recklessness. According to the statistics gathered by the National Safety Council in analyzing the personal cause of accidents, improper attitude is the cause of 50 per cent.

Unfortunately, improper attitude is all too frequently caused by factors outside the employer's and sometimes the employee's control. Whether we like it or not, this is the situation we have to face today and may have to face for some indefinite period in the future. It is a challenge to the safety man to develop the workman's loyalty in addition to his interest in safety per se.

Discouragement and Unhappiness

Finally, I come to discouragement and unhappiness as important potential causes of accident.

The distress and unhappiness brought about by a great war such as this one can be of devastating effect. We have felt its effects only slightly, but even so, we must constantly be on the alert to keep alive the will to live and act safely when it seems as though the whole effort of the entire world were to make safety impossible.

Even though we have been spared on our home front, the let down in mental attitude toward safety is a serious and discouraging factor. Let me review the industry with which I am familiar.

Decrease in Accidents

Whatever the cause, the records of the Portland Cement Association show a wonderful decrease in number of accidents from over 3,000 in 1924 to 142 in 1932. This rose to 315 in 1936, which I believe was caused in part at least by the depression with its discouragement and

unhappiness. It dropped to 180 in 1938, caused partly I believe by the improvement in economic conditions, and reached 444 in 1942, unquestionably from causes due to the war.

The war effort and its many complicated problems needs our safety effort as never before. We lose almost as many men by accident as by the casualties of war. We cannot afford this loss.

The message I am trying to bring you is that all the hazards of accident are not physical. The worst of them are mental and the worst of all can come from worry, improper attitude, discouragement and unhappiness.

If we are to avoid these hazards and make our country a safer and happier place to live in, we must be far more alert than in the past. We must make a greater attempt intelligently to understand the constantly changing hazards to our well being, and we must look closely to our home front so that we do not lose any of the worthwhile things we are fighting a war to preserve.

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*Past General Chairman

†As elected by delegates in Congress Session

TUESDAY AFTERNOON SESSION

October 5, 1943

Presiding: General Chairman, Maj. R. C. Stratton, CWS, Office, Chief of Ordnance, Safety & Security Branch, Chicago.

Accident Analysis in Wartime Chemical Plants

By CAPTAIN G. C. WHALEN, Chief, Safety Section,
Plant Protection & Safety Department, Chemical Warfare Service, Washington.
Presented by 1st Lt. Olenius Olson, Jr., C. W. S.

In this war as in the first World War, the chemical industry has been called upon to supply hazardous materials for which new plants had to be designed, chemicals for which there was little if any peacetime need and about which information was extremely limited. It has been difficult, and is rapidly becoming more difficult, to secure necessary equipment, raw materials, supplies and technical manpower. New and improved munitions and fighting equipment are continually coming off the drafting boards. Often this has made it necessary to cancel contracts in the middle of the stream, and nothing is more completely confusing to the plant operator than such an unfortunate event.

The quality of workmen in chemical plants has been a major problem for which description has been only partly responsible. Many chemical plants are, at best, disagreeable places in which to work, and today workmen can, within reason, write their own tickets; hence, the chemical plants must necessarily offer special inducements to attract labor. In addition to these special aches and pains the chemical industry has all the complex problems of other industries.

Rapid Development of New Products

New commercial chemical processes are usually several years from the laboratory to production. But wars and Commanding Generals will not wait for trials, pilot plants or elaborate experiments. If the Commanding General in a theater of operation wants a more sensitive starter on incendiary bombs, a more effective screening smoke, or a flame thrower that will work effectively from a jeep, he cables his desire and expects to get delivery in the shortest possible time. Experts on the staff of the Chief of the Chemical Warfare Service and those from industry

go into a huddle. A paper formula or design results. A manufacturing directive is sent to Chemical Warfare Service Arsenals, and chemical plants all over the country bid for a contract. Contracts are let; then, as in caustic plants, everything goes badly for a while; then all of a sudden it gets a lot worse. But the General gets the goods and gets them on time.

Tendency to Relax Safety Efforts

During such a blitz, plant safety is an easy item for plant management to forget. The relaxed effort is not immediately apparent; hence, it would be a little wonder if safety was asked to wait until the pressure was off before it was resumed. Frequency and severity rates for private chemical plants assigned Chemical Warfare Service for continuing protection indicate that there has been little or no compromise with safety during this emergency, but this is largely because the products most inimical to safety are manufactured in the arsenals.

There is no need to repeat published injury statistics, since they are available in your copy of "Accident Facts", except as a means of comparison. The Chemical Warfare Service has safety responsibility for all plants manufacturing toxic, irritant or incendiary products manufactured for the War or Navy Departments. This includes many chemical plants of all types. They all have one common aim—to produce with the smallest number of industrial injuries.

Rates of Plants Assigned to C. W. S.

In January of this year, private plants assigned to Chemical Warfare Service for continuing protection developed a frequency rate of 23.6 and a severity rate of 3.48. The safety section of Chemical Warfare Service

was started under a War Department directive in November of 1942. January was the way. Men who were well informed in plant protection had to be trained in safety. In February of 1943, the frequency rate came down three points to .32 and severity was reduced from 3.25 to .32. By June the frequency rate was down to 18.9 and severity, after fluttering around a bit, landed at 2.7. For six months' period from January through June, the rates were: frequently 20.9 and severity 1.62.

Processing Hazardous Materials

These suffer by comparison with the chemical industry rate, as published in "Accident Facts", of 9.90 and 1.29 respectively. But in comparing these rates, it must be remembered that those assigned to Chemical Warfare Service are all of the heavy chemical group, that they are processing extremely hazardous materials, many of which are not used commercially. For example, a few weeks ago, in the mixing of a compound used for screening troop movements, eight men were killed. There had been thousands of tons of the same material mixed before with the same equipment and by the same men. One change had been made: instead of shipment being made in paper bags, it was ordered in metal drums. I can hear the word static. Perhaps that is right but it is far from all.

All the ingredients that go into the smoke mix have high ignition temperatures. They had all been tested and met specifications. There was no evidence of dust before or after the catastrophe. The room was air-conditioned and relative humidity was controlled between 50° and 60°.

In the investigation following the accident it was found that one of the ingredients was releasing acetylene and some free hydrogen due to the action of moisture, there being small quantities of carbide as an impurity in this component. There were no workers to question, since the eight persons present perished at the time of the blast or shortly thereafter. It was discovered, however, that for some reason the mix was heating. This discovery was made in questioning various plant employees. A guard had observed one of the workers from this room out on the loading platform. He said that he had gone out to cool off. The air conditioning should

have made such action unnecessary since it should have been much cooler inside than out. One of the compounds going into this mix had been secured from a new supplier and may have had the properties that would cause heat which would accelerate the formation of acetylene and hydrogen. Tests are being run on this possibility at the present time.

It was soon recognized that the definite reason for the blast might never be fully known, as in most fires and explosions this blast destroyed most of its own evidence. Therefore, a mix which was considered comparatively harmless is now being mixed in the same manner as a high explosive in small batches by remote control and in barricaded cubicles. This method is being carried out not only in plants having the misfortune to find out the hard way that compounds were dangerous, but in all plants making the same or similar products.

Repetition Prevented

Another disaster occurred in a plant mixing a similar compound when a recirculating air-conditioning system, moving 12,000 cubic feet of air per minute, picked up smoke generated by the slowly burning mix in the mixer and carried it in great quantities into an assembly room where approximately thirty-five persons were working. The assembly room was approximately 40' x 60', equipped with four double exit doors equipped with panic bolts, yet the smoke became so dense in so short a period of time that several workers could not find the doors; this resulted in two deaths from suffocation and several minor injuries. One woman worker broke a window and crawled through it with an open door little more than three feet from the window. Several persons were injured when panic prompted them to climb a man-proof fence two hundred feet from the plant.

The indicated action to prevent a recurrence of this type of accident was clear since two avenues were open: either install automatic smoke and fume detector in the air-conditioning system, which would shut off the air conditioning and exhaust all lines to outdoors; or move the mixing operation to a separate building and mix it by remote control in small cubicles and in small batches.

It is believed that no further hazard exists from these sources, but this is finding the hazard the hard way. More time in the test

tube stage should eliminate most of the hazards in chemical plants that have caused most injuries and deaths since the war began, but this is war and while we cannot retrieve the spilled milk or put Humpty Dumpty together again, by close analysis and passing of information, repetitions can be and are prevented.

Industry Generally Cooperative

Private plants contracting for war products under the Technical Services, such as ordnance and Chemical Warfare, are manufacturing under the Walsh-Healey Act and are, therefore, subject to cancellation of contract or work stoppage if they do not maintain a safe work place. There have been only two occasions of contract cancellation and three of work stoppage by Chemical Warfare Service, and none of these cases were in strictly chemical plants. The chemical industry generally has been extremely cooperative and frequency and severity rates quoted are considered to be very good.

On the other hand, our inspectors have reported many strange conditions in plants where better practice is known, and a check of the frequency and severity rates for these plants bore out the inspectors' contention that their interest in safety was more apparent than real. We have found plants with more than 1000 employees who kept no injury record except first aid station record, which did not indicate where the injury occurred or any information concerning it except clinical record. Yet this plant employed a full-time safety director and went through all the motions of a complete, wide-awake, safety-conscious outfit.

Another plant, one of the oldest in its field, experimented with a grinding process that built up what was described as slight pressure in a 10-lb. ball mill. Without anything but rule-of-thumb estimates, they went into a 500-lb. mill; result—complete loss of that part of the plant, one death and five very serious injuries.

No plant is perfect and recommendations are in order everywhere, but these recommendations must be tempered by the inspector's knowledge of the availability of equipment and manpower to make the recommended changes. However, it has been clearly demonstrated that neither safety consciousness nor

plain common sense can be taken for granted even in the largest plants.

Difficulty of Setting Up Programs

In addition to the private contractors, Chemical Warfare Service has four manufacturing arsenals. All but one of these are operating where nothing but trees and grass grew before Pearl Harbor. This in itself was a tremendous engineering feat. It is impossible to visualize the miracle that has been wrought without seeing these establishments. These arsenals manufacture all the war gases, including loading them into many types and calibers of shells and bombs. They do all the research and developing of new chemical products. These arsenals produce an amazing quantity and variety of products that are unknown commercially, with very few serious injuries.

However, the frequency of injuries has been quite high. Collectively for the first six months of 1943 four arsenals have had a frequency rate of 54.35 and a severity rate of 2.0. It actually took six months to determine the causes of injuries on which to base an accident prevention program. That program is now in execution and it is expected rates will be cut 50 per cent before 1943 is over. The arsenals producing the greatest number of man hours have turned in frequency rates of 8.5 and 11.6 for the past two months and severity rates for the same period of .04 and .1. This shows excellent progress and indicates what can be done.

Postwar Profit

The spirit of competition, plant safety, recognition of hazards and lots of respect for the hazardous products will, it is felt, overcome the insidious conditions imposed because of the war. The chemical industry will profit greatly by the experiences these arsenals and the chemical plants themselves are having. Now products are being developed, many of which are both hazardous and which create a hazardous atmosphere in which to work. The plant that eliminates these hazards will also eliminate most of the objectionable working conditions and, as a result, will attract the better-class worker. This worker will turn out the best product, and management will doubtless find that the time and money which have been used for safety developments will pay unexpected dividends when the war is over.

A Review of the Ordnance Department's Accident Experience

MAJ. W. J. NIEDERAUER,

Office of the Chief of Ordnance, Safety and Security Branch, Chicago

In July 1941, the Ordnance Department initiated action whereby individual injury reports and monthly summaries of industrial injuries occurring in the various ordnance installations throughout the United States, the Canal Zone, Alaska, etc., would be reported to a branch of the Office of Chief of Ordnance. At that time, procedures recommended by the American Standards Association were adopted.

For a period of time, an effort was made to compile accident rates on the basis of five classes of disabilities, but this did not prove practicable—largely because of excessive correspondence with the various Ordnance establishments, particularly to explain methods of computing time charges. The result was that we changed to a four class disability rate; a rate including only fatalities, permanent total disabilities, permanent partial disabilities and temporary total disabilities. In this branch of the Office of the Chief of Ordnance, which has since become known as the Safety and Security Branch, individual injury reports and monthly injury summary reports are currently received from all government owned ordnance establishments, and also certain private plants.

Reporting Injuries

The form used by the Ordnance Department in reporting industrial injuries up until recently was essentially the one recommended by the National Safety Council in their Safe Practices Pamphlet No. 21 entitled *Standard Industrial Injury Reporting System*, but slightly revised to fit the needs of the Ordnance Department. This form has since been replaced by a revised version of it, which is being used by the entire War Department.

We recognize accident statistics as tools in an accident prevention program, and they are used accordingly. We use them in our plans to stimulate and maintain interest in the program of the various ordnance establishments; as a basis around which circular promotional letters are written; as a subject for conference material, etc. Our field safety auditors, when making safety audits of

ordnance establishments, are furnished detailed studies of the ordnance establishments' accident experience and that of similar ordnance establishments.

Highlights of Experience

The following is a brief resume of some of the highlights of the Ordnance Department's industrial accident experience. It will be noted that the accident experience of the first half of this year is being compared to the accident experience of the entire year 1942.

Chart I: This chart depicts the quarterly frequency rates for 1942 and the first half of '43. It will be observed that during 1942, the rate was abruptly downward, especially in the last two quarters. This is particularly significant since 1942 was the period of greatest increase in employment and production.

Chart II: A more detailed picture of frequency rates is given in this chart which presents monthly rates for January 1941 through July 1943. The outstanding feature revealed by this chart is the consistently favorable downward trend from the beginning of 1942 to the present time, as compared with the upward trend previous to Pearl Harbor—undoubtedly reflecting the results of the Ordnance Department's accident prevention program which was intensified during that period. The 1943 trend is slightly upward and appears to be stabilized at about 9.5. The trend from May to July was more steeply downward than the average trend for 1942.

Chart III: This chart shows our accident experience by types of disabilities and, specifically, disabilities brought about by the type of accident classified as explosions compared with disabilities brought about by all other types of accidents.

Of course, explosions result in a greater percentage of death and permanent total disabilities than all others do, e.g., during the first half of 1943, of all the disabilities brought about by explosions, about 33 per cent were classified as deaths and perma-

nent total disabilities; whereas, all others had less than two per cent so classified for 1943 and less than one per cent for 1942. However, you will also notice that deaths and permanent total disabilities represent less than two per cent of all our disabilities—explosions and all others combined. Permanent partial disabilities are also higher in explosive accidents than in the group identified as all others. Further analysis indicates that those accident brought about by explosion, about 72 per cent of them in 1942 were of a temporary nature, and for the first half of 1943, about 50 per cent were temporary total disabilities.

As would be expected, the bulk of injuries brought about by all other accidents were temporary total disabilities—about 96 per cent during 1942 and the first half of 1943.

Chart IV: This chart permits a direct comparison of accidents classified as explosions with all others. It must be pointed out at the outset that this chart differs from the one previously shown, in that Chart III shows, graphically, the types of disabilities brought about by explosions, types of disabilities brought about by all other accidents and types of disabilities from all accidents.

It will be particularly noticeable that our fatalities and permanent total disabilities brought about by explosions decreased from 70 per cent of the total in 1942 to about 38 per cent of the total during the first half of 1943. Likewise, we experienced a reduction in permanent partial disabilities brought about by explosions. About one per cent of our explosives accidents result in temporary total disabilities.

Chart V: We are not in a position to measure the occupational exposures by age groupings of employees working in ordnance establishments; consequently, this chart simply shows the ages of injured personnel as taken from the individual injury reports received during the periods covered. The age grouping 25-34 had the greatest percentage of the total number of injuries. It represents 32 per cent for the year 1942 and about 33 per cent for the first half of 1943.

Chart VI: On this chart, we show our accident experience as it relates to the various parts of the body. Our hand and finger injuries for 1942 were better than

24 per cent of the total; whereas in 1943, it was down to approximately 18 per cent. The eye injuries showed a very slight improvement and accounted for six per cent of the total for the first half of 1943. Injuries to the abdomen increased from three per cent of the total of 1942 to six per cent of the total for the first half of 1943. Foot injuries showed no change and accounted for 15 per cent of the total; and likewise, back injuries also showed no change, but accounted for ten per cent of the total.

Chart VII: The nature of injuries, i.e., amputations, burns, contusions, etc., are shown on this chart. Strains, sprains and hernia increased from 19 per cent of the total in 1942 to 22 per cent of the total for the first half of 1943. Likewise, our fractures showed an increase. They increased from 14 per cent of the total of 1942 to 17 per cent of the total for the first half of 1943. It will be apparent that injuries classified as dermatitis represented about three per cent of the total for the year 1942 and the first half of 1943.

Chart VIII and VIII-A: I mentioned earlier that the Safety and Security Branch in the Office of the Chief of Ordnance compiles information concerning the causes of accidents from data contained on the individual injury reports. One cause of an accident is recognized as that of the unsafe act of the employee. On this chart, we show the unsafe acts which brought about accidents throughout 1942 as compared with the first half of 1943. An analysis of over 17,000 reports received during 1942 and the first half of 1943 indicates that about 80 per cent of our accidents are wholly, or in part, caused by unsafe acts of the persons. We find that unsafe conditions were responsible for but eight per cent of the accidents during 1942 and only nine per cent during the first half of 1943. However, it was a contributing factor in 39 per cent of the accidents reported during 1942, and in 36 per cent of those reported during the first half of 1943.

Further statistical analysis reveals that approximately 37 per cent of the 1942 accident experience, and 42 per cent of that during 1943 was caused by unsafe acts alone. Still further statistical analysis reveals that the remaining 16 per cent of the 1942 accident experience and the balance of 11 per cent in our 1943 accident experience had

neither an unsafe act nor an unsafe condition, which, incidentally, would seem to indicate the need for more effective application of the ASA Cause Code. The outstanding unsafe act was that of taking an unsafe position or posture. It increased from 19 per cent of the total for 1943 to 24 per cent of the total for the first half of 1943.

Chart IX: Unsafe personal factors, defined as "mental or bodily characteristics which permitted or occasioned the selected unsafe act," are shown on this chart. The principal offender was improper attitude, which increased from 29 per cent for 1942 to 35 per cent for the first half of 1943. Lack of knowledge or skill was another outstanding factor accounting for approximately 23 per cent of the cases reported during the first half of 1943.

Chart X: On this chart, we show the principal groupings of the agencies associated with our accidents. The miscellaneous group, which would be expected to be high in such a grouping as this, accounted for 20 per cent of the total. Machines accounted for 14 per cent of the total for 1942 and decreased to 11 per cent of the total for the first half of 1943. Accidents having to do with vehicles increased from nine per cent for the entire year 1942 to 12 per cent for the first half of 1943. Hand tools were associated with four per cent of our total accidents for the first half of 1943.

Chart XI: This chart shows unsafe conditions. This classification has to do with conditions of the agencies selected. Reference to this chart shows that approximately 32 per cent of our accidents had no unsafe condition associated with the agency. Reference to the accident experience for the first half of 1943 indicates that 15 per cent of the accidents were due to hazardous arrangement. Likewise, 13 per cent of them had to do with defects in the agencies.

Chart XII: Types of accidents as defined as the "manner of contact of the injured person with an object or substance, etc." are shown on this chart. The greatest percentage of our accidents are caused by the type known as "struck by moving objects." About 29 per cent of our accidents were classified as this type. Slips and over-exertion were second in importance, and they accounted for approximately 16 per cent of the total for 1942 and the first half of 1943.

We seem to have had an increase in falls, i.e., falls on the same level; likewise, an increase in falls to different levels—the former increasing from six to nine per cent of the total and the latter increasing from six to seven per cent of the total.

Chart XIII: This chart shows the relationship of agencies to their conditions. I said that machines accounted for 11 per cent of the total number of accidents during the first half of 1943. We find that 62 per cent of accidents associated with machines were brought about by improper grading. Another example is that of hoisting apparatus which we find associated with five per cent of the accidents during this period. Defective apparatus was the condition to the extent of 13 per cent of the accidents associated with this agency.

Still another example is that of the agency classified as bombs, which accounted for two per cent of the total during the period January through June 1943. Twenty-seven per cent of these accidents associated with bombs was brought about due to a hazardous arrangement.

Chart XIV: On this chart, we show the relationship of the unsafe personal factors to the unsafe acts. One of the most outstanding unsafe acts is that of taking an unsafe position or posture. For the first half of 1943, this act was associated with 24 per cent of the accidents, and it was the improper attitude of an employee to the extent of 44 per cent of those accidents that this unsafe position or posture was brought about. The unsafe act of unsafe loading, placing, mixing, combining, etc., accounted for 12 per cent of the accidents, and they had personal factors classified as lack of knowledge or skill and improper attitude that together accounted for better than 68 per cent of these accidents.

In conclusion, I wish to indicate that the Ordnance Department has a very diversified exposure to industrial injuries and illnesses. It is diversified to the extent of including exposures found in chemical manufacturing, warehousing, metal working, woodworking, assembly, proving grounds, maintenance, etc. Our man-hours of exposure has steadily increased with the increased war effort. Our accident rate has improved too; but in a direction of conserving manpower—DOWNWARD!

Vision and Safety

By MILTON M. BOWMAN

Field Representative, National Committee for the Conservation of Manpower in War Industries, Div. of Labor Standards, U. S. Dept. of Labor, Washington, D. C.

Mr. Bowman gave a talk of approximately one hour's duration, profusely illustrated by slides, and with the use of many accessories for the purpose of demonstrating various points in his discussion. There were no stenographic notes taken, and it would be impossible to give complete accounting of this presentation. We attempt here merely to touch on the high spots of this talk.

Mr. Bowman's discussion of manpower conservation was related to safety as the means to be used in obtaining greater manpower efficiency through avoidance of lost time due to industrial accidents resulting in death or temporary or permanent disability.

He stated that "it can be done" and proceeded to demonstrate the fact by his many illustrations and his recapitulation of progress made. A bad accident condition can be corrected anywhere, provided the urge, cooperation, etc., is there—plus the manpower to do the job, physically, mentally and visually alert.

Everything must be done to have the best conditions—good "housekeeping", proper working facilities and conditions, good illumination, etc. Similar factors are to be found in operation of vehicles on the highways, but the problem can only be licked if it is approached in the proper manner. In this connection Mr. Bowman emphasized the necessity for proper training of personnel who are to do the job, and pointed out that this includes the use of trained personnel to supervise the work.

In discussing his subject, he pointed out that insofar as conservation of manpower in industry is concerned it is not only important to do a good job in the plant, but it is important to do a good job of accident prevention on the highway and in the home.

He agreed with those present that there are many causes for the present accident frequency and it is difficult to place re-

sponsibility on any one cause. However, there is one thing that must always be considered—the human machine, its care, its function, eyesight, reaction time, etc.

He discussed various safety factors—proper lifting, safety shoes, helmets, physical training and other matters relating to physical fitness.

He then proceeded to an interesting discussion of eyesight. Its function, the care of the eyes, demonstrating his points with an exhibition of accessories.

Mr. Bowman emphasized three points:

1. Always consider the importance of the eyes, and do not experiment with them.
2. When in trouble, consult someone who knows what it is all about. If in doubt, ask the family, company or school doctor.
3. Then by all means, follow advice, and get the best because there is nothing too good for your eyes.

Doctors have recently pointed out a group of people doomed to blindness and stated that 75 per cent of that group went blind needlessly. If they had consulted proper authority in time most of them would have avoided blindness. In 95 per cent of the instances of people having trouble with their eyes, only 5 per cent of the cases are hopeless.

People who are born blind have a certain amount of success, but the individual who loses his sight takes from 18 to 24 months to adjust himself to the fact that he is blind.

The audience was then warned of the dangers of glaucoma, trachoma, and suggestions were made, as given out by a committee of doctors.

He then discussed the relation of speed to vision. Not only is the range of vision narrowed by increased speed of travel but the distance at which the eye focuses is also affected. For instance, when driving

at a speed of 40 miles per hour, the eye focuses 1,200 feet ahead; at 50, 1,400 feet and at 60 miles per hour, 1,800 feet. Thus, the perception of things close by is hazy and becomes more so with increased speed.

Further emphasizing eyesight as a major item in conservation matters, he pointed out certain types of accidents resulting from faulty vision. He dealt with the subject of eye function, care and correction for troubles, and warned against use of inferior lenses, goggles and driving glasses.

Comparison was made with the lenses of a cornea. He pointed out how correction of eye defects helped overcome fatigue conditions. He further emphasized

that at the age of 38 to 40, many people would develop visual difficulties unless correctional glasses were obtained.

It was pointed out that the eye is essentially a part of the brain and there are five places where causes of dim or defective vision might be located. Eye muscles and the interior of the eye were explained and attention called to how syphilis, diabetes, nephritis, alcohol and diet could damage sight.

He urged pre-employment, re-employment and periodic examinations, emphasizing eyesight examination and correction of defects, as a means of insuring safer conditions and resultant conservation of manpower.

WEDNESDAY AFTERNOON SESSION

October 6, 1943

Presiding: James J. Duggan, Director, Process Dept., Carbide & Carbon Chemicals Corp., South Charleston, W. Va.

The Problem of Waste Disposal In the Chemical Industry

JOHN S. SHAW

Director of Safety, Hercules Powder Co., Inc., Wilmington, Del.

A generation ago, the chemical industry of the United States was more or less in its infancy, and there was relatively little objection on the part of the public to chemical wastes from the small plants which were in the majority. The nuisance aspect was confined mostly to the roasting of ores and discharging of small amounts of gases in the open air and to the dumping of acids and alkalis into public waters. The chemical producer, therefore, could operate without serious public objection by simply diluting the waste gases and liquids going into the air and streams. He could be content with low chemical yields, and his processes were crude.

Present Pollution Problem Serious

Today, however, we see an entirely different picture. Our population has increased by about 40,000,000 people, and industrialization has spread and increased to such an extent that Eldridge*, Hoskins*, and other authorities claim that the industrial organic pollu-

tion contributed to streams is about equal to that contributed domestically. In other words, today, our country has a combined organic pollution of industrial and domestic waste equivalent to that of a population of 260,000,000 people. Yet, our streams become no larger and industry and population continue to grow, so that contamination of air and water is a serious matter that bids fair to grow worse.

Another measure of the enormity of the problem is the cost of treatment of waste. Mr. F. W. Mohlman, Director of Laboratories, Sanitary District of Chicago, has stated that it was estimated by the National Resources Committee that the cost of treatment of chemical wastes in the United States in 1939 was 28.3 millions of dollars, and that the estimated cost of all industrial waste treat-

*E. F. Eldridge, Research Associate, Engineering Experiment Station, Michigan State College.
*J. K. Hoskins, Sanitary Engineer, U. S. Public Health Service, Cincinnati, Ohio.

ment for the same period was approximately \$700,000,000. That was for the year 1939; it is easy to realize that today with excessive waste from stepped-up production, the cost must be even greater. It would be interesting to know how much of the \$700,000,000 was salvaged in the form of marketable products from the industrial waste.

Economic Approach

The subject is so enormous that it is impossible to discuss details in this report. We can, however, touch upon general points of interest with the hope that we will stimulate interest in the opportunities offered of utilizing or salvaging waste materials which are now being thrown away at great cost.

We all realize the direct bearing this subject has on the health and safety of our rapidly growing communities. Let us, therefore, approach the problem from the economic and more practical standpoint.

During the last World War, a smokeless powder plant manufacturing 75,000 pounds of smokeless powder a day could operate in a fairly well populated area with its exit stack gases, containing the oxides of nitrogen and some nitric acid, being hardly noticeable. Today, a smokeless powder plant of several times the capacity of the one of the last World War has a real problem in disposing of its waste gases. In one parking lot alone, it cost over \$5,000 to restore the finishes of automobiles which were damaged, for in the event of rain or even heavy dew, nitric acid falling upon people's homes and property has a very injurious effect.

As to contamination of streams, those chemical producers fortunate enough to be located where there are still ample capacities in nearby municipal water works will continue to get by for a time. Those who are situated so that their waste goes into streams supplying water to small towns which cannot handle more than natural water have to set up their own water treatment or purification plants for both domestic and chemical wastes.

Improve Yield or Salvage Waste

Before concerning ourselves with actual methods of disposing of waste, I should like to emphasize what I consider two ways of tackling this problem.

First of all, everyone of us should examine

carefully our chemical processes with the idea of wasting less of our main product by increasing our yields. For example, increased condensation and absorption capacities might be the answer to increasing yields. This has been true in the production of H_2SO_4 , HNO_3 , HCl and other acids and the cost of increasing the yield has been more than offset by the value of the product saved. In other words, first let us try to increase our yields and thereby reduce waste at a saving.

Secondly, salvage waste products, either directly or by the production of by-products. This has been found to be very profitable in many cases, and chemical and market research have made strides in this direction. As a simple example, at one time untold thousands of tons of nitre cake were dumped into streams and rivers. Then a market was found for sodium sulphate or salt cake and HCl . The chemist perfected a simple process for making these products by treating the nitre cake with $NaCl$ and distilling off and condensing the HCl , leaving the sodium sulphate as a residue. In this way, practically no waste goes into the streams, and two by-products may be sold at a profit.

If all attempts have failed to improve yields or to salvage the waste at a profit, then we must make the best of a bad bargain and eliminate waste at as small a cost as possible by making it pay for at least a part of the cost of removal. For example, wash waters from purification of TNT contain some toxicants and a great deal of coloring matter and salts, all of which are objectionable in the streams. By concentration and incineration of these wash waters, certain salts are produced that are marketable. Although the price obtained for the salts does not pay for the process, it does materially reduce the cost of this waste disposal.

To summarize the foregoing points, we should try to meet this problem in two ways, by improving our yields or salvaging waste, whether at a profit or as a means of helping meet the cost of disposal.

Rapid Strides Being Made

We are all familiar with the older methods of waste disposal, of neutralizing waste waters and creating better absorption equipment, of sludging and coagulation, of filtration and proper treatment of effluent waters before they are dumped into the streams. But rapid

strides are being made in developing new methods of taking care of waste—not the least of which is the vacuum flotation process.

This method is discussed in the "Engineering News-Record," February 25, 1943 issue, and is so interesting that I'd like to say a few words about it. It is a cleverly designed process and a profitable one in many instances, since many greases and solids difficult to settle may be separated by this process and sold. It looks very promising for the separation of light solids as well as heavy particles of grit from wash waters. It also bids fair to be useful for concentrating tion tanks, and in several cases, it is claimed, the process provides sufficient treatment so that waste waters may be discharged into municipal sewer systems without any further treatment. There are fourteen plants in operation at present. Two of these units are in use for treating cannery wastes; four for pre-treatment of sewage, and the remainder for recovering fine particles of rubber from water in the manufacture of synthetic rubber.

A review of the book, "Industrial Waste Treatment Practice" by E. F. Eldridge, Research Associate, Engineering Experiment Station of Michigan State College, which was published by McGraw-Hill Company, 1942, reveals many new developments. Time does not permit a discussion of these processes now. Other good references include the January and February, 1943 issues of "Chemical and Metallurgical Engineering," which feature articles by Mr. F. W. Mohlman on "Industrial Waste Disposal" and "Waste Disposal Problems in Wartime."

Demand for Improvement

The subject of waste disposal in the chemical industry is becoming tremendous

in size and importance. Our Chemical Section should not lose sight of the rapid developments taking place due to the pressure of the ever-increasing load on the public water treatment facilities and the demand for better and more palatable water. The damage inflicted upon property, fish, game, cattle and other livestock is meeting with increasing public objection. The demand grows for better recreational conditions in lakes, streams and coastal waters. Industry, itself, is demanding more attention to the matter of deterioration in the quality of water used for industrial and commercial purposes. Industry is also demanding that an industrial neighbor shall not pollute the water and air from factory to factory, because of the effects upon the health and morale of industrial workers. Stench and less disagreeable odors, toxicants and corrosive gases, liberated in industrial communities, are all to be considered in the solving of this problem.

Before legislation compels us to take care of waste disposal, we should be able to meet health requirements without having to close our plants or at least reduce production, pending experimentation and development of improvements. There is no dodging the problem with which we will be confronted if we postpone the evil day and invite regulation through legislation.

Fellow-members of my committee contributing to this report are: Mr. Allen L. Cobb, Eastman-Kodak Company; Mr. S. W. Gurney, Liberty Mutual Insurance Company; Mr. R. S. Mackie, General Electric Company; and Dr. E. G. Meier, Employers Mutuals of Wisconsin. It is hoped that in the discussion to follow, these gentlemen will have the opportunity to give their ideas and suggestions, as well as any of you who have any problems to discuss or comments and suggestions to make.

Women in the Chemical Industry

A COMMITTEE REPORT

S. M. MacCUTCHEON, Safety Director, The Dow Chemical Co., Midland, Mich.

Our committee was charged with the responsibility of studying the available literature with reference to the employment of women in the chemical industry and contributing their own personal plant experience on problems within the scope of the study.

The rise of the total employment of women on plant and labor jobs within the member companies of the committee was significant. There was about a three to one ratio of September 1943 over September, 1942, of women on chemical plant and labor jobs in the six industrial organizations represented.

Legal Requirements

For the purposes of simplification, we have divided this report into seven or eight divisions. The first division to be discussed is state and legal requirements. A thorough study and understanding of the requirements applying to your plant is the necessary preliminary step to introducing women to your plant.

In many cases the minimum legal requirements as established cannot be accepted as maximum and adequate safe practice standards. We must, on the other hand, recognize the importance of a thorough study and understanding of these legal points.

An extremely wide variance was found to exist in the legal requirements; for example, state regulations on the allowable weight limits for women vary from fifteen pounds in one state, through a computed weight, which is one-third of the body weight, to a maximum of seventy-five pounds in another state. In still other states there was no legal requirement on this point.

The number of hours which a woman may work varies from seven to twelve hours a day and from forty to sixty hours a week. This is only a summation of the legal requirements as applying to women in industry. It does, however, serve to highlight the necessity for your familiarity

with the regulations as applying to your plants.

A particularly important angle on this regulation problem is the exclusion of certain jobs applying to certain specific chemicals, when considering women. In many states particular jobs are prohibited which tie in with the handling of certain chemicals unless the job has been inspected and approved by the Department of Labor inspectors.

Further details covered by state regulations include such items as provision of separate first aid facilities, screening of stairways, provisions of benches, etc. The problems recognized by many, or at least some, employers have been recognized by the states in many cases, and in some instances digests or extracts of the regulations applying have been issued by the State Department of Labor.

Plant Engineering for Women

Engineering a plant for women workers was the second division considered. This has been further subdivided into "Engineering the plant from the standpoint of personal service facilities," and "Engineering as applied to job performance."

Taking up the first phase, "Engineering the plant from the standpoint of service facilities," here, again, state regulations must be considered. Again strict adherence to the state regulations may well be below your own accepted plant standards.

The minimum regulations offered by the committee include provision of toilets—one seat to fifteen employees; provision of washrooms, which may be combined with locker facilities; provision of lunchrooms, which may be combined with lounge facilities. The importance of proper planning has been mentioned in the report; that is, planning ahead for the establishing of these facilities. This is important since women have been found to be more sensitive to the environmental conditions than men.

Some companies have been faced with

the problem of duplication of facilities in separate, adjacent buildings. In each building there was a limited personnel. This problem has been solved in one case by setting up a policy of installing at least a toilet and wash basin in each building with the other facilities of these locker rooms, lunchrooms and rest rooms centralized in a building on an area basis.

Since the employment of women is sometimes considered as a temporary measure, there has been a tendency to conform only to the letter of the law in setting up these personal service facilities. We feel that it is the safety engineer's duty to cooperate with interested parties in combating this tendency.

There was an interesting comment that came up during the study of the problem. The comment was, "You sure do make it hard to hire a 'gal'."

The answer was, "You are not being asked to do anything that you haven't been doing or shouldn't have been doing for your men employees."

Now, engineering the plant for women workers from the standpoint of job performance: This, of course, enters into our consideration when setting up job specifications. There are certain fundamental differences between men and women which must be considered at this point.

Women are, on the average, five and a half inches shorter than men. Women's reach is shorter than men's. Her general strength, on the average, is less than a man's. These few factors are sufficient to make the point that a re-engineering job operation is often necessary in adapting the job to the woman worker. Necessary changes that are often simple, for that very reason, are overlooked. We have in mind such things as providing a patented barrel truck to eliminate the necessity of pushing or rushing a barrel across the floor; or adjusting a dump valve in a centrifugal basket to bring the weight load within the limitation; move shredder safety switch six inches closer to the operator; setting up a roller conveyor to eliminate having to push the barrel away from the loading station. Interesting enough, in many cases these engineering changes have been entirely

adaptable to increasing the efficiency of the males.

Social Problems

Social problems was another division considered in the report. Social problems have much importance, and under this heading such ideas come to mind as the establishment of day nurseries, transport problems, hours, shifts, recreation programs, etc.

These problems are not peculiar to the chemical industry and have received a considerable amount of study by industry as a whole. Because of non-specific character of the problem, the committee has drawn no conclusions. We do call your attention to the existence of many fine references to these and allied subjects. These have been set forth in the reference biography attached to the final report.

Clothing and Equipment

Clothing and safety equipment is another division in the report. We know that safe clothing for a woman worker approximates that worn by a man worker on a particular job. There are, however, fundamental differences in design and styling which must be recognized. American Standards Association has realized this fact and is at present working on standards covering certain items of women's safety apparel.

A word on the uniform versus the non-uniform clothing regulations problem: In the study by the sub-committee with regard to this we reached the conclusion that in clothes where no definite clothing program had been set up they lived to regret the lack of positive regulation in this regard.

An allowance must be given in the prescribed uniform for an expression of individuality. Regimentation is not popular and some choice should be allowed, with the exception of general specifications where an unusual hazard exists which necessitates rigid adherence to specifications set up.

Hair covering is important in that it is the one item of safety clothing on which there is the greatest variance between men and women workers. The problem,

of course, is self-evident. May we repeat the qualifications outlined for acceptable hair covering: First, the hair covering should confine loose hair. Second, it should be relatively dust-proof, where dust is a factor. Third, the crown should be high, and the visor stiff in cases where moving machinery is an existing hazard. Fourth, the fit should be comfortable and loose enough so the hat will be easily removed from the head or snatched from the head in case of contact with moving belt, shaft or spindle.

General safety specifications on clothing, such as fire-proofing, smooth surface finishes, rubberizing, etc., are similar when applied to men or women's clothing and are readily adaptable to women's apparel.

Induction Methods

The method of induction is another division of the report. Details of any induction program will, of course, vary depending upon the plant's size. There are certain principles, however, which remain constant. We have included in these; first, the establishment of a separate division of employment or personnel department to handle the problems of hiring, interviewing, and inducting women into your company. This division should be headed by a counselor or assistant employment director, or employment director for women, whatever title you see fit to choose. Secondly, the physicals recommended are similar to the physical examinations given male employees and should include blood tests, urinalysis, etc. Pre-employment physicals are, of course, particularly important in the chemical industry.

Third is the importance of prompt handling of applications. There are two points on this to consider: first, any labor market today would be recognized as being extremely competitive. Second, the thought processes just before a woman applies for a job are entirely different from what we are used to thinking of with relation to male employees. That serves to highlight the importance of a prompt handling of applications.

The fourth point under induction principles in placement. The medical and safety departments should correlate their knowledge of job requirements, plant conditions,

necessary safety equipment, etc. This knowledge is used through the proper channels which will vary in different companies in setting up job specifications. It is of value, of course, both to the employment and supervisory personnel.

Safety Training and Education

A word on safety training and education: The theoretical aspects of safety training are no different when applied to women or men. Practically, however, there is a need for greater emphasis on safety training with the woman worker. This is obviously true because of her unfamiliarity with industrial practices. It is necessary to begin instructions in training farther back with the woman worker. This works to the advantage of the employer in some cases, however, since it is not necessary to unlearn incorrect methods or unsafe practices.

The study has shown a necessity for overcoming a fear psychosis tendency on the part of women when introduced to chemicals; and not necessarily hazardous chemicals. In most cases it is just the word "chemicals." This, of course, is a reaction which should be handled early in the training program.

This education starts with the first employer-employee contact, which again highlights the importance of the hiring personnel selected. The safety department pre-placement contact, when carried on, is an extremely important point. At this time you discuss such items as general safety policies of the organization and of the department in which a woman is going to work.

You will alleviate the fears with regard to such words as chemical pressure, acids, caustics, etc. This safety education, however, must be recognized as a corollary of a broader subject: "Women's part in the safety program." The important point here is, don't neglect the benefits of including women in your established program.

Job Training

Job training is another division of the report. Specific job training is recognized as the crux of a safety education program. A necessary first step to this is the establishment of a well-defined

standardized procedure. You set up your specifications. You have gone through what you consider proper selection of personnel. You have covered the point of safety education; yet this is all meaningless unless you have a definite follow-through on specific job training via performance.

One chemical plant has done an outstanding job in training women workers in plant operations. They were faced with a problem of building up a crew of five or six hundred employees, sixty per cent of which would have to be women. They made use of the previously mentioned principle of starting way back in the training procedure. When they came to the part of the program applying to plant operation they first studied pipes and piping. Next valves were discussed; the construction operation and the use of valves. They next went into pumps. Pumps were torn down, studied, put back together and then hooked up with pipes and valves that were now understood.

This process of breaking a job down into component parts was followed until they built up to an understanding of the operations and mechanics of operation of such items of equipment as condensers, refractors, etc.

The problem as outlined is perhaps somewhat of an ideal but it does call to our attention the advantage of planned job training.

Work Problems

The remainder of the report has been entitled, "Work problems." This provision has been, frankly, so designated for want of a better category in which to include certain specific problems more or less applicable to women in the chemical industry.

First, on lifting. The various weight limits we have already discussed, and the variances in the particular job, not alone from the standpoint of weight of the object, but size, bulkiness, etc., and variance in the personal capacity of the individual employees, makes it almost academic to discuss how much a woman can lift safely.

Even positive state limits, considering the variations we have mentioned, may

include a regulation to the effect that no woman shall be given a job disproportionate to her strength. A sensible base line is needed, however, from which the plant foreman, supervisor, or safety man can start, but individual cases must be studied as such, despite the establishment of any limit.

We refer you for further information on this problem to the very complete study which was made by the du Pont Company on the problem; also, to Special Bulletin Number 2, The Women's Bureau, United States Department of Labor.

The rest period is another problem. In studying the need of provision for rest periods we must consider the fact that on certain types of jobs women do tire more quickly than men. State regulations again should be checked and the type of work may be the determining factor in establishing a policy along this line.

On routine production or assembly jobs, experience has repeatedly shown the value of setting up two rest periods of ten to twenty minutes' duration. In certain laboratory, or chemical plants the value or need for such regulations may not be so apparent, but in any case rest periods should be recognized as a fatigue combatant along with such items as proper illumination, ventilation, etc.

Supervision is another work problem. Women prefer male direct supervision. This is admittedly a broad statement and open to the usual exceptions or objections. It is given as a statement of summation of the committee's experience.

This direct or job supervision should, however, be supplemented by a woman in a general supervisory capacity; that is, a woman acting as a matron or counselor, or shift counselor.

We can't over-emphasize the importance of the competent personnel on this advisory supervision type of work. The counselor, through her personality, tact, diplomacy, understanding of job conditions, understanding of employee problems and such, may well make or break the women in industry program in your individual company.

Skin irritants is another work problem considered by the committee. The effect of skin irritants on women as contrasted

to men seems to be an extremely controversial subject. Comparable exposures have seldom been obtained and we feel a positive statement one way or another as to the relative effect of skin irritants on men or women would be out of order.

The practical plant man might well rise, however, to a point of order on that with a case history of women on particular jobs who have had difficulty with skin irritants, when for a good period of time you have had men on identically the same jobs with absolutely no trouble from that standpoint.

If this is so we feel that a consideration of the following factors may explain the problem and thus lead to its solution: First, women naturally have a more sensitive skin than men. Secondly, women have gone through a period of years improving on nature through the further softening of the skin on hands and arms. Third, women's pre-employment environment has seldom been what we consider as a skin toughener. Fourth, women are sometimes sensitive to the use of cosmetics, or, as one individual put it, particularly to the overuse of cosmetics. And fifth, and perhaps the most important on a particular process over a period of years, you may have gone through a weeding-out on a particular operation of a procession of sensitized employees. Now when you switch that process from male to women employees, don't forget that you may have to go through that same weeding-out process. These factors receiving due consideration, the problem of preventing dermatitis to women workers assumes the same aspect as prevention with respect to male employees.

Chemical exposure is a related problem. Chemical exposures as related to women workers is another subject on which no apparent exhaustive or conclusive studies have been made. Such statements as that women are likely to be more seriously affected or women may show more susceptibility in the opinion of so and so; or that women are more susceptible than men, do not give us too firm a footing on which to take a stand.

There is a general agreement of the

heightened effect on women of certain chemicals such as lead and benzol. Particularly important is the effect of certain chemical exposures on pregnant women.

The only conclusion submitted by the committee on this problem is that the employment of pregnant women is entirely a matter for the decision of industrial or personal physicians. From our practical safety engineers' point of view, however, this theoretical discussion of susceptibility is of great concern.

We have quoted a paragraph from the National Safety Council's pamphlet Number 107: "Irrespective of susceptibility, women like men can work safely on toxic material operations only if the engineering design and control is such as to largely preclude the possibility of occupational poison." I don't know whether that point is quite clear. Let us put it this way: If you as individuals feel you have a process which is safe for your male workers and unsafe for the women, we suggest that you check yourself on the first point.

All precautions which we would advise with reference to the control of chemical exposures are ones with which you are already familiar and further details here would be largely repetition.

Job Limitations

The degree of manual labor seems to be the single existing limitation of the type or class of jobs on which women may be employed. The requirement for quick, positive judgment has been listed as a job limitation. This is often lack of experience or background rather than fundamental fault of a woman worker. Training takes longer but this should be considered as a retardant rather than a limiting factor.

In conclusion, we want to pay tribute to the part that women workers are playing in our fight for victory on the industrial front. Their contributions to the chemical industry have been great and varied on jobs which range from laboratory analyst to control and research chemists, through plant operators and mechanics to production inspectors and packers.

Round Table Discussion

Moderator: John S. Shaw, Director of Safety, Hercules Powder Co., Inc.,
Wilmington, Delaware

MODERATOR SHAW: First we will talk about waste disposal. If you wrote any questions while I was reading the paper, or if you are writing them now, shoot them along.

I have a few that have already come up. I might start you off on one: "Is individual maintenance of respirators in which each employee cleans and maintains his own respirator satisfactory?" That question is submitted by E. G. Meiter, of Employers Mutual of Wisconsin. Who has an answer to this question?

MR. E. G. MEITER (Industrial Hygiene Laboratory, Employers Mutuals, Milwaukee, Wisconsin): The answer is no. Individual maintenance of respirators is not sufficient. If individuals are asked to maintain their own respirators they will not do it; respirators hang on walls on the wall and are not worn. It is much better to use some form of maintenance system where the respirators are collected each day and cleaned by someone designated for that purpose.

MODERATOR SHAW: Thank you, Dr. Meiter. Next, "Should only the fire hazard be considered when selecting a cleaning or degreasing solvent?"

MR. GEORGE MUSTARPA (Hercules Powder Co.): There was an ordinance bulletin which came out recently that suggested that all degreasing solvents be checked.

MODERATOR SHAW: "Why should a safety organization study an economic problem? Safety has a large field in saving life and limb; why worry about material and stream pollution? A safety program must be carried on aggressively and it is my opinion that the approach must be direct, constant and concentrated on the subject."

MR. ALLEN L. COBB (Acting Safety Director, Safety and Fire Prevention, Eastman Kodak Co., Rochester, N. Y.): This question comes back to a pet hobby of mine, that the safety engineer's job is truly engineering. Anyone who studies

engineering knows that the economic approach to a matter is one of engineering considerations.

When we are trying to eliminate hazardous conditions to employees and to the community we have to deal with management. Management isn't going to be very much impressed by something which is not economically practicable. Therefore, we have to offer a solution to our particular safety or health problem which is not only safe but is economically sound from an engineering standpoint.

MR. GEORGE MUSTARPA: There was an Ordinance bulletin on that.

MODERATOR SHAW: I don't think you can sell safety to your boss or anybody else purely on sentimental grounds. No one has ever visualized himself as being killed or meeting with an accident that wounds him. However, I don't think you can divorce this entirely from sentiment or the humanitarian side.

Happily, safety measures are also economic measures. Safety pays in a great many ways. It has been estimated by some companies that the return is ten dollars for every dollar invested.

MR. S. W. GURNEY (Laboratory Director, Liberty Mutual Insurance Co., Boston, Massachusetts): I think there is a missing link there. The question, as I understand it, hinges upon the link between waste disposal and accident prevention.

MODERATOR SHAW: I touched upon that very briefly in my paper. I said it was mostly because of health and morale.

MR. GURNEY: Here are some practical things I have found since I have been on the committee:

A research laboratory having the need of a small amount of hydrogen sulphide furnished in cylinder form used what they wanted and when they had finished with the experiments, those cylinders were given to the sub-contractor who

took care of their dump. These cylinders were thrown on the dump. This was before metal recovery was so essential, so they were simply rolled down the declivity. There were three men who made a habit of going around salvaging what they could from dumps. They noticed the fittings on the cylinders were brass so they took a sledge hammer and knocked them off. The gas escaped and two of the men died from acute sulphide suffocation plus acute hydrogen sulphide poisoning.

Probably the answer to that is quite obvious, but here is another not quite so obvious. A large soap company, manufacturing soaps and oils had occasion to use Fullers earth for clarification of their oils and their soaps. The spent Fullers earth became a problem for disposal. It was given in the usual way to a sub-contractor who used it for filling on a vacant lot. Unfortunately, in using it for fill some wood scraps, paper and the like got into the Fullers earth. Now Fullers earth in this condition is not particularly flammable, but once it becomes ignited it burns somewhat like a peat fire.

There were several thousand tons in the deposit and in some way it got ignited and burned under the surface like peat fire, giving off smoke through cracks in the surface. The incandescent material could be seen below and was a nuisance. Kids used to run across it playing their games and three of them went into it up to the arm pits and were severely burned.

Another very common problem is the disposal of lacquer solvents and cleaners. Most plants using lacquers have the cans cleaned out, using lacquer solvents in the process and then give the drums to a trucker. The trucker carts them off to the dump—sometimes with instructions to burn them and sometimes with no instructions whatever.

One particular case that came to my attention just before I came to this meeting was a trucker who had a number of drums of such dirty solvents and lacquer wastes. He took them to the dump, backed up to the edge of the dump and simply put them over the tailboard onto the ground. The lacquer solvents vaporized somewhat and flashed from the hot

exhaust of his truck engine and he and the truck were both burned up.

Here is another problem. We don't think of water as being particularly dangerous or harmful or as being a particular problem of disposal, but I have in mind one large company that used tremendous amounts of water for cooling purposes. It goes out from the plant's cooling pumps at a hundred and fifty or a hundred and seventy-five degrees Fahrenheit. The simplest way of taking care of that was to let it flow into a small stream which went by the plant.

It was merely cooling water. There was no contamination in it whatsoever. That water flowed under a bridge on a main highway perhaps a quarter of a mile from the plant, but it still retained a considerable amount of heat at that point and caused heavy fogs under certain conditions of weather and temperature. The fog was so heavy, in fact, that there were a number of very serious accidents, not only from collisions but accidents from simply losing their way in the fog while going over the bridge on this main highway.

These are simple waste disposal problems for which the answers to you may seem to be entirely obvious but my visits in industry collecting this information reveals to me the fact that very few of our safety engineers in our plants know what are the waste materials to be disposed of or how they are disposed of. I think that in order to solve this problem satisfactorily we have got to give the waste disposal problem to a very competent and informed man—the chemist or engineer who knows the chemical and physical properties, the flash points, the possibilities of reaction of all of these materials that are going out—and make him responsible for the disposal of this particular waste.

The problem is too big and too varied for any one man to give all the answers in one lifetime, certainly, but I think we can probably tackle the thing in its broad aspects, as Mr. Shaw is going to tackle it.

MODERATOR SHAW: That is a real contribution. Now here is a time-worn subject but an interesting one to almost all of us: "How can tank cars

be ventilated effectively without the use of too much equipment which is difficult to handle?"

I don't think the question is quite complete. Probably we would have to ask the inquirer a few questions before we could answer his. He says "to ventilate." He doesn't speak of steam or filling them up with neutralizing agents and washing at all. If the one who wrote that question will explain a little more about what he has in mind we will try to answer it.

P. C. LAMB, LEVER BROTHERS CO., CAMBRIDGE, MASS.: I am the person who asked that question. We are interested in the ventilation of cars which contain inedible grease purely and simply to have an uncontaminated atmosphere for the person who works in there or who is cleaning out the car.

MODERATOR SHAW: The problem is one of suffocation and not of toxicity.

MR. J. E. C. VALENTIN (Process Safety Department, Bakelite Corporation, Bound Brook, New Jersey): I believe, Mr. Lamb, that you will find it very successful in the handling of the ventilation problem if you will secure a rather lightweight device. It is the Lamb Air Mover and is very easily handled by one man. It can be attached to the top of your man-hole or dome of the car and will handle three to five cubic feet of air a minute; taking in and at the same time taking out. I will be glad to get you further information on that if you like.

MR. LAMB: I don't know whether it is peculiar to us or not but we use that equipment and we have difficulty in ventilating the ends of the car. It does a swell job in the rest of the car.

MR. ALLEN L. COBB: Pipe it up to the ends of the car.

MODERATOR SHAW: "Will Mr. Shaw indicate if any further data is available on the TNT waste utilization? What are the salts available after burning the TNT waters? How many plants use this system?"

The salt is probably sodium sulphate. Does anyone else have anything on that?

"What is the degree of explosive hazard that exists from the powder contained

in TNT waste waters? Are there any flashes or explosions on record?"

We do know that TNT is an explosive and a high explosive and it would be foolish to think it wouldn't be dangerous to leave around in ditches and holes in any quantity at all. The wash will destroy vegetation and is dangerous from that standpoint. TNT is toxic, and we don't want it around even if it were not explosive. I wouldn't want it in washing ditches and drains or anywhere that animals might drink the water, or where fish or game might be killed. I can't tell you what quantity will be dangerous but I dare say you could find separated crystals in little groups in puddles and that you could detonate them with a cap.

MR. NOBLE: I know of cases on record where the wash water from TNT has formed a scum on the surface and was detonated by sunlight.

MR. BRENDLEN: We also had a case of dragging the hose around in red water disposal. Just as the man turned around to pick up his hose he noticed a flash. He hadn't dragged it more than a few feet. There are quite a few such cases on record.

MODERATOR SHAW: The contents of the wash boiler is not explosive as I understand it. Am I wrong on that? I don't think we have been able to shoot the concentrate of the wash boilers, have we? Can we shoot the concentrated red wash?

MR. HAROLD L. MINER: No, because it does not shoot. When it is dry and run through the incinerator it will not shoot.

MODERATOR SHAW: The method of concentrating these is to concentrate them to ninety-five per cent solid and ignite them in a drum. If they were to explode, I wouldn't ignite them. I think you must have some dry TNT on the outside of the hose, and dragging the hose sets up friction between the hose and the floor, or whatever you were dragging the hose on. That is my belief of what caused the flash. However, there might be some other factors there that I don't recognize.

"How may viscous waste materials containing solids and flammable liquids

be collected and destroyed?" Allen Cobb asked me that. I don't know why he did because he knows the answer.

MR. ALLEN L. COBB: This, of course, is one of the problems that you do get into extensively in chemical plants where about all you have are dirty materials and you don't put them in safety cans. They are clogging up screens and we, perhaps, make some compromise with the ideal.

Many times we would like to have low-flash materials put in containers provided with screens and otherwise having the characteristics of safety cans. From practical experience containers are of fairly heavy construction—about quarter-inch steel plate—and contain maybe twenty gallons at a maximum capacity. They can be used for fairly heavy viscous materials and are provided with a very loose-fitting cover which can be carried out to the place where you do your burning. The whole container can be put on the pile and the material burned out of the can. Of course, it warps the can after a number of times, but it can be hammered back in shape again. That is one practical method of doing it.

Burning them in incinerators or something of that sort might be desirable, but experiences with all kinds of inclosures have proved them to be extremely hazardous. It would seem the only effective and safe method is the old-fashioned spreading of the materials out in shallow pits not over six inches deep and igniting from a safe distance.

MR. S. W. GURNEY: There have been one or two instances of recovery of that sort with a still in which it was possible to get into the still easily for cleaning out the residue, which, of course, is high in value in a recovery of that sort. I know of one plant that figures the value of their recovered material at fifteen cents a gallon. Their cost of recovery is put at four cents a gallon. With somewhat over a thousand gallons a week in normal production it certainly pays them to do that.

I think where you can recover, you certainly have an element of safety added over burning.

MR. ALLEN L. COBB: I am glad

that you brought that up. It is essential that you recover all you can in these days when those materials are so valuable. I think we should try to recover every bit of solvent material possible through solvent recovery systems, distillation, etc.

I was speaking primarily of the sludges left over after you have done all you can in the way of distillation. I would like to call attention to distillation as a means of recovery of some of these materials. A waste recovery still is used primarily for recovery of dirty acetone, and also on occasion used for recovery of degreasing solvents, such as trifluoride.

After being used for the degreasing recovery one such still was washed out carefully, then used for recovery of acetone, which is its normal use. When the operator went to draw off the recovered acetone, he had hardly drawn off more than a teaspoonful when he had an explosion in the drum. He wisely shut off the flow and sent for help. When they drew off small samples in graduates they found a film formed above the material which almost immediately bursts in flame. Investigation revealed that reaction between the colloided hydrocarbon and acetone formed an unstable material and considerable investigation was necessary before we could empty the still out at all. We found additional carbon tetrachloride in the still. You have to watch out for some of the unusual reactions which may develop.

MODERATOR SHAW: "Do you consider burning either in open cans dangerous?"

MR. ALLEN L. COBB: If you have to get rid of solvents such as ether, the safe thing to do, if it is in small cans, is to heave the whole can on the pile, but to have a good two hundred feet or more between you and the fire. The fire can be started electrically by resistance wire or with a fuse fastened to a nitro-cellulose material.

I would a great deal rather have the ether can open if it is at all possible, so you won't have the cans bursting and sailing through the air. If you can get the material in the open can safely and leave it on the pile; that is, I think, the best way to do it.

MODERATOR SHAW: Here is a question for you on women: "Is there any protective cream on the market that will prevent yellow stains from weak nitric acid contact on women operators' hands. Rubber gloves give the proper protection, but are hard to get. Cream could be used as a temporary expedient."

David Warden, Safety Supervisor, Hercules Powder Co., Parlin, New Jersey, asks this question. I have not seen a cream yet that would take the place of rubber gloves. Do you mean to put the cream on the hands and then put the hands in gloves?

MR. DAVID K. WARDEN: No gloves at all.

MODERATOR SHAW: You want it to take the place of gloves and have this cream prevent staining the hands with nitric acid. Who knows of a cream that will do this.

Harold Miner saw this original question before he departed. He said that du Pont's do have, as you probably know, a protective cream. He said he didn't hold out much hope of it being your answer. I don't believe there is a cream that will do it because it will wear off faster than those girls can keep it on their hands.

Here is another on women in industry: "What are the differences as to the thoughts of women applying for jobs compared to men? What effect does this have on safety, if there is a marked difference?"

MR. DAVID WARDEN: I have another question here that might be in line right now and maybe Mr. McCutcheon could help us out. The question I had in mind was this: In hiring male operators for jobs in the plants, we subject them to a medical examination, specifically for indications of hernia. I wonder how many of the women would volunteer to have an examination to look for the same thing.

MR. S. M. MacCUTCHEON: If you will excuse me a second I will by-pass that and back up a bit. "Differences in attitudes or thoughts of women in applying for jobs as compared to men." Perhaps this question was written as the

talk was going on. I did mention a point along that line.

Briefly, it came into the discussion when talking about the induction of women and the importance of prompt handling of applications. There were two reasons for the importance of prompt handling: First, the competitive labor market today which, of course, is the same with men or women. Secondly, there is a difference in the attitudes or thoughts of women when applying for jobs.

Our point there is that women applying for jobs nowadays have a sort of patriotic motive. They have the patriotic motive, but when they go to the employment office and sit around for an hour and a half they are through. That patriotic motive may not stand up as well as the motive the man has, perhaps not so much now as in the past, of getting a job to make a living. Is that enough to answer?

MR. DAVID WARDEN: Not exactly. I am trying to find out how much difficulty industry has in getting women to volunteer for this medical examination for women.

MR. S. M. MacCUTCHEON: That is a separate question. The second part of his question is, "What effect does this have on safety if there is a marked difference?" I don't know. I would like to toss that out if anyone has any comments to make.

MR. HANNIGAN: I brought that up because you did mention there was a difference. I asked you what it has to do with safety. We have had to fire a lot of men that have come in with patriotic motives and a lot that came in for the job. I didn't see any difference in the outcome. Take the case of a woman who takes a job because she is patriotic; she is not much of a good worker after the first few days, so if you get someone else to do the job in the first place, you are better off.

MR. S. M. MacCUTCHEON: From the plant superintendent's point of view, if you take just the women that need the job you may not get as many as you need.

As to the question on hernia examinations, I know of no particular plant where physical examination does cover that; therefore, I can't answer the question.

Dr. Meiter, isn't it true that women are much less susceptible to hernia than men?

DR. E. G. MEITER: No.

MR. HANNIGAN: We use a woman doctor for examination and have no difficulty in giving hernia examinations.

MODERATOR SHAW: I think a woman physician is an answer to your problem.

MR. DAVID WARDEN: That might be the answer.

MODERATOR SHAW: "Under the equal pay for equal productivity, how do you reconcile, for instance, a rest period granted to women but never before granted to men? Please discuss this as a general picture, rather than being specific."

Well, I might guess there are two reasons. We have already been told that they tire more easily; and, second, we are progressing for we now think that men should have a rest period in the middle of the afternoon, too.

This gentleman says in general that he wants to bring up this point; that women are given easier jobs than men in physical endurance, physical output and yet they are favored with a rest period.

Well, I still say that is progressive. We certainly don't want to put the heavy load on the weaker sex, generally speaking, although I have seen women outlift men.

MEMBER: When men travel long distances, as in my plant where some travel twenty-five miles, we found a rest period morning and afternoon relieved not only the fatigue, but accidents. We found our accident periods that were worse were the fourth and eighth hours of work, and definitely with long trips to go to work, a rest period with a possibility of food was a safety precaution. We found that to be the case with both men and women.

MODERATOR SHAW: Mr. J. N. Guelich, of R.C.A. Victor, wants to know about treating hydrofluoric acid burns and asks us to comment on boric acid soaks. Somebody has marked on this card to ask R. S. Mackie, Chemical Engineer, General Electric Company, Clevel-

and, Ohio. He does handle hydrofluoric acid. He indicated in his talks with me that plenty of water, which is so often used with other acids, is the first remedy. I would write him.

MR. RAPIERE (University of Chicago, Chicago, Illinois): We investigated that problem for our laboratory and also in the Kettering Laboratory. Mr. Mackie said that plenty of water and continual washing for several hours, as long as the skin continues to have that white appearance, was the best means.

MODERATOR SHAW: How about boric acid soaks?

MR. RAPIERE: He said the use of water was the best means. Of course, some of that area may be permanently injured. There have been some suggestions to use lime water, and the treatment also includes application of certain oxides.

MODERATOR SHAW: Before I used any chemical for a neutralizing agent, I would be very careful to make sure it was right.

MR. RAPIERE: I think it is borne out that in preparing any solution to neutralize burns, you should always use water first and be on the safe side, because any neutralizing agent will generate some heat, especially in the eye, where you get more detrimental action.

DR. E. G. MEITER: I just want to say a few words about the disposal of collected dust and show you several slides. Whatever exhaust systems are required for the removal of dry dust, efficient dust collectors should be used to separate the dust and dirt from the air before it is blown to the outside atmosphere. Any exhaust stacks where this air is discharged should be above the roof line of adjacent buildings.

In the first slide, we note that both of these principles that I have mentioned are violated. In the first place, we see a high dust cloud coming out of a stack which is so low that the dust will blow right back into the building through the ventilators, through the skylights and through the open windows.

Now, having once trapped the dust, means should be provided to prevent the escape of dust when emptying the col-

lector hoppers. In slide two we see the dust collector hopper being emptied without any dust disposal. You can see that the operator himself is exposed to high dust concentrations and oftentimes these dust collectors are located inside buildings where a lot of men are unnecessarily exposed to the dust.

These hoppers can be properly emptied; first, in a dry state by using an enclosed, specially designed truck body attached to the ventilating system; and, second, in a wet state by attaching a wet disposal device to the dust arrestor.

In the next slide is shown a specially designed, enclosed truck body, where this dust can be efficiently disposed of. You will notice that the central tube here is a corrugated tube connected directly to the exhaust system. When the air from the truck is exhausted, we have a downdraft in both manholes, through which the truck is being filled. This can be done without any dust at all. This can be done efficiently either by applying the suction by means of an independent fan fan, or by a proper valve arrangement we can use the regular ventilating system.

Not only can this truck then be filled without creating a dust nuisance but in hauling the dust to the disposal grounds there is no blowing by the wind or jarring of the dust as the truck is driven along the highway. Naturally there is some exposure to the workman while emptying the truck, but by standing against the wind and using a dust respirator, this can be made a very fine job.

Now the next slide shows the wet disposal device which is now commercially available. This was described in the January issue of "Industrial Medicine." Here we have dust from the dust collector coming into a variable speed conveyor. Water enters the center of the spinning or spinner disc and both the water and the dust impinge at high speed, loses its identity and forms a

paste. By using the right amount of water and getting the correct adjustment, this can be removed either in a very wet sludge or in practically any consistency that we wish.

This device is usually used where we have a multiple dust collector system mounted on a rail and, by means of a flexible hose connection and electrical connections it can be moved under each hopper or used along the conveyors and connected all to one unit. This can be used outdoors in temperatures as low as ten above zero.

MR. McQUEERY (General Chemical Company): I wanted to mention the hydrofluoric acid problem. It is assuming greater uses all the time, particularly in the refining of aviation gasoline. I presume that is why these gentlemen brought this problem up.

About six or seven months ago the War Department called together the leading manufacturers of hydrofluoric acid to discuss this very problem. I am sorry I can't tell you the name under which this organization goes, but its headquarters are at Bethesda, Maryland. They have prepared a pamphlet as to the correct procedure in treating hydrofluoric burns which may be obtained by writing to them.

MODERATOR SHAW: Write to the National Institute of Health, Bethesda, Maryland.

We still have some unanswered questions which leaves me unhappy but if you want to persist until you get the answers, write the Council and they will put it in the hands of the right specialist to give you the best information they can get.

CHAIRMAN STRATTON: The questions addressed to the National Safety Council should be addressed to the attention of the Chemical Section representative, Mr. Van Atta.

Coal Mining Section

Officers 1943-1944 †

General Chairman—THOMAS MOSES, Room 1602 Koppers Building, Pittsburgh, Pa.

Vice-Chairman—J. T. RYAN, JR., Mine Safety Appliances Co., Pittsburgh, Pa.

Secretary—R. H. NICHOLAS, Pittsburgh Coal Company, Pittsburgh, Pa.

Labor Representative—DR. WALTER N. POLOKOV, United Mine Workers of America, Fairfax Station, Virginia.

Mine Operators' Representatives—JOHN E. JONES, Old Ben Coal Corp., West Frankfort, Ill.

EDGAR C. WEICHEL, Hudson Coal Co., Scranton, Pa.

U. S. Bureau of Mines Representative—J. J. FORBES, U. S. Bureau of Mines, Washington, D. C.

Geo. W. GROSS, (Alternate), U. S. Bureau of Mines, Pittsburgh, Pa.

Mine Inspectors' Representative—C. L. LUTTON, H. C. Frick Coke Co., Pittsburgh, Pa.

News Letter Editor—E. H. DENNY, U. S. Bureau of Mines, Pittsburgh, Pa.

Engineering Committee Chairman—A. D. SISK, Big Sandy-Elkhorn Coal Operators Assn., Pikeville, Ky.

Entertainment Committee Chairman—J. T. RYAN, JR., Mine Safety Appliances Co., Pittsburgh, Pa.

Film Strip Committee Chairman—ROBERT M. MEDILL, Illinois State Department of Mines and Minerals, Springfield, Ill.

Membership Committee Chairman—CADWALLADER EVANS, JR., Hudson Coal Co., Scranton, Pa.

Poster Committee Chairman—RICHARD T. McALLISTER, United Mine Workers of America, Duquoin, Ill.

Program Committee Chairman—J. J. FORBES, U. S. Bureau of Mines, Washington, D. C.

†As elected by the delegates in Congress session

Meetings for Formation of Coal Mining Section

October 6 and 7

During the past two years several coal mining members of the Mining Section came to the conclusion that a separate section devoted to coal mining would enable the Council to accomplish more in this field. This opinion was based on the belief that the problems of the coal mining industry were entirely different from those encountered in metal mining and that it was necessary to develop specific materials. A group of the coal mining members held several conferences, and these discussions finally resulted in approval of the formation of a separate section by the Executive Committee of the National Safety Council.

Following this approval a special meeting was held in Columbus, Ohio, May 26, 1943. The meeting was presided over by Mr. Thomas Moses. At this meeting announcement was made of the contemplated formation of a Coal Mining Section and, in order to get the movement under way, a temporary committee was formed under the chairmanship of Mr. Moses. The committee was known as "Coal Mining Committee to Conserve Manpower."

Following the formation of the committee, Mr. Moses prepared a message

to be sent to coal mine inspectors throughout the country. Mr. Moses also held several meetings in various coal mining states, devoted to organizing safety committees among coal mine inspectors and operators. In the meantime, arrangements were made to hold an organizing meeting during the 32nd National Safety Congress.

A preliminary organizing meeting was held on the morning of October 6, and a second meeting on the morning of October 7. Officers were elected and tentative plans laid for the work of the section.

In view of the fact that these meetings were held only for the purpose of organizing the section, no papers were prepared for delivery. However, at the meeting of the existing mining section the program was designed to cover both coal and metal mining. Reference should, therefore, be made to the program of the Mining Section for papers dealing with both coal and metal mining.

The section having been organized, plans for the development of a program are now under way and a complete program will, of course, be prepared for the next National Safety Congress.

Construction Section

Officers 1942-1943

General Chairman—W. A. HAZARD, Bethlehem Steel Co., Bethlehem, Pa.
Vice-Chairman for Building Construction—LLOYD A. BLANCHARD, War Department, Washington, D. C.
Vice-Chairman for Heavy Construction—G. W. MAXON, Maxon Construction Co., Dayton, Ohio.
Vice-Chairman for Highway Construction—LESTER D. WISE, Pennsylvania Dept. of Highways, Harrisburg, Pa.
Secretary—G. O. GRIFFIN, Dravo Corp., Neville Island, Pittsburgh, Pa.
News Letter Editor—EDGAR N. GOLDSTINE, San Francisco, Calif.
Engineering Committee Chairman—R. J. REICHLUTH, The New Haven Trap Rock Co., New Haven, Conn.
Membership Committee Chairman—D. DONALD, J. W. Cowper Co., Inc., Buffalo, N. Y.
Program Committee Chairman—F. J. CRANDALL, Liberty Mutual Insurance Co., Boston, Mass.
Statistics Committee Chairman—C. H. BLACK, Stone & Webster Engineering Corp., Boston, Mass.
Visual Education Committee Chairman—H. H. HAYES, Tennessee Valley Authority, Chattanooga, Tenn.

*Past General Chairman

Officers 1943-1944†

General Chairman—G. O. GRIFFIN, Dravo Corp., Pittsburgh, Pa.
Vice-Chairman for Building Construction—LLOYD A. BLANCHARD, Corps of Engineers, U. S. Army, Washington, D. C.
Vice-Chairman for Heavy Construction—E. A. BLANFORD, Kansas City Bridge Co., Kansas City, Mo.
Vice-Chairman for Highway Construction—LESTER D. WISE, Pennsylvania Dept. of Highways, Harrisburg, Pa.
Advisory Committee—
 W. A. HAZARD, Bethlehem Steel Co., Bethlehem, Pa.
 R. J. REICHLUTH, New Haven Trap Rock Co., New Haven, Conn.
Secretary—A. H. PFREYER, Harnischfeger Corp., Milwaukee, Wis.
News Letter Editor—EDGAR N. GOLDSTINE, 232 30th Ave., San Francisco, Cal.
Engineering Committee Chairman—C. H. BLACK, Stone & Webster Engineering Corp., Boston, Mass.
Membership Committee Chairman—MILTON E. SMITH, Chicago Bridge & Iron Co., Chicago, Ill.
Program Committee Chairman—F. J. CRANDALL, Liberty Mutual Insurance Co., Boston, Mass.
Statistics Committee Chairman—HARRY J. KIRK, Associated General Contractors of America, Inc., Washington, D. C.
Visual Education Committee Chairman—THOMAS M. WERN, Bridgeport Brass Co., Bridgeport, Conn.

†As elected by delegates in Congress Session

TUESDAY AFTERNOON SESSION

October 5, 1943

Presiding: General Chairman, W. A. Hazard, Engineer of Erection,
Bethlehem Steel Co., Bethlehem, Pa.

Safe Use and Proper Care of Wire Rope

N. IRVING LEX, Asst. Chief Eng.,

Wire Rope Engineering Division

John A. Roebling's Sons Company, Trenton, N. J.

(Illustrated Lecture)

I would like to introduce this subject by stating that wire rope is one of our most reliable structural materials, and I feel justified in making this statement because it is a precision product. It is fabricated of carefully selected steel wires that have been cold drawn to extremely close tolerances and made to meet rigid physical and chemical requirements.

Contrary to a belief held by many of its users, wire rope is not a product that is easily and quickly fabricated by taking a bunch of wires and twisting them into strands, and then twisting these strands into a rope. It is made of a definite number of wires of the correct size and these are laid together—not twisted—to form a pattern known as a strand. A certain number of similar strands are then laid together around a core or center to form the finished rope. Care must, of course, be exercised during the manufacturing process to lay the wires in the strands and the strands in the rope to the correct pitch or lay, and to employ a center of the right diameter, if the finished rope is to operate to the best advantage in service.

Obviously, many other factors must be given careful consideration from the making and rolling of the steel, the cleaning, drawing, and heat treatment of the wires to the fabrication of the finished product on the rope closing machine, but I do not intend to go into detail regarding these processes. Let it suffice to mention that unless the fundamental requirement in good rope making is recognized, the other operations, no matter how carefully performed, will not impart reliability and quality to

the product. This fundamental requirement is steel from which can be produced wire that is homogeneous and uniform throughout its entire length and possessing the toughness and fatigue resistance necessary to withstand the severe conditions of operation a wire rope is generally called upon to perform.

Slide: Types of Wire Rope

Regarding the different types of wire rope I wish to be brief, because all of you probably know that this product is manufactured in several different grades, and that each of these can be furnished in many different constructions. Generally speaking, there are four standard constructions. These are illustrated on this slide and are the 6x7, which is shown at the top; the 6x9, which is shown next; the 8x19 and the 6x37 illustrated at the bottom. The four ropes shown are of the same diameter, and the relative size of the wires, which imparts various degrees of flexibility to these different constructions, is clearly shown. The first, or 6x7 construction, makes a fairly coarse rope, and in fact, it is often referred to as the "coarse laid" construction. It is used to advantage where abrasive or corrosive conditions are quite severe and where the size of the sheaves and drums over which it operates are so liberal that bending is of little consequence.

The 6x19 construction is fabricated of more but smaller size wires, and as a result this makes a much more flexible type of rope. It can withstand bending to much better advantage than a 6x7 rope, but still is well able to resist abrasion or scrubbing types of abuse. Probably more

of this type of rope is employed than any other because it lends itself more readily to a multiplicity of uses.

The 8x19 and 6x37 ropes are, in the order given, the most flexible and the least abrasion resistant of the standard rope constructions. These ropes are employed where limited sheave or drum diameters or the number of sheaves over which the rope is reeved demand a very pliable construction. Due to the relatively small wires of which they are fabricated, they are not well suited to conditions where severe abrasion or corrosion is of major importance.

Slide: Cross-sectional Views of Six Ropes

The difference between these standard constructions is perhaps better illustrated on this slide showing the cross-sectional views of these ropes. It also illustrates the way in which the various names have been derived, the first number in each case applying to the number of strands in the rope and the second, the approximate number of wires in each strand. For instance, the 6x7 rope has six strands each of which is made with seven wires.

There are, of course, many other constructions of wire rope besides the ones shown here, and there are also several different constructions which fall under each of the four standard classifications. For example, 6-strand ropes with from 16 to 25 wires in each strand fall under the 6x19 classification, and three such ropes are shown here on the bottom row. The first of these actually has 19 wires per strand while the other two have 21 and 25 wires respectively in each strand. Likewise, 6-strand ropes with from 26 to 46 wires in each strand, fall under the 6x37 classification, but on this slide, only one of these constructions is shown. Each different construction is best suited to a particular field of use, and of course, best economy will only be obtained by employing the correct construction for any given installation.

Slide: Inclined Plane

The coarse laid or 6x7 construction is often used on slopes such as the one

shown on this slide, or mine haulages where the rope must withstand considerable scrubbing but where the drum and sheaves over which it must bend are very liberal in diameter.

Slide: Locomotive Crane

The 6x19 type of rope is used for most general hoisting purposes because it combines resistance to abrasion and ability to withstand bending to about equal degree. This locomotive crane illustrates one application for this type of rope, and in the next slide, another type of service is shown.

Slide: 350 Gross Ton Crane

This crane, incidentally, has a gross capacity of 350 tons and about 11,000 ft. of from 1" to 1½" dia.

Slide: Mine Hoist

The 6x19 construction is also generally used for shaft hoist duty. This picture shows one of the larger hoisting drums on which two ropes 1½" in diameter and each approximately 16,000 ft. long are wound. This is a cylindro-conical drum, 16 ft. in diameter at the ends and 30 ft. in diameter on the large section at the center.

Slide: Overhead Traveling Crane

The 8x19 construction is sometimes used on overhead traveling cranes of the type shown here, but in general, the 6x37 construction is much more satisfactory for this service. In the smaller sizes, this represents the most common application for 6x37 ropes in the industrial field.

Slide: Shovel

In the larger sizes the 6x37 construction is used on stripping shovels in the Mid-Western coal fields. The bucket on the machine shown in this illustration is capable of handling 16 cu. yds. of material at one time.

Slide: Dipper Dredge "CREST"

Another application for the 6x37 construction is on the larger dredges such as the one shown on this slide. This dipper is able to handle 16 cu. yds. of material.

Two Steel Ropes $2\frac{3}{4}$ " in diameter are used for the hoist duty, and of course a myriad of smaller ropes are employed for other purposes.

Slide: Rope With Independent Wire Rope Center

Any of the various standard constructions can be furnished with either a hemp center or a center consisting of an independent wire rope. The all-metallic construction, however, is most commonly employed in 6-strand ropes since conditions requiring its use can seldom be met satisfactorily with the 8x19 type of rope. An independent wire rope center adds about $7\frac{1}{2}$ per cent to the strength of a rope, and in some cases it may be desirable to use it for this purpose. In the majority of cases, however, it is employed to provide a firmer support for the strands of the rope.

Slide: Dragline Excavator

For some classes of service, notably on excavating machinery such as the dragline and the shovel shown here, the operating tensions are so great and the sheave and drum sizes so limited in relation to the diameter of the rope, that high pressures exist between the rope and the equipment over which it must bend. To prevent flattening and distortion under such pressures, the independent wire rope center construction is generally employed.

Slide: Rope With Dry Deteriorated Hemp Center

An independent wire rope center can also be used to advantage where such high temperatures are encountered that a hemp center would become charred or burned. The hemp center in the rope shown here has deteriorated in this manner, and this cross-sectional view clearly shows how it has become reduced in diameter and how the center has allowed all of the strands to pull in toward the middle. The tendency for the strands to overlap is well shown, but since overlapping could, of course, not take place, destructive nicking has occurred at the points of strand contact. This has reduced the strength of the rope and detracted to a considerable extent from its useful life.

The most common use of an independent wire rope center type of rope to withstand heat is on overhead traveling cranes in steel mills where ladles of molten metal must be handled.

Slide: Regular and Lang Lay Ropes

The 6x7, 6x19, and 6x37 ropes are sometimes fabricated in the so-called Lang Lay construction shown by the bottom illustration. In the Regular Lay construction shown at the top, the wires are laid in the strands opposite to the direction in which the strands are laid in the rope. As a result, the individual wires on the outside of the rope are approximately parallel to the axis of the rope.

In the Lang Lay construction the wires are laid in the same direction as the lay of the strands and in this case the wires make a considerable angle with the rope axis. The Lang Lay rope has the same strength as the Regular Lay and it has the advantage of being slightly more flexible for the same size and strand construction.

Slide: Worn Regular Lay and Worn Lang Lay Ropes

The Lang Lay construction also has the advantage of offering greater resistance to abrasion. This is because of the longer length of each outside wire exposed to wear. These two worn ropes illustrate the difference, the flat worn spots on the crowns of the Regular Lay rope being considerably shorter than those on the Lang. The Lang Lay construction, however, is a little more susceptible to damage during installation, and it generally needs more care in its operation.

During the last few years, improvements in the fabrication of Lang Lay ropes have been made so that it is becoming more and more possible to increase rope service by making use of the inherent advantages of Lang Lay ropes on installations which previously required the use of the Regular Lay construction.

Slide: Standard Rope and Preformed Rope

There is another type of rope that is being given considerable space in advertisements today—preformed rope. Pre-

formed rope is made of the same material as is the standard type of rope, and it can, therefore, be furnished in any size, grade, and construction, and as either Regular Lay or Lang Lay.

It is fabricated in the same manner as standard rope except that during the final operation the wires and the strands are formed to the spiral shape they must assume in the finished rope. Due to this, the strands do not have a tendency to unlay when the rope is cut, and this inert characteristic is what makes a preformed rope readily distinguishable from one of standard construction. The top illustration in this slide shows the manner in which a standard rope will unlay when cut; whereas, in the bottom illustration, the preformed rope remains in its original condition.

This characteristic makes preformed rope less susceptible to some forms of abuse and less likely to be damaged during installation, and today, when so many plants are being forced to employ inexperienced help, this advantage of the preformed type of rope may represent a real economy.

Preformed rope is also a little more flexible than standard rope of the same size and construction, and it is for this reason that better service can be obtained by employing it in cases where bending conditions and fatiguing stresses are particularly severe. For instance, it is generally used today on excavating machinery, on some elevators where the sheave sizes or manner in which the rope is reeved subjects it a fairly severe bending conditions, and also in many cases where the ropes are subject to considerable handling and protruding wire breaks might present a safety hazard.

Slide: Standard Rope and Preformed Rope Showing Broken Wires

There is another difference between standard and preformed rope that becomes apparent after the rope has been in service for some time. This is that broken wires are not so easily detected in the preformed as they are in the standard type of rope. Due to the fact that the strands and the

wires have been shaped to their spiral forms, it is understandable why, when a wire break occurs, the broken ends remain in their original positions and do not spring up from the surface as they do on ropes of standard construction.

The top illustration shows the manner in which broken wires generally occur in a standard rope, and the difference between these and the breaks in the preformed rope shown below, is apparent. Due to this characteristic, it is generally difficult or impossible to locate broken wires in a preformed rope by running along it with one's hand or with a piece of cloth or waste.

We have found that the best way to examine this type of rope is to use a good light and to inspect it by eye, making no attempt to wipe it first since this only tends to smear grease over the worn crowns. If these crowns are not touched, the ruptures can be seen at the points where contact with the sheave and drum grooves normally keeps the wires entirely free of lubricant.

I do not mean to imply that the inspection of preformed rope is too difficult to be accomplished with accuracy. I merely wish to point out that there is a difference between the two types of rope and a somewhat different procedure may have to be followed when inspecting preformed rope if its true condition is to be accurately determined.

Slide: Wire Rope Sling With Thimble Splices

An outstanding application for wire rope in the industrial field is for slings, and the reliability of this structural material is as important in this class of work as in the field of operating ropes. It will be appreciated that wire rope differs from chain for the reason that chains, as the old saying goes, are only as strong as their weakest link.

A wire rope sling seldom has less than 114 wires and very frequently 259 or 271 wires. It is, therefore, quite apparent that the breaking or cutting of a few wires will not seriously impair its strength. At the

same time, ample warning is given by the broken wires so that the rate of deterioration can be watched and replacement can be made before a dangerous condition is reached.

This, the same as with operating ropes, represents a very definite safety feature, but it must be remembered that corrosion, the same as with operating wire ropes, can cause deterioration of an indeterminate type, which must be prevented by an adequate lubricating practice.

Slide: Wire Rope Sling With Open Sockets

Wire rope slings are of three main types, one of these being made from wire rope with the ends spliced or socketed or arranged with some other type of fitting to connect it to the load. On this slide a wire rope sling with open sockets on the ends is shown lifting a turbine cover weighing approximately 58 tons.

Slide: Grommet Anchor Sling

A second type of sling is made with a grommet as its main member. A grommet as shown here, is a closed loop made of a single strand laid up by hand in the form of a wire rope. The wire rope in this case would be a 7-strand rope, or as more generally understood, a 6-strand rope with strand center.

The strand is woven completely around the circumference of the grommet seven times, and since the finished grommet is made of once piece of strand, the two ends must butt together at one point which is inside the grommet structure. It will be seen, therefore, that a grommet type of sling is a very precise product and brings into play the strength and reliability of a number of wires wound around a number of times to complete the whole.

The grommet sling has the advantage of placing the fittings in compression and having only the grommet itself as the real tension member. This is the case because the grommet is designed to go completely around the load and around the crane hook as well, and by keeping the cast or forged fittings in compression and having only the wire rope in tension, an additional safety feature is provided.

Slide: Flat Weave Sling

A third type of sling which we call a Flat Weave Sling, is made of six parts of wire rope woven together in the manner shown here. This type of sling is best adapted to handling light or medium loads. It is very flexible, and being flat, does not kink or become set as readily as round rope or grommet slings when used around sharp corners.

The weave of the sling is made so that one part of the rope does not cross another, and as a result, shearing actions within the sling itself are avoided. This same feature enables the component parts of the sling to become adjusted under load so that each takes its proper share of the load.

Slide: Flat Weave Slings Lifting a Bed Plate

Two slings of this type are shown here being used to lift a bed plate. This application well illustrates the ease with which flat weave slings can be adapted to intricate shapes where otherwise entirely special and more costly slings would have to be employed.

Slide: Bridle Sling Used at 45° Angle

One of the most important factors to be kept in mind in regard to a safe operation of wire rope, grommet, or flat weave slings is that the sling be of proper design and of sufficient strength to satisfactorily handle the load. In the design, consideration must be given not only to the magnitude of the load but to the angle the rope must make to the horizontal.

When a sling is used as shown in this illustration, the maximum safe load is not as great as it would be if the same sling were used with the legs vertical. For example, if the maximum safe load for a sling used vertically were ten tons, the safe load for the same sling with legs at a 45° angle with the horizontal as shown here, would be only seven tons. Were this angle reduced to 30°, the safe load would be only five tons.

It is, therefore, desirable in designing and using a sling, to keep this angle as large as possible, and it is important not to use

any sling to lift a heavier load than that for which it is intended, or to use it with the rope making an angle smaller than that for which it was designed.

Slide: Corrosion Fitting

To return to operating ropes, there are many factors we might discuss in regard to the installation and maintenance of wire rope. However, these points are continually being stressed by wire rope manufacturers and are familiar to those who handle the product. Therefore, since time is limited, we can omit this part of the story, but there is one very important factor which I want to mention. This is in regard to the lubrication of wire rope.

All wire rope is lubricated at the time it is made, but this lubricant cannot last the entire life of the rope since weather exposures and the kneading action of the rope as it passes over sheaves and drums tend to wash away and squeeze out this original lubricant. Replenishing of the lubricant is, therefore, necessary not only to protect the rope and prevent the development of corrosion, but to keep the individual wires and the center well oiled so that friction is kept to a minimum.

A wire rope is a flexible member because the many parts of which it is composed can move with respect to each other as the rope operates around a drum or over a sheave. When this movement can take place with the least amount of friction, internal wear of the component parts and the development of fatigue are reduced to a minimum, and of course, both of these factors enhance the life and safety of the rope. The rope shown on this slide is corroded and badly pitted on the surface. Not all ropes however, show corrosion so plainly as this one.

Slide: Protected and Corroded Ropes

In some cases where moisture has penetrated to the center of a rope, corrosion may cause considerable damage without being very much in evidence of the surface. Such a rope is the bottom one shown on this slide. Considerable deterioration of the center and the wires on the underside of the strands has taken place. Any

pronounced reduction such as this which cannot thoroughly be accounted for, should be regarded with suspicion, and a careful check should be made to determine the cause.

In this case, the only evidence of corrosion was indicated by the great reduction in diameter of this section of the rope in comparison to another section of the same rope, illustrated at the top, where corrosion had not been involved. Except for careful measurements of the rope, corrosion of this type may be impossible to detect, and it represents a dangerous condition which could have been avoided through a proper lubricating practice.

Lubricants of practically any consistency ranging from fairly thin oils to heavy almost tar-like substances can be obtained suitable for application to wire rope. Whatever material is used, however, must be free from any element which might attack the constituent parts of the rope, and it must be chemically neutral.

Where severe corrosive or wet conditions are encountered, a fairly heavy compound that acts as a protector as well as a lubricant, should be used. To apply this properly, it must be heated so that it will penetrate the strands and reach the center of the rope and so that it will adhere to the surface and protect the rope externally.

Other, somewhat lighter lubricants should be used for average conditions where protection against corrosion is needed, but where a material having a little more lubricating value is required. Some lubricants for installations in this class can be applied cold, but most satisfactory results will be obtained if a little heavier material applied in the heated stage is used. In this way, better penetration and longer protection to the rope will result.

On still other types of equipment thinner lubricants that will properly penetrate without being heated, can be employed. Ropes on plant cranes and elevators can generally be treated in this manner, since they operate indoors where corrosive conditions are seldom encountered.

Slide: Split Funnel Lubricator

The funnel arrangement shown on this slide is used to lubricate the ropes on a mine shaft where corrosive conditions are particularly severe and where a heavy tenacious type of lubricant is applied in the heated stage.

The hot lubricant is poured in the top of the funnel as the rope is run slowly in the downward direction. The leather backing in the small diameter section at the bottom, acts as a wiper and prevents an excess amount of lubricant being applied.

Slide: Elevator Rope Lubricator

This is one type of lubricating device that has been designed for use with elevator ropes. In this case there is no mine water or excessive moisture with which to contend, and a fairly thin grade of wire rope lubricant is used. It can be seen that this is a split box arrangement made of two small containers, each one having a series of holes whereby lubricant is fed to each rope of the set.

The device shown here is used to lubricate a set of six ropes at one time, and when it is closed around the ropes, the brushes below the containers function in a manner to work the lubricant into the valleys of the rope and spread it around so that an excessive amount is not applied to any one point.

Slide: Lubricating Elevator Ropes

This slide shows the lubricator being used on an actual installation, and it might be mentioned that, by using this device, it is possible to lubricate a set of ropes in about 15 minutes; whereas, it used to take two men several hours to do this work by hand. Probably, if methods could be employed on all installations to apply lubricant as quickly and as effectively as in this case, more operators would find fewer objections to establishing a proper lubricating practice.

Slide: Worst Rope Lay

One of the primary reasons wire rope is such a reliable member derives from the fact it can be inspected while it is in

service, and the development of wear and broken wires which finally necessitate its replacement, can be watched. There are many ways in which these two factors, that is, abrasion and broken wires, can be measured to judge the condition of the rope, and some inspectors who have been working with wire rope for years, have devised reliable inspection practices of their own.

Such methods generally represent a means for estimating the remaining metallic area or remaining strength of the rope. After this has been done, it is necessary for the inspector or operating official in charge of the installation to decide upon the safety of the rope for further operation. In making this decision, one of the factors which must be given consideration is the factor of safety of the installation.

The factor of safety is equal to the breaking strength of the rope divided by the maximum load of stress imposed upon it. For example, a rope with a breaking strength of 60,000 lbs. working under conditions such that its maximum stress is 10,000 lbs., has a factor of safety of 6. Theoretically, this rope would sustain a load up to 60,000 lbs. before breaking, but of course it would not be practical to use it in such a manner.

Some margin of safety must be allowed for overloads, impact stresses, and other factors that cannot very well be estimated at the time an installation is designed, and naturally, some allowance must be made for maintaining a proper degree of safety after wear and broken wires have reduced the metallic area and original strength of the rope. In addition, allowance must be made for maintaining the maximum stress in the rope at a value below its elastic limit, as otherwise permanent deformation of the steel wires would occur. In general, a wire rope installation should be designed with a factor of safety of at least 5, and in many cases it is imperative that safety factors considerably higher than this be provided.

This slide shows a worn rope, and on the following slides one method is illustrated by which the condition of such a rope can be judged. In using this method,

or in fact, any method based on a visual inspection of the rope, it is important that corrosion or any other unusual factors have not contributed to loss of rope strength since, in such cases, it would be impossible to estimate the condition of the rope with reliability.

Such unusual factors can, however, be avoided by proper care and maintenance, and the following method represents a practical one which can be employed where deterioration has occurred in an entirely normal manner.

First, it is necessary to make a careful inspection to locate the worst rope lay, or that lay containing the maximum number of broken wires. A rope lay is that distance measured along the rope in which one strand makes one complete revolution around the rope. This distance has been chosen instead of a foot since the rope lay bears a definite relation to the rope diameter; whereas a foot, as can be seen from the top and middle illustrations, bears a different relation for each different size of rope.

It has been found from countless tests, that the condition of the worst rope lay governs the strength of the rope; and so, after this spot has been located, it is necessary to count the broken wires, and as illustrated by the rope at the bottom, to list them by strands.

In the sample shown here, breaks numbers 1 to 8 have occurred in strand No. 1, breaks numbers 9 and 10, or a total of 2, have occurred in strand No. 2, and no broken wires are in strand No. 3. In strand No. 4 there is one broken wire, and four broken wires in each of strands No. 5 and No. 6. This makes a total of 19 broken wires in the length of this rope lay.

Slide: Abrasion on Regular Lay Rope

The other factor besides broken wires which detracts from the strength of a worn rope, and which can be measured at the time of an external examination, is abrasion or wear on the outside wires.

This slide shows the manner in which an outside wire in a regular lay rope wears, and it is apparent that as the depth

of wear increases, the dimension "L" continues to lengthen. "L" changes more rapidly and is a measurement which would introduce less error than if dimension "w" were used. The length of "L" is, therefore, the measurement taken when inspecting a rope, and by applying it to the following chart, the strength lost due to abrasion can be accounted for.

Slide: Abrasion on Lang Lay Rope

It is necessary, due to the different character of the wear on a Lang Lay rope, that abrasion be measured in a somewhat different manner, and this slide is shown merely to illustrate the difference. It will be observed that 6x19 and 6x16 wire ropes are measured between the closest points of wear on the first and sixth wires in the strand. This method, of course, has to be used with charts developed on this basis.

Slide: Alignment Chart "A"

There are two alignment charts for each rope construction, and the one shown here is the one to which the measurement of wear is applied. This particular chart is for a 6x19 regular lay rope. The line drawn across the chart has assumed that a 1 1/4" dia. rope has been inspected on which the length of wear "L" has been measured as 3/4". The rope size is taken on scale "A", and the measurement of length of wear on scale "B". In this case, the straight line indicates from scale "C" that 81 per cent of the diameter of the outside wire is remaining.

Slide: Alignment Chart "B"

This figure is next applied to the second alignment chart which takes into consideration the number of broken wires in the length of the worst rope lay. Here it has been assumed that the rope contains twenty breaks at this point; so a straight line is drawn from 81 per cent on scale "D", which is the reading taken from the preceding chart, to 20 on scale "F", and it is found that the percentage of rope area intact on scale "E" is about 79 per cent.

Slide: Chart for Distribution of Breaks

This chart must also be used since, if

the distribution of the broken wires is not even in all six strands of the rope, the strength would be a little reduced because of the unbalancing effect of this distribution. For example, a six strand rope having two breaks in each strand, or a total of 12 in the worst rope lay, would, if actually tested, show a little higher strength than a rope identical in all respects except that it had three breaks in each of four strands and none in the remaining two.

In both cases there are twelve broken wires in the worst rope lay, but in the latter case, these breaks are contained in only four of the strands, and the dotted line drawn on this slide shows that a value of 89 per cent, obtained from the previous alignment charts, would be reduced to 86 per cent because of this distribution. Of course, in the case where broken wires are fairly well distributed in all six strands, this chart would not make any change in the final reading obtained from the previous chart.

Slide: Correction Curves

There is one further point that should be mentioned in regard to these charts. That is that the final result represents the effective percentage of the rope area remaining. Unfortunately, this may not be equivalent to the actual remaining strength of the rope due to the differences in the manner in which ropes are used on different types of installations.

This is illustrated here by showing the correction curves that were plotted when similar charts were compiled for elevator ropes. It was found from tests that identical ropes, showing the same degree of wear and the same number of broken wires in the worst rope lay, but which had

been used on different types of machines, actually and slightly different remaining strengths as a result of operating conditions.

In the case of traction type elevators it was possible to plot correction curves to take this into account, since traction elevators are so standardized that they can be classified in three groups. The correction curve "A" is therefore applicable to ropes that have been used on single wrap machines, "B" for ropes that have been used on double wrap 2:1 machines, and "C" for ropes used on double wrap 1:1 machines.

Industrial installations vary so greatly, however, that it was not possible for us to plot correction curves to be used with the regular lay and the Lang Lay charts. Such a curve can, however, be plotted for any particular installation by making several tests of worn ropes that have been used on this installation and plotting the results of these tests against the effective per cent of the rope's remaining area as obtained from the charts.

Such a curve will then, when used together with the charts, enable a person to estimate the remaining strength of future ropes used on this particular installation.

It should be mentioned that since the charts were originally made from the results of measurements and tests on ropes of Roebling manufacture, most reliable estimates of remaining metallic area should be expected in the field by using them on this make of rope. The same method can, however, be used in setting up inspection practices for ropes of other manufacture if the rope is used as a basis for obtaining data from which charts of a similar type can be made.

Safe Working Heights for Earth Embankments

PHILIP C. RUTLEDGE

Professor of Civil Engineering, Northwestern Technological Institute,
Evanston, Ill.

(Prof. Rutledge prepared several illustrations for presentation with his discussion, which cannot be reproduced here. These are on file in the National Safety Council Library.)

The purpose of this paper is to analyze the stability of long, self-supporting vertical earth embankments and to show how the safe height of a trench wall can be predicted. The methods presented herein cannot be applied to braced cuts, to pits or wells, or to sloping embankments.

Types of Failures of Vertical Embankments

A self-supporting vertical embankment in soil may fail by sloughing, slumping, sliding, or squeezing up at the base.

Sloughing is sliding on the face or surface of the embankment. In sands and gravels sloughing makes excavation on vertical slopes impossible. In soils which will stand on vertical slopes sloughing is caused by drying and cracking of the embankment wall, by loading the edge of the wall, by erosion of rain water and by accidental damage to the wall. The result usually is a minor annoyance in the construction operations.

Slumping is manifested by bulging of the lower part of the embankment wall toward the excavation and general subsidence of the adjacent ground surface. It usually occurs gradually and, since warning is given of the impending trouble, serious accidents need not result. The most common occurrence of slumping is in wet, very fine sands, inorganic silts, or rock flours and is caused by slow movement of water in the soil voids toward the cut. In these soils a dangerous form of rapid slumping known as a "flow slide," which may result in almost complete and immediate disappearance of a trench, can be caused by heavy vibrations. Slumping also occurs occasionally when an embankment cuts into a layer of very soft, wet, plastic clay.

Sliding is the downward and inward movement of a large and fairly definitely defined mass of the embankment wall. It is by far the most common mode of failure for soils which will stand with unsupported vertical banks. Once motion begins, sliding failures occur rapidly, but several hours, days, or weeks may elapse between opening a cut and its failure by sliding. Because the result is rapid downward movement of a large mass of embankment soil, sliding failures frequently injure men working near the base of the embankment.

Squeezing up at the base as the sole mode of failure of an unbraced vertical cut can occur only when the cut is carried through a relatively stiff soil to or into a very much softer material. Even in this case it is necessary for the open width at the bottom of the cut to be greater than its height, for the thickness of the softer base soil layer to be greater than the height of the cut, and for the strength of the base soil to be less than half that of embankment soil in order for failure to occur by squeezing up at the base before the embankment fails by sliding. However, yielding at the base may precipitate a sliding failure in a potentially unstable embankment.

Soil Properties for Analysis

The analysis of failure of unbraced vertical earth embankments requires a knowledge of the shearing resistance of soil. The shearing resistance of any material is its maximum resistance per unit area to sliding along internal planes. In terms of shearing resistance and of self-supporting vertical embankments, soils may be divided into two groups: first, those which will not stand on vertical slopes to a height of two feet, and second, those which will stand to heights greater than two feet.

The first group includes all of the clean sands, gravels, and mixtures of sand and gravel. The second group includes all other soils. The shearing resistance of

soils in the second group can be expressed by the simple equation

$$s = c + n \tan \phi \quad (1)$$

in which

s = shearing resistance in lbs. per sq. in.
 n = normal pressure in lbs. per sq. in. acting on the sliding plane.

$\tan \phi$ = coefficient of internal friction for the material.

ϕ = angle of internal friction for the material.

c = shearing resistance of the material for $n=0$. This is commonly called the "cohesion" of the soil.

The values of " $\tan \phi$ " and " c " are determined by tests on the soil. Equation (1) can then be used in solutions for field problems provided the test conditions duplicate the field soil conditions in regard to normal pressure, soil water content and natural soil density and granular structure. In a plot of shearing resistance against normal pressure, equation (1) appears as a straight line. By means of simple mechanics it can be shown that the maximum strength of a cylinder or block of the soil in simple compression is represented by the diameter of a circle which passes through point O, has its center on the line On, and is tangent to the line representing equation (1). Analytically the equivalent expression for the compressive strength is

$$P_c = 2c \tan (45^\circ + \phi/2) \quad (2)$$

in which both P_c and c are expressed in pounds per square inch.

Soils with shearing resistances which can be expressed by equation (1) should be subdivided as follows: first, the group of soils in which vertical slopes are susceptible to slumping failure due to movement of water with the soils voids; and second, all other soils.

The first sub-group includes wet fine sand, inorganic silt, and rock flour. In these soils the cohesion, c , is created largely by surface tension of water in the voids of the wet soil. Either an excess of water in the soil near the bottom of a cut, or submergence of the soil at that point, will eliminate most of the cohesion which supports a newly cut vertical slope. This loss

of strength normally progresses slowly from the bottom of a cut toward its top and the result is a slumping failure. There is one sure way to identify soils in this group. Place a pat of the wet soil in your hand, shake it vigorously, then press your finger into the pat. If the soil becomes "quaky" and has a shiny look due to the appearance of free water on its surface during shaking, and if, when the soil pat is pressed, the surface dries out and becomes dull looking, the soil is a type which will lose most of its cohesion in the presence of an excess of water. All other soils in the group which will stand in vertical cuts are not affected by the shaking test.

To summarize, the sloughing soils can be recognized by their action and by their characteristic granular appearance which is familiar to every construction man. The slumping soils can be recognized by the shaking test. All other soils will stand in self-supporting vertical cuts and are susceptible to sliding failure. This last group constitutes a large proportion of the soils which are found within the first ten or twenty feet of the earth's surface.

Deformation and Sliding Failure of Vertical Cuts

Actually soil is not a rigid mass, and after the cut has been made the soil will yield downward and toward the cut. In this condition two sets of stresses act on the soil in the embankment. First, the weight of the soil in the embankment causes vertical and horizontal compressive stresses which increase with depth. And second, the horizontal deformation of the embankment toward the cut causes horizontal tensile stresses. The net result of the two sets of stresses is a zone in which the resultant horizontal stresses are tension. Soils are weak in tension. As a consequence tension cracks tend to form, particularly if the top of the embankment dries out as a result of opening the cut to air, or is subjected to alternate wetting and drying. Sliding failures may occur with or without previous formation of tension cracks. Usually, if a vertical cut stands for several days before it fails, tension cracks have formed in the surface of the soil adjacent to the top of the cut and have contributed to the failure.

Analysis of Sliding Failures

To determine the possibilities of a sliding failure in terms of the shearing resistance of the soil, it is necessary to know the shape and position of the sliding surface within an embankment mass. Then, if all possible shearing resistance along the sliding surface is mobilized before sliding failure occurs, the problem becomes statically determinate and the methods of simple statics can be used to determine the maximum safe height of the cut. Two general methods are available for carrying out this operation. (At this point Professor Rutledge showed several force diagrams, which cannot be reproduced here, and gave methods and formulas for analysis of sliding failures. Anyone desiring further information concerning this portion of the lecture may obtain this by writing to the National Safety Council.)

Charts -
 No. 2100
 1943

WEDNESDAY AFTERNOON SESSION

October 6, 1943

Presiding: General Chairman, W. A. Hazard, Engineer of Erection, Bethlehem Steel Co., Bethlehem, Pa.

Planning A Construction Job for Safety and Economy

J. L. SHIELY

President, J. L. Shiely Company, Inc., St. Paul, Minn.

The proper planning of a construction job has been and always will play an important part no matter how large or small the job is.

We know that a safe job is an economical job. Naturally we want a safe job, and, naturally enough, we want an economical one too. We realize too well that the business mortality in the construction industry is higher than in any other type of industry. Contracting is a hazardous business. Risks are part of the business. There is a point where safety can cost more than the risk you take. I do not pretend that this is the only consideration. There are others. Methods determine whether the job shall be operated at a profit or loss. Methods often determine whether employees shall live or die of accidental injuries. To insure profits and safe opera-

Conclusions

The results of this study can be summarized very briefly as follows:

(1) The most common and dangerous type of failure of a self-supporting vertical embankment in soil is a sliding failure.

(2) The depth to which a vertical embankment can be cut without danger of sliding failure is a constant times the compressive strength of the soil.

(3) Determination of a reliable value for the constant requires only a modest program of field experimentation.

(4) Field determinations of the compressive strength of soil are simple and inexpensive, but the work must be done carefully to insure reliable results.

Methods Designing

You gentlemen know that a lot of thought and consideration is given by the architects and designing engineers when the plans for projects are being drawn. At the start of the design, there may be quite a number of rough sketches drawn before the final, most economical or best arranged layout is prepared. These architects and designing engineers now have their thoughts on paper and these drawings have come into the hands of the contractors. We, the contractors, who have the responsibility for planning the construction job might term ourselves the "methods designers" as we must design

the method for producing in the field what the architects and designing engineers have already produced on paper. A good methods designer must continually adapt himself to the individual conditions on each new job and produce the designed methods which will insure completion of the project with the most dispatch, greatest profit, and with the least risk.

Typical Construction Job

Before you have gotten far along on a typical job, you have been convinced that your organization chart should have included an engineer who should have the following qualifications for the medium-sized job you are doing. He should be 25 to 40 years of age, with as much construction experience as possible, and he should have a reasonable consideration of the expenditure fund. He should be able to clearly analyze your insurance problems, know the state, federal and municipal laws, and the kind of coverage which you require, your relationship with sub-contractors and the liabilities caused by visiting officials, inspectors, vendors, agents and the like. He should understand the crafts you employ, the knowledge of scaffolds, supports, ramps, frames, roofs, steel shapes, beams, floorloading, steel cable, etc. He must know amperes, direct current, alternating current, oil immersed fuses, crane booms, king pins, block sheaves, steam, compressed air, in all types of oil or gas engines. He must know lightning, sanitation, sewage disposal, fatigue conditions, first aid, fire compliance and be able to assist in contested cases which resort to law. He must know what goggles, respirators, aprons, signs, shields, helmets, life preservers, safety belts, electric-lineman protection equipment and safety shoes are required and have them available.

I do not know this man, but if I were a young engineer, I would qualify myself for this job, and the next position open would be that of general manager. The general idea I would like to convey is that what we need is not a safety specialist, but a combination of a constructor and safety engineer who knows the risks before they are taken and can evaluate them.

Safety Engineering A Productive Function

Let's agree that abstract and concrete safety engineering is a productive function of contracting. Let's see first what the prime consideration of safety is likely to be on this typical job. By a proper study of each individual phase of the work before the job starts, there is the chance to incorporate into the designed methods that are to be used on the job all precautionary measures that would tend to prevent accidents and save the expense of changes which have to be made later that are very expensive, especially on industrial plant construction.

On some jobs, management has interested itself to such an extent that traffic control drawings were made and the flow of traffic agreed upon before the job started. A copy of each drawing was distributed to each truck driver and foreman, and as a result, each driver had the advantage of looking over a special road map that had been streamlined for the job he was working on. Some of these drivers even framed these traffic control drawings and hung them on the walls inside their homes. They were revised from time to time as the job conditions changed, and the location of accidents were indicated.

A Western job covering a large area has many concrete structures scheduled to be built over the entire area. Batching plants and ready mixed concrete plants are spotted in convenient locations. Factors governing the location of these plants are the most economical locations, determined by length of haul to where the concrete was to be used, having in mind a minimum of backing of trucks and located so that the flow of traffic between two points can be void of interruption and delay and that traffic will move in a continuous flow at all times.

On one such job, we thought that the time spent in the proper routing of these trucks more than paid for itself as it certainly resulted in a speedier handling of the concrete and a smooth flow of traffic which, in turn, paid in the reduction of vehicle accidents on this job. We tried to standardize our methods to such an extent that trucks were pulling straight out and backing of trucks was held to a minimum. We tried to eliminate points where trucks

had to cross the path of another line of traffic. A good method to develop planned safety economy is to eliminate interruption where uncontrolled interference is likely to occur between men and equipment or between men and men.

Safety Costs

Safety costs should be kept at an absolute minimum at all times by perpetual and rigorous follow-up. This is good business because it is far more to your credit to achieve the superlative results at minimum costs. Anyone can do any job where costs are not a factor. Those managements who provide adequate and reasonable allowance for the expenditure of funds and make or cause to be made the necessary and detailed interpretation of needs are, as you might expect, profiting economically in public goodwill, in good employee relations, and are experiencing no ill effects of the human conscience. This is proof that adequate safety can be, and has been, translated in tangible results which can be measured.

Whatever other examples might be taken, of either lesser or greater severity, one will find, as so many have found, that indirect costs almost always exceed the direct costs of an injury by four to one. Safety engineering is an economical factor

in direct proportion to a man who can use his personal zeal for efficiency, the experience and knowledge of the work that has to be done, plus the most detailed possible understanding of the personalities of individuals, especially foremen and superintendents.

That safety engineering is a productive function, when accomplished factually with quality, is as undeniable as stating that only buildings with adequate foundation stand up or that men with two arms can do more work than men with one arm.

I am firmly convinced that the smaller jobs need a safety planner who can qualify with a knowledge of insurance, economically applied, and enough knowledge of insurance laws to make adjustments as locations are changed. That he should know safety in all its phases is paramount. He should be well versed in traffic, lighting, fire hazards, policing, and, above all, he should be a designer who can fill in the details that help contracting make the contribution to society that justifies our existence.

I believe also that safety promotion requires consideration by contract letting bodies. Contract letting agencies add to general safety progress when they give consideration to the low bidder's safety record as well as his ability to construct.

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TUESDAY AFTERNOON SESSION

October 5, 1943

Presiding: General Chairman, H. B. Taylor, General Sales Manager, Northwestern Yeast Co., Chicago.

Food For Health Program in Wartime Industry

By MARY I. BARBER

Director of Home Economics, Kellogg Company, Battle Creek, Michigan
and

Food Consultant to The Secretary of War
Office of The Quartermaster General, United States Army

In 1914, Dr. Graham Lusk wrote: "The workshops of life require fuel to maintain them and a necessary function of nutrition is to furnish fuel to the organism that the motions of life continue. Furthermore, the workshops of life are in a constant state of partial breaking down and materials must be furnished to repair the worn-out parts. In the fuel factor and the repair factor lie the essence of the science of nutrition."

Today, the workshops of life are closely tied to the workshops of industry; but not yet is the same thought given to fueling and repairing men and women workers that is given to the machines. But without the human masters the machines would be useless.

Good Nutrition Means Safer Work

Aptitude tests and health examinations show employers the kind of jobs employees can fill. Having hired these people, the employers assume certain responsibilities. Many firms provide a medical department or at least equipment for first aid on the premises. They have a safety program and, of course, liability insurance against accidents. There is no insurance against an employee suffering from poor nutrition! There is no law to force an employer to furnish an adequate, hot meal every day; there is no law to make an employee eat properly! Yet, good nutrition means safer work, with fewer accidents and, even more important, better work with fewer absences.

Industry is facing a feeding problem more difficult today than ever before. The number of workers has increased so that

canteen facilities are over-burdened. Rationing and shortages of food and equipment present more difficulties. Perhaps meat gives the most trouble. Meat has been so plentiful in this country that it is an integral part of our national thinking. It is possible to live with little or no meat, as has been proved by people in many countries of the world. But it seems impossible for industrial workers in the United States to live without meat and be happy.

Special Problems

Thus, industrial feeding for the health of workers offers these special problems:

1. Furnishing meals that will be eaten with relish and minimum of complaint.
2. Providing at least one-third of the daily food in amount and variety to furnish the fuel for energy, building material for tissue repair, regulating material for keeping all parts of the human machine functioning efficiently.
3. Rousing interest and a feeling of responsibility in the employers and the employees, for cooperation in the food and nutrition program.

To discuss the first point: if possible, the cafeteria should be a pleasant, well-ventilated room. The meal hours should be staggered to prevent standing in line for too large a part of the noon hour.

One situation showed that out of 4,000 workers only 600 were eating in the plant cafeteria. An investigation showed that the food was good but the service too slow. The concessionaire was losing money; the workers were dissatisfied and

not eating adequate lunches; candy, soft drinks (all fine in their place) were substituted for real meals.

Still another case showed a cafeteria with the most awkward kitchen arrangement possible and a very unappetizing array of food on the counter, which was in an attractive room. The food tasted better than it looked but a state of mind had been formed against it before it was eaten.

The only answers to these problems are: a management with an intelligent, sympathetic attitude, a skilled food service director and adequate facilities for quick service.

Nutritional Requirements

Point two should discuss what constitutes one-third of the daily requirements and how they can be met. The food service director must be sound in nutrition information, as well as in the technique of running the kitchen and dining room. The Canadian Medical Association and the life insurance companies have published an effective, simple booklet that explains body food requirements clearly.

Industrial workers should be encouraged to study the fundamentals of nutrition. If the plant furnishes at least one meal, it can be the cornerstone on which the other two meals are based. It is much better to have few choices on any one day, but to vary dishes from day to day. The food must look good to be tempting.

Food prices are not discussed here because each plant must decide whether or not it must make a profit, break even, or take a loss. Many firms feel that it is good business to lose money while keeping workers food-happy and well.

Arousing Interest in Program

Point 3. Arousing interest in both employers and employees may be a real job. Certainly safety directors are the key

persons here. First, they themselves must be thoroughly sold on the importance of a nutrition program and the role that good health plays in a safety record. Next, they must be able to sell the management and, more than any one else, the foremen and forewomen the idea that food and health are dependent upon each other. The lead persons can, if they will, make an informal check of the food habits of the people they direct. This takes tact, patience and stick-to-itiveness. People feel that food is their own personal business and resent interference, unless a desire for help is cultivated.

It is not necessary to give facts and figures to show the benefits that have been derived by nutrition programs in certain industries. Careful checks have shown that improved nutrition means fewer colds, greater vitality, faster work. The value of such a program is so obvious that one wonders why it is not taken as much for granted as sanitation and proper lighting.

Nutrition for our armed forces is the first consideration of the Army, Navy and Air Corps. It is food that maintains their stamina, keenness and success. Their ability to use the planes, guns, tanks and all the implements of war depends on their health. Is not the health of the men and women who make these implements fully as important? The subsistence branches of the Army and Navy guard the food health of their men and women. They furnish rations which are adequate for good nutrition. The rations provide fuel, building and regulating materials three times a day. Cooks and bakers are trained in special schools, mess management is stressed, and the result is a well fed Army fighting its way to victory. Final victory cannot be won unless the men and women behind the Army also are well fed and have stamina, keenness and courage equal to that of our fighting forces.

WEDNESDAY AFTERNOON SESSION

October 6, 1943

Presiding: C. C. Roddick, Safety Director, H. J. Heinz Co., Pittsburgh, Pa.

Pertinent Facts of the Food Section Accident Experience

C. G. BENDER

Mgr., Industrial & Safety, Bell Aircraft Corp., Atlanta, Ga.

First, I want to call your attention to the only bright spot in the entire food industry accident record by saying that the severity rate for food was 1.04 days lost per 1000 man hours worked for 1942. This rate gave the section a standing of 12th among 32 industries. As pointed out in the "Accident Rate" pamphlet, the severity rate represented a 19% improvement, and the reduction was one of the largest in American industries. There is the one bright spot in the whole summary of statistics regarding the food section.

The food section has nothing else of which to be proud on a comparative basis with any industry or with the other industries the National Safety Council has deemed it advisable to place in a comparative list. Why should the food section rank 20th? Also why should its frequency increase from 16.16 to 18.65, which represents a 15% increase, as compared to a drop in the average for all industries?

Similarity of Experience

There is one outstanding observation I cannot help but recognize in comparing the "Accident Rates" pamphlets of 1942 and 1941; that is, the two contain almost identical wording in explaining outstanding hazards and the manner in which accidental injuries have occurred. In other words, our experience in 1942 was basically the same as in 1941, but no one has taken the initiative to ferret out this information to present it to the section as a whole, so that in recognition of the problem corrections might be placed in effect. I will just call your attention to one comparison I have made in the two pamphlets: In 1942 the pamphlet states the principal unsafe act by an injured employee was: "repairing, oiling, adjusting, or otherwise working on machinery in motion, instead of shutting off power."

The same identical quotation can be made from the 1941 pamphlet. The problem is still identical and, unquestionably, has been for several years. It has been unnecessary to change the wording from one year to the next, which to me proves that we in the food section have been complacent and have done little or nothing about preventing injuries.

Getting back to the 1942 pamphlet, here are some of the highlights:

1. The 1942 experience in the food industry was based on the largest coverage ever reported, in that, 625 units sent in their records, as compared with 578 for 1941.
2. The average frequency rate of 18.65, as compared with 16.16.
3. The National Safety Council says the frequency average rate is 10% higher for 1942 than for 1941, but unless my mathematics are incorrect, the increase is 15% rather than 10%. I think the Council was merely being nice to us in trying to make it look as good as possible, in spite of our standing. In order to confirm whether it was 10% or 15%, I asked a committee of statistical experts at my present plant to figure the increase, and they report that 15% is correct. I have also had the food section executive committee check the figures, and the report is again 15%. You see I do not want any fight with the National Safety Council, but, apparently, somebody is wrong.
4. There is a splendid tabulation on page 3 which not only compares the 1942 record of the food section with the sections I have already mentioned, but also compares the changes in frequency rate from 1926 to 1942. You will be surprised to know that in these 16

years, the improvement in frequency in the food industry is only one-half that of all industries, in that food improved by about 33%, whereas most industries like rubber, chemical, steel, automotive, improved by some 60% to 65%. This definitely is not to the credit of the food industry. Along with the tabulation on page 3, this very pertinent sentence stands out, as follows, "the increase in the industry's frequency rate compares unfavorably with the general reduction of all industries of 2%".

Small plants had the worst 1942 record, which is nothing rare or unusual, in that small plants always have the worst records, although it is not necessary, as has been proven by many smaller plants in the food section. Rather than being necessary, it is a challenge to the small plant to do everything within its power to encourage safe working practices and conditions.

Reviewing page 4, I think the outstanding facts are in the high-rate branches of the industries, in which it is stated that the grain elevators, on the whole, had the highest injury rates. The dairy products and sugar refineries also had high rates, but the proportion of permanent partial disabilities to total injuries was exceptionally large in sugar refineries, dairy products, and bakeries, in that it was 1 in 14 cases. Also, we find that the frequency rates in all branches of the industry increased over 1941 with the exception of hotels and restaurants. Of all branches, bakeries, milling and grain elevators had the largest increase—about 35%.

Outstanding General Factors in Accidents:

1. The operation of machinery was the principal source of injuries.
2. Oiling, making adjustments, etc., near moving parts of machines without stopping them was the principal unsafe practice.
3. Inadequate guarding, etc., caused one-half of the accidents.
4. Most of the injuries occurred when employees got their hands and other parts of their bodies caught in or between parts of machinery.
5. Violation of instructions and other

improper attitudes were the principal causes.

To the oldtimer in the food section, these factors are as old as the section itself, and it seems absurd that we allow these same things to occur year after year without doing something about it.

Agency of Injuries and Types of Serious Injuries

Rolls, mixers, and other types of machinery, accounted for 114 out of 323 serious injuries, and a percentage of about 33.

Getting fingers and other parts of the body caught in moving parts of machinery was the outstanding way in which workers were seriously injured. This accounted for about 60% of the total, and they were particularly due to the unsafe practice of making adjustments, cleaning, and doing similar work without first shutting down the equipment.

Unsafe Acts by Injured Employees:

I think it advisable to read word for word the pamphlet's discussion of this topic as follows:

An unsafe act was involved in 80% of the injuries. The principal ones of importance were:

1. Repairing, oiling, or adjusting, or otherwise working on machinery without first shutting off the power.
2. Standing or working in unsafe positions.
3. Starting or stopping, or otherwise using equipment without authority, or getting proper signals, or without tagging or locking equipment to prevent its operation.
4. Using defective equipment or the wrong type for the work at hand.
5. Operating of equipment at unsafe speeds.

Causes of Serious Injuries

An unsafe condition, in general, was involved in two-thirds of the serious injuries, with the outstanding three conditions being poor housekeeping in 80 cases, inadequate guarding in 75 cases and worn, broken or poorly designed equipment in 56 cases.

Disobedience of instruction and rules, haste and other inattentions accounted for 50% of the 323 injuries, and lack of knowledge of safe practices, together with inexperience, accounted for 93 of the 323 cases.

Questions to be Asked

To all this you say, "So What?" You will say the wrong people are here, because the group present today represents managements that are interested enough in safety and that their records are satisfactory, but it might be interesting to ask why these companies with poor records are not represented. It might also be interesting to ask if we in the section are doing everything in our power to see that these other people do participate in Congresses, safety conferences, schools, discussion courses, etc. I feel we should ask ourselves several questions, some of which should be the following:

1. Can we be satisfied that we are doing everything as a section, that can be done to call to the attention of the weaker members, the poor experience we have?
2. Has the executive committee taken active part in bringing these poor statistics and facts to the section as a whole?
3. What, if anything, are the sectional chairmen doing to curtail unfavorable trends in their groups?
4. Should the sectional chairmen function only once a year, or all through the year?
5. Can't the executive committee spend more time on these concrete things which affect the experience of the industry, rather than on other things which come up and are time consuming, but from which no constructive action is ever taken?
6. Does the statistical committee work with the National Safety Council in developing these figures so that it can tip the section off as to what the experience is, as it is being developed?
7. Can a program be adopted for reaching the poor experience plants?
8. Does everybody read and try to digest the excellent statistics contained in

"Accident Facts" and "Accident Rates", as published by the Council?

9. Should we be complacent and alibi for the poor record, or should we do something about it?
10. Isn't it true that if all plants knew as much about their own statistics as we do about the industry's statistics, much preventive work could be done before these accidents occur?
11. Is it beyond imagination of the industry to get statistical figures so that a study could be made on all lost time cases, for example, as well as those cases considered serious injuries, such as amputations or loss of life?

Composite Accident

In closing, I should like to give you a composite picture of how the majority of the serious injuries occurred in 1942 in the food industry:

A person, usually a man but sometimes a woman, tried to make an adjustment, clean, oil or do a similar job on rolls, mixers, conveyor or packing machine, and in so doing became caught in or between moving parts of the equipment, because it was either unguarded, poorly guarded, or because of poor housekeeping, or further, because the person violated instructions, was in a hurry, or had not been instructed in the safe way. The injury: an amputated finger.

Procedure For Remedy

As safety representatives of your management at this Congress, you, personally, are responsible for each and every case that occurs in your plant, regardless of how well we, as safety men, have learned to try to satisfy our conscience by the trite saying that the foreman is responsible for accidents. Certainly he is responsible for doing his part, but let's not forget that we alone can feed him the ammunition, the enthusiasm, the knowledge of how to do the safety job, the pertinent statistics necessary to him, the encouragement and last but not least, the credit for having done a good job. The foreman can't be held responsible until we, as safety men, complete our responsibility to him. In other words, it's time for us safety directors to go to work and do a job.

In my interpretation of the functions of the executive committee the individual section chairmen of the committee are the safety directors of their particular group. Similarly, the executive committee, as a whole, is in a parallel position to the industrial plant's management advisory committee. This being true, does it not follow that it is within the scope of the responsibility of the committee to take action on

this very poor record. I think it is time that the executive committee, and the sectional chairmen in particular, roll up their sleeves and really get to work, in the same manner that each of us would in our individual plants if the experience were bad. Yes, I am suggesting an active job for the industry's top men, and I am suggesting that you go to work and do a job for the food industry.

Victory in Sight

MILTON M. BOWMAN

Field Representative, National Committee for the Conservation of Manpower in War Industries, Division of Labor Standards, U. S. Department of Labor, Washington, D. C.

A summary of this illustrated lecture may be found in this volume of the Transactions under the Tuesday Afternoon Ses-

sion of the Chemical Section, entitled "Vision and Safety."

THURSDAY AFTERNOON SESSION

October 7, 1943

Presiding: Clyde T. Stephens, Safety Director, Interstate Cotton Oil Refining Co., Sherman, Texas.

A PANEL DISCUSSION

CHAIRMAN STEPHENS: Dr. Brehm is not able to be here. Instead, we have Mrs. Katharine Gage, R.N., the Larsen Canning Company, Green Bay, Wisconsin; Mr. W. F. Crawford, Safety Director of Bayuk Cigars, Inc., Philadelphia; Mr. C. F. Moberg, Safety Director, Kraft Cheese Company, Chicago; Mr. C. C. Ruddick, Safety Director, H. J. Heinz Company, Pittsburgh, Pennsylvania; and Dr. R. W. Rush, Corn Products Refining Company, Argo, Illinois.

The discussion leader this afternoon is Hugo A. Klemm, Director of Safety Education, Industrial Commission of Wisconsin, Madison.

MR. KLEMM: You will notice the subjects on the program include a summary of topics having to do with dermatitis, tenosynovitis, promotion of safety programs in small or scattered

plants, safety training for supervisors, the elimination of wet floor conditions, and so forth. Write your questions and we will proceed with the discussion.

The first question comes from Frank Booz of the Carnation Company, Oconomowoc, Wisconsin:

"In the house-to-house delivery of fresh milk, using regular stand-up drive type of trucks, what method can be used to keep the drivers from falling out of the trucks when involved in accidents, and yet not interfere with the delivery operation?"

I think the expert on our panel to handle that job is Charlie Moberg of the Kraft Cheese Company.

MR. MOBERG: My first reaction is to say, get rid of the trucks. Some companies have adopted various means such as bars and chains, and they were not a

success. The best practice developed that I know of is an arrangement where you have a stool or a chair, with a back on it, so that when a man applies the brakes he has some reinforcement. Also, he has some control of his feet and hands.

MR. BOOZ: We have what Charlie mentioned, but we have had four cases since the first of the year where they were thrown out of the left side of the truck.

MR. HAVEN: I want to back up the statement Charlie made first, that the thing to do is to get rid of that type of truck for that particular job.

MR. BOOZ: Of course that can't be done now.

MR. HAVEN: That is right. The critical materials, and so on, won't let you, but that, of course, is the final answer to it. We had a man thrown out, and he broke his neck. We immediately decided that was not the truck for our business.

MR. KLEMM: Here is the second question. It comes from George Steel of Ralston Purina Company:

"A man was injured in the plant in the course of his duties but absolutely refused medical attention. A physician was sent to his home and he used his case to drive the doctor away. Should this one be charged as a disabling case? If so, how much time should be charged?"

MR. CRAWFORD: I question very much whether it can be charged or should be charged. I should say, as a disabling injury. While I am not entirely familiar with the practice or the laws in the forty-eight states, in the State of Pennsylvania, for example, if an injured person refuses medical treatment, he loses all rights to compensation.

Considering it from the second viewpoint, I don't know how in the world you would know how many days of disability to charge.

MR. KLEMM: Another question: "Protection of fingers from abrasion when handling 100-pound paper bags. Gloves are not a solution."

That is presented by R. B. Sens, of the Spreckles Sugar Company.

DR. RUSH: I fully appreciate that gloves aren't the answer because it makes it almost impossible to handle bags. The

only thing I can think of in a case of that kind might be sort of a period of breaking in, in which they give those hands a chance to get toughened up.

Another thing is this: Frequently we have had them come into the first aid station and have taped their fingers up with adhesive tape. That is a considerable job, but they usually toughen up the skin on those fingers until they get so they handle them without any trouble.

MRS. GAGE: Why wouldn't painting the fingers with compound tincture of benzoin do it? That would toughen it. Incidentally, be certain the hands are perfectly clean before the benzoin is applied.

DR. RUSH: Personally, I haven't any thoughts on that. I have never used it. It might work.

MRS. GAGE: Would there be any objection to it?

DR. RUSH: No objection. If it works, it would be a fine idea.

MR. SENS: Toughening up is not possible. We found it is our old-timers as well as the new ones who are wearing out their finger tips. Tape has been used but it lasts possibly an hour or two hours and has to be renewed, which means that they can't all be running up to the first aid station to have it renewed, and they have to have the tape on the job.

DR. RUSH: We have had a little trouble with finger tips getting sore but never anything that was really serious and it practically always happened to new employees. It may be it is a different type of bag. It has never been a problem with us except with the new employees.

MR. LEVIN (Cincinnati Milling Machine Co., Cincinnati, Ohio): I am not in food, but we have run into a similar problem. We have tried and used successfully a metallic linked chain glove, either in partial fingers or in full hand. We found that in handling metal with sharp burrs it worked out quite successfully.

MR. KLEMM: Now the next question, offered by C. A. MacIver of Commander Larabee: "What are the principal points in outlining the development of sustained interest in a safety program?" That is a broad subject and an important one. I wonder if Mr. Ruddick will handle that question?

MR. RUDDICK: Of course, the main point is to have someone to sustain interest; some live wire in charge of the program to keep it moving. He has to take every opportunity that comes along, to publicize and sell the safety program.

Then, of course, he must sustain interest further by following along the lines of foreman training. Continuous meetings or conference group meetings with a foreman, will help to sustain interest in that field. He naturally has to have rallies, departmental meetings, committee meetings, a constant educational program going on all the time, to pick up something spectacular occasionally to sustain that interest and to keep it a moving thing all the time.

MR. HAVEN: I think that maintaining interest in the safety program or safety activity in the plant is an individual proposition. I think safety meetings are necessary. But in order to have an individual or have a group of individuals maintain interest, they must be dealt with individually and not collectively.

There are a number of ways, generally speaking, of maintaining interest, for instance, departmental contests with suitable prizes. Your poster plan also helps. Letters from the manager or department head to the individual at home might help. I think every individual is different. Therefore, you have to work on him in a different manner than you would with a group of people.

Most people can be interested in safety; it is a selling proposition. If you sell a person once and fully convince him that safety is necessary for his own personal benefit and not that of the company, you have less trouble in maintaining his interest.

MR. KLEMM: The next question is offered by Mr. H. J. Burczyk, Commissioner of Wisconsin Industrial Commission:

"In the food canning industry, slips and falls due to wet floors have been causing many accidents. How has this problem been solved in plants where this hazard has existed during the past? Is it possible to eliminate wet floors in the average food plant?"

Mr. Moberg, will you answer this question?

MR. MOBERG: Wet floors, whether in the canning industry or dairy industry, or what, I believe, can be cured. The only approach is to find out where the water is coming from.

If you are working with vats and tanks, don't dump the tank onto the floor. Drain the water away. You have hoses, and they are still obtainable for that purpose. In one plant they set a small, portable tank at the drain of the vat or tank, when they clean it out. Another way is, by an arrangement of pipes and a suitable pump by which water can be pumped from one tank to another without splashing it around.

MR. BURCZYK: Is there any type of industry that cannot get away from wet floors or slippery places?

MR. JACK LENOX (G. A. Baly, Ltd., Canada): In our fermenting room basement, it is necessary to have the floor wet. Beyond that, the floor must be perfectly smooth cement in order to minimize the bacterial danger.

The floor is not only wet with water but the various sediments of the brews coming down make it a constant hazard. Every week we have someone falling, usually landing on his head, so there are contusions and probably more serious accidents. We have never yet been able to solve it successfully.

MR. MOBERG: Is this moisture coming from vats or tanks?

MR. LENOX: Vats and tanks. It is necessary to wash the floor continually, all day long. It involves constant washing to eliminate the sludge that is coming down from the various brews.

MR. MOBERG: That is allowed to run on the floor?

MR. LENOX: It goes into the sewer and spreads out in an area, and people are walking through that all the time.

MR. MOBERG: See if you can't confine that waste to one definite outlet away and off the floor because then you are not going to have to do the washing and you are going to have a dry floor.

MR. KLEMM: The next question we have comes from Mr. D. M. Harmer of the Joseph E. Seagram & Sons, Inc. The question is:

"Is a disabling injury that occurs in a company athletic contest charged as a lost-time accident? Does an appendectomy count as a lost-time injury?"

DR. RUSH: Personally, I don't see how an injury that occurs in a company athletic contest, unless that athletic contest was part of their regular work, could be counted as a lost-time accident.

I don't see how an appendectomy could be counted a lost time accident for the reason I can't see how the appendicitis could be attributed to a man's work. You couldn't call it an occupational disease. As far as I see, it couldn't be caused by an injury in any way. So, I don't see how it could be called a lost-time accident.

MR. KLEMM: Here is part 3:

"Compulsory pre-employment physical examinations are necessary in any sound safety program. What do you advise for older employees?"

DR. RUSH: I don't know exactly what is wanted there by "What do you advise for older employees?" unless it is a matter of placement.

To me, one of the most important things in your pre-employment physical examination is in being able to tell your employment department what sort of a job that man should have, or that woman should have. It is a matter, particularly in this day and age, when we are hiring anybody without much regard to what their physical condition is, and just as long as they can do any sort of a job we may have in the plant.

I am assuming that "What do you advise for older employees?" is a question asked as to what kind of work they should be placed on.

MR. HARMER: What I meant to say was, what do you advise as physical examinations for older employees? In other words, do you recommend that they be examined yearly, say, or periodically? We do have compulsory pre-employment examinations but the examination for older employees is more up to their own

judgment. In other words, they are given that facility.

DR. RUSH: I think every plant, if it can, should have periodical examinations for all employees. I think it is one of the most important things that can be done as far as physical examinations are concerned because a man's physical status changes as he goes along. Many times an older employee may have to have his job changed because of some change in physical status that makes the job he has been doing a good many years either a hazard or beyond his physical ability.

As to the time between examinations, we have a routine of every two years for everybody. If, during those periodical examinations, we find anyone who has a condition we think may be progressive or may develop into something before another two years are up, we may call those in as often as we feel is necessary to keep track.

DR. KLEMM: Doctor, would you recommend a thorough physical examination?

DR. RUSH: What do you mean by "thorough physical examination?" Where you are going to draw the line, would depend, I think, on special hazards that you may have. If we had a plant or if we had a condition of a special hazard, then you might want something very thorough.

These periodical examinations should pick up the beginnings of chronic conditions in the early stages, so the individual may be warned and have those things corrected before they become disabling.

How far you want to go with your physical examination depends on how public health-minded you may be and how much money you want to spend.

If you want to go far enough to include x-rays of the chest, rectal examinations, complete blood pictures and everything of that kind, that would run into a very sizable job.

MR. KLEMM: Another question is presented by Mr. A. M. Smith of Reserve, Louisiana:

"Foremen need formal safety training. they work three eight-hour shifts, seven days per week; ride buses which arrive on schedule and leave on schedule just

before and immediately after shift change hours. All come from long distances (five miles or more). Work schedules during shifts require the foreman at their operations continuously. Fifty per cent cannot read. How can we provide safety training for all of these supervisors?"

MR. CRAWFORD: If the matter is so important that you feel the men should have safety training, then I certainly feel it is up to the management to give them that safety training.

Obviously, your question is, "how can they do it?" Then I say how do they operate the plant, for example, if a man may be sick and out for two or three days? You could have a relief or substitute foreman to take over while they are taking this safety training.

MR. RUDDICK: In our plant we have three shifts, too. We had classes at two-thirty in the morning, and I came out and opened those classes and closed them. We had classes at seven in the morning, and we had classes at three in the afternoon. We had classes at all hours, but we had classes. I think that is part of the answer.

MR. KLEMM: Here is a question presented by Mr. B. R. Bowden of the Elwood Ordnance Plant:

"Is it true that soap and water are the best disinfectants and preventives for the spreading of poison ivy and dermatitis and other skin eruptions?"

DR. RUSH: Personally, I think he is quite right in assuming that soap and water is best. In all dermatitis, the most important factor is prevention, and prevention means keeping the irritant off the skin.

A rather comprehensive study of dermatitis and its prevention was reported in the Journal of the American Medical Association not long ago, and I believe you can get a reprint.

Soap and water certainly are most important. If it is poison ivy, the kind of soap you use is the old-fashioned laundry soap instead of some of the fancy hand soaps. It has more alkali in it and will do more to take off the oleoresin that is responsible for the dermatitis caused by poison ivy. Cleanliness is certainly the

most important thing in preventing skin eruptions.

MR. M. L. WURMAN (Bayuk Cigars, Inc., Philadelphia, Pa.): May I differ with the doctor for a moment. I think it depends on what type of dermatitis you may have.

We had 300 cases of dermatitis in the last eighteen months, in which water was the worst thing we could get on them because it was taking the oils or the fats out of skin, which was coming from moisture or water. Therefore, we had to put oil back in. We are using a water repellent substance to keep the water off the hands. We were getting wash-woman hands.

DR. RUSH: There may be individual case where that is true but I say in general, taken as a broad subject, your dermatitis wasn't from the water, however. It was something that your natural fats and your oil were protecting the skin against. The thing to do is to find out what that was.

MR. KLEMM: Here's a question from John F. Wilson, Oconome Packing Company, Wehauk, Maine:

"Why do most industrial doctors resent safety engineers diagnosing an injury when they invariably insist upon telling the safety department how its program should operate?"

MRS. GAGE: A doctor's training has taken him a good many years to acquire, and he is naturally safety conscious. His training starts in by prevention in every phase, whether it be safety, public health or just preventing disease.

So, I can't say that industrial doctors resent it, exactly, but I think it is one field stepping into another field. I wouldn't try to tell a doctor how to do things but I do try to point out to the safety engineers where they are short because I happen to belong to that safety group.

MR. KLEMM: I think you have answered the question all right, very diplomatically, too. I think it depends upon the organization and procedure you follow in that plant.

Here is another question:

"We had the case of an individual who reported a peculiar skin difficulty. It seems that, when he would close his hands, the skin would turn green. What causes this condition? His doctor called it dermatitis and said it was due to handling of tobacco in the field. Is this correct? How can this difficulty be eliminated? Does allergy have something to do with it?"

MR. CRAWFORD: I don't believe it is dermatitis. The question here seems to be that, when the man closed his hands, the skin would turn green. It would seem to me there was some difficulty in the circulatory system and that the base cause would not be dermatitis. I would like to hear what Dr. Rush has to say.

DR. RUSH: I don't think there is any answer. That must be strictly a personal idiosyncrasy of some kind. It would be my guess, as Mr. Crawford has mentioned, it was a circulatory disturbance that showed up at those particular times. If the man had a congenital heart, he might have some clubbing of the finger tips. I never heard of dermatitis that turned green. The only ones I ever knew were red.

MR. WURMAN: I have never heard of any such case in all the tobacco fields we deal with, and we deal all over the world. Even in our plants we have never seen any hand turning green from tobacco. Tobacco in the field is green; in the sheds the chlorophyll changes color to brown.

MR. KLEMM: Here is a question from Mr. George C. Stroke of the Spencer Kellogg & Sons, Inc.:

"How can you make employees wear goggles?"

MR. RUDDICK: When you tell a man or try to reason with him that his family is bound to suffer if he loses an eye or two eyes and he still doesn't listen to reason, there is still another tool we can use. Get your labor committees or safety committees interested. They suggested this morning that you ask the union to appoint people to your safety committee. Then delegate to them the problem of getting their people to obey the safety rules.

They cited an instance this morning. A man in a department was violating a rule. This department had formulated its own safety rules, which were much better than management had ever formulated. This man left his milling machine and went to a grinding wheel to grind a tool, which would only take a few seconds to do. One of his fellow workers tapped him on the shoulder and said, "Look here, Pete, I think you ought to wear goggles, don't you?"

The fellow said, "No, I don't think so. I'm only going to be here a minute."

"I know, but that is one of our rules, and I think you should."

This fellow said, "The devil with the rules."

So they had a hearing on this case, and his fellow union members tried the case and sentenced him to wear goggles for thirty days on his particular machine.

The fellow smilingly obliged, and he was sold thereafter on the safety rules of that department.

MR. HAVEN: We have always had the problem of getting men to wear goggles. Recently, a face shield came on the market that struck my fancy and seemed to be the answer to our problem. We bought 500 pairs. We had a regular procedure:

If we had twelve men in the plant that needed goggles, we had each man come in individually to the manager who talked with him about the value of his eyes and what it meant to him if he should lose one or both of his eyes.

He told him, "We are so much interested in it that we have purchased this eye shield for your use."

Then he reached over and he got the box, bearing a label: "This eye shield purchased expressly for" with the man's name on it. "It is to be used by no one else."

We have found in the few months they have been out that the men have taken these goggles and used them. We made it personal. Each man understood why we wanted him to wear them.

MR. KLEMM: Another question for the registered nurse:

"Should the registered nurse take care of a serious cut, or will she send the man to the doctor? What advice? Should she sew up the wound?"

MRS. GAGE: Again, with all courtesy to the doctor, that is his job. Definitely, the nurse should never assume that responsibility. The registered nurse's job is to cleanse the wound, where it is possible and feasible, apply a sterile dressing and accompany the patient to the doctor. If it is a serious cut, because even though he is transported in an ambulance, there may be a possibility of his hemorrhaging, and she is there to do her part as a first aid attendant. But the doctor does the sewing in any and all cases.

MR. KLEMM: Here is a question by A. F. Smith of the Monsanto Chemical, Marshall, Texas. The question:

"An opinion as to the frequency of periodic medical examination (and of what should this examination consist) for food handlers, white and colored, in plant cafeterias? There are no state regulations."

MRS. GAGE: If a man has a physical disability, we might check on the physical disability and be sure that he is not in a position or job that is too hazardous. I personally believe in a rectal examination as part of a physical examination, pre-employment physical. As far as the food handlers are concerned, I believe that a Wasserman test is very important.

MR. RUDDICK: The State of Pennsylvania requires of all food handlers in restaurants and cafeterias that they be checked with a serological examination every six months. That can be done either at your clinic, in your city or township, if you have one, or in your medical department where those samples are given to the city clinic or state clinic and examined and a report turned back, to be, in turn, transmitted to the employee.

There are employees who will object to such an examination. I know a company that instituted such an examination before the state insisted upon it. With the U. S. Public Health Service, they arranged a schedule for examining all employees. They first went to the union and

explained the situation. The union was very agreeable, if the company would keep the findings strictly confidential between the doctor and the employee. That apparently satisfied the entire personnel, and the examinations went off very nicely.

MR. KLEMM: We have a question offered by Mr. L. A. Hopper of Joseph E. Seagram & Sons:

"What is the best method to follow in order to have all employees report minor injuries? Every employee is given safety instructions."

"Should a company pay half the cost of safety shoes or require employee to pay all the cost?"

MR. MOBERG: "What is the best method to follow in order to have all employees report minor injuries?"

We have tried a lot of stunts on that, and we are still looking for the foolproof method. We use posters of various kinds.

Unless you make everybody stand inspection ever so often, you are not going to get it unless your educational program has convinced everyone that it is to their own advantage to properly report these things so that they can be taken care of. But you have to do a lot of selling on these things, because some people say, "It is all right; it doesn't bother any more," but they don't know about the little bugs. I don't believe there is any other fool-proof way out of it.

W. H. SCATES (Camation Co., Oconomowoc, Wis.): The National Safety Council have a sound slide film called "Open for Infection." You probably know about it. It is an excellent means of educating the employee to recognize the importance of first aid treatment.

MR. MOBERG: On safety shoes, I think that is governed, to a great extent, by company policy and possibly by the job. I think there are certain jobs—well, a man shouldn't be required to work in that kind of a job unless the company did something about providing him with protection. In that case they should pay for the shoes; our company does. There are other cases where they would like to have the man wear shoes. In those cases, if the company feels they want to make

the investment. So, I wouldn't say a company should pay half the cost unless you are putting on some special program, trying to make it a 100 per cent affair or an introductory proposition. If you did it, then you would have to have it understood that it was as an introduction because if you start it, you are going to be expected to carry through.

MR. RUDDICK: I would like to inject another phase to the subject. Nothing has been said today about induction training. In my company, every person, every man, woman, boy and girl who starts with the company goes through a two-hour induction program. They are doubly impressed right then and there with the importance of minor infections and what they mean. That is followed up by the foreman. He has a prescribed routine he must follow in inducting the new employee into the work.

Further, the foreman must train the new employee on the job according to J.I.T. methods. There he injects the safe way of doing the job, and reporting a minor injury is as much a part of doing the job safely as is production.

When it comes to penalties, what do you do?

After you have taken all the other steps, given him all the warnings that any man should expect, if you have educational means and induction program, departmental meetings, foremanship training, and if you have a follow-up on your delayed treatment cases, then give the man three warnings and fire him. But you have to go a long way before you get to that point.

Have your record system show how many delayed treatment cases you have every month and in what departments those delayed treatments are occurring. Put out that report to every department. Send an individual report to the foreman of every man or woman who is a delayed treatment case. Emphasize to the foreman that that is a company rule, that every employee must report a minor injury.

MR. KLEMM: Another question comes from Mr. M. M. Noxon, Ralston Purina Company, Minneapolis. The question is:

"What has been the experience with and what is the opinion of the experts regarding cash bonus for safety records? Are you in favor of these bonuses?"

MR. HAVEN: Having been in this business for twenty or twenty-five years, my personal opinion is that a cash bonus is a vicious thing.

* The representative of a large milk company in New York came to me the other day and wanted to get out from under the bonus system which they had started a number of years ago.

Don't pay a man extra cash for a job he is supposed to do. He gets his reward, which a bonus would be, in his pay envelope.

Don't start a cash bonus system because if you give him \$10 today for being a good boy, next year he will want \$20.

MR. BONNELL (Campbell Soup Company): Is not the foreman or supervisor sometimes paid a bonus for additional production every week or month as an indirect premium, in the premium system?

MR. HAVEN: I think that has to do with an original agreement with this man as part of his salary. It is the same as a sales organization. You get a percentage of sales. That, in a way, is a bonus, but I am talking about a bonus for a good safety record. I don't think that a man should be paid a bonus for having a good safety record. I believe that he should be awarded something. We give awards, sure. We give, for ten years' safe driving, for instance, a Hamilton watch, as you can see by the poster on the board down there. But that is an award, not a reward. It is not a cash reward. We don't believe in cash rewards. It is going to get you into trouble if you ever start.

MR. KLEMM: One of the members, Mr. A. M. Smith, asks:

"There are ten men on each eight-hour shift; six missing from each shift in one twenty-four-hour period; all back the next day; all reported they were sick, but were apparently well the next day. Is this a case for the medical department?"

DR. RUSH: It looks like another case of passing the buck. Every so often they

hand something to the doctor and say, "Tell us 'yes' or 'no' whether this man should work or not." If they were back the next day, they certainly weren't very sick the day before. You are sure there wasn't a ball game or opening of the hunting season, or something else on that particular day?

MR. KLEMM: We have a question from G. Harvey Ward, Plant Protection Section, District No. 3, Sixth Service Command, Army:

"What steps or programs are in effect to check the canners or packers of foods along the lines of protection against accidental or intentional food contamination, other than the regulations and enforcement of local, state or governmental agencies?"

I told Mr. Ward, when he presented this question, I thought he ought to be right up next to this microphone to follow through on that question.

MR. RUDDICK: I heard a statement made in a National Safety Congress meeting a couple of years ago by a member of the United States Public Health Service, to the effect that there never has been a proven case of poisoning from food processed in a canning plant, due to the negligence of the packer. There have been cases where the negligence of the consumer in handling the can or in storing or keeping the can or package has contributed to bacterial growth, to contribute poisoning to the system.

As to the means of checking the canners, I would like to point out that the canners have been the leaders in the field in giving the government the regulations which they so effectively enforce at the present time.

The good canners at present have very modern control practices. They have quality control departments and research departments that are continually exceeding the goals set by the government to improve the regulations.

I believe all the canners in the Food Section of the Council will agree with me that the food regulations set up by the various government departments are exceeded in every respect.

Other processors also have quality control methods and are protecting the public in that manner.

MR. KLEMM: Does that answer your question?

MR. G. HARVEY WARD: Perhaps I didn't ask the question correctly. The question is more on the intentional angle rather than that of quality or processing of the foods.

Being from the War Department, we have occasion to investigate any number of cases in which things have been injected into the foods, principally foreign matter of metallic nature, or glass or something similar.

The War Department is set up, through the Plant Protection Section, to do a certain amount of investigation of those persons who are actually doing the work. That does not include the health angle. It does include the background and history of the person doing the work. Naturally, with the limited force the government employs, a great many of the food packers are not on that list of responsibility.

The question was propounded by my colonel as to what steps, if any, are the food people taking themselves to assist the government in that line, whether or not safety or other departments are making any investigation, health checks or other things of the individuals involved in the actual handling of the food as an assistance to the government.

MR. RUDDICK: I will confess I completely misunderstood the question. Those of us from quality packers just don't quite appreciate the significance of such a question. We have always investigated our people. We have always made quality checks to make sure that there is no intentional or unintentional sabotage going on in the plant.

A great many of us have prohibited the use of paper clips and pins in interdepartmental correspondence, the wearing of badges or buttons or rings or jewelry of any kind with the employees. We have done all sorts of things to increase or improve the quality of the products.

I think a close check by a quality control department would probably be the real answer. I do know that x-ray machines have been used quite effectively in determining foreign objects or foreign material in products. Chemical check, however, determines your moisture content and your various other contents of the package.

The government has assisted greatly in this respect but I think the food packers have been doing a good bit of that for a good many years.

MR. KLEMM: We have another question here:

"How should department personnel be disciplined for talking to the fellow worker? Should the safety director be the 'goat'?"

In elaboration, I think that has to do with operations on dangerous machinery, and departmental people talking with one another. Who should do the disciplining? Should it be the safety director? Should it be a foreman, superintendent? In the case of women, should it be the nurse?

MR. CRAWFORD: I believe it depends entirely on the type of work that is being done. There are a lot of jobs, for example, where management does not object to the workers talking while they are performing their normal operations. I know it is true in our case.

However, taking the second thought expressed by Mr. Klemm, working around dangerous machinery, I think, if it is decided that, for the best interest of the men performing the work that talking should be prohibited, I think that should be decided after discussion with the safety director and the line foreman in charge and then followed through with whatever procedure is adopted.

Let's say, for example, they decide there shouldn't be any talking. If such is the case, it is up to the line supervisor or foreman. I can't see any reason at all why the safety director should be the goat.

MR. KLEMM: George Steel of Ralston Purina Company asks:

"Bi-parting elevator shaftway doors are divided into two parts, the upper half

raising out of sight and the lower half dropping to floor level, the edge forming the threshold between car and floor. These doors are counterbalanced so they move in opposite directions. When the strap hanging from the upper half is pulled, they come together with quite a force. Several times in the past few years, employees have gotten their hands between the doors as they close. The result is a smashed hand. Does anyone have an idea that will prevent this type of injury?"

MR. RUDDICK: I have an idea but I don't know whether it will work. In conjunction with education and training, and having a man to operate the elevator, who is familiar with it, and there all the time, if you must change operators, or if you allow anybody to run the elevator, then do something in addition, and here is the thought: Put a handle on the upper door, alongside the strap where the man's other hand must be placed and put a sign on the door so the operator sees it, which says, "Your hands belong here and not there."

MR. KLEMM: Here is a question by one of the members of the panel. Mr. Ruddick asks:

"Now that pyrethrum is no longer available, is there a safe, effective insecticide on the market which can be used without fear of food contamination?"

MR. WURMAN: If you will write the Department of Agriculture, they will tell you that at the present time there is no substitute.

MR. VICTOR BEIN (Naval Air Station, New Orleans, La.): I am not quoting officially, all this is on my own behalf but the Navy recently sent out a bulletin in which they have found a material to replace pyrethrum. They are experimenting. I am sorry I do not remember the name of that product. I think it is a commercial product.

MR. DEAN M. CLARK (Society of Grain Elevator Superintendents of North America, Chicago, Ill.): Fumigation has been one of my babies for a long time. There is a bulletin put out by the government, Dr. R. T. Cotton, U. S. Bureau of Entomology, Manhattan, Kansas, that

gives the respective killing powder of all the various chemicals and chemical combinations. Ethylene dichloride with dry ice might do; dry ice might take care of your problem alone, providing you have got the chambers in which to operate.

In the grain business there are several combinations that are used; sulfur dioxide and carbon tetrachloride and carbon disulfide, I think, is one of the most widely used. I think if you will get that bulletin from Dr. Cotton you shouldn't have too much trouble.

I appreciate that Pyrethrum is a powder; it is easy to use, you have very little vapor, and all that sort of thing, but I really believe, without much trouble, you can find something that would be even better than what you have used.

MR. WURMAN: In Cuba we used carbon disulfide for years but it is too dangerous. In our other plants, where we have fumigation chambers, we use hydrocyanic gas. That is all right but it takes six months, after you use the gas, to clear out in ventilation rooms, to get that gas out of your cases.

The reason we use Pyrethrum is that you dust it around and, when you are ready to use it, you go ahead and use it. There is no smell or no odor. The reason we are afraid of gas is, after you have used the gas, you are always afraid something is left in.

MR. CLARK: Having been associated with a great number of experiments that have been conducted over the last fifteen years, I would say perhaps CO₂ gas would do it, probably. It is absolutely odorless. It is not harmful to humans. It kills the worm in all four stages. As a matter of fact I will tell you about a little experiment we conducted in a sour, musty bin of rye. We planted the cases of bugs in this 50,000-bushel bin and killed all the bugs. The rye came out clean, sweet and cool.

MR. WURMAN: Will it kill larvae, too?

MR. CLARK: Yes.

MR. KLEMM: This question is: "Is cellulitis ever traumatic?"

DR. RUSH: If they are asking for those suppurative cellulitis cases in which you get an infection with a lot of swelling and a lot of redness and temperature, and all that sort of thing, I would say no. The trauma might be a predisposing factor that might set the stage for a blood-borne infection or something to localize in a certain place. But as far as getting suppurative cellulitis from trauma, I think that doesn't happen. In fact, every contusion, in a way, is a cellulitis because it does set up a certain inflammatory reaction in the subcutaneous tissue. But I am assuming they probably want on this question the so-called suppurative cellulitis which causes a lot of damage and possibly leaves disabilities and things like that, in which case trauma does not cause the cellulitis.

The only thing it could do would be to set the stage, so to say, so that organisms that might be floating around in the blood stream, in that particular individual, might localize in the area and set up an infection.

MR. KLEMM: I have another question here:

"Are eye shields effective? Are they practical? Do shields destroy good eyesight?"

MR. HAVEN: My humble opinion is that putting anything over a man's eyes for any length of time, unless they are fitted to his eyes, would be harmful, although I don't want to go on record on that, but eye shields certainly are effective. There isn't any question about that. We found it so in our plants.

MR. BALTZER: The American Society of Safety Engineers is now trying to promote some research work which will determine the effectiveness of plastic eye shields and plastic face shields. Most safety engineers who have been experimenting with both hard and ground glass goggles and the plastic face shields or eye shields feel that the hardened glass goggles should be used when there is any danger of impact. They give the added resistance that is necessary.

MR. KLEMM: This concludes my part on the program, and I am going to turn the meeting back to Mr. Stevens.

THE CHAIRMAN: It seems to me

this has been one of the most successful panel discussions the Food Section has ever had. I believe all of you will agree that this has been a very beneficial afternoon. I will now turn the meeting over to the General Chairman, Herb Taylor.

... Mr. H. B. Taylor assumed the chair ...

THE CHAIRMAN: My next and last official act is to turn the gavel over to our new Chairman, Clyde Ruddick.

MR. C. C. RUDDICK: We are going to endeavor to make the Food Section, if it is at all possible, bigger and better than ever before. I hope, with the Executive Committee which has been elected with me, to be able to put into practice the many things that we have dreamed about in the past. We made a splendid start, and I hope that we can continue on in the future.

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Chairman, Committee on Education and Training of Ship Personnel—TELFORD KNIGHT, War Shipping Administration, Washington, D. C.

As elected by delegates in Congress Session

TUESDAY AFTERNOON SESSION

October 5, 1943

Presiding: Byron O. Pickard, Chief Safety Engineer, Waterfront Employers Association of the Pacific Coast, San Francisco.

The Security of Vessels in Port

CAPTAIN NORMAN B. HALL

Chief, Port Security Division, U. S. Coast Guard, Washington, D. C.

In order to obtain maximum security and efficiency, the Port Security activities of the Coast Guard have been closely coordinated with the work of other government and private agencies directly or indirectly concerned with similar problems. In Washington we maintain close liaison and cooperation with the Army and Navy, the Department of Justice, the Office of Petroleum Administrator for War and the Office of Civilian Defense, as well as with private agencies such as the National Safety Council, the American Petroleum Institute, the Bureau of Explosives, the National Board of Fire Underwriters, the National Fire Protection Association and others. We have also encouraged the Captains of the Port to coordinate their activities with those of other agencies in the various ports, and in several there have been established formal coordinating committees consisting of representatives of all public and private agencies whose work relates to the protection of ports and shipping. Our object has been to remove all friction and unnecessary duplication; and to insure that all available personnel and facilities are assigned in such manner as to insure their maximum utilization and the optimum security of our ports and vessels.

Security and Efficiency

In instituting port security measures, the Coast Guard has always attempted to balance two factors: the first is the need for thorough and effective port security measures. We have recognized, however, that the need for maximum security must be balanced against another factor, which is the need to maintain the output and efficiency of ports and their facilities at a maximum. Our security measures have been designed to insure a proper balance

between these two factors. Our object has been to attain the maximum possible security, without impairing the operation of our vessel and port facilities.

Today, no person is permitted on a vessel or waterfront facility unless he possesses a Coast Guard identification card. In addition, all operators of waterfront facilities have been urged by the Coast Guard to institute pass systems. A simple yet effective system has been suggested by the Coast Guard and adopted by large numbers of operators.

To prevent persons from approaching waterfront facilities and vessels from the waterside, the Coast Guard has relied upon two measures. First, it has maintained constant small boat patrols of all harbor areas. Secondly, all boats must obtain movement and departure licenses from the Captain of the Port. We have found that the combination of the Coast Guard identification card system and the vessel license system enables us to maintain a substantially effective control of the approach of persons to vital facilities from the waterside, as well as from the land-side.

Combating Fire

Injury to vessels and port facilities may result from accident, negligence or sabotage. Irrespective of the cause, however, the most common and dangerous means of injury is by fire. Realizing the necessity of combating fires, if adequate port security is to be maintained, the Coast Guard has been taking steps to prevent fires and to combat and limit any waterfront fires which may occur. In every port, waterfront facilities have been surveyed by Coast Guard officers to determine the existence of fire hazards. In almost every case, these hazards have been voluntarily

corrected. With this increase in the number and scope of Coast Guard surveys, the existence of fire hazards is rapidly being corrected.

The fighting of waterfront fires has long been handicapped by lack of fireboats in most ports and harbors. In order to correct this need, the Coast Guard now operates a fleet of over 250 fireboats, each with a pumping capacity of over two thousand gallons a minute. It is not the intention of the Coast Guard to relieve local fire-fighting authorities of their responsibilities, but only to work in cooperation with them in the protection of waterfront premises.

Of course, the war has greatly increased the volume of explosives shipped through American ports and supervision of the loading and unloading of explosives is, likewise, a function of the Coast Guard. The Captains of the Port have strictly supervised the loadings, in order to insure that every necessary precaution is taken.

Standardized Regulations

All of the measures of which I have spoken perform the dual purpose of safeguarding our waterfront facilities and safeguarding vessels while in port. But ships, by their very nature, require that certain special protective measures be taken. Prior to January of this year, many agencies had issued regulations for vessels in port, while the Captains of the Port had established local regulations to handle this problem. As a result of these varying and sometimes conflicting regulations, Masters going into the different ports were often confused as to the measures they would be required to take for the protection of their vessels. The Coast Guard, therefore, determined to issue standardized regulations for the protection of vessels in all American ports; and to issue them in such form that Masters would be conversant with the basic security measures they would be required to take.

The regulations for the security of vessels in port have been promulgated under the authority of the so-called Espionage Act which provides criminal penalties for their enforcement. Their

purpose is to insure the safety of vessels in port and they apply to all vessels, foreign and domestic, in all ports of the United States. While they furnish the basic minimum requirements for the security of vessels, it should be noted that, when special circumstances arise, the Captain of the Port may require additional measures to be taken or may waive any of their provisions. I should also like to point out that these regulations do not relieve the masters, owners, operators, or agents of vessels of their primary responsibility for their security but, on the contrary, place upon them the responsibility for carrying out the basic measures required by these regulations.

Summary of Provisions

Let me, briefly, summarize for you a few of the salient provisions of these regulations. First, it should be noted that we divide all vessels into two categories; those which are in service and those which are out-of-service; and different regulations are provided for those in the out-of-service group. Vessels in service are further sub-divided according to their gross tonnage, but most of these regulations are applicable to all vessels over 1,000 gross tons.

All vessels in port, except those out-of-service, are required to maintain at all times a crew of officers and men equivalent to a regular deck and engine room sea watch, not including day men. These officers and men are required to be on the alert and to maintain efficient and continuous watches and inspections. In addition to the members of the crew, additional guards are required. These are of three kinds: ship guards, cargo guards and fire guards, each class performing the type of duty indicated by its title. The types of persons which may act as guards are specified in the regulations and they must be certified and approved by the Captains of the Port. Their necessary equipment and their duties are set forth in detail.

To prevent unauthorized access to vessels, these regulations provide that no person may be permitted aboard unless he possesses: (1) A Coast Guard identification card or other means of identifica-

tion satisfactory to the Captain of the Port; (2) an acceptable pass, issued by the operating company or by the Master of the vessel; and (3) a legitimate reason for being aboard at the time that entrance is sought. It is our view that by preventing unauthorized entrance to vessels, the possibility of injury is substantially mitigated.

In order that a vessel may be prepared for any possible emergency situation that may arise, the regulations provide that steam pressure should be maintained or, if that is not possible, that the ship's fire-fighting system be connected with its shore system and its switchboard connected with a shore source of electric power. In addition, vessels are not permitted to be without means of propulsion for over 24 hours, unless the approval of the Captain of the Port has first been obtained. Decision as to what fires shall be maintained when loading dangerous cargo is made by the Master and the terminal superintendent. Further requirements of these regulations are that mooring lines shall be tended and that emergency towing hawsers shall be available, fore and aft, should it become necessary to move the ship. Requirements are specified for the lighting of vessels and for compliance with blackout and dim out regulations.

Other regulations deal with the control of lighters and vessels alongside, with the removal and disposal of refuse, with supervision of the handling and transfer of cargo, and with prohibitions against the discussion of ship's business and prohibitions against smoking, under specified conditions and in various sections of the ship.

Detailed inspections are required by the ship's officers of the vessel and of shore protection facilities. In this manner, fires and other sources of danger are caught in their incipient stages, while the officers and men charged with the protection of the vessel learn of the available means of combating fire and other possible sources of injury. To further assist in combating any situation which may arise, the Master and Chief Engineer are required to instruct their crews concerning these regulations and the use of available apparatus.

Responsibility for Compliance

The basic responsibility for the compliance with these regulations is placed in the Master, owner, operator, and agent of the vessel. The Coast Guard, however, assists them in every possible way and takes necessary measures to insure that their responsibility is fulfilled. In this connection, Coast Guard inspections are made at frequent intervals and standard inspection reports are completed for each vessel by Captain of the Port personnel and by the personnel of the British Security Co-ordination for British vessels coming under their cognizance. Through these regulations, we have installed a uniform ship security program in all ports and, by these inspections and enforcement, we assure that they are substantially complied with. It is our belief that compliance with these regulations has resulted in safeguarding vessels against dangers of injury resulting from accident, negligence, subversive activities or other causes.

Perhaps I can demonstrate the results of care in the handling of ships and articles going through our ports by giving you a few brief figures concerning explosives. You may have read recently that during the month of July, American and British Air Forces dropped approximately 35,000 tons of explosives upon enemy installations on the continent of Europe. The destructive effect of these you can visualize for yourself. During that same month, over 45,000 tons of explosives were shipped aboard vessels from one American port. Think of the disastrous effect which mishandling of this cargo, so vital to the war effort, would have had upon this port. Yet, through the care which we have exercised in the supervision and protection of this cargo and the ships carrying it, no loss of any kind occurred. That is an example of the effectiveness of our ships' safety measures.

I am sure you all have noticed that the newspaper accounts of the recent bombing raids which our air force have carried out against the Ports of Naples, Genoa, Messina, Tunis, Bizerte and Tripoli have all mentioned that the principal attacks were upon the docks, wharves and shipping in those ports. Earlier in the war, the Nazis blasted Plymouth,

Liverpool and other British ports. Of course, the purpose of these raids was to prevent supplies from being landed or unloaded and to destroy shipping; for the destruction of these waterfront facilities and vessels will as effectively delay or prevent the obtaining of supplies as will the destruction of vessels while in transit. We must bear this lesson in mind and recognize that any injury to our ships in port will, in the same manner, prevent essential supplies from reaching our men abroad and our Allies. Merely because

our harbors are not subject to bombardment, does not mean that we need not protect them from injury resulting from accident, negligence or sabotage. We must take every possible step to protect them from injury from any cause.

The Coast Guard's activities in this field have been such that I can report to you at this time that there has been no serious injury to any vessel in American ports in over a year and a half, since the Coast Guard undertook fulfillment of this responsibility.

Explosives and Military Ammunition on Board Vessels

WILLIAM T. BUTLER

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Safety in transportation of explosives consists of the observance of many minor precautions. In providing safety in the handling and stowage of explosives or ammunition you have but one chance. Therefore, so-called minor precautions in this instance assume the proportions of major precautions. There are three primary elements evaluated equally in the Coast Guard plan of providing safety of cargoes of explosives: sabotage, fire and carelessness.

Sabotage is protected against by prior checking of both personnel and the physical conditions of loading facilities and the vessel. Longshoremen, winchmen, carpenters and their supervisors engaged in handling explosives are required to possess a Coast Guard identification card and an explosives handling permit card. To secure the identification card a person must submit an application setting forth essential personal history and be fingerprinted. This application is carefully checked. The issuance of an explosives handling permit card is predicated upon possession of an identification card and, in addition, the applicant must be sponsored by a stevedoring company or other acceptable authority and must show a knowledge of the art of handling and stowing explosives.

Before a vessel proceeds to an explosives-loading anchorage or pier, it is given a general inspection. The pier receives a

general inspection and military guards are at posts protecting all approaches to the pier. The holds of the vessels are thoroughly searched before commencing to load the cargo of explosives. Each draft of packages is checked both at the railroad car door and upon its arrival in the hold of the vessel. Damaged packages are not permitted to be placed on board a vessel.

The second element, fire, is guarded against by the inspection of the vessel's own facilities, such as its boilers, the condition of the boiler and engine room bilges, operation of galley stoves, the screening of the smoke stack and galley smoke pipe. Rubbish is not permitted to accumulate upon the vessel. Tugs and barges having legitimate business requiring them to come alongside the vessel are checked to be certain their smoke pipes are screened and, in some instances affecting living arrangements on barges, it is required that the fires be doused. Smoking is not permitted and persons are not permitted to have matches or mechanical lighters in their possession. Coast Guard fireboats are oftentimes stationed alongside the vessel or pier. At some explosives-loading terminals, a Coast Guard towboat is stationed in readiness to withdraw a vessel in event of fire occurring on the pier or adjacent thereto; and in a great many instances, portable fire pumping units with

stand-by Coast Guard crews are stationed at these piers.

The third element, carelessness, is difficult to control. Men engaged day after day in handling explosives, although realizing fully the danger in this occupation, lapse into carelessness. Through its explosives-loading details, the Coast Guard protects against this human trait by constantly supervising the handling and stowage of the explosives. Guards comprising the detail are assigned at the railroad car door and on the barges that bring the explosives alongside the vessel. Roving deck guards on the vessel keep a watch to see that watchmen do not get careless. They are required to observe the cargo gear and inspect such gear frequently to guard against failure. It is the duty of the members of this detail to prevent the operation from becoming perfunctory, which is carelessness under another descriptive name.

Coordination

Activities of the Army, Navy and Coast Guard in the transportation of explosives are thoroughly coordinated. Liaison contacts operate daily in an effort to provide maximum security for vessels and ports. Local port and municipal authorities are consulted with reference to application of local ordinances or regulations and in determining policy. Insofar as is practicable, Coast Guard regulations pertaining to explosives are not construed as preventing the enforcement of local regulations, provided such regulations are not inconsistent or in conflict with federal regulations or result in setting-up a hindrance to the prosecution of the war. Uniformity of control between rail, motor vehicle and vessel transportation of explosives is maintained by a close cooperation between the Bureau of Explosives and the Coast Guard.

Explosives and Ammunition as Cargo

Merchant vessels before taking on cargo consisting of explosives are required to:

- (1) Secure a permit from the Captain of the Port. The application for this permit must be accompanied by a manifest of the explosives and other dangerous articles to be loaded on board the vessel and a preliminary cargo stowage plan

showing where it is proposed to stow this cargo.

- (2) Construct the type magazine required by the regulations.
- (3) Remove all debris from magazines, holds in which explosives are to be stowed and from the decks of the vessel.
- (4) Submit the vessel for a general inspection for compliance with the explosives regulations.

After proceeding to the explosives-loading anchorage or pier it is required that:

- (1) The Captain of the Port permit to take on explosives shall be kept available.
- (2) An officer or other person, as required by the regulations, be designated as in charge of the vessel.
- (3) The person in charge of the vessel shall, in company with the Coast Guard officer in charge of the loading detail, inspect the vessel's cargo handling gear and the slings, trays, nets and other equipment furnished by the stevedore.
- (4) The officer in charge of the vessel always shall be available while explosives are being taken on board.

- (5) At the completion of the work period, the officer in charge shall inspect the hold and have all means of ingress closed off, including the covering of hatches with tarpaulins.

The assignment of a Coast Guard detail to supervise the handling and stowage of explosives does not relieve the owner, charterer, agent, master or any other person of his responsibility under the regulations.

Authorized Locations for Loading and Unloading

Merchant vessels are not permitted to take cargoes of explosives on board or to discharge such type of cargoes except at locations authorized for this purpose by the Captain of the Port. There are four types of locations set up for such purposes:

First: Explosive anchorages which are located in remote areas within the harbor. Any type of explosives or ammunition

may be loaded or unloaded in an explosive anchorage.

Second: Explosives-loading piers. These are piers that have been especially constructed for this purpose or existing piers that are sufficiently isolated from all other waterfront facilities as to provide a safe distance separation in event of an explosion occurring. At these explosives-loading piers any type of explosives or ammunition may be loaded or unloaded from a vessel.

Third: Ammunition-loading piers. These are piers selected because of their location apart from vital port facilities and so separated from adjacent structures as to afford maximum protection, calculated in accordance with the risk involved in loading or unloading the particular type of ammunition. At these piers only those types of military ammunition that are specifically permitted by the provisions of the regulations may be loaded on or unloaded from a vessel.

Fourth: Small-arms ammunition loading. Any pier designated by the Captain of the Port may be used for the transfer of small-arms ammunition. Small-arms ammunition is defined as that type of ammunition used in pistols, revolvers, rifles, shot guns, or in machine guns having non-explosive bullets, and usually consists of a paper or metallic cartridge case, the powder charge and bullet being all in one assembly. In designating these loading areas, the Captain of the Port gives consideration to the wishes of local authorities.

Repairs to Vessels Transporting Explosives

A vessel having on board explosives as cargo shall not proceed to a ship repair plant or enter upon a drydock or marine railway or otherwise undertake repairs, except as permitted by the regulations. Essentially, it is provided that no repairs other than emergency repairs to the vessel's main propelling plant or auxiliaries thereto, or the boilers or auxiliaries

thereto shall be undertaken, while having on board any explosives as cargo. It should be noted that the emergency repairs are limited to the extent that the emergency can only involve the vessel's main propelling plant or boilers or their auxiliaries, and it is further limited in that the explosives referred to are on board the vessel as cargo. Welding or cutting operations other than those required by the foregoing emergency repairs may be carried on provided the Captain of the Port issues permission therefor. Exempt from this prohibition are the explosives which may be on board the vessel in the form of ammunition for defensive armament or the required supply of distress signals, rockets, flares, and powder for the ship's Lyle gun. Vessels that have just discharged any cargo consisting of explosives shall not have any repairs undertaken in the holds until all precautions are taken to see that no residue of cargo is left to create a hazard.

Summary

From the point of view of safety of our vessels, security of our essential port facilities and adjacent to our ports, it behooves everyone of us to be safety-minded at all times in the handling and transportation of these highly dangerous types of cargoes. The regulations governing explosives or other dangerous articles on board vessels, especially the section devoted exclusively to the transportation of military explosives and ammunition, were drawn up by the Coast Guard in collaboration with transportation and ordnance personnel of both the Navy and the Army.

It cannot be denied that there may be other safe methods of handling and stowing explosives, but the regulations as outlined in this discussion represent a consensus of opinion and the specific provisions thereof must be observed until they are amended. It is believed that maximum safety and security to vessels and our port facilities so essential to the success of our war effort will be realized, if all concerned observe the spirit and letter of the regulations.

Preparation of Tank Vessels Prior to Alterations or Repairs

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The prevention of personal injuries and damage to property has always been a serious problem in the alterations and repairs of tank vessels. The cleaning of the tank and compartments of a tank vessel and the testing of the atmosphere within these tanks and compartments are technical problems regularly encountered when such vessels are used for transportation of crude petroleum and its products.

Toxic Effect of Petroleum Vapors

Vapors given off by crude petroleum, gasoline and other petroleum products cause anesthetic effects when inhaled and, unless precautions are taken, such effects may be encountered by workers during the cleaning operations.

The toxic effect of gasoline vapors in various degrees of concentration is illustrated by data from the U. S. Bureau of Mines Technical Paper No. 272.

Flammability of Petroleum Vapor-Air Mixtures

Petroleum vapors are highly flammable, and considerable care is required to prevent the occurrence of fires or explosions. When mixed with the proper amounts of air these vapors form explosive mixtures. The explosive mixture range of gasoline in air, for example, is generally accepted to be from 1 to 6 per cent by volume. The lower figure corresponds to the minimum amount and the higher figure to the maximum amount of gasoline vapor capable of producing a flammable mixture. The vapor concentration below which the mixture will not burn is called the "lower explosive limit" and the vapor concentration above which the mixture will not burn is called the "upper explosive limit." For some of the more volatile hydrocarbons, such as commercial propane, the upper explosive limit is 9.5 per cent. The explosive range for natural gas is 4.8 to 13.5 per cent. Although explosive limits have been established definitely for a number of hydrocarbons, it must be remem-

bered that petroleum products seldom are handled as pure hydrocarbons. It is essential, therefore, to consider the lowest and the highest explosive limits of the hydrocarbons of any products or mixtures being handled.

Hydrogen Sulfide

Other gases associated with petroleum products also are toxic if breathed in sufficient quantity. Hydrogen sulfide, the most prominent of these gases, is contained in some crude oils and is present also in some unfinished refinery distillates as a result of reaction at high temperature and pressure. Hydrogen sulfide is harmful, and even fatal, in relatively small concentrations. It is especially hazardous because of its paralytic effect on the sense of smell, making detection by odor impossible. The U. S. Bureau of Mines has found that a concentration of 0.01 per cent in air will produce irritation of the eyes and other physical disturbances upon exposure for two minutes, with increasingly harmful results upon continuous exposure. Exposure for two minutes in a concentration of 0.07 per cent has resulted in death. Hydrogen sulfide also is explosive in concentrations from 4.3 to 46.0 per cent in air.

Oxygen Deficiency

The atmosphere within clean tanks which have been closed tightly for some time is frequently deficient in oxygen due to rusting of the metal of the tanks. Such tanks, therefore, should not be entered until they have been ventilated thoroughly. Normal air contains about 21% oxygen. Air which contains less than 16% will not safely sustain life.

Early Safety Measures

A detailed study of the methods employed prior to 1922 in the cleaning of tanks and compartments of tank vessels and the testing of the atmosphere within these tanks and compartments brought out the fact that too little attention was

paid to cleaning and too much dependence put on the analysis of the atmosphere within the tanks.

It seems desirable to point out two fundamental principles which apparently were not universally recognized prior to 1922. The first is that a certificate of safety is worthless unless the inspector has entered the tank or compartment in question and has examined it carefully for deposits of oil and/or sediment which may generate vapor. Without such an examination, the analysis of the atmosphere means nothing more than that the tank is safe for a man to enter at the time of testing. The practice of taking samples by means of a sampling tube or sampling bottle lowered from the deck seems entirely inadequate, except for preliminary information.

The other fundamental principle is that the maximum permissible content of petroleum vapor is fixed by its effect on men inhaling the atmosphere, rather than by the lower limit of the explosive range. The lower explosive limit of different hydrocarbons varies, but 1.0 per cent is perhaps a representative figure. On the other hand, it is stated that petroleum vapors in concentrations of 0.3 per cent or more are intoxicating to some people on exposure for 30 minutes or longer, so that the actual danger limit is far below the explosive limit. It has been experienced that men are able to work in tanks for indefinite periods when a maximum of 0.2 per cent of petroleum vapor calculated as pentane is enforced as a limit.

Cleaning Procedures

The recommended procedure for cleaning is the Butterworth method in which hot water is applied mechanically by means of special equipment. The personnel employed for cleaning operations has increased to one captain who acts as supervisor, 3 certified chemists, 6 foremen, 5 pump men, 3 timekeepers and a group of casual laborer who are experienced tank cleaners, ranging in number from 50 to 75.

It is impossible to specify arbitrarily that a tank of a given size shall be steamed or machine washed a certain number of hours, since the amount of steaming or washing required varies with the nature

of the oil which was carried last, the atmospheric conditions, and other factors. The intensity and duration of each process rests, therefore, with the judgment of the supervisor and the chemist, and is governed by the conditions and circumstances which necessitate such cleaning.

Butterworth Method

With the Butterworth Method, heated water is directed upon the interior surface of tanks by means of high pressure streams from two revolving nozzles. The nozzles are geared to turn simultaneously and slowly in all planes, horizontal to vertical, so that the water streams from the nozzles are directed upon the entire interior surface of the tank.

As soon as the cargo is pumped out, steam is forced through the heater coils and steam smothering lines. If condensed steam comes through the heater coils clear, indications are that the lines are satisfactory. If steam fails to come through or if the condensate is oily, it is evident that the coil is ruptured and that cleaning is necessary before a certificate can be issued for the compartment in which the questionable coil is located. Smothering lines are steamed for approximately ten minutes. Butterworth machines are next placed in the cargo tanks through special openings or through hatches if the vessel is not equipped with such special openings. Generally two machines are operated at the same time, one in each of two main, wing or summer tanks. The hatch and ullage covers are closed but not dogged down. During the period of washing, which normally take from 1½ to 2 hours per tank, the ship is held at a slight list if necessary to speed the drainage of the tanks to the suction. The cargo pumps are operated slowly to withdraw from the tanks the refuse oil and hot water resulting from the washing operation. For most efficient cleaning operation, the water is heated to a temperature of approximately 175° F. The water is supplied at a pressure of approximately 175 pounds per square inch from the vessel's deck fire lines.

After the tanks have been washed sufficiently, the Butterworth machines are removed and the tanks ventilated by means

of wind sails, Venturi tubes or air blowers lowered into the tanks through the hatch, or by steam gas suckers installed in the ship's deck discharge lines. When the atmosphere within the tanks has cooled sufficiently for men to enter, a sample of it is obtained by means of a sampling tube or sampling bottle lowered from the deck and analyzed for toxic or combustible gases. If the atmosphere is found to contain not more than 0.2 per cent gas by volume, the supervisor in charge of cleaning enters the tanks to make a preliminary survey before men are sent into the tanks with hand hose to wash toward the suction any sediment or scale left in various parts of the tank. Sediment which is not pumped through the suction line is removed manually. A careful watch is maintained over the men doing the work.

Manual Method

When Butterworth machines are not available, the approximate time required for steaming is estimated on the basis of previous cargoes. After the heater lines are blown, the hatch covers and ullage holes are closed but not dogged down. Steam at a line pressure of about 75 pounds is allowed to enter the tank through the smothering lines for the period of time considered necessary to sufficiently soften and loosen oil and sediment on the bulkheads, beams, etc., so as to permit removal with streams of hot water. Upon completion of the steaming, the hatch covers are thrown open and wind sails, air blowers or steam gas suckers are used as described above for purpose of expelling gases and steam. When the tanks have cooled sufficiently, a preliminary test of the atmosphere within is taken.

If the gas content is more than 0.2 per cent by volume, further ventilating or steaming and ventilating are required. If the gas content is 0.2 per cent or less, men equipped with hand hose descend the ladders slowly, washing down the top, sides and beams as they go. The water used for washing is at an approximate temperature of 100° F. and at a pressure of about 50 pounds. A convenient means of supplying hot water for washing is provided by a "Y" connection which intro-

duces steam into a nozzle on the fire line and provides a positive regulation of temperature. A careful watch is maintained from deck for the safety of the men below. When the top, sides and beams have been washed thoroughly, work is commenced on the bottom. Starting at the forward outboard corner of the tank, the oil and sediment are washed toward the suction from which point they are removed to a barge or a slop tank ashore by means of the ship's pumps, which are kept in operation throughout the entire washing period. Any material which is not removed through the suction line is removed manually.

Final Inspection

After all tanks and compartments in question have been washed and cleaned in accordance with either of the above methods, the main pump room, bilges are cleaned. Next, water is pumped through all ship's cargo lines and discharged into the slop line. After pumping for a predetermined period, the water is discharged on deck where it is examined by the chemist, the chief officer and the supervisor in charge of tank cleaning. If the water is clear, the cargo lines are considered to be cleaned. Whenever possible, depending on the shifting of ballast, valves are left open to air out the cargo lines.

The tanks then are entered and inspected by a certified chemist; and, if found to be cleaned to his satisfaction and if the gas content is 0.2 per cent or less, a certificate is issued stating the tanks (reported individually) are either "Safe for Men and Fire" or "Safe for Men—Not Safe for Fire."

Repairs Remote from Cargo Tanks

Whenever a vessel must be dry docked for a survey on account of a seriously damaged bottom or for repairs confined solely to work on the rudder, propeller, tail-shaft or other parts remote from the cargo compartments, such tanks may be smothered with steam and sealed prior to the vessel's arrival in the shipyard. In case it is found necessary to do any work in and/or around any of the tanks, the tanks in question are cleaned by either the Butterworth method or the manual method and certified as heretofore described.

Combustible Gas Indicator

Various types of indicators have been used in the past for the detection of petroleum vapors to insure that the atmosphere is non-toxic and to guard against fires and explosions. All have employed

basic principles, such as diffusion, volume change on combustion, or heat of combustion. Of course, the last type seems most suitable for the petroleum industry because of the wide variety of gases which are likely to be encountered.

*** WEDNESDAY AFTERNOON SESSION**

October 6, 1943

Presiding: W. C. Garbutt, Casualty Manager, Pittsburgh Steamship Co., Cleveland, Ohio.

War-Time River Safety

By JOHN E. JULI
Safety Supervisor, Dravo Corp., Pittsburgh, Pa.

The growth of river transportation has brought about the necessity for a large scale safety program and this need has been met by various agencies. The safety problems are unique, inasmuch as they deal with the vagaries of nature.

Success in the operation of river fleets must be attributed in a good measure to the outstanding work of the U. S. Engineers. Rivers must be made safe for navigation and we regard this agency with deep respect for the good they have accomplished. They have performed a yeoman service in dredging, clearing rivers of obstructions, construction of locks, dams, inspection of boats and safety equipment, reports on river stages and many other features that tie in so vitally with the successful and safe operation of river fleets.

The U. S. Coast Guard now patrols all the rivers on a 24-hour basis and their work in preventing sabotage and making periodic inspections of crews of the towboats has been a valuable help in the plant security and safe operation of all war plants situated along the river.

With the aid of these two agencies, it remains for the individual operator to cooperate to the fullest extent.

If you were privileged to go aboard a towboat, you would be impressed with the appearance of the interior. The towboat serves a dual purpose in providing a place to work and also a place to live. The engine rooms are well maintained and

kept spotless. All machinery is painted in a three-dimensional scheme, which is a forward step in safety, as well as enhancing the working conditions. The living quarters of the crew, the stairways, the pilot house and the most remote corner of the boat are clean and well-lighted. The skipper and his crew take great pride in their housekeeping. There is a keen rivalry between the crews of the various fleets, and they do everything in their power to make the boat and their quarters a pleasant place in which to live.

The skipper of the boat is the executive officer and he is assisted by licensed pilots who must know the river throughout its length. The skipper spends considerable time in making up his tow in a safe manner, eliminating as many duck ponds and notches as possible, thereby creating safer working conditions.

The successful operations of a fleet depends on the proper type of employees hired. This is quite a problem, due to the number of river men leaving for other employment. A skipper of a boat attempts to hire a man who has spent part of his life near the river. The man must pass the physical requirements of the Medical Department before he is permitted to report for work. He then is placed in charge of an experienced man—the mate or engineer. Various hazards in operation are pointed out to him and he receives careful instructions on safe practices on boats. He attends safety zone

meetings which are held at the end of each trip, if possible, at which time many river problems are discussed and remedied. We make good use of slide sound films at these meetings, because we firmly believe that visual education is an outstanding feature in the success of any accident prevention program.

Because of the limited medical facilities, first aid training is given to members of the crew. A large percentage of our men and women have completed the American Red Cross and the U. S. Bureau of Mines course in first aid. Life saving, fire and safety drills are held aboard the boat to better acquaint the crew with the

proper thing to do in an emergency. Members of the crew are reminded on the use of Kapok life vests in working on or over the water. When you consider the hazards connected with river work, such as fogs and floods, it is extremely important that a man receive as much training as possible.

Safety plays such an important part in the war effort that everything possible should be done by the safety engineer to continue the safe operation of this means of transportation in order that it might continue to play its full part in the successful conclusion of the conflict in which we are now engaged.

Objective Statistics Plot Our Course

By A. H. SCHRODER
Safety Director, Freeport Sulphur Company, Port Sulphur, Louisiana

By objective statistics we mean those statistics which break down the accident into all of its major and contributive causes and furnish us with a detail of the background of the incident. This complete breakdown is a monotonous detail but is productive of much information for the safety director. The detail of the information uncovered is hardly that which would be furnished to management and work supervisors, but the conclusions reached through this medium are definite and should be used in steering the safety program in its entirety.

In 1938, it being desirable to pursue a more objective program of safety work, and effort toward a complete statistical breakdown on accidents was made by our company. Information made available by means of these figures was used in the direction of work supervisors in their accident prevention efforts and served as a guide for safety inspections and committees. A point of particular interest in these figures for the pre-war years is their consistency; all curves followed a definite pattern and gave positive information for continued objective work. During 1941 a trend of change was detected, and 1942 showed considerable divergence which is continuing during 1943.

Accident Causes Changing

An attempt to recommend steps to

correct the conditions which obtain in the changing picture of accident causes will not be made here, as all of us are familiar with the steps necessary for accident prevention. It is essential, though, that we be aware that the picture is changing, so that we may accent those parts of our program which tend to correct the new angles that may be uncovered by a complete analysis. The analysis sheet of the Standard Injury Reporting System, obtainable from the National Safety Council, is an excellent starting point for a program of breakdown for cause.

There exists today a distinct need for safety directors to be able to make an exact comparison of present day accidents to pre-war experience, in order that trends in the causes may be uncovered and corrections made in programs for continued effective prosecution. The factors which, when loaded statistically, are of particular importance are: occupation, agency of injury, mechanical cause, what employee was doing, type of accident, location of injury, character of injury, age, seniority, hour of injury, day of week, etc. Comparison of curves on occupations reveals an increase in the number of accidents suffered by skilled journeymen, foremen and operators. This increase is most serious now that skilled men are at a premium and should give us

particular concern. Increased overtime work, the higher pressure of work today and worry undoubtedly contribute to this condition.

Mechanical Equipment Should Be Thoroughly Inspected

A review of figures covering the agency of injury reveals that the activities of inspecting safety committees should be concentrated on mechanical equipment which in the rush of present activities is not receiving the servicing and maintenance it did during the pre-war years. Lack of overhaul of hoists and similar equipment is a point for concern for safety director. An increase is noted in the purely mechanical causes, the factor which is largely attributable to the failure of equipment; whereas, in the pre-war years, a greater percentage of accidents was due to personal fault. The type of accident is also greatly affected by the mechanical factors. The character of injuries suffered is changing as older men are becoming more numerous in the more hazardous occupations. We are suffering today an alarming increase in fractures and severe back strains, which must be blamed on the increased age of employees. Where a younger man would suffer little injury in an accident, it will be found older men suffer an increase in the number of fractures and severe strains. However, the conclusion reached is that although the older men suffer more severe injuries their over-all frequency of injuries is lower.

The use of the hour of injury factor for detection of fatigue showed a distinct change when compared to the pre-war years. Accidents in the pre-war years had two approximately even peaks, morning and evening. The change appears to be a flattening of the morning peak and a distinct increase in the evening, which could also be attributed to the advanced age of labor.

Need for Cause Coding

In our search for means to wage an effective fight against the rising toll of industrial accidents too few of us have taken the time and trouble to build our program structure on the solid rock of

cause coding. We can uncover any factor needed for program guidance through this medium. Accident statistics mean to many safety directors, even those of many years' experience, simply a record of the number of lost-time injuries and the number of days lost. Cause coding is the objective type of statistical effort which enables us to give positive direction to those who must do the actual preventive work. Foremen and supervisors have production jobs which need full-time attention and can hardly be expected to give to their accident problems the time needed for a complete breakdown for cause; nor can they be expected to have the skill, openmindedness and training necessary for an accurate analysis. This is the primary responsibility of the safety director.

Seemingly, it would not be entirely conjectural to conclude that the greatest fundamental difference between the small groups with their comparatively had experience, together with the larger employers who do not enjoy a good experience, and the industrial plants which have continually been successful in their accident prevention work lies in their inability to accurately forecast where, when, and how their accidents will occur. Knowledge of this nature can be derived only from complete cause coding. Management, when furnished with concrete recommendations, backed with definite cause data, can usually be depended on to take steps in the right direction. We must, however, be in a position to prove our contentions.

Analysis Is Essential

The conclusion reached is that an analysis of accident details is most important in the direction of safety work. It is the only sure guide to objective and positive prosecution; and information gathered is of continued use in after years when charted to show trends and disclose the need for positive revision in program detail. Our war years show a definite trend of change in type, age, character, severity, etc. Unless we are in a position to get this information from reliable statistics, we cannot make the needed changes and be certain of results. Certainly, objective statistics plot our course.

Safety Aboard a Lake Freighter

JOHN W. MCGIFFIN

Supt. of Safety, Canada Steamship Lines, Ltd., Montreal, P. Q., Canada

The safety department of the Canada Steamship Lines was organized in 1938. A survey was made of past accident records and the management was amazed at the number of personal injuries which had occurred each operating season; but more amazed at the sums of money that had been paid out for medical aid, hospitalization and compensation. Since the organization of the safety department our annual costs attributable to personal injuries have been reduced on an average of 66% and the first year showed a reduction of 75%. Safety has paid wonderful dividends to the company in the financial sense, as well as giving great satisfaction from a humanitarian viewpoint.

With all lake freighters being built on the same general principles, a hazard which exists on any one vessel is likely to be common to them all. This entails great difficulty, as well as quite an expenditure, in getting all hazards corrected as speedily as possible. In our case, with our head office in Montreal and our vessels operating all over the lakes, a great deal must be handled by correspondence or by a heavy program of travel.

A survey of past accidents shows that the causes of personal injuries on lake freighters break down generally as follows:

1. Falls.
2. Eye injuries.
3. Handling mooring wires.
4. Handling hatch covers or strongbacks.
5. Handling gangplanks and toeplates on package freighters.
6. Working around engines.
7. Galley accidents.

To eliminate falls all ladders leading to engine room are regularly checked. Any that are found to be too steep are removed and replaced by stairways of the proper angle with standard risers and treads. The same procedure is followed for ladders leading to the bow deck from the spar deck.

Ladders into cargo holds are kept in constant state of repair. Damaged or missing rungs are replaced as rapidly as possible. On bulk carriers these ladders are a real source of danger as they are easily damaged by unloading buckets and must be watched most carefully. The same precautions are taken with all other ladders that are found on a laker.

Good housekeeping on board ship is considered of paramount importance in connection with the prevention of personal injuries due to slipping and falling. Decks must be maintained in a neat and ship-shape manner. Leaking packing glands on deck winches make for a slippery deck, especially as the fall weather approaches with its freezing temperatures.

One of the most essential requirements for the avoidance of accidents due to falls aboard ship is good lighting of passageways, holds, storerooms and other enclosed spaces. Lighting is provided to reflect dock hazards, and all such hazards are painted white to serve as a danger signal. We also cover mooring wires with pieces of split hose painted white, and after dark a red lantern is placed beside them. The split hose serves two useful purposes. First, it protects clothing from grease that always covers the lines and secondly, calls the attention of the unwary to the hazard.

Handling hatch covers and strongbacks is another fruitful source of personal injury. A man should never be allowed to go upon the fore and aft beams or thwartship beams of a hatch for the purpose of adjusting the gear for removing them. The removal of hatch covers and strongbacks should always be under the supervision of a deck officer or other competent person. After hatch covers and tarpaulins are in place, members of the crew not be allowed to walk over them.

Eye injuries can be almost completely controlled on lake steamers by the use of goggles; their use is indicated in chipping and scraping, when boiler tubes are

being blown, combustion chamber cleaned, boilers or fires cleaned, and many other instances. We are very strict regarding eye injuries and goggles are considered by crew members as an integral part of their working clothes.

Our safety program starts with having a doctor on a retainer at practically every port of call on the Canadian side of the lakes. In other words, a steamer is never more than about ten hours from a doctor. We do not have compulsory physical examinations, but leave it to the discretion of the master and chief engineer to see that men who are physically unfit are not engaged.

The master and chief engineer also see that every man supplies himself with the proper clothing. If necessary, advances are given so that men can properly equip themselves. Crew members must have a serviceable pair of boots. The wearing of slippers or sneakers is not tolerated. Serviceable gloves are also required for certain jobs. Inspection of all crew members is made regularly by the master to see that boots are properly laced. This precaution has more than proven its worth in the reduction in the number of sprained ankles on the part of the forward crew and burned feet on the part of the firemen. The inspection also looks for sloppy apparel that might catch in moving machinery and the advantages of close fitting garments are impressed upon crew members.

From this point on the safety program is under the guidance of the first mate and 2nd engineer. This has worked very successfully and their safety record is discussed along with other qualifications when they are considered for promotion. Green men and older hands alike are regularly coached on the safe way to perform the various jobs on shipboard. Safety meetings are held once a month under the guidance of the master.

Interest in safety is maintained by our merit flag competition. This contest originated in 1939, and interest has increased each year. Monthly bulletins of steamer standings are issued, and I am pleased to say that we have eleven steamers that have yet to report a lost time injury since the contest started. These vessels have

each operated over one thousand accident free days. From this you can see that the competition has been very keen.

I would now like to draw your attention to what was once the greatest single cause of fatalities on our lake fleet, especially ships of canal zone. As you are aware, a lake vessel in the course of a season will make a great many docks and canal locks. Much of this is done at night, and each docking and locking through the St. Lawrence canal system entails putting at least three men rapidly ashore, in order to take the lines. In the past this had been accomplished by means of a "monkey line." This "monkey line" was well named, as a deckhand required great personal strength and the agility of a monkey if he were to land safely. The old time landing boom was about fifteen to twenty feet in length and swung outwards from the spar deck. At the end of the boom was the "monkey line," a rope, the length of which depended upon the steamers draft and the height of the dock the men were to be landed upon. At regular intervals in this rope were knots to prevent a man sliding down the rope too rapidly after he was swung out over the intervening water between the ship side and the dock. In many cases, these knots only served to break the deckhand's grip as he hung suspended, and many fatalities occurred because men swung out too soon, lost their grip and dropped into the water to drown or he crashed between the ship and the dock.

The new method of using the landing boom puts the responsibility for the safety of the men to be put ashore squarely on the deck officer on watch at the time. All landing booms today must be at least twenty-eight feet long. This boom is supported by and braced to a revolving upright, extending from the spar deck to the bow deck. On the revolving upright at arm level on the bow deck is a handle for swinging the boom. This is operated by the deck officer on watch at the time. The "monkey line" has been replaced by a 3/4 inch manilla line which runs along the underside of the boom and passes through a block at both ends of the boom. To the outboard end of the line is attached an 18 inch metal rod which supports a wooden seat. The metal rod enables the

man after landing to quickly flip seat out from between his legs. The inboard end of the line passes through a block then over a cleat. Several turns of the line are always taken around the cleat.

On the end of each landing boom a light has been installed, the rays of which are directed downward and brightly illuminate the surface on which the deck hands have to land. Since putting these rules into effect in 1938, the most serious accident reported to date has been a sprained ankle.

You all know that the success of safety work depends upon the support received from company management, and in this

regard I would like to say that the interest and support of our management has been excellent.

Safety aboard a lake freighter is a broad subject, but possibly you are now aware of some of the problems with which we are confronted each operating season.

With lake freighters performing such an important role in the transportation system of both the United States and Canada, it is imperative that the present manpower shortage is not aggravated by avoidable personal injuries. This challenge is being met. Lake freighters are carrying record cargoes of ore and coal cargoes vital to our war program.

THURSDAY AFTERNOON SESSION

October 7, 1943

Presiding: D. L. Hartnett, Regional Safety Consultant, U. S. Maritime Commission, Philadelphia, Pa.

The Control of Fumes in Shipyards

WILLIAM E. LAWRENCE

Safety Engineer, New York Shipbuilding Corp., Camden, N. J.

Many articles have been published on this subject, including miles of statistics; however, I am sure that every shipyard in this country today has acquired knowledge through experience and information unselfishly passed on by pioneers in ship welding until it is assumed that everyone knows the most satisfactory fume elimination is that of ventilation by exhaustion.

Extensive experiment during the past decade with different types of equipment proved that the surest method was to remove the trouble at its source. Blowers and exhausting devices were developed accordingly, with satisfactory results. Respirators fitted with metal fume filters will give some protection when fume concentrations are low.

In common with other shipyards and heavy industries, much care is being exercised by plant medical staffs in routine re-checks and re-examinations of workers exposed to welding fumes. In so far as we know, we still can honestly state that we have not had one case of lasting or per-

manent ill effect to anyone associated with welding, tacking, burning or heating.

New Method and Precautions

You may be interested to hear of a development new to us at our plant. It may be new to some of you also. I refer to carbon arc burning in connection with smoothing off the large countersunk heads of tap bolts in armor plate decks. These heads were formerly chipped and ground off flush with the deck plates. This was a long, tiresome, rough and costly job. By the use of the carbon arc, they are burned off so that only a small amount of grinding is necessary, thus cutting the time and labor to a minimum. (5/16" carbon, 400 amps., 7000° F.)

Of course, the fume and dust hazard had to receive special consideration. This was accomplished by the use of a compressed air jet, which blows the slag and carbon residue into exhaust funnels located at the ends of two 3" metallic flexible tubes with powerful portable ex-

hausters at the outlet ends of these same tubes. This equipment is skidded easily along the deck as required and is kept close to the job at all times, even eliminating the necessity for the use of respirators.

Seasonal Hazards

Many other fumes must be controlled in shipyards. One of the seasonal hazards in our own plant will have to receive attention before the advent of cold weather, which is just around the corner. Men will build fires in any kind of a receptacle in spite of safety men and supervision, and will use fuel, such as charcoal or coke, without stopping to realize the danger involved and the necessity for proper ventilation. The resulting carbon dioxide and carbon monoxide gases are both deadly and create oxygen deficiencies.

We recently issued a notice in connection with this hazard and posted it conspicuously. It stated that if any fire pots were found on ship contracts, plant protection men should immediately contact a safety inspector and be governed by his decision as to the removal of same.

Fumes From Fires

I think we should mention the danger of fumes from fires in ships on the ways, while under construction, and in the water after launching. Many of the fires may be trivial but there is always the possibility of men being trapped by smoke and toxic fumes and unable to get out from below decks. This is when the trained safety inspector or a good watch force man comes into the picture. He must quickly don a mask, hook on a life rope and go down to make sure everyone is out. He must be followed as closely as possible by another man with a powerful electric lamp. If any deficiency of oxygen is suspected, an oxygen breathing mask must be worn. Ventilation must be provided at once, smoke and fumes must be exhausted and a fresh supply of air blown in.

Much could be added about the maximum allowable concentration for carbon monoxide and carbon dioxide, but the main point to remember is that carbon monoxide is the number one poison killer, both in industrial and non-occupational

life, following close upon auto accidents as a cause of death. It is true that wherever there is smoke you may suspect carbon monoxide.

By all means take no chances. Don't wait for a chemist's report on the samples of air from suspected areas. Ventilate! Constant alertness on the part of watch force men and safety inspectors is an absolute necessity to combat such hazards. The education of the men by their supervisors and the use of warning posters is recommended, but above all, ventilation by exhaustion and the introduction of a fresh supply of air is imperative under these dangerous conditions. Several narrow escapes from death have been experienced in shipbuilding due to the thoughtlessness of the men and not because of ignorance. They forget to think.

Insulation Materials

The use of insulation cement, if it contains toxic solvents such as carbon tetrachloride, is a menace to workmen unless precautions are taken to properly safeguard them under such hazardous conditions. A large shipyard recently experienced such conditions which were brought to the attention of the plant health committee and the management. The result was that the entire supply was re-distilled and a substitute safe solvent provided, thus eliminating the hazard without loss of material. This demonstrates again that careful planning will assure safety with production, always a winning pair.

The use of water repellent asbestos insulation has recently replaced some types of material formerly used in ship work. For protection against dust or possible asbestosis from such material, it is recommended that both on ships and in shops, or where the material is prepared, it be dampened and that dust respirators be worn, also that special ventilation be provided. Periodic medical examination of those exposed to such hazards is also necessary.

Sand Blasting and Plating

Sand blasting and shot blasting, with its silicosis hazard, can be done safely if provision is made for standard sand blast rooms or cabinets. Special ventila-

tion must be provided, with frequent inspections of all equipment by an experienced safety inspector or supervisor. This check-up must never be neglected.

Regular periodic examinations, including X-rays, are mandatory. The least suspicion of a leaking face piece can be easily detected by the operator and should be reported at once to the safety department for immediate correction. If an operator begins to eat sand, he will realize at once that his equipment is not safe.

Fumes and dust from friction saws in shops are easily removed by proper exhaust ventilation and should be carried by ducts from the machine to dust collectors out of the shops if possible.

Plating room fumes, with modern ventilating systems now available, are no longer a problem in any up to date shipyard. A few years ago, however, a different story could be told.

Recent changes in painting specifications on naval vessels have provided for the use of zinc chromate which, although perhaps not particularly toxic, must be considered when sprayed in small compartments. Respirators are advocated along with safe ventilation. When working in large shops where large plates are sprayed, after they are placed in racks from the pickling tanks, the use of air line respirators is recommended, as these areas are too large for efficient exhaust ventilation. However, crane operators handling material in such locations, especially above pickling tanks, should be provided with respirators. Fans may be placed in the crane cabs to blow fumes and vapor away from the operators.

Protection must be furnished for any job in which dust fumes or smoke from any substance containing lead is breathed daily, for example; when welding, cutting, burning, shrinking or straightening where material is metal, coated with paint containing lead. Special ventilation, using local exhaust hoods or tubing kept not less than 8" from the job and drawing 200 c.f.m. discharged where the contaminated air will not be breathed, is satisfactory.

In ship construction two types of ventilation are used, local exhaust to remove

fumes at the point of origin and general ventilation to supply fresh air to confined working spaces.

Lacquer spraying, if done in approved booths, properly ventilated, presents no greater problem. When cleaning compounds are being used, chemical cartridge respirators will give protection if concentrations are low.

The use of proper extinguishers on different type fires must be considered. Fumes from the use of the wrong ones may cause the death of persons improperly instructed. Periodic demonstrations by those responsible should be made for the benefit of firemen, watch force men, and safety inspectors. The use of instructive posters and bulletins is also advised.

Fumigation of refrigerator spaces in ships practically ready for delivery is important. Precautions must be taken to safeguard men whose duty it is to open and ventilate such spaces after fumigation. They must wear all-service gas masks while installing temporary ventilation equipment and, if a deficiency of oxygen is suspected, an oxygen breathing apparatus must be used.

Cooperation of Management and Employees

An important item in ventilation of ships under construction is to impress management with the necessity for co-operative planning by the engineering department and drawing rooms for the early installation of as much of the ships permanent ventilation system as possible, especially in engine and boiler rooms. Present construction of naval vessels practically prohibits the use of temporary ventilation units, due to the inaccessibility of such spaces and the impossibility of bringing in fresh air, especially after they are closed in.

The importance of the availability of trained ventilation men must be considered. Their services are vital in the avoidance of delays in maintaining continuous production. The elimination of fumes by their alertness to such hazards and inconveniences will help to minimize absenteeism and assure delivery of ships ahead of schedule, thus assuring a quicker victory.

We must not forget the importance of organized first aid crews trained in the use of inhalators, resuscitators and approved methods of artificial respiration. These crews with portable emergency equipment must be available and ready to act at a moment's notice.

Perhaps one of the most important methods of impressing employees, especially new ones, with the idea of danger from respiratory and other hazards is through safety instruction in orientation classes before they start to work. This is being done in many industrial plants with marked success. We believe that such a

program will be of vital interest to those who have had no previous shipyard experience.

Before closing I want to mention the ventilation standards as recommended in the U. S. Navy Department—U. S. Maritime Commission, "Safety and Industrial Health Manual in Contract Shipyards" a recent issue, and the "1021 Answers to Industrial Health and Safety Problems" published this year by Occupational Hazards, Inc. They are most helpful and timely publications and should be available to everyone connected with safety programs in any industry.

Crane Safety

LIEUT. COMDR. L. F. KENGLE, U.S.N. (Ret)

A survey of the information at hand on crane safety shows that there is a wealth of material on this serious subject. It has been exhaustively studied and reported. As you know, standards of safety have been set up by the American Society of Mechanical Engineers, by the Bureau of Yards and Docks of the Navy Department, by the National Safety Council, by the American Standards Association, by the states in their Industrial Accident Commissions and by the insurance carriers for private concerns. It should be apparent then, that since these extensive standards cover the design of the structure and the safety of the mechanical equipment and protective devices, cranes may be acquired, redesigned and overhauled with a maximum of assurance that from the items of design every known hazard to health and safety will be eliminated.

Criticism of Present Rules

From the above sources there may also be gained a well-rounded set of rules covering inspection and test. Not only is this information available from these sources, but methods of reporting, checking and inspection can be set up, so that positive assurance may be had that these minimum standards will be maintained throughout the life of the equipment. These rules cover the vast majority of all crane operations. The only criticisms that

may be leveled at these rules are: First, in the simplification of the rules so they may be easily understood by all operators; secondly, in the adequacy of the rules to cover all incidents; third, in the standardization of the equipment used; and, fourth, in providing weight indicators to supplement on the part of the operators.

It requires judgment to make the rules fit into one's own crane problems. It is recommended that they be perused thoroughly, so that sets of rules and instructions may be made out for each activity with extraneous material eliminated from the instruction books issued to the operating personnel.

Basis for Discipline

We find it is better to base your discipline on a violation of a rule rather than upon an incident. This establishes in the minds of the operating personnel a realization of the significance of a published rule or regulation. Although the violation of a rule may not result in an accident, the continued violation of a published rule will eventually lead to a serious incident. After an incident of serious nature, its effect has a disciplinary aspect. If the rules are adequate, concise, and understandable and are complied with by personnel, no incident can occur.

I believe that if we will check all of our

crane accidents we will come to the conclusion that there existed an error in judgment on the part of the operator or rigger, or both.

Judgment Based On Training and Experience

It has been said that judgment is based upon training and experience. How much training it takes to overbalance the lack of experience and how much experience it takes to mature training varies with the individual. In order to bring these two items into phase, we have established certain rules in our activity. First is a semi-annual physical examination for all crane operators in which muscular coordination is checked and vision made a specific requirement. This is particularly essential in assuring ourselves that every crane operator has depth perception.

I believe the next step should be to establish in the minds of every operator the sincere interest management has in accident prevention. This must be established before you can expect them to take your rules and regulations seriously and it does not become a popular thing with the operators to break the rules.

It is recommended in some crane specifications that all levers be so arranged that they will move in the direction in which the crane load moves. This should be elaborated upon so they will be placed in every piece of equipment in the same relation to each other. This is borne out by an experience we had in one among sixty locomotive cranes, in which the throttles were opened with forward and backward movement of the throttle lever. This contributed to a minor incident where, in an emergency, an operator accustomed to a forward moving throttle was operating a locomotive crane with a throttle operating by opposite motion and by habit opened instead of closed his throttle.

Neatness and Organization

The cleanliness, neatness and organization in shops and throughout the yard where crane operations are carried on leads to cleanliness in crane cabs. Careful attention to making the access ladders meet with all of the standard safety re-

quirements impresses upon the operator the item of safely going to and from his work. At every crane access ladder and every operating crane cab, we have provided two small signs: one illustrating the standard crane signals with the notice that these are the signals to be recognized and obeyed, and the other sign is a short set of safety rules.

Crane operators are required to relieve each other at levels other than the crane itself and the crane energy must be removed before leaving the cab. A careful inspection is to be made by the relieving operator after relieving. He is impressed continually with the rule that he is to accept signals from a single individual, the rigger in charge of the operation, and in the case of locomotive cranes, that he is not to move his crane until the crane pilot or safety man has cleared him, is present and aware of his responsibility. These we recommend as essential in the establishing of safe habits.

Fire extinguisher equipment is maintained in the cab and is regularly inspected. To prevent panic in event of power failure, aerial bombing, or fire, every overhead crane is provided with a knotted rope, well secured in the cab, so that every operator may abandon his crane in any of the above events.

Inspections

Our crane inspections are complete and periodic and careful records are made. Both the rigger in charge and the crane operator make reports to a relief of every extreme strain and this is also reported by memorandum to the responsible authority. The management's concern for this is such that the responsible seniors respect these reports and subject the equipment to a rigid inspection and test, if indicated, for every reported incident.

Weight Indicators Used

We are using a hydromatic weight indicator that can be put in the dead end of all boom crane lifting cables, matched up with a boom length indicator of rigid construction. These weight indicators were bought at a cost of \$500 each. These were so successful and were so readily accepted by the operators that the manufacturer

*WILSON PALMER, United Shoe Machinery Corp., Beverly, Mass.

*PHILIP G. RHOADS, J. E. Rhoads & Sons, Wilmington, Del.

*H. G. SCHAFFNER, Schaffner Bros. Co., Erie, Pa.

FAYETTE SHERMAN, George A. Hormel & Co., Austin, Minn.

C. R. SIMS, American Oak Leather Co., Cincinnati, Ohio.

*Past General Chairman

ERROR: ioerror
OFFENDING COMMAND: imagemask

STACK:

-dictionary-

Microsoft(R) Windows 98

Document: ACDSee 32 print job

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Date and Time: Tuesday, October 03, 2000 3:07:15 AM

B. Psychology as an Aid to the Foreman

H. C. TAYLOR

Employment Mgr., Western Electric Co., Chicago

I. Introduction

In coming here to discuss psychology as an aid to the foreman, it would be presumptuous to imply that much of what we may say will be either new or startling to you, for if we define psychology as the study of human nature, it is clear that any human being who deals with human nature must in some sense be a psychologist. Most especially it is a large part of the foreman's job to deal with human nature, and he is thus forced to become a psychologist, in this practical every day sense. The successful life insurance salesman who makes the "Million Dollar Round Table," the successful politician and the successful supervisor must all be successful in part because of their ability to deal intelligently with human nature.

It has not, then, been the contribution of scientific psychology to discover any startling ways to deal with human nature which were unknown to the successful practical handlers of men. That contribution has been rather in the laborious observation of these successful dealers with human nature and in the careful recording of what works and what doesn't work—the sifting of the truths from the half truths and the falsehoods in the common lore of mankind. Despite the core of truth in our common knowledge of humanity, our every-day beliefs about human nature are actually full of contradictions, as is well illustrated by many of our proverbs. For example, "out of sight, out of mind" sounds true enough until we remember that "absence makes the heart grow fonder." "Look before you leap" seems to be a worthy precept until we recall that it is also said that "he who hesitates is lost."

The point is that the expert handlers of men are not always expert in pinning down just what it is they do that works; and it has been the task of the students of human nature to observe, record, and summarize the formulas of success in dealing with people.

Let us examine a few of the recently emphasized principles of dealing with people, with full recognition that in the main these principles are familiar to all of us, but with the hope that their repetition may be of

some help in carrying out the major responsibility of all of us: that of dealing capably with the human problems that confront us as supervisors.

In choosing the particular items we are to discuss, I have not attempted to make an outline which would provide thorough coverage of the supervisor's job from the psychological standpoint. They have been chosen almost entirely because they seemed individually to be important and because it seemed possible to say something about these matters which might give them a new emphasis in our thinking.

You will note also that in the choice of items to be discussed, there has been no effort to point them specifically toward the problem of safety. The fact is that the psychology of human nature does not suddenly change when the problem is one of safety. The procedures which are useful in dealing with human nature are about the same, whether we are thinking of safety, wages, promotions, efficiency, or any other matter in which the foreman may find it necessary to take account of the characteristics of people.

II. Why People Work

One of the most frequently discussed topics in industrial psychology is that of "motivation." There has been much arm-chair speculation and considerable scientific study of the factors that lead people to work and which stimulate them to work effectively. I suppose we are all tempted to dismiss the whole topic of motivation to work by citing the obvious fact that "most people work because they have to." But beyond the level at which people will work because they have to, there are, of course, much higher levels to which they can be stimulated by having additional reasons for good performance. We shall not attempt to cover the field of motivation exhaustively, but there is one factor that has received much recent emphasis that may be worth some discussion. That is that *perhaps the most important thing that a worker wants from his job and his company is a "sense of belonging."*

Not so many years ago in our discussions

of the factors affecting efficiency and morale at work, we used to talk a great deal about the physical conditions of work. There were studies of the effects of illumination, ventilation, temperature, hours per day, days per week, and rest periods on the efficiency and morale of workers. There is no doubt that these factors were of some importance. Nearly all studies of these matters, wherever conditions could be controlled sufficiently to warrant any conclusions at all, showed that there are "optimum points" with respect to such variables, at which points efficiency tends to be at a maximum. However, possibly the most striking finding of these studies has been the discovery of the power of the human organism to adjust to conditions and to perform with good efficiency even under relatively adverse circumstances, provided only that the will to do the job is present.

It is evident that as distinguished from the physical factors just enumerated, psychological and sociological influences are vastly more powerful in determining the extent to which people can function with effectiveness and satisfaction on their jobs. Among these factors, none is more powerful in its effect on people's behavior than what we have referred to as the "sense of belonging." In a broad sense, the "sense of belonging" pertains not only to man's work situation, but also to his position in the entire community in which he lives. This sense of belonging is illustrated perhaps more by our sentiments toward our home town by our attitudes toward any other matter. Those who do not develop a feeling of participation in their communities, a feeling of being "at home" with their fellow-residents of the community, tend to become the unconventional people, the non-conformists, the maladjusted ones, the ones who are "out of tune" with the world in which they live.

The sense of belonging is equally important in determining a man's effectiveness at work. If he refers to the company as "we," if he identifies himself with the organization in which he works, if that organization is a part of him and he feels he is a part of it, a great deal of the basis for effective performance is present. If, on the other hand, he thinks of the company as "they," his interest in performing his job to the best of his ability is probably not deep enough to motivate him to put forth his best efforts.

As we look at the phenomenal success on the firm of Jack and Heintz, we are struck chiefly by the extent to which the employees of that organization apparently have acquired a sense of participation and belonging.

Some of the factors contributing to the fostering of this attitude may be enumerated.

A. There must be clear-cut procedures for the handling of personnel matters such as wage adjustments, promotions, transfers, etc., and these policies must be known to the employees. Such policies enable the employee to recognize that he is being treated in accordance with the "rules of the game" rather than on the basis of an arbitrary edict of invisible management. Such policies add to his sense of stability and security. They enable him to believe that he is living in a world that "stays put" rather than a world that is "subject to change without notice."

B. The employee must be able to see that he has a recognized function, that his function is important, and that it contributes to the success of the company. In this connection, you will recall that Bill Jack, of Jack and Heintz, has set up a public address system in all departments of the organization and that he personally takes occasion at frequent intervals during the day to tell employees about the progress of their work. If a new order has just come in which will require increased effort, or if yesterday's production was particularly high or particularly low, this information is relayed to the people at once.

C. Perhaps most important of all, the employee must feel "at home" with his fellow employees and supervisors in his own immediate organization. Fundamentally, it is so evident that people should be led to feel at home in the job situation that the point may seem too obvious to mention. Nevertheless, it is common knowledge that the attempt to settle technical, production and organizational problems so often absorbs the whole attention of supervisors that, in actual fact, little systematic provision is made to enable employees to adjust to their work situation. For example, it is certainly clear that a new employee, particularly in a large organization, is bound to feel confused and bewildered in his first days on the new job. He doesn't know how to punch his time clock, where the wash-rooms are, where the restaurant is, or where to hang his hat. He

may not even know how to get in and out of the premises, except by following the procedure of trial and error. Such confusion and bewilderment lead to heavy turnover in the early days of employment; and the unpleasant experiences of these early days may be difficult to correct at a later date. Despite the fact that this is so obvious, it is more often true than not, that new employees are left to learn these things as best they can.

We set up facilities for the maintenance of machinery in good working order because we are aware that they will not have sense enough to maintain themselves. Somehow, we assume that the multitude of little things which contribute, day by day, to the feeling of participation and the sense of belonging on the part of employees can be neglected on the basis that they will have sense enough not to be influenced by such apparently trivial matters. The fact is that no matter how trivial the sense of belonging may sound and no matter how trivial the factors that contribute to it may appear to be, these matters have a more powerful influence on the efficiency and stability of the human machine than all the air-conditioning and fluorescent lighting which might be installed as a substitute.

III. The Job of the Foreman as Supervisor

Having considered one aspect of the problem of motivating the individual worker, we may turn now to an entirely different topic: that of the job of the foreman as a supervisor. Obviously, the foreman has many responsibilities other than those which are directly supervisory. He is responsible for technical and organizational problems which do not necessarily involve his ability to handle men in the supervisory relationship. Looking specifically at his supervisory job, it involves basically two activities. First is his job of *communicating* up and down his line of authority. It is necessary to communicate problems and proposals up the line, as well as to communicate problems and assignments down the line. Second is his responsibility for *making decisions* as to actions which are to be taken. With respect to these supervisory responsibilities, you may be interested in some principles which were once arrived at by a group of supervisors who met to discuss these problems. The materials presented in this section

were organized by the Training Department of the Hawthorne Works, Western Electric Company, and are based upon a series of conferences with department chiefs at the Hawthorne Works. You will note throughout this list of principles how completely they revolve around the two chief responsibilities of communication and decision.

1. Listen to the whole story as brought to you by your subordinates rather than "jumping to conclusions." Arrive at a decision based on all the facts.

2. Make definite decisions so that your subordinates are in no doubt about where you stand.

3. Make decisions promptly. Don't sit on a decision beyond the time when action is urgently needed.

4. Give reasons for your decisions so that subordinates can understand the whole situation and thus act more intelligently.

5. Back up your decisions in every respect under your control. One comment made concerning this point may be worth quoting: "After we have pitched in and done a 'hot job' for the boss, we hate to have it sit on his desk for weeks or months without getting any action. Half of our satisfaction in doing a job well is lost unless the job goes some place."

6. Be able to change your mind in case new facts are brought to light which show that a previous decision requires modification.

7. Develop a consistent policy of your own. See that it is clearly understood by subordinates so that they keep their own organizations in line without running to the boss too often.

8. Base your policies on the best interests of the organization and the company, rather than engaging in "political footballing."

9. Delegate to subordinates as much responsibility as possible.

10. Keep subordinates informed concerning all activities which have a bearing on their work or their organization.

11. Keep subordinates informed as to broader phases of company policy, business outlook, etc., so that they may guide their activities accordingly.

12. Evaluate subordinates fairly and impartially on the basis of their work.

13. Take an active interest in the progress and advancement of subordinates.

14. Maintain a sincere personal interest in subordinates as individuals. Extend that personal interest as far as possible to the individuals in the entire organization.

15. Avoid taking your position too seriously—feeling too much self-importance.

IV. The Importance of Listening

We have just discussed the job of the foreman as supervisor—that is, as one whose task is to make assignments and coordinate the work of others in achieving a company objective. In addition to this task which is to a considerable extent psychological in nature, every supervisor is also required to deal with the personal and emotional problems of his people, as distinct from the objective and concrete problems involved in his normal supervisory relationship. In this connection, one procedure has been developed during recent years which has received so much favorable attention that it merits some discussion at this time. This procedure suggests that in our day-to-day handling of people, the most important thing we can do is to listen.

Perhaps no single technique for the capable handling of human beings has received the emphasis during the past ten years that has been accorded to this simple principle of wise and thoughtful listening. Although the principle of listening is implied in much of the literature of clinical psychology and psycho-analysis, the industrial implications of the method have been profoundly influenced by the thinking of Professor Elton Mayo of the Harvard University Graduate School of Business Administration. Many of you will be interested in reading Professor Mayo's book, *The Human Problems of an Industrial Civilization*, if you have not already done so. Professor Mayo's thinking is also reflected in the well-known "Hawthorne experiments" which have been reported in Roethlisberger and Dickson's, *Management and the Worker*. In the academic setting, Professor Carl Rogers of Ohio State University has used the method in counseling college students, and you will be interested also in his book, *Counseling and Psychotherapy*.

I should like to emphasize further that this method is not really the one which we commonly think of in attempting to help

people. It is really a new and significant tool, in the sense that many expert practical handlers of men do not commonly employ it to its fullest extent.

What is our common way of attempting to help people when they come to us with problems? Well, first we do listen to them for a while, of course, in order to form some notion of what they say their problem is. Second—and before they have even begun to talk themselves out—we formulate our own notion of what they ought to do to solve their difficulties; and third, we proceed to give them what we believe to be some good advice. We tell them what we think they ought to do. A moment's reflection will convince us that this is the almost universal way of attempting to help people.

Sadly enough, this method is based upon at least three major fallacies. First, it assumes that the person is really able and willing to give us a reasonably accurate picture of his difficulties. Second, it places the advisor on a high and precarious pedestal in assuming that his notion of what ought to be done would really be best for the person who needs help; and third, it assumes that the person who needs help can and will take advice and act upon it.

The futility of giving good advice is so obvious in the experience of all of us that I suppose we must all sometimes wonder why we continue to give good advice. Even in cases where we are pretty certain that we know what the real problem is and believe that we can see quite clearly what would be best for the individual concerned, it is discouraging to see how ineffectual our pleas, exhortations, and advice really are.

By contrast with this method of giving good advice, what happens if we simply listen, patiently and intelligently, as the individual who needs help continues to give us his story? What happens is that as you encourage him to continue talking, he works out a solution to his problem himself. He may never state very clearly just what his real problem is, and he may not arrive at a solution that you feel was right—though ordinarily this will be the case. But the important fact is that he will determine upon a course of action, whereas he was formerly confused, bewildered, and unable to decide what to do. And since this course of action is one that he decided—one which grew out

of his experience—it is one which he can go out and carry into action.

Let us consider now just how one goes about it to help people by intelligent listening. Basically, of course, the procedure is very simple. It consists simply in giving reassurance to the speaker that you understand what he is saying and that you are interested. If your relationship with him is good and if he is engrossed in what he is saying, this reassurance sometimes involves no more than a nod. Professor Rogers says that the method is so simple that he has sometimes been accused of fostering the "uh-huh" school of psychology. However, there are a number of practical rules which may be given to help us in listening to other people's problems in such a way as to keep them talking without embarrassment or fear as to how we may be reacting to what they are saying.

The major rules for carrying on this kind of helpful interviewing have been summarized by Roethlisberger and Dickson and by Professor Rogers, and the following list represents a very free paraphrasing of the suggestions given in these two sources.

1. *Don't be concerned at all as to whether the statements made by the interviewee are true or false.*

It should be recalled that in the interview we are trying to keep our attention focused on what he thinks and how he feels. The question as to whether what he says is factually correct or incorrect is irrelevant. Note that this doesn't mean that we have to "believe everything he says." Conversely, it doesn't mean that we have to "take everything with a grain of salt." It simply means that if we are keeping our attention faithfully on an understanding of his problems, his opinions, and his feelings, the question of the truth or falsity of his remarks does not concern us.

2. *Don't be concerned as to whether his reasoning is logical or illogical.*

Once again, it may be repeated that as a listener, we are interested in how he is looking at his problem; and if we begin to concern ourselves as to whether he is thinking logically or not, we are allowing ourselves to depart from the role of listener.

3. *Don't be concerned as to whether his present or contemplated behavior is*

ethically or legally to be sanctioned or condemned.

Obviously, this rule involves the same point of view we have been emphasizing in previous rules. That is that your approval or disapproval of his conduct is irrelevant. The moment your approval or disapproval is injected into the interview, you have thrown the interviewee into a position where he must justify his conduct to you and you in turn must argue your position with him. The important point is for him to arrive at a re-evaluation of his conduct rather than for you to attempt to force such a re-evaluation on him.

4. *Don't even sympathize with him in his struggles and difficulties to solve his problem.*

Sympathy he can get from any kind-hearted soul who is willing to listen. Sympathy will only strengthen him in his present course of action, which obviously must not be entirely satisfactory, inasmuch as he still has a problem. Thus, such comments as "you certainly got a bad break out of that deal and I don't blame you a bit for acting as you did" may make him feel good at the moment, but they break his struggle toward a solution of his problem by offering approval of his present behavior.

Obviously, we should not be unsympathetic, either. By way of a fourth and final emphasis, the critical point is that if we are to maintain our role as listener, it is not *our* opinions and values that count. It is *his* opinions and values that are important.

Recognizing that the above list may sound too negative in approach to be complete, we may enumerate three positive suggestions which may be helpful in carrying on the listening interview.

5. *Maintain an honest and sincere interest in the interviewee's problems, opinions, and feelings.*

As long as this sincere interest is present in the interviewer, the pitfalls which have been enumerated above may be avoided without too much difficulty.

6. *Be particularly interested in his feelings and opinions, as distinguished from the subject matter that he is discussing.*

7. *The technique of "restatement" is most commonly used in helping the interviewee to continue his talk, whenever it is necessary to comment at all.*

The technique of restatement consists simply in putting in your own words the feelings which he has just been expressing. It is at these points of restatement that the interviewer gives the clearest indication as to whether he has really understood what the interviewee has been trying to say. Be sure that you restate what he was really trying to say, with no interjection of your opinions or evaluations of his conversation.

It will no doubt occur to you that the listening method has been used mostly by professional counselors, in industry, in school, or in clinical practice. This is true insofar as the handling of really difficult problems is concerned. Deep-seated problems may require prolonged interviewing, extending over a considerable period of time. However, the technique of listening is equally applicable to the more immediate problems of bewildered employees who come to supervisors with some fancied slight or frustration which has arisen in the work situation. Our common procedure is to point out to the employee, rather early in the conversation, where he has been looking at the problem in a wrong light, and to suggest to him what we think he should do. But in these small and not very deep-seated problems, it has been impressive to note the success of the listening method as contrasted with the method of giving advice, in leading the employee to take effective action to solve his problem.

It is recognized that, as a supervisor, you will have many problems brought to you which require action, in an area in which it is your responsibility to act. In these cases, it is not meant to imply that you can always dodge this responsibility by the simple expedient of listening. It does seem true, however, that even in many cases, where at the outset, action seems neces-

sary, there is really no action which you could take that would solve the employee's real problem. Thus, *more listening* may ultimately lead to *less action*, in the case of those problems where the difficulty lies within the employee himself rather than in the circumstances which surround him. The method, therefore, has a real place in the supervisor's job as a method for helping him to smooth out the human problems of his organization.

V. Summary

There is no brief way to summarize a discussion such as this, in which we have not attempted to reach a single conclusion with respect to a single topic. However, we can at least enumerate, by way of conclusion, the areas which have been discussed.

1. We have discussed the importance of the "sense of belonging" as a factor contributing to the day-by-day effectiveness of people at work.

2. We have indicated that the job of the foreman as supervisor is to a large extent a job of *communication* and *decision*; and we have presented some rules which may be helpful in assuming these supervisory duties.

3. Recognizing that the supervisor must deal intelligently with the personal and emotional problems of his subordinates, we have discussed a recently emphasized procedure for the handling of such problems. This method is the *method of listening*.

It is hoped that this discussion of some of the psychological and social aspects of supervision may be helpful as a basis for reviewing the human elements of the foreman's job.

The symposium concluded with a discussion led by J. E. Lovas.

Seeing for Safety

WEDNESDAY MORNING SESSION

October 4, 1944

Presiding: HAROLD R. BIKLER, Personnel Director, The Mutual Life Insurance Co. of N. Y., New York City.

Practical Experiences with Visual Survey Service Rendered to Small Industrial Plants

HARRY S. GRADLE, M.D.

Vice-Pres., Illinois Society for the Prevention of Blindness
Chicago

One year ago the Illinois Society for the Prevention of Blindness instituted a visual service for manufacturing plants whose size does not justify the maintenance of an organized safety division or the operation of a full-time medical department.

The visual service operates in the following manner:

1) The management is contacted and given full details of the service, and if it is accepted, a contract is signed.

2) A "tester" contacts the personnel or safety director who arranges a routing schedule whereby the employees are sent to the selected place in the plant on such a time schedule that there is a minimum interference with the normal operation of the plant.

3) At the appointed time the tester conducts a visual survey of each employee, measuring:

- (a) The visual acuity of each eye for distance, without glasses.
- (b) The visual acuity of each eye for distance with the employee's glasses.
- (c) The visual acuity of the two eyes combined for near, without glasses.
- (d) The visual acuity of the two eyes combined for near, with glasses.
- (e) Muscle balance.
- (f) Depth perception.
- (g) Color sense.

This is all recorded on a form on which is also noted the employee's name, age, sex, occupation and department.

4) While the visual survey is being conducted, a safety engineer surveys the entire plant, including the offices, checking:

- (a) The general illumination.
- (b) The illumination of individual pieces of work.
- (c) The illumination both by daylight and at night.
- (d) The visual hazards that exist in each portion of every operation of the plant, from the standpoint of flying particles, dangerous obstructions, dust, and so on.

Not only the operator of every individual machine, but also the safety of passers-by is considered.

5) The report of the vision tester is analyzed from a medical standpoint, and is submitted to the management. The names of the employees who require correction of visual defects, who have a manifest ocular disease, who are deficient in color sense or who are deficient in depth perception are recorded. The urgent cases are starred.

6) The report of the safety engineer accompanies the medical report. In it are described the areas of insufficient illumination, together with recommendations as to the type of fixture and the wattage necessary to correct the defect. The various vis-

ual hazards from operations within the plant and the type of protection requisite to eliminate such hazards are also described.

7) A technician who has been trained under Professor Joseph Tiffin at Purdue University makes a job analysis of such jobs as designated, giving the visual skills necessary for the maximum in work performance. This is submitted, together with the visual analysis and the safety analysis and recommendations in order to simplify the administrative work of management.

8) The Society also offers services of members of its staff to promote a safety campaign among the employees of the plant.

The cost of this service to management is one dollar per employee tested. The Society does not refract or offer to supply glasses or goggles, nor does it specify any specific safety devices or illuminating fixtures. It has nothing to sell except a survey of possible visual hazards and recommendations for the elimination of such hazards. It offers this scientific service only as another step in the continuous struggle against blindness from all causes.

Management has much to gain from such visual service. Statistics have shown that overall efficiency has been increased as much as 28% by supplying glasses, as needed, to employees with deficient vision. Efficiency in a plant is greatly increased and fatigue is reduced by proper illumination. Improvement in working conditions, both physical and environmental, reduces lost time. The amount of time lost by eye accidents which can be eliminated by safety measures, adds up in a year to appalling figures. And finally the reduction of eye accident incidence results in a reduction of accident insurance costs.

The visual survey, as such, is fairly satisfactory. A few individuals who require visual correction will slip by, and vice versa, but such instances are few in number. Unfortunately, some employees tend to consider the survey process as an actual refraction of the eyes, which of course it is not. A small number, luckily only a fraction of one per cent, refuse to submit to the survey. But, by and large, the visual survey informs management which of its employees require ophthalmic attention to bring their visual functions to the highest possible efficiency.

But, apart from statistical purposes, a survey accomplishes nothing unless it is followed by a corrective program. In the medical report, management is urged to institute an immediate ocular corrective program and, if it desires is supplied with a list of competent ophthalmologists. That is as far as the Society can go at present. The original program contemplated refractions within the plant by ophthalmologists on a contract basis, and subsequent supply of corrective glasses and goggles by a reputable optical concern. The manpower shortage in ophthalmic as well as optical circles has forced the abandonment of that feature, until after the war at least. This is particularly unfortunate because the age group now employed is in greater need of correction than is the younger group of employees of normal peace time. The complete answer to the problem of a corrective program cannot be solved at present and for the duration, management has to be urged to have the ocular corrections carried out where possible.

That brings us to a discussion of the question as to whether such corrections should be performed by oculists or by optometrists. Examination by an optometrist who is capable of recognizing diseased conditions when they exist, suffices, provided such diseased conditions are sent to medical men for proper care. The optometrist must be recognized as a trained specialist and be paid for his services rather than depending upon the sale of glasses for his reward. The latter practice leads to the abuses which have so frequently brought visual surveys into disrepute. On the other hand, only medical men who are recognized as specialists by their fellow practitioners through special certificates or through membership in exclusively ophthalmic societies, should be employed and paid for their services on a contractual basis. In either case, corrective glasses and/or goggles should be supplied to the employees on prescription from the doctor or the optometrist direct from a reputable optical concern whose financial dealings are solely with management.

Encounter Difficulties

The principal difficulty encountered thus far in the visual aspect of the service is to persuade management to undertake the cor-

rective program. Informing the employee and telling him to have it done where he pleases, at his own convenience, and at his own expense, practically vitiates the value of the survey. The same holds true for the procurement of corrective glasses and goggles. To obtain the resultant increased efficiency of a complete corrective program, management must adopt a paternalistic attitude.

The safety aspect of the survey presents a somewhat different angle. Management is more familiar with the problems presented but, even here, compliance with the recommendations is difficult to obtain. Almost without exception, lighting has been far below the standards advised by illuminating engineers, and management seems loath to alter the character of fixtures, the type of illumination, or even the intensity to meet the recommendations. Of course, there is some difficulty in obtaining material at present, but not sufficient to slow down an improvement were it adequately pushed by management. In the plant offices, where management spends most of its time, lighting conditions are better than elsewhere in the plant where fine machine work tends to exact a greater ocular toll than does the routine book work in the office. This may be due to management or to more insistent demands by office workers.

Various mechanical devices for ocular safety are obtainable and are apt to be installed as the first compliance with the recommendations of the safety engineer. But the goggle question is difficult. Average management does not seem to comprehend the enormous safety factor of complete goggling, the necessity of individualization and service in a goggle program, and the example that must be set to employees. In the safety as well as the visual aspect of the service, survey and recommendations are of no value unless there is at least an attempt at wholehearted compliance. That is something that depends upon individual management and cannot be forced. Consequently the time has arrived that during the discussion previous to signing the contract for the service, management must be told bluntly that unless an agreement is made to attempt to carry out the recommendations of both aspects of the service, there is no use in wasting the plant's money and the Society's time in undertaking the survey.

The visual survey of new individuals entering employment after the original survey has been completed, offers many complexities, and is one that has to be arranged for according to the conditions in each individual plant. An annual resurvey of employees has been requested in some instances.

Digest of What Is Good Plant Lighting, and How to Secure It

I. L. ILLING

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This paper is not intended to be a complete analysis of the subject of Plant Lighting, but merely a demonstration and discussion of the significant factors influencing vision; so that the listener and observer of plant lighting installations will have an appreciation of the subject and form his own conclusions.

The very flexibility and adaptability of the human eye leads the user to expect the impossible. We can read a newspaper under full moonlight ($\frac{1}{4}$ foot-candle) and also under sunlight (10,000 foot-candles), an intensity ratio of 40,000 to 1. Should we load an ordinary 5 H.P. machine with even a 25 H.P. load (a 5 to 1 ratio) the machine

would probably be wrecked. And yet some people ask the eye to function under conditions even more unfavorable than those mentioned. Ask any person how much light he needs and he will reply "All I want is enough to see." He doesn't realize that in addition to mere perception he wants to see: Accurately, quickly, safely, easily, comfortably and with all the above for long periods of time. The average person has never realized that his interpretation of "see" includes all of these factors and that each adds to the difficulty of the visual task and consequently he requires more light or other seeing aids.

In the past lighting information and

advice has been secured from lighting equipment salesmen, from sales engineers and from scientists. The qualifications of each of these groups and their place in the industry will be discussed.

There will be demonstrations of the effect of varying intensities of illumination on the visibility of objects which vary in size, on objects which vary in contrast and on objects in which the time for observation is limited. There will be a short discussion of the Relative Visibility — Post-Candle Chart.

The new technique of Brightness Eng-

neering will be gone over in some detail with examples of visual operations which are affected by the four fundamental brightness considerations. While the subject of brightness is not new, but rather as old as lighting itself the scientific consideration of its effect on vision is definitely a new and important subject. As a matter of fact the lighting of the future will undoubtedly be determined by Brightness Engineering rather than Foot-Candle Engineering as some lighting has been in the past.

(Mr. King followed these remarks with an illuminating demonstration.)

Color as an Aid to Accident Prevention

CHEM. APPROACH

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(Paper Presented by Henry G. Lamb)

Color, in its application to industrial safety, has seldom, if it has ever before, been discussed during National Safety Congresses. Discussions in recent regional safety conferences have not only created a demand for more technical information, but also a demand for a safety color code universal in its application, and acceptable to all concerned. The War Department has taken the leadership in making this demand known by requesting the American Standards Association to set up a project, through which such a safety color code could be developed. The ASA has organized a committee for this purpose and the work is now under way.

The decision to proceed with such an undertaking has shown that the subject is not as new as one might at first think. There is a wealth of information available to the safety engineer which he can use in connection with handling specific problems, or in connection with his safety engineering work throughout the plant. A review of this information might be of value at this time.

Colored lights on shipboard are used to indicate the presence of another vessel and its position. At night the port side of each ship carries a red light, while the starboard side carries a green light. This simple system, in general, signals to all other ships that when they see the green light on an-

other vessel, they have the right of way, whereas any ship observing an approaching red light, knows that she must concede the right of way to the approaching vessel. Thus the use of color in connection with ship lights assists navigators in avoiding accidents through collisions.

One of the earliest uses of colored signals has been by the railroads. These signals include red for "Stop" or "Danger," yellow for "Caution" and green for "Go." They also employ the color blue as "Warning" when men are working on certain equipment or where tank cars are being unloaded. It is interesting to note that in the railroad signals, white signifies "No Signal." This is particularly important because of the large number of illuminated signals which are provided with either green or red glass in front of a white light. Therefore, when any one of these colored glasses becomes broken, a white light will show, and as far as the engineer of a train is concerned this means that he has no signal, and he must act with great caution until he can receive instructions through some other source or until he can see a signal in good order.

You are certainly all familiar with the uniform traffic control devices for streets and highways. Today, as with the railroads, the green light means "Go" to everyone. Yellow or amber means "Caution," and red means "Stop." I am wondering

how many people today can remember the inception of the automobile and with it the variety and contradiction of traffic signals that were developed in various communities throughout the country. The chaotic condition was remedied through the development of the American Standard for Colors for Traffic Signals many years ago.

The latest form of transportation, the airplane, makes use of color in signaling. The red and white lights on the wing tips which flash alternately in and out, not only indicate to one plane that another is in the vicinity, but show the direction in which the airplane is approaching and consequently the side on which it must be passed.

Color in Industry

So much with the field of transportation. What has been done in connection with the use of color inside industrial establishments?

Under the leadership of the American Society of Mechanical Engineers a Code for the Identification of Piping Systems was approved as American Recommended Practice by the American Standards Association in 1928. This standard recommends the identification of various classes of materials flowing in pipes in accordance with five color groups, as follows:

Red—Fire Protection Equipment

Orange-Yellow—Dangerous Materials

Green—Safe Materials

And when required:

Blue—Protective Materials (other than sprinkler systems)

Purple—Extra Valuable Materials

Another color code was approved by the American Standards Association in 1930. This covers the Identification of Gas Mask Canisters. Here various colors and combination of colors have been assigned to the different types of gases against which the gas masks afford protection.

In 1941, an American Standard was approved which provides Specifications for Industrial Accident Prevention Signs. This standard in addition to specifying the shape and general layout of these signs, make definite recommendations concerning the colors in which signs, intended to convey certain instructions, should be painted. Red is specified for danger signs, yellow for cau-

tion signs and green for safety instructions. Black and white are specified for directional signs. These colors as with ships, railroads, automobiles or airplanes make it possible for a person, unable to read in the language used on the sign, to know that the sign indicates danger, caution or safety as the case may be.

Still another American Standard involves the use of color for accident prevention purposes. This is the Building Exits Code developed by the National Fire Protection Association. The use of color is in connection with Exit Signs. The committee which prepared this document has been actively engaged since 1913 in continually studying the subject. The seventh edition which was approved in 1942, makes somewhat of a departure from precedence with regard to color. For many years exit signs were colored red but the present edition now prescribes green for such signs, in conformity with the color scheme adopted for traffic signals whereby green indicates to "go," rather than red which means to "stop."

So the story goes of the use of color in industry in so far as accident prevention work is concerned, and in so far as uniform national practice is concerned as indicated by the approval by the American Standards Association. Undoubtedly individual industrial concerns have developed schemes involving the use of color in various phases of accident prevention work. These have not been referred to in any specific way in this paper, because any differences which might be contained in them might cause confusion. Color is a universal language. A painted picture does more than present a scene. It tells a story, and so as far as accident prevention work is concerned a particular color should always tell the same story. Certain private standards however should be mentioned because they have been the cause of the present general interest in color as an aid in accident prevention work, and thereby the cause of the demand for the development of a safety color code. I refer to the color codes developed by three of the leading paint manufacturers. These suggestions have been discussed in regional safety conferences during the past year.

It is not the purpose of this paper to discuss the advantages or disadvantages of

each of the recommendations of the paint manufacturers. They have been presented for universal use by industry. Therefore they are being studied by the national committee which has been charged with the responsibility for developing a safety color code. The main consideration is the principle that color speaks a universal language, and the future color code must be based on this principle and be in harmony with the basic concepts of the uniform standards to which reference has been made.

Color Blindness

As in the case of all the standards which have been developed the setting up of a general safety color code does not simply involve the choice of a particular color for this, and another for that purpose. Very careful consideration must be given to the actual definition of the colors in terms of one of the accepted methods for determining the true definition of a particular color. It is not generally understood for instance, that a very large proportion of the population are what are known as normally color blind persons. While some persons cannot distinguish the differences in colors at all, others can distinguish the differences if given a little aid. A very great amount of attention was paid to this matter in developing all of the standards to which reference

has been made. For example the particular shade of green which is specified for street traffic lights was chosen because of the amount of blue which it contains. This amount of blue makes it easy for the normally color blind person to distinguish clearly green from red and thus drive down our highways without fear of becoming involved in an accident through inability to understand signals. The new committee has many highly technical problems like this to solve, and therefore needs all the assistance which can be obtained.

Industrial safety engineers can help in the development of these problems in several ways.

1. They can send to the American Standards Association any technical information which they believe will be of value to the committee.

2. They can study and criticize the tentative draft of a color code which will be distributed widely to industry for this purpose before the committee completes its assignment.

3. They can put the final code into active use in order that a body of experience can be obtained to indicate the future changes which should be made to make the code more effective.

Steam Railroad Section

TUESDAY AFTERNOON SESSION

October 3, 1944

Presiding: GENERAL CHAIRMAN H. A. DAAKE, Supvt. of Safety, Erie Railroad Co., Cleveland, O.

THE CHAIRMAN: All members of the Executive Committee were of service from the time of their appointment. Mr. S. C. Flagler, Chairman of the Safe Practice Pamphlet Committee, who is Safety Supervisor, Santa Fe System, resigned a few months ago, when he was transferred from Topeka, Kansas to Albuquerque, New Mexico, due to the distance he would have to travel to meet with us. Thereupon, Mr. P. F. Buckle, Superintendent of Safety, Chicago, Burlington and Quincy Railroad, succeeded Mr. Flagler as Chairman of this committee, and with Mr. G. M. Dempsey of the Milwaukee Railroad and Mr. C. L. LaFountaine, General Safety Supervisor of the Great Northern, St. Paul, Minnesota, completed the sound slide film, "Keep 'Em Rolling."

Another development is in the matter of safety poster work. There will be twelve new railroad safety posters each year from now on, beginning with the four railroad safety posters recently received in miniature form.

The demands of our armed forces and other war conditions with which we are well familiar have placed a heavy burden on all railroad operating officers, and we are well aware that fatalities to passengers and to railroad men would be far greater were it not for the intensive safety training by railroad officers and others in supervisory positions who have this responsibility. Since our last meeting, many thousands of new employees who never worked on a railroad before, many of them high school students, have done their work in a commendable manner because they were trained and properly supervised.

We would have a little clearer understanding of what has been accomplished for safety by the American railroads by a brief

comparison of certain operating factors, fatalities and injuries, of World War I during 1918 and of World War II, in 1943.

The peak of railroad traffic of World War I was in 1918, with its forty-three billion passenger miles and four hundred nine billion ton-miles of transportation service. Last year, there were eighty-eight billion passenger miles and seven hundred thirty billion ton-miles of transportation service, or one hundred per cent more passenger service and eighty per cent more freight service than in 1918. Yet in 1918, four hundred seventy-one passengers were killed, and three thousand four hundred nineteen railroad men lost their lives while on duty. In 1943, two hundred seventy-eight passengers died in railroad accidents, and one thousand seventy-two railroad men lost their lives while on duty.

Thus it may be seen that railroad passengers were three times as safe in 1943 as they were in 1918 and railroad men twice as safe. The greatness of this achievement, in which we have all participated, can be appreciated in part by the volume of traffic handled every day. In 1943, there was a daily average of two and a half million passengers, who traveled an average distance of one hundred miles. There was an average movement of four million tons of freight an average distance of five hundred miles. Perhaps this great volume of traffic and its tremendous exposure hazard will never be reached again in our time.

Railroad officers are constantly seeking to bring about still greater safety to railroad passengers, to those employed on the railroads, to highway travelers who do not always approach grade crossing with reasonable care and thus endanger the lives of both passengers and train crews, and to

those both young and old who do not appreciate the hazards of trespassing on or along railroad tracks. Thus we have come to participate in or attend the meetings of the Steam Railroad Section; to receive the best prevailing thoughts and experience; to discuss our mutual problems; and to return

to our jobs better equipped to bring about a noteworthy reduction of accidents and personal injuries. When busy railroad officers gladly give of their time and talents and provide inspiration and instruction for these meetings, we can readily appreciate the importance of a good attendance.

Greetings from Safety Section, A.A.R.

O. F. GNADINGER

Chairman of the Safety Section, Assn. of American Railroads and
Supvr. of Safety, Elgin, Joliet and Eastern Railway Co., Joliet, Ill.

In the past four years our work as safety officers has assumed a new importance, and I hope some day we will receive recognition. Interest in accident prevention has increased through the entire country, and safety has taken on a new meaning. It's a sad commentary on our way of life that it was not until the beginning of this bitterest conflict in the history of the world that the people of this country did come to realize that there was such a thing as conservation of manpower, and that it was an important matter.

Safety these days means more to us than it did before. It means the conservation of manpower, the conservation of railroad equipment, and the safe movement of troops, war materials and supplies. It is my hope and I believe the hope of all those present that after this conflict is ended, we will not lose sight of the fact that the conservation of which we speak is as important in peace as in war.

Recently, some well-meaning but poorly informed persons have taken occasion to point out that some of the disasters that have occurred on the railroads, particularly wrecks of passenger trains, have been due

to the lack of safety devices. We who investigate the accidents that occur on our railroads know that only a very small percentage of the accidents that occur are due to the lack of safety devices, or are due to unsafe conditions. In the past four years, we have had to employ new and inexperienced men. The railroads have operated with a shortage of equipment and an inability to secure necessary materials for repairs and replacements. We have had other problems, like the shortage of help, but in spite of all this, the railroads have had a job to do. They've done it, they're doing it, and they're going to continue to do it.

As a group, we have no reason to be anything but proud of the safety records of American railroads. From day to day we meet with new problems, and it is with such meetings as this that we can get down and decide what is best to do.

Mr. Chairman, I hope you have a successful three-day session, and with the help at your command, there is no reason why you should not. On behalf of the Safety Section of the Association of American Railroads, we wish you every success.

"Men of Maintenance"

... The sound slide film, "Men of Maintenance," was presented by D. E. Mumford, Asst. General Safety Agent, New York Central System, New York City.

Non-Train Accidents (Maintenance of Way and Station)

(Panel Discussion)

Discussion Leader: P. F. BUCKLE, Supt. of Safety, Chicago, Burlington & Quincy Railroad Co., Chicago.

Participants:

H. N. HAMMOND, Freight Agent, Chicago & North Western Railway Co., Proviso, Ill.
I. H. SCHRAM, Chief Eng., Erie Railroad Co., Cleveland.
D. W. NAPP, Supt. of Safety, Norfolk & Western Railway Co., Roanoke, Va.
FRANK COZZI, Supt. of Safety, Delaware, Lackawanna & Western Railroad, New York City.
C. M. KIDGALL, Asst. to Vice-Pres., Southern Railway System, Washington, D. C.
S. C. JUMP, Div. Eng., Illinois Central System, Chicago, Ill.

MR. BUCKLE: Last year, 980 deaths and 45,794 other reportable injuries to railroad employees on duty were reported to the Interstate Commerce Commission. Of these, 176 deaths and 24,118 other injuries or 18 and 53 per cent of the total respectively, were classified as non-train casualties.

I believe it is fair to say that greater exposure to severe hazard exists where men are working around moving engines and cars. It is also proper to say more persons on the railroad are exposed to non-train accident causes.

But during the past ten years, an average of 132 employees a year have met death and over 13,000 have been injured as a result of non-train accidents, and this justifies our serious consideration of the problem and what may be done to solve it.

The greatest single cause of death and injury from non-train accidents last year was falls. Forty-six employees were killed and 4,000 injured.

The next greatest single cause of death was in maintenance-of-way motor car accidents, in which 36 men were killed. A much higher severity rate occurred here,

because the injuries in this category were less than one-third those occurring because of falls.

Fourteen men were killed because of collapse, fall and forth of objects, and here occurred the third greatest cause of injury.

Coming in contact with electric current caused eleven deaths, fourth greatest single cause of death. Only six other injuries from electric shock were reported.

Handling freight and supplies resulted in only four deaths, but here occurred the second greatest single cause of injury, there being over 3,700 cases reported.

MR. SHORT (N.C.&St.L.): We have a problem that maybe you can help me with: Our method of icing cars is for one man to get on top of the car and another man to pitch it up. We've had several injuries due to this method. Could anyone in the panel tell me if there are such things as conveyors, or how do they ice their cars? We ice our cars in terminals. We don't carry the cars out of the yard; they ice in the train. They'll miss a piece: it'll fall down and hit some employee or other person.

MR. CIZEK: We had a similar problem where an ice-house broke down and we had to resort to icing somewhat as he did; but we came to a point where we bought a machine that elevates the ice to the top of the car and slides it off a chute right on the roof.

Where you have enough ice to justify the purchase of the machine, you're all right; but if you haven't, why, your problem still remains.

MR. BUCKLE: Tell me, Mr. Cizek, do you operate that machine out in the train-yard between tracks?

MR. CIZEK: Yes.

MR. BUCKLE: And do you ice any of your cars, Mr. Short, in your train-yards?

MR. SHORT: No, none out in the yards. Usually, the cars we ice are in service in the terminal.

MR. HAMMOND: Electric hoists are made for use in freight houses for the very purpose of hoisting ice from platforms to the tops of refrigerator cars. We have two of them in our freight house, and they're used very successfully and almost without chance of accident or injury.

If you have electric power anywhere near cars being iced in the yard, this kind of a hoist could be used to very good advantage.

MR. BUCKLE: Mr. Short, the Santa Fe Railroad, and also the D. & R. G. W., have splendid elevated trucks that they use for top icing their cars to preclude the thing you're speaking of, and if you'll write Mr. E. L. Duggan, Superintendent of Safety of the Santa Fe, Chicago, I'm sure he'll be glad to furnish you with prints.

MR. SEYFARTH (C&W-L-Belt): We had trouble with men loading push cars, particularly rail or ties, and I was wondering whether it was due to the fact they don't block the cars, or whether some railroads have a brake on push cars.

MR. BUCKLE: Are your injuries because of material falling upon the men?

MR. SEYFARTH: No, it's pinched hands, mostly.

MR. SCHRAM: I believe in analyzing the cause of them you will probably get the remedy. It's a good thing when push cars are loaded that they be blocked. The big thing about loading a push car is coordination in movement of the men handling the material.

You simply have to get your foremen educated to organize their work and tell the men the various steps and you'll be surprised how the rate goes down.

Some of your accidents may be due to objects falling off the push car when it's being handled behind a motor car. It's been my experience that brakes on push cars don't do any good. The whole thing revolves around having the push car properly loaded. There was a time when we had accidents coming from rail handled on one push car behind a motor car. Also rail

was set rigidly on two push cars, and when the cars went around a curve, the rail slid off. So now we prescribe two push cars with a drawbar between them of sufficient length. We set the rails on angle bars turned flatways so the edge is up, and the rail can move on that, accommodating itself to the curve.

MR. SEYFARTH: You maintain a strict height on the push cars?

MR. SCHRAM: That's a very important thing; our push cars are absolutely standardized.

MR. KIMBALL: In connection with handling ties, rails and timbers, our experience has been that approximately 55 per cent of the injuries are due to getting hands and fingers caught or material falling on their feet. Placing safety shoes on the men has permitted us to reduce our injuries.

MR. BUCKLE: I daresay that it would hold true on any of our railroads that 55 per cent of the injuries resulting from handling rail, ties or other timber is because of material falling on feet or toes.

MR. CARROW (P.R.R.): I'd like to ask about handling heavy freight. I find that a very large percentage of serious injuries occur when gangs are on their own. Recently, a gang had a 2,500 pound load to convey from a platform to a car. They had to use a board that was eight feet long to cover the distance, and first tried to get it over, but couldn't make it. They backed off and took a run, and the board, the 2,500 pound object, and the two men fell between car and platform. It was just a miracle that they weren't killed.

Have you a system whereby the men are required to call on the foreman or somebody in charge to supervise heavy loads being handled in or out of cars?

MR. HAMMOND: Any extraordinarily heavy or cumbersome piece of freight should never be tackled by a gang without the supervision of someone who has had a considerable amount of experience. In the case mentioned, the first move would be to see that the apron or runboard placed between the cars was securely anchored from both ends so that there'd be absolutely no chance of that runboard slipping off the platform or off the sill of the car. If your crew had used a finger-lift truck or a low dolly, it seems to me there would

have been no chance of an injury occurring, even over such a long board.

MR. CARROW: In our plant, we have definite instructions never to tackle a hazardous job until someone with considerable experience (and that usually is a foreman) is with them to direct the work safely.

MR. SHAFER (Union Railroad): We have considerable trouble every year with employees receiving creosote burns unloading ties. I just wonder if someone could give me a suggestion as to what to do to overcome creosote burns?

MR. KIMBALL: That gave us considerable trouble and we went to the United States Health Department. They recommended an emulsion. There are a number of emulsions that you might purchase locally in most any drug store; however, some men, especially those who have very light complexions or are blond, are subject to a certain reaction when they're around or near creosote, and if a person is allergic to that, in many instances we have assigned him to other work.

If hands and face are properly cleansed and bathed in the emulsion before and after handling ties, I think you'll find that creosote burns can be overcome except in allergy cases.

MR. NAFF: I might add that in our timber preserving plant where we handle ties that are covered with creosote, our men bathe their arms, necks and faces with linseed oil, and we found that to be very effective.

MR. CARROW: Before they start to work?

MR. NAFF: Yes, and then, of course, when the day's work is over. They have access to a shower.

With the average section force, a carload of ties comes along in the local, and they must unload it. They're wet with creosote. They're not all furnished with the linseed oil either, but we've found that most any kind of oil is effective—just a common motor oil. They rub it over their arms and we require them to wear gloves and to wear their sleeves down. Occasionally, some fellow in spite of all that will rub it in his eyes, maybe wiping perspiration.

MR. SCHRAM: We got an emulsion and when the employees didn't have that

product on hand, they generally used old crankcase oil. Any of these soft oils will do.

The darker a man is in color, the less he's liable to burn, and you'll never find it where you have colored labor. If you have a lot of blonds, they're always in trouble with the stuff.

MR. SHAFER: We use carron-oil, but it's pretty hard to get the fellows to put it on before work, and it's hard to get off afterwards. We've found that even with gloves creosote works right through and will cause a burn; that's more so with a light-complexioned fellow.

MR. BUCKLE: Free use of water is a very good remedy afterwards.

MR. LOWE (S.P.): My problem is how to teach foremen. We have about 12,000 Mexican nationals coming and going (about a sixty per cent turnover a year). It's almost out of the question teaching them, so I'm concentrating on the foremen. I'd like to know if anybody has any booklet or specified method of procedure so you can teach nine hundred or a thousand foremen who are constantly changing. We can't get to them fast enough, although I might say we have the lowest maintenance-of-way ratio we have had in twenty years notwithstanding.

MR. SCHRAM: We have a course in education in safety on our railroad. It's under the direction of an assistant to the president, and taught to everyone on the line. I took the course and used the charts in teaching my staff. My engineers (maintenance-of-way) taught it to the division engineers and supervisors and so on down so that all our supervision (including foremen whom we call supervision) have had this course. We have the charts, and we have the manuals. I know that Mr. McAllister, assistant to the President of the Erie Railroad, will be glad to give that to anybody. I think it's very valuable. We have actually taught the Mexicans. Of course, we haven't any number of them like you have. Every track supervisor had his classes. He had his interpreter with him, not one of the gang, but a fellow who had been with us a long time. He actually showed them every operation, and then the Mexican did it. In other words, if he was teaching them to use a spike maul, he

drove the spikes himself, and as he did it, the interpreter explained it in Spanish. Then the Mexicans lined up one at a time to do it. As they made mistakes, they were corrected, and each Mexican went through it until he could do that particular operation properly.

We have a maintenance-of-way department safety book, which was translated into Spanish. You'd be surprised how safety conscious these Mexicans are now. As a matter of fact, I think their good record on the Southern Pacific is due to that.

Our ratio is much better with Mexicans than other fellows, because they really believe what we tell them. It's not unusual to see one Mexican in a gang correcting another who is doing things contrary to rules and instructions. It's very unusual to see that in a gang of Americans, and it's not uncommon for them to ask questions.

Another thing about them, they believe what you tell them about reporting small injuries. The first day they were on the job was devoted to safety lectures and instructions, and, of course, we did other things a little later. For instance, we showed the picture, "Men of Maintenance." We made our own instructions and had them translated into Spanish, and then the interpreter gave that as the pictures went along.

MR. DUGGAN: We took the rules from our "Maintenance of Way Safety Practices," and built up a rule book, printing it in Spanish. We issue that to each Mexican national as he comes on the property, and it points out what we hope to accomplish in the way of making him a safe worker. I believe it has afforded some measure of protection in dealing with that type of labor.

If you gentlemen would be interested in seeing a copy of the booklet and write me, I'll be glad to give it to you.

MR. BUCKLE: I want to thank the Santa Fe Railroad for that pamphlet. We borrowed the idea from you, and we gave the Mexican nationals (we have about three thousand of them on our railroad) a copy of that booklet before they went to work. We certainly believe it is extremely worthwhile.

Unfortunately, a great many of the Mexican nationals can't read Spanish, so we

have to follow a visual education and demonstration method such as Mr. Schram has described.

MR. KIMBALL: I don't like to leave you with the impression we don't do anything. We have had fifty thousand copies printed in Spanish, every phase of operation. We translated the film, "Men of Maintenance," completely into Spanish and have a Spanish interpreter read it to them, but I still say the big job is to teach the foremen.

MR. NAFF: Mr. Schram, will you please tell us just how you reached your maintenance-of-way men with the picture, "Men of Maintenance."

MR. SCHRAM: The picture was shown, first, to the Mexican gangs. We thought they needed education the most at that time. I'm not so sure now.

The second thing that we did was to keep on moving with the picture. Now, we're not through with it at all. We only started it last June, and it's going to take a long time to get over our railroad, but we're going to keep along with it so that all our gangs receive that education.

Now, as far as the course of instruction comes, we generally have one new course out a year, but it doesn't take a year to reach all our men. It's a little hard to take foremen off their track for a couple of days to go through these lessons, and so, generally, while the new course on our railroad is introduced in the fall, we start out on the divisions about at the end of the working season. Probably the course we'll have this year will start about the first of December, and we always manage to get it cleaned up during the winter.

In most of these courses we've been able to cover a lesson in two meetings. Now, if you know this J. I. T. stuff and the J. M. T. stuff, you will know that sometimes the J. M. T. is a little hard. For instance, if you took a Mexican or an Italian foreman, it would be pretty difficult to get that over in two meetings.

In New Jersey where practically all our foremen are Italian they are given the literature and manual, and we tell them to take it home with them. They almost always have a daughter who's a schoolteacher or stenographer or something like that, and she almost always does a pretty good job in teaching dad what there is to it.

MR. KIMBALL: We make a monthly report showing the cause of every accident in the maintenance-of-way department. Every month that goes from the chief engineer, to the roadmaster, to each supervisor and to each foreman, and as it goes down the line, the different officers issue their instructions.

Every section foreman on the Southern Railway System knows every thirty days the cause of every injury in the previous thirty days, and the foremen are called in periodically and each one of those causes is gone over.

MR. LONG (DAHL): I wonder if you have had any more trouble with the J. M. T. than with the J. I. T. with your average run of foremen.

MR. SCHRAM: The men, I think, learned the J. I. T. very readily, and they took to it very nicely; they found it a new way of expression.

With the J. M. T., it requires more effort on the part of the man taking the course. Some of them did exceptionally well, and some of them didn't do so well. Naturally, the man with a little education did better. The J. M. T. has one nice thing about it: it's a great producer of suggestions, and I think the railroad itself profited more from the J. M. T. than it did from the J. I. T. The men probably profited most from the J. I. T.

MR. MUMFORD: Our program is to hold meetings in the late winter and the early spring at a time when we can spare the foremen. A schedule is arranged so that all foremen, assistant foremen, and potential foremen will be brought in in groups. One-half of the subdivision one day, and the other half the next in order to keep supervision on the territory. We hold meetings on two successive days on one subdivision. Part of the time is devoted to maintenance rules, and a good bit of the time to safety practices and safety rules.

Our supervising safety agent will go over all the accidents that have happened on that division the preceding year. We reach all of these foremen again by motorcar trips, and then call the gang for a group talk, and in this manner, each foreman on the entire system gets instruction on safety each year.

MR. NAFF: Just how did you reach your men?

MR. MUMFORD: We took, "Men of Maintenance," and put it on a schedule, showing it to men in freight cars or any place we could semi-darken, wherever we could get a gang of men available. One of our enterprising division engineers, entirely on his own volition, mounted a portable generator in a boxcar and called out a work train. He showed the picture over his entire division wherever he found the men at work.

MR. JUMP: We believe if a man is taught to observe the rules faithfully, that we will accomplish results.

We hold quarterly safety meetings for the supervisors, and they pass the word along to their foremen. They make a report of what they've taught all the foremen, and those reports are circulated to the other supervisors in the district and the division engineers on the system.

We have a safety calendar for each working day in the month. At seven o'clock in the morning, every man in the maintenance department reads that same safety rule.

Our supervisors are required to check the material and time books twice each period, and at the same time, they initial the foreman's safety calendar.

As we go along, it has been our practice to pick out a man in the gang to explain the rule.

MR. LOWE: I'd like to know what is being done to prevent injuries to maintenance-of-way men from flying steel, spike mauls, claw bars, etc.

MR. SCHRAM: Most of these accidents from flying chips of steel from spike mauls and other striking tools is due to their being used too long. On our railroad we have a limit of wear. It's a little different than the A. R. E. A. has in its manual. In addition to that, you will always have the uneducated man who does something like spiking over the rail and hitting the edge of the rail or some of the other things that happen. Now that comes back to the old story of education, and having a foreman conscious of the fact that he must not only tell a green man how to do it, but he's got to follow this so-called J. I. T. method of telling them, showing them, correcting them, and having them repeat it until they get it right.

MR. LOWE: We have had a lot of injuries from brand new tools, and we have

had a lot of injuries from tools that have been re-worked.

MR. SCHRAM: Well, that's a problem in repairing tools, and, of course, that depends almost entirely on the quality of the workmanship in the shop. The only way you'll meet it is working with the people who have the job to do of preparing the tool.

MR. JUMP: We instruct our men that they are not to use a tool which is unsafe. Nobody's ever told me that there is any standard for us when a tool becomes unsafe because the man working with it knows. We haven't had an easy time getting tools

during the last three or four years. Our principal trouble from flying particles was in striking the head of a cracked chisel. We watched the heads of these chisels and took them out of service when they started showing signs of cracking or spreading. We put a rubber hood over chisels which we make from old air hose.

We watch all tools and see that employees discard them as soon as they're not safe.

MR. LOWE: What do you recommend using to strike the claw bar?

MR. JUMP: It should be struck with the sledge, but the men use the spike maul.

WEDNESDAY AFTERNOON SESSION

October 4, 1944

Presiding: GENERAL CHAIRMAN H. A. DAAR, Supv. of Safety, Erie Railroad Co., Cleveland, O.

Our Safety Responsibilities

WAYNE A. JOHNSTON
General Manager, Illinois Central System

To meet the challenge of an unfavorable accident trend brought about by changed conditions due to the war, we must all come to the realization that an injury to an employee must be regarded just as seriously as a bad delay or a head-on collision. We must ask the questions: *How, Why and What? How did the injury occur? Why did the injury occur? What can be done to prevent the same injury happening again?*

This can only be accomplished by prompt, complete investigation of every injury. Statements regarding cause and possible cures must not be perfunctory but should portray a thorough-going inquiry made by the supervising officer, preferably on the ground as soon as possible after the injury occurs. Investigation is the source of the most impressive material for education and instruction. More than this it is the "case method" of safety study by which it is possible to keep abreast of developments and learn of new hazards constantly arising as conditions change, particularly in these times.

A definite program should be formulated to interest and educate all employees in safety and to secure their active participation in the drive to eliminate injuries and accidents. Such a program must have as its foundation the full acceptance by man-

agement of its responsibilities to safety, as to be successful leadership and executive drive is essential.

Too often an educational program consists of a hodge-podge of rules and slogans which has some general value in selling safety but does not specifically instruct the worker what to do or what not to do to perform his job safely. The goal of an educational program must be not only to awake and retain the employees' interest in safety, but it must put a finger on definite and concrete ways he should carry out his job in an injury free manner. This means that each job should be analyzed, so the types of injury connected with his work can be explained to each employee, and instructions given him on how the job can be done safely.

Training in safety must be given by instruction, demonstration and repetition under supervision. One of our most important jobs is to discover the men whom the safety education and training program fails to reach effectively, and either convert them or if possible put them on work where the inherent hazard is low. Discharge as a means of enforcing compliance to the safety program is not only evidence of supervisory failure, but will result in covering up the real facts leading to personal injury.

It is an obvious fact that the quality of supervision in the final analysis will determine the value of the training. It is the foreman's job to make certain that safety is given primary consideration in all that is done. Management cannot, however, place the entire responsibility for safety in the supervisor's lap. Management must not only require that proper attention be paid to safety, but must direct the work, take an active interest in it, and take whatever

action may be necessary to correct weaknesses as they show up.

Planned, positive, continuous action is the only way we can eradicate injuries. You, as safety men, are carrying the ball. The rest of us are on your team—blocking down the field toward the single goal of smashing the seventh column which is sapping the manpower so badly needed to carry on our operation.

Grade Crossing Safety

W. J. FLANNIGAN

Superintendent of Safety, Northern Pacific Railway, St. Paul, Minnesota.

Disturbed by the increasing number of highway grade crossing accidents, the executive committee of the Steam Railroad Section of the National Safety Council authorized the appointment of a committee on prevention of grade crossing accidents. I was appointed chairman and serving with me were the following:

P. F. Rockle, Chicago, Burlington & Quincy Railroad Co.

L. B. Harper, Illinois Central System

E. L. Henry, Chicago & North Western Railway Co.

L. E. Hoffman, St. Louis-Southwestern Railway Lines

C. M. Kimball, Southern Railway System

B. W. Smith, Missouri Pacific Lines

This committee adopted a program designed to inaugurate a real campaign in every state in the union. The fundamentals of this state-wide program were based on the formation of an organization in each state to carry on the necessary work of engineering, education and enforcement. The organization was to be built around state agencies and civic groups. The work of the organization would commence with obtaining the cooperation and active participation of the Governor, who would act as chairman of this group. Through him, the appointment of an executive assistant would be arranged for—this executive assistant to be the head of the State Highway Patrol, chairman of the industrial commission, or whatever state department officer might be in charge of accident prevention. All of the other departments carrying on accident prevention programs, either in their department or in their supervision of public agencies,

would be members of this committee. An active campaign would be carried on with civic bodies such as the veterans' organization, Kiwanis, and Rotary. The superintendent of public instruction would be requested to incorporate within the school curriculum instructions concerning accident prevention, emphasizing the grade crossing and trespassing angle. Through this state-wide organization, solicitation would be made for speakers to carry on the educational program before the members of luncheon clubs, fraternal organizations, public gatherings of all sorts, and the schools in session.

Through the state highway department, an active campaign would be carried on from the engineering viewpoint covering the physical characteristics of crossings and arranging where necessary to provide better sight distances or audible forms of protection in cooperation with the railroad; cooperation of the Railroad or Industrial Commission in the matter of closing certain crossings and in grade separations where practicable; securing the cooperation of the state highway patrol and local enforcement agencies in proper supervision of existing motor vehicle laws. If the formation of this state-wide committee was successful and general interest obtained by all groups, state highway patrols and other enforcement agencies would, as a matter of fact, become vitally interested in the prevention of this type of accident because of the aroused public opinion.

Mr. Lew Wallace, Manager of Field Organization of the National Safety Council, felt everything was being done concerning the Highway-Railroad Crossing program that could be done. The National Safety

Council Field Organization was working in several states, and the lack of help on their staff prevented them from organizing larger territory. Under direction of Charles Kimball, the National Safety Council has been working on organizations in southern and southeastern states. An effective organization had been established in the state of Georgia.

Mr. Hill, Chairman of the Railroad Committee, C.M.P.W.P., in order to expedite the work throughout the Nation as a whole, appointed railroad safety officers chairman of districts, other than the southeastern region where Mr. Kimball was chairman, as follows: southwestern region, Mr. L. E. Hoffman, Chairman; eastern and midwestern region, Mr. G. W. Elste Jr.; western region, Mr. F. W. Curtis, Chairman; northwestern region with myself as chairman.

At a joint meeting of the Steam Railroad Section Grade Crossing Committee and the committee, C.M.P.W.P., great stress was laid on the necessity of utilizing the National Safety Council field staff in perfecting these state-wide organizations. While it is true that a state-wide organization is less handicapped in placing a grade crossing accident prevention campaign before the people than railroad safety officers, I feel very effective work can be accomplished by railroad safety officers going ahead and organizing these state-wide committees in accordance with the fundamental policy adopted by the grade crossing committee of the Steam Railroad Section of the National Safety Council. In the state of Minnesota such an organization was formed and is functioning. An analysis of grade crossing problems in the state of Minnesota through the efforts of Mr. LaFountaine, Superintendent of Safety on the Great Northern Railroad, was presented to the Minnesota State Safety Council in such a manner as to impress the organization with the need for active participation in the prevention of this type of accident. Mr. A. V. Rohweder, Superintendent of Safety of the D.M.I.R. Railroad actively interposed in behalf of the program with the result that at the annual summer meeting of the Minnesota State Safety Council held in Duluth, August 18th, the entire program of the traffic section was devoted to the subject of grade crossing prevention. Appearing on the program was the Chief Engineer of the State Highway Department, who spoke on the engineering

phase of the problem, Superintendent of the Highway Patrol who spoke on the enforcement of motor vehicle laws, Mr. LaFountaine, who spoke on the railroad's responsibility, the Chairman of the Railroad and Warehouse Commission and myself, who outlined the fundamentals of this accident prevention program. The problem was thoroughly discussed by these speakers covering every phase, and the consensus was that the program that was outlined be adopted. Governor Thyne who was present at the meeting paid high tribute to the Railroad Safety Departments for their interest in public safety as well as the excellent work they were accomplishing in the prevention of accidents in the industrial field.

He analyzed the accidents involving collisions at highway-railroad grade crossings and the resulting tragedies to Minnesota families. He urged all civic bodies affiliated with the state council to become interested and active in the development of this program and pledged the earnest consideration and sincere endeavor of all state agencies in his administration in support of the program. In the discussion of the program, representatives of the civic organization present, pledged their cooperation. Since this meeting, the State Highway Department has been making a survey of all grade crossings in the state with the view of remedying any unsafe physical conditions. The accident division of the State Highway Department is carrying on an extensive educational campaign and the state editorial association is cooperating in this educational program.

In addition to this work, in the northwest region contact has been made in the state of North Dakota and preliminary ground work arranged for in organizing the state of North Dakota on a like scale with Minnesota. It is expected that an organization can be perfected in North Dakota and Montana during this month. In the near future thereafter, Mr. LaFountaine and myself will contact responsible parties in the state of Washington which will cover the four states accepted in the district. While it is true that in Minnesota, the State Safety Council is well-organized, and it was a comparatively easy matter to influence their direction toward solving the grade crossing problem, and the states of North Dakota and Montana are perhaps not as large and as complicated as many of the eastern states, we

nevertheless have found an appreciative audience in both of these states. It is our belief that those concerned in each respective state should meet as soon as possible, and confer with the governor and the officers whom he may appoint to act as executive chairman, and perfect a state-wide organization. This

organization, by carrying on an educational program, will not only have a beneficial effect in the reduction of highway railroad grade crossing accidents, but will likewise influence trespassers and employees to become more safety conscious, with a beneficial influence on the casualty ratios of the respective railroads.

Trespasser Accidents

G. W. ELSTE, Jr.

Supt. of Safety, Baltimore & Ohio R. R. Co., Baltimore, Md.

For the past ten years, an average of roundly 2,500,000 trespassers have been ejected from railroad property, to say nothing of the large number actually placed under arrest. There has, however, been a very marked reduction in the number of these ejections in the past two or three years. For instance, during the past year 584,593 trespassers were ejected, compared with 918,429 in the previous year and roundly 3,500,000 ten years ago, indicating a substantial decrease in railroad trespassing.

We are primarily concerned over the trespasser evil because of the large toll of life and limb it exacts every year. While there was a reduction in 1943 under 1942 of 13% in the number of trespassers killed, and 16% in the number of injured, and a reduction under the previous ten year average of 26% in the number killed and 42% in the number injured, there is still a yearly average of better than 3,000 persons killed and injured. Our interest lies not only in the humanitarian aspect of the situation but also in the penalties it involves, because we can no longer simply dismiss a trespasser casualty on the basis of the assumption of all risk by the offender, and we are all familiar with the growing tendency in that direction.

Secondly, we are concerned because of the many depredations committed by trespassers, such as placing obstructions on track, which in many instances results in wrecks and consequent loss of property, lading, personal injury, theft and armed hold-ups of employees, passengers, etc.

Many roads have for years conducted vigorous campaigns employing the methods with which we are all familiar as being very effective, and with encouraging results, but many have done little or nothing either because of a feeling that the problem is

insurmountable, or that it has not existed to such an extent on their individual properties as to cause them any great concern, or being occupied with too many other problems considered of more importance. The same skepticism was displayed following the inauguration of organized accident prevention on the railroads more than a decade ago. The fruits of our efforts in that undertaking during the succeeding years speak for themselves.

From the standpoint of conservation of life and limb alone, there can be no doubt of the wisdom of giving the trespasser problem a permanent place in our safety programs. Certainly they should embrace the prevention of trespassing along with any other phase of accident prevention. Instead, many of us treat it as somewhat of an orphan of the safety movement so far as organized anti-trespassing work is concerned, and rather dismiss it as the work of a relatively few police officers widely scattered over the railroad. Of course, it is quite natural to assume it is primarily the concern of railroad police to protect railroad property, apprehend transgressors, eject train riders and other unauthorized persons from railway property. And not only have they been most effective in this respect, as evidenced by the figures previously referred to, but have done excellent work of an educational nature through school and other contacts. I am, however, rather inclined to the view that because of the feeling that the control of the problem is primarily a function of railroad police, we safety officers have not taken it actively into our safety programs when obviously it should constitute an integral part.

It seems to me that to be successful in dealing with this problem for the present and particularly for the future, our efforts

should in a large measure be concentrated on it as it affects school children or children of school age, because any success we have in educating these children against the evils of trespassing on railroad property will reflect itself in their conduct when they reach the adult age.

I lay particular stress on juvenile trespassers because it has been the experience on the railroad I represent, and I believe equally so on other railroads, that it constitutes the greatest problem, in that in many instances while trespassing, they attempt train wrecks and frequently with success. Only recently a passenger train on our railroad was wrecked as a result of two boys, 9 and 11 years of age, placing an obstruction on the track. Fortunately no serious injuries or deaths resulted although there was considerable property damage. Some of these depredations are committed by these juveniles with malicious intent to wreck a train. Others are committed without the realization of the possible or probable consequences.

We all have knowledge of outstanding success in this respect on many railroads through the cooperation of schools, Parent Teachers Associations, Girl and Boy Scouts and organizations such as local Safety Councils, "The Safety Legion of America," with which one of our fellow safety officers, Mr. Daake of the Erie Railroad, is very actively associated, and many others. All of these contacts stand ready and willing to cooperate with us in educating juveniles against the hazards of railroad trespassing, and yet most of us have not taken fullest advantage of this assistance.

Not only have we enjoyed in the past

this very valuable assistance, but also in many directions, there is indication of equally valuable assistance from industrial employers in combating the trespassing evil. In an address a year or two ago, the Safety Director of a large industrial concern made these observations: "You fellows are doing a fine job in safety but you are missing the boat by not contacting industry directly on this trespassing problem. Why don't you write letters directly to the industries you serve and give them the shot in the arm they need to get started on this fight?" He cited his own company as a good example of this overlooked bet. He said that his company had long been interested in the prevention of accidents at home, at work and on the streets, but that never to his knowledge had any railroad company written them soliciting their cooperation in the prevention of trespassing. He pointed out why industries should be concerned with casualties resulting from railroad trespassing, stating that most industries do not realize the extent to which these casualties occur each year and suppose that most of them involve hoboes or itinerants whereas according to statistics nearly two-thirds of all such casualties involve persons other than tramps, and that nearly all of these reside in the community where they are killed or injured.

I would like to repeat comment made in the 1943 report of the Trespassing Committee, Safety Section, Association of American Railroads: "There can be no question about the sincerity of the desire of the railroads, if from none other than a humanitarian aspect, to abate this prolific slaughter. To accomplish this, we need only take full advantage of the means at our command."

"Keep 'em Rolling"

The slide film, "Keep 'em Rolling," was presented by G. M. Dempsey, Gen'l. Inspec-

tor, Div. of Safety, Chicago, Milwaukee, St. Paul and Pacific Railroad, Chicago.

Non-Train Accidents. (Maintenance of Equipment and Stores) (Panel Discussion)

Discussion Leader—C. L. LAFOUNTAIN, General Safety Supvr., Great Northern Railway Co., St. Paul.

Participants:

H. REES, Supt., Motive Power, Baltimore & Ohio R. R. Co., Pittsburgh, Pa.

E. G. ROBERTS, Gen'l. Storekeeper, Chicago, Rock Island & Pacific Railway Co., Silvis, Ill.

H. PRICE, Master Mechanic, Atchison, Topeka & Santa Fe Railway System, Chicago.

G. A. GORMAN, Gen'l. Storekeeper, Chicago, Burlington & Quincy R. R. Co., Chicago.

A. B. MONTVILLE, Safety & Fire Prevention Agent, New York, Chicago & St. Louis R. R., Cleveland.

J. A. McNALLY, Safety Inspector, Wabash R. R. Co., Decatur, Ill.

J. L. ROSSON, Supt., Motive Power, Great Northern Rwy. Co., St. Paul, Minn.

E. L. DUGGAN, Supt. of Safety, Atchison, Topeka & Santa Fe Rwy. System, Chicago.

C. M. BOWLING, Supt. of Safety, Louisville & Nashville R. R. Co., Louisville, Ky.

J. P. BOLAND, Master Mechanic, Elgin, Joliet & Eastern Rwy. Co., Joliet, Ill.

MR. ALLISON (B.&O.): I'd like to ask the gentlemen of the Panel what they think of the value of organized shop safety committees and the open meetings of the shop men themselves; whether they think the organized shop committees will serve the best purpose in education and training of employees, or whether they think the open meetings where you address your talk to the men themselves at such meetings is of most value?

MR. REES: I think the open meetings are really more valuable than the committee meetings, but I think that both should be in each and every railroad shop.

MR. PRICE: We practice both methods. I don't know that I could say which one gives the most value. We have had the shop safety program in effect for many years and relied, to a large extent, on the carrying on of our safety gospel through that committee.

We have the meetings, very short meetings, with the entire shop personnel there, and I think they have a definite place.

MR. EGAN (N.Y.N.H.&H.): Do you find more accidents in the engine house than you do in the shops?

MR. DUGGAN: On the Santa Fe we find more in the roundhouse than we do in the shop proper.

MR. McNALLY: The engine house usually contributes the largest number of accidents, and I believe that a safety committee

organization in every shop together with mass meetings is your best bet.

MR. CLARK (P.R.R.): What safety appliances are used to protect employees while working on top of the locomotive boiler?

MR. REES: We did have quite a lot of accidents caused by men falling off the running board and the top of the locomotive, especially working on the dome or removing the throttle. We tried a safety belt, and I don't think the safety belt is very effective while removing or taking off a dome cap or removing a throttle, but we did develop a platform made out of about one-inch tubing, or you can make it out of some superheater units. That's made into a square and placed right over the dome on the boiler, with a railing about two feet high, and the man is perfectly safe working there.

We also introduced that platform in the roundhouse. We tried a safety belt, but I don't think it's very good working around the throttle. It's all right on the front end.

MR. ROBSON: We've used a hand railing around the front end throttle when removing Type B superheaters or doing work on the front end throttle on the later classes of power.

This hand railing is made from extra heavy pipe. Although we haven't made a platform, the hand railing itself affords the mechanics and men working up on the top of the locomotive a grab iron they can hold on to while taking the nuts off from superheater units, and that has worked quite successfully in connection with the Type B superheater unit on the large power.

I believe the device that Mr. Rees mentioned should work in the back shops in particular where an overhead crane is available for placing a device on top of the locomotive. I'm not certain that would work in roundhouses.

MR. HENRY: I made a study of 241 reportable accidents that happened on our railroad the first six months of this year. I found that 49 of them occurred to employees who had been less than one month in service. Going on with my analysis, I found that 21 per cent of these reportable accidents occurred before six months had passed; seven per cent occurred between six months and one year; thirteen per cent one to five years; six per cent five to ten

years; twelve per cent ten to twenty years; twenty-five per cent twenty to thirty years, and seventeen per cent to employees with over thirty years in the service.

These men have training; they have good hearing, good eyesight, health, experience; they have protection in machinery; they have everything that we can afford. Yet that's the type of men that are injured on our road. Can you tell me why?

MR. BOLAND: I'd like to find that answer myself. During the past vacation period we have had several high school boys working in our shops and roundhouses, even on the cinder pits, around coal chutes and various places where there are really hazardous tasks to the positions. I suppose they're probably a little more intelligent than some of the older men we've had for forty years; they've had good training and are given a good lecture when hired and they've proved to be very valuable boys.

As Mr. Henry says, it's our old time machinists and mechanics of all descriptions that are being injured, and it's a question I couldn't answer because they certainly know the work.

MR. PRICE: I find that the newer employees who are being injured are in the lower brackets, for instance, car cleaners and laborers. That's where the preponderance of injuries to new employees occur. Now, in the mechanics and helpers of the older group, the experience is somewhat similar to Mr. Henry's experience. The men with many years service are being injured. I think it's often on account of working overtime, and working under considerable pressure, whereas in the coach cleaning and laborers bracket, we don't have that to contend with.

MR. SEYFARTH: I'd like to ask if anyone has a list of accidents by individuals showing the time loss or the number of accidents each individual has. I found out in maintaining such a record that there are a lot of repeaters.

MR. HENRY: Yes, we do keep a record of each individual, and we know how many times each one is injured. We have a lot of repeaters, there's no question about that, but that doesn't seem to answer the question.

Most of you will agree that in your studies of the accidents that are not caused by defective machinery or tools, it's not the lack of experience; it's something else.

MR. LAFOUNTAIN: Do you know of any department other than maintenance of equipment and stores department that had to take more old men and more women and young boys? I know, going through our own shops, I've seen machinists working that didn't have the kind of helpers they had before the war, and that might help to cause injuries.

MR. MUMFORD: We must not forget for one moment we're safety men. We're not here to make excuses or accept them. I find we're getting in a trend of trying to offer excuses—a thing we can't tolerate. We have no problem today that cannot be met by adequate supervision. It is our job to encourage supervisors to be the men of the hour. We have proven to our own satisfaction that where supervision adequately watches men at work and insists upon safety, those accidents of which Mr. Henry speaks will cease to exist.

MR. WAYNE: We find in a number of instances where we have the younger foremen coming up at the present time that they seem to be reluctant to point out to these older employees the violations of rules, or to tell them something on safety. We brought that to their attention very forcibly because we found a number of the older men are much worse than the younger men.

MR. LEWIS (Soo Line): Following up that point, I want to know what form or recommendation is taken, what action should be taken for supervisors or employees violating safety rules?

MR. GOERNER: Our experience on the Burlington has been just the opposite of what has been brought out here. In the stores department where we also operate a planing mill, a stone quarry, a large reclamation plant, a scrap dock and other items that require machinery, we found that 73 per cent of the injuries have been running to employees with under two years of service. In checking over the last 80 non-reportable injuries, we found that 50 per cent involved employees with less than six months service. The employees injured were in service up to 28 years. These newer employees were injured mainly because of strains to muscles and sprains because of stumbling. They occurred to men, some women laborers, some Mexican nationals and some older men who had been hired recently who probably hadn't worked for

some time. However, we find this: that the older men had the more serious injuries.

MR. LAFOUNTAIN: We'll pass along now to Mr. Lewis' question. He wanted to know what disciplinary action was taken in cases where supervisors noticed rule violations, and I'm going to ask Mr. Duggan to answer the question.

MR. DUGGAN: We're conducting a very vigorous campaign at the present time on the Santa Fe to reduce accidents, and in many cases we have taken disciplinary action when we found a man violating a rule and making it unsafe for others around him. In one particular case, we had a foreman who instructed his men to change the practice of handling the work, but he didn't stay with it until they had accomplished that task. He wandered off and left the work up to the inexperienced men. In the process, due to the fact that it was a new plan, one of the men was severely injured. In that case, we held a formal investigation and disciplined the supervisor for failing to stay with the men until the task was safely accomplished.

I don't believe that it is a good policy to discipline men who become injured, but I do believe it is a good policy to discipline men when you see them indulging in unsafe practices. That's the method we're following on the Santa Fe.

MR. CARROW: Could you give some illustrations of the extent you put that into effect? Do you suspend the men?

MR. DUGGAN: We have a merit and demerit system on the Santa Fe, Mr. Carrow. We don't suspend employees; we give them demerits, and in this case we gave the foreman ten or fifteen demerits.

MR. GNADINGER: Do you remove them from service?

MR. DUGGAN: In rare cases we do. It's rather unusual to take a man out of service for demerit marks.

MR. GNADINGER: You're speaking of shop men?

MR. DUGGAN: All branches of the service. They're removed when they have a hundred demerits.

MR. REES: On the Baltimore and Ohio, we don't have a merit and demerit system, but if a foreman has three or four accidents, he's called in by the officer in charge, and that record is reviewed, and he's told very plainly he's either got to make an improvement or else! We've never yet had the occasion to remove anybody from service.

MR. DUGGAN: Mr. Price is going to take a man out of service tomorrow on account of an excessive accumulation of demerits.

MR. LAFOUNTAIN: I don't think we're going to settle this question of discipline here today. As old Bob Ingersoll said, "Punishment should be made to fit the criminal and not the crime."

MR. IRVING (P.R.R.): I want to ask the Panel (I assume they do have engines with emergency footwalks around the engine cab)—whether they permit men to go out on it?

MR. ROBSON: On the Great Northern that catwalk is provided as an emergency exit for enginemen. We do not permit enginemen or mechanical department employees to use that catwalk in performing their regular duties. That is, we don't permit enginemen to use the catwalk to go out on the runningboard. Our rules require that the employee go out the gangway steps to the ground and use the steps on the front of the locomotive to ascend to the runningboard. The catwalk is merely for use in emergencies on the road.

THURSDAY AFTERNOON SESSION

October 5, 1944

Presiding: GENERAL CHAIRMAN H. A. DAAKE, Supvt. of Safety, Erie Railroad Co., Cleveland, O.

How to Improve the Development of Safe Working Habits

By HUGH A. McALLISTER

Asst. to President, Erie Railroad Co., Cleveland, Ohio

The sound basic principle of "telling is not enough" is so deeply imbedded in my conscious and sub-conscious mind that I

really dislike to even attempt to TELL anybody anything.

Telling, telling, telling, somebody is always

telling somebody what to do. The father tells the son, the mother tells the daughter, the teacher tells the students, the preacher tells the congregation, the lawyer tells the jury, the salesman tells the buyer, the president tells the vice-presidents, the vice-presidents tell the officers and supervisors, the supervisors tell the foremen, the foremen tell the men and yet, how much constructive action is produced.

Job Instruction Training **TEACHES** us to **TELL, SHOW, DISCUSS, REPEAT, QUESTION, CHECK** and have the listener **REPEAT** until the teacher **KNOWS** that the learner **KNOWS** and **UNDERSTANDS** the instructions or information being presented.

I appreciate very thoroughly that every man here has done a lot to improve the development of *Safe Working Habits* and yet facts, which you know better than I do, prove that much improvement is still needed.

Think Improvement Can Be Made

I appreciate very keenly why safety supervisors and others interested in building *Safe Working Habits* can become very much discouraged and feel that nothing more can be done. I have often experienced the same feeling during the past twenty years while trying to improve the sales methods of salesmen, dealers and executives.

I have always found that a positive, confident, optimistic attitude is absolutely essential to attain any type of improvement.

The learner is usually somewhat negative and therefore the teacher, supervisor or leader must be positive and **THINK IMPROVEMENTS CAN BE MADE**.

Act with Enthusiasm

1. Enthusiasm is the mightiest asset in the world!
2. It shatters gloom, laughs at rebuffs, conquers the unconquerable!
3. Enthusiasm is not the exclusive property of anyone!
4. No one is too old or too young to have it. It doesn't cost a penny!
5. Whatever you are doing—do it with **ALL** the **ENTHUSIASM** you've got!! And don't backtrack for anyone or anything! Train **ALL** Supervisors to **TEACH INDIVIDUALS TO WORK SAFELY**. This is a very vital step. Notice we emphasize **ALL SUPERVISION** should be

trained to **TEACH INDIVIDUALS TO WORK SAFELY**.

This job can't be done by just one or a dozen safety supervisors talking or even teaching safe practices while the line supervision are not interested and take no part in the teaching and training of the workers.

Many people interested in this subject have reached these timely conclusions:

1. Mass education in safety has its limitations.
2. Safety preachments are losing their appeal.
3. Many types of minds cannot be reached through emotional persuasion.
4. Effective safety training teaching demands *preparing and teaching the individual*.
5. The foreman or supervisor may have to start on himself.

Keep in your conscious and sub-conscious mind that **TELLING IS NOT TEACHING**.

How to Get Ready to Instruct

- Have a Time Table—
- How much skill you expect him to have, and how soon.
- Break Down the Job—
- List principal steps.
- Pick out the key points.
- Have Everything Ready—
- The right tools, equipment, and materials.
- Have the Work Place Properly Arranged
- Just as the worker will be expected to keep it.

How to Instruct

- Step 1—Prepare the Worker
- Put him at ease.
- Find out what he already knows about the job.
- Get him interested in learning job.
- Step 2—Present the Job
- Place in correct position.
- Tell, Show, Illustrate, and Question carefully and patiently.
- Stress key points.
- Instruct clearly and completely, taking up one point at a time—but no more than he can master.
- Repeat until you know he knows.
- Step 3—Try Out Performance
- Test him by having him perform job.
- Have him tell and show you; have him explain key points.
- Ask questions and correct errors.
- Continue until you know HE knows.

Step 4—Follow Up

- Put him on his own.
- Check frequently. Designate to whom he goes for help.
- Encourage questions. Get him to look for key points.
- Stress safety. Create job enthusiasm.

IF THE WORKER HASN'T LEARNED, THE INSTRUCTOR HASN'T TAUGHT.

REASONS WHY TELLING ISN'T ENOUGH:

1. Eye-minded instead of ear-minded.
2. Impossible to explain some operations.
3. Too many words confuse.
4. Words make a job seem complicated.
5. Terms are not clear.
6. Abilities of listeners differ.
7. Ability to explain is an **ART**.
8. Few people know **HOW** to listen.
9. Ego impels us to use our mouth more than our ears.

HOW TO TEACH A PERSON TO DO A JOB SAFELY.

Tell—Show—Discuss—**REPEAT** and Check these Steps and Key Points:

PREPARE THE LEARNER for SAFETY TRAINING.

1. Find out Safety Knowledge, Experience, Interest and Attitudes.
- through tactful questions
- mass training is not enough.

I think you will agree with me that **PREPARING** the learner for safety training is a very essential step.

The more thorough the *preparation* the more sure we are that the ideas we teach will take root, grow, and bear fruit.

The learner's mind and emotions should be stimulated and inspired to completely accept the information which we present. All fear, antagonism and skepticism should be eliminated.

Encourage the learner to talk and tell his safety experiences, interests and attitudes.

All of this information will make the teaching of safety rules, facts, and policies much more effective.

THROUGH TACTFUL QUESTIONS

We don't attempt to give our supervisors all the needed detailed information with which to teach the worker but we do ask him to put these questions to himself:

1. What safety training have you had?
2. Name some of the outstanding causes of injuries?
3. Which safety habits have you acquired?
4. Have you driven an automobile?
5. What is your safety performance?
6. What dangerous habits or liabilities do you have to overcome?
7. How much effort will you invest to help eliminate dangerous habits?
8. What results did your *previous training* produce?
9. What facts have you about **LOSSES** due to injuries?
10. What are your *conclusions* about the **NEED** for safety training?

Don't waste much effort or time talking or lecturing about safety until you know what the learner knows, thinks, and feels.

*Preparing yourself and the learner precedes effective **TEACHING**.*

MASS TRAINING IS NOT ENOUGH

Mass safety training has done a lot of good and will continue to have a place in safety education. However, many leaders in safety work feel that much better results will be attained when we take time to **TEACH** the *individual*. Of course, *preparation* can be *applied* to the group but the individual needs may not be uncovered.

There are usually a number of people in a group that can't be motivated by a mass appeal. They seem to be tired of listening to safety preachments.

Some employees may not fully appreciate the **NEED** for more safety training. They may have a hazy conception of the local, national and universal **LOSSES** caused by injuries but fail to have a complete deep realization of the **FACTS**.

To develop such an essential setting in the mind and feelings of the listener, we should Tell—Show—Illustrate—Discuss—and Repeat the following **FACTS** or more current facts:

- 1941—101,500 people killed by **INJURIES**.
- 350,000 permanently disabled.
- 3,750,000 injured.
- Cost the United States 4 Billion Dollars in one year.
- 460,000,000 man-days of labor lost.
- similar to closing 175 plants, each

- employing 10,000 men, for one year.
- enough to release our boys from the prison camps of fever-ridden Bataan.
- enough to give General McArthur the offensive and the chance to crush Japan.
- factory accidents increased as much as 50% in many centers since Pearl Harbor.
- results of ten years' industrial safety work have been practically wiped out.
- 1942—20,000 factory workers may be killed, 90,000 permanently disabled, 2,000,000 laid up for indefinite periods.
- safety business is cold-blooded bookkeeping.

To give the learner an optimistic viewpoint that good results can be attained, we like to present the following question and its answer—Can the Slaughter be prevented?

- Factory in Massachusetts operated 7,019,000 man-hours with no accident.
- Steel company in Cleveland 5,325,000 injury free man-hours.
- Machinery firm hit high mark of 11,114,000 man-hours free of accidents.
- Chemical firm topped it with 11,361,000 hours.
- Army Construction Engineers reduced accident rate 47% under private construction first 6 months in 1942.
- Saved 206 lives and enough man-hours to build house facilities for 120,000 soldiers.
- War Production Fund of \$5,000,000 to conserve manpower.
- \$5,000,000 being invested by business and industry to **RE-ENERGIZE** the Safety Movement.

Protection of Priceless Personal Faculties
An effective presentation and discussion of this subject should do much to impel a learner to have a genuine desire to develop *Safe Working Habits*.

People are selfish and proud and certainly don't want to lose their eyes, arms, legs and other priceless personal faculties.

Maybe we have failed to dramatize and make clear and impressive the value of these priceless faculties.

Every individual is a bundle of emotions and can be impelled to at least try to develop safe working habits if the right appeal is made.

Safeguarding the Worker

When a foreman assumes the responsibility for managing a plant department, he assumes much more than the responsibility for turning out a certain amount of work of a given quality at a certain cost. In addition to these responsibilities, he assumes the obligation to safeguard the workers' safety and health while on the job.

A new worker has the right to expect that everything possible will be done to safeguard him. Not only does the man look to the foreman for protection, but the company looks to the foreman and expects him to protect the life and limb of men under his supervision. It is assumed that the position of foremanship automatically carries with it this responsibility.

Most foremen recognize this and wholeheartedly accept responsibility for injury prevention. One of the first qualifications of a foreman is that he have sufficient human interest in his men to guard them well from anything that will impair their safety or their health. Such responsibility requires intense and constant attention. It is not enough to establish rules and construct physical safeguards against hazards, the foreman must wage a ceaseless campaign of *safe habit development* among his men.

Injuries Are Costly

Other things being equal, the safe department is usually more efficient than the one in which injuries occur more frequently. Management is apt to judge a department's efficiency, to a large degree, by the department's safety record.

As a manager of a business within a business, every foreman is anxious to constantly increase efficiency, and is always on the alert to improve results. The remarkable reduction in personal injuries during recent years has coincided with greatly increased operating efficiency during the same period.

The worker pays dearly for injuries, for not only does he suffer, but so also does his family. No amount of money can ever pay a man for the loss of an eye, a hand or a leg.

Obligations to Fellow-Workers

One thing a foreman should impress on each worker is the fact that he has a cer-

tain obligation to prevent accidents to others.

There is a certain type of man who has a reckless disregard for what may happen to himself. He puts on a certain bravado. As a matter of fact this is not bravery at all. He is a menace to those who work with him. All workers should be impressed with the importance of keeping an eye open to avoid being injured by a fellow-worker.

Telling people to **THINK SAFETY** is not enough.

Discussion, debate, and directed stimulated thinking leaves impressions which can't be quickly erased. We learn to think by thinking and expressing our thoughts in our own selected words.

PRESENTATION OF HOW TO PREVENT INJURIES:

Tell—Show—Discuss—**REPEAT** and Check these Key Points:

1. Modern Thinking says "Accident" and "Carelessness" are obsolete.
—"Accidents Will Happen" is fatalistic and negative.
—"Carelessness" serves as a weak excuse.
2. **INJURIES** are results of **UNSAFE POSITIVE ACTIONS**.
—Most injuries caused by **MAN** or **MACHINES** are **AVOIDABLE**.

Notice we keep the basic principles of teaching: Tell—Show—Discuss—**REPEAT** and Check before our conference leaders and members during each and every conference.

This continuous repetition should eventually help us to apply these principles in the **TEACHING** of *Safe Working Habits*.

1. Modern Thinking says "Accident" and "Carelessness" are obsolete.
—"Accidents will happen" is fatalistic and negative.
—"Carelessness" serves as a weak excuse.
2. **Injuries** are results of **Unsafe Positive Actions**.
—Most **Injuries** caused by **MAN** or **MACHINES** are **AVOIDABLE**.

These thoughts should be stated, restated, and illustrated until each and every member of the conference accepts them as truth and determines to do something about **TEACHING** them to the workers.

The conference members will contribute some good information to support these statements if given an opportunity.

A trained conference leader impels discussion which will help to develop *Safe Working Habits*.

Unsafe Thinking Is Responsible for Unsafe Positive Actions

Actual Cases:

- (a) "He left the guard off."
- (b) "He failed to wear goggles."
- (c) "He took chances to make up 30 minutes."

Your Daily Safety Audit

Safety Assets	Dangerous Liabilities
Mind on the Job	Mind-Wandering
Alertness	Sluggishness
Accurate Knowledge	Ignorance
Job Enthusiasm	Listlessness
Health and Energy	Fatigue
Cooperation	Antagonism
Confidence	Fear—Worry
Dependability	Horseplay
Sobriety	Indulgences
Safety Minded	Negligence
Safe Working Habits	Haphazard Efforts
Receptive-Attitude	Stubbornness
Orderly	Poor Housekeeping
Tested Speed	Unreasonable Haste
Essential Safe-guards	Criminal Egotism
—One Liability may destroy all Assets.	
—Improving Assets will Decrease Liabilities.	
—Opportunities for Supervision and Management.	

The major purpose of the above is to help the teacher to make an impressive contrast between the *Safety Assets* or *Human Traits* which contribute to *Safe Working Habits* and the *Dangerous Liabilities* which cause injuries.

Here are More Ideas to Tell—Show—Repeat—Discuss and USE:

- (a) Basic training in safety is just as natural as correct fingering in learning to typewrite or play the piano. There are right and wrong ways of holding monkey wrenches, claw bars, grate shakers, freight house trucks; and there are right and wrong ways of getting on and off moving cars or locomotives.

We cannot expect a man to use proper judgment unless he has been taught the correct way.

(b) A great majority of all train accidents and personal injuries are caused by the man thinking of something else other than his job, or in some cases having his attention directed elsewhere. Safety of train operation depends on the engineer observing and acting on the automatic signals as he comes to them. If he is in a daze or his attention is directed to something else in the locomotive he is apt to pass the signals. Men are hurt and often killed by being struck by trains because they weren't thinking of the danger of walking on main tracks or even yard tracks. *If any way can be found to impress men with the idea that they must keep their minds on their job, it will prevent many accidents.* This means that on locomotives no one should be talking to the engineer when unnecessary. Subjects foreign to the job on hand should be left for later discussion.

(c) The instruction that has been given on safety education has been largely on the safety rules and the train rules, and in many cases men have learned the rules verbatim. We have not concentrated on giving the worker the reasons for them. We should look upon rules as a result of accumulated experience, and the reasons for each of them explained in order to make it easier for the worker to remember them.

(d) Many accidents are caused by a man assuming something that he should not have assumed. He assumes that the approaching train will stop; that the approaching train is some other train than what it is; that someone else is going to take the necessary precautions; that a yellow signal does not mean what it says. Men are led into traps by having an unexpected set of circumstances, contrary to what they usually find. It is a principle of good railroading that the worst possible condition be assumed to be existing and each man should then act accordingly. The absence of a signal is a stop signal; an improperly displayed signal is a stop signal. The same principle applies to all other safety education.

(e) Most operations can be checked by more than one man. For example, an engineer is supposed to pay attention to automatic signals, but it is the fireman's job to call them jointly with the engineer. It is their job to be on the alert when approaching signals. This is for their own

safety. On the assumption that one man might make a mistake, the second man should be able to catch it. We expect a flagman to flag properly, but it is the conductor's job to see that he does. This rule is not made for the sake of discipline, but for the sake of getting proper operation. Men sometimes feel that the Book of Rules is a set of instructions that the Trainmaster uses to discipline men, in place of looking upon them as accumulated experience to be used for the guidance of employees. At times men take unwarranted chances, not only with train safety but their own personal safety. It is up to others who observe such actions to insist on correction.

General

It cannot be too strenuously emphasized that safety is dependent on mental reactions. For example; we had a dirty yard where the tracks were covered with pieces of coal, draw bars, car doors and rubbish. It presented an unsightly appearance but we had practically no personal injuries because the yard was so cluttered up that every man was careful where he walked and was very careful in getting off moving cars because he didn't know what he would strike when hitting the ground. We had the yard cleaned up and then had an increase in accidents because men assumed that the yard was clean, and didn't look before hopping off moving cars. This resulted in turned ankles on small humps of coal, on the edges of ties, tripping over switch stands, etc. These accidents were due entirely to lack of carefulness brought about by their changed mental attitude.

Habit

Safe Habits are essential. A man who has been nearly hit by a train on double track will always be cautious when working around a double track railroad and will always be thinking of a train coming on the other track.

Remember that somebody said, "Habit is like a cable, we weave a thread of it every day and at last we cannot break it."

Improving the development of Safe Working Habits is a very slow process of continuous **TEACHING** and **DAY BY DAY SUPERVISION**.

We hope you will go home and go to it with **SURE-FIRE TEACHING METHODS PLUS GENUINE ENTHUSIASM!**

"Why Risk Your Life?"

The motion picture, "Why Risk Your Life?", was presented by C. L. LaFontaine, General Safety Supvr., Great Northern Railway Co., St. Paul, Minn.

Train Service Accidents

(Panel Discussion)

Discussion Leader: L. E. HOFFMAN, Inspector of Operation, St. Louis-Southwestern Railway Lines, Tyler, Texas.

Participants:

- A. C. KLEIN, Safety Supvr., Chicago & Northwestern Rwy. Co., Chicago.
- E. L. DUGGAN, Supt. of Safety, Atchison, Topeka & Santa Fe Rwy. Co., Chicago.
- F. A. BOGUE, Supt. of Safety, Chicago, Rock Island & Pacific Rwy. Co., Chicago.
- C. W. RILEY, Dist. Safety Eng., Chicago, Milwaukee, St. Paul & Pacific Rwy. Co., Ottumwa, Ia.
- J. EDWARDS, JR., Supt., Baltimore & Ohio R.R. Co., Akron, O.
- B. W. SMITH, Supt. of Safety, Missouri Pacific Lines, St. Louis, Mo.
- L. H. BUTTERFIELD, Supervising Safety Agent, New York Central System, New York City.
- A. A. LOWE, Supt. of Safety, Southern Pacific Co., San Francisco, Calif.

MR. HOFFMAN: "Struck and run over" is the greatest cause of fatalities in train service accidents. I had several questions submitted to me, and I shall make use of a few of them.

What has been found the most effective method to get employees to look in both directions before crossing tracks?

MR. DUGGAN: I haven't found the most effective method to get the employees to look in both directions before they cross tracks. It is a serious problem on the Santa Fe, and one that we have attempted to improve by safety teaching in line with what was told us today. We have rules on our railroad the same as you do, and we attempt to get the employee to comply with these rules. We tell him that he must expect trains to run at any time on any track in either direction. We illustrate to him what happens to the man who doesn't look in both directions before he comes on

a railroad track. I know of no other method.

All we have is the old tried and true method of trying to make the employee aware that it requires alertness when he steps on railroad property, and that he must look in both directions.

MR. L. H. BUTTERFIELD: After an accident on any of our divisions where a man has been struck and run over, we seem to go along for a month or two without a serious accident of that kind in the territory, probably because the man is well known and because the story is well told. That is, every man on that division acts as a safety agent because of that accident, and when I find a violation of that kind, I begin to talk about the accident which may have happened yesterday or years ago, but which is remembered and can be recalled by the employees. I try to get an expression from the employees as to men that they knew about and what happened to them. In other words, it is a teaching proposition, education and enforcement.

MR. F. A. BOGUE: I can only agree with the previous speakers, particularly the latter. When we have a case of an experienced man being struck and run over, or a new man, it travels fast over the division, and after such an accident, particularly if it is fatal, we find that you do not have another accident of the same sort in the same territory very soon.

I think that the publicity that follows an employee's being run over does much to impress the rest of the men for a time with the necessity of the greatest care and the need to always look in each direction.

MR. HOFFMAN: On the "struck and run over" accidents, 43 per cent have been fatalities in the past five years. In addition, we know there are quite a number of

the men who do not die for several days, and are therefore included as reportable injuries rather than as fatalities. Another feature of these "struck and run over" accidents is the fact that there are more other employees killed and injured by being struck and run over than among train, engine and yardmen.

MR. LOWE: I think we have to get ahead of the accidents rather than follow them. I don't think the answer rests in the fact that we had one killed yesterday, and the men are going to be more careful for thirty days, because if we do, we will have to have one killed every thirty days in order to keep it going.

I try to handle it by having my people on the road (and division officers) turn in a large number of unsafe practice reports. Our measure of the ability of the officer to do a good job of preventing accidents rests in how many unsafe practices he sees and how many he turns in. If he has accidents and doesn't have unsafe accident reports, that is, if things are wrong and he doesn't see that they are wrong, then the Superintendent puts the "finger" on him and shows him that he hasn't got the right answer. I do the same with my supervisors on the road.

I think the answer is for you and me and everyone on the railroad to see the unsafe practices; to see men in between cars, crossing over when they are throwing switches and all the other things that sooner or later get them. The only other way is to stop the job and gather all the men around for a talk.

MR. HOFFMAN: I think we realize the importance of "struck and run over" accidents, but due to limited time, we shall go on with the subject that is causing the second largest number of employee fatalities in train service accidents: getting on and off cars or locomotives. That particular cause is first in reportable injuries. Why do you feel we are having so many employees injured or killed getting on or off cars?

MR. EDWARDS: Our answer to that question, based on the experience we have had on several divisions, is that such accidents are due primarily to the failure of the injured employee to keep his mind on the particular subject or issue at hand. That divides itself into falling from cars

standing still and falling from cars in motion. Strange as it may seem, the greatest proportion of these accidents comes from falling from cars standing still. It might be due to the fact that an employee, while the car is in motion, maintains a death grip upon the hand-holds, and he gets his feet securely placed; that he realizes from the motion of the car, there may be an impending accident. With the car standing still, he becomes more or less careless.

The moving picture, which I consider an outstanding exhibition from the Great Northern Railway, indicated one subject particularly, the types of cars which a man boards. We have safety rules which say that the brakemen, in boarding cars, should keep away from the highest cars, because there is more danger in being struck in close-clearance points (bridges and so forth). It was seen that the brakeman boarding the tank car didn't have quite enough strength to push himself up on the running board, and after several attempts he dropped back and without any difficulty whatever boarded the box car.

In an accident which is investigated, the last question I like to ask the man is, "How could this accident have been avoided?" I have yet to see a case where an employee will answer that question without showing some method which, if taken by him, would have permitted him to avoid the accident.

MR. HOFFMAN: One statement made applies to all train service accidents in particular, and in fact all our personal injuries, and that is to get the employee to keep his mind on what he is doing.

Coupling or uncoupling locomotives or cars causes a great many accidents, and I am going to ask Mr. Riley to say something on that subject.

MR. RILEY: I have found that the majority of accidents caused by coupling or uncoupling cars is due, primarily, because of old habits. As the picture demonstrated today, those are such things as the man running along between moving cars. They start that habit of getting between the cars before they have completely stopped, and it is a tough proposition to break them of it.

We know that our excuse is "education," but to teach the old hands, the 30 or 40-

year men, and get out in the yard with them and show them their mistakes is really a "he-man's" job, and you know it. Every time you go in a terminal you see men do things that frighten you. It does me, but what we are going to do about it is something for somebody else to answer.

In my opinion, the men that switch cars, couple or uncouple them, create these dangerous conditions by bad habits.

MR. HOFFMAN: What is the best way to train new employees to avoid injuries in getting on or off cars or locomotives?

MR. KLEIN: We find that the best way to train a new man to get on and off moving cars is to first give him proper instructions and place him in charge of a trained railroad employee. Recently, we had a group of men out in one of our yards, and among the things we showed them was the proper method in getting on and off cars, starting with their left foot and following with their right, making sure they have a secure grip on the hand-hold. We had the men go through that training several times until we were satisfied they were perfectly able to carry on the work without causing an injury to themselves when they are out in the field as switchmen or brakemen.

MR. HOFFMAN: The fifth in rank of causes of employees on duty being killed in train service accidents is operating hand brakes.

There are a large number of types of hand brakes. I am going to ask Mr. Riley to comment on the causes of these hand brake accidents, and the best methods to instruct a new man.

MR. RILEY: I put in quite a number of days with a hand brake instruction car at our terminals. We would, by bulletin, notify the train and yardmen of a meeting. There are 13 different types of hand brakes mounted in the car.

On the power brakes, the men would come in and handle them very easily, but we are not having men injure themselves on power brakes. Our men who are being injured are hurt while operating the old style brake in 9 cases out of 10. In some cases, the brake club is involved. In this car, we have the old style hand brakes, too. We also have brake clubs, and the old timers, whom we expect to educate the new men, were the clumsiest ones in the operation of the old style brake.

We have steam hose connections on the car set up just exactly as on passenger equipment. The old time passenger conductors that have been operating and running passenger trains for years get down on their knees and they can't handle the steam hoses. The same applies to the hand brakes. A good many of the switchmen who operate hand brakes every day would take hold of the power brake with both hands. All of the instructions very carefully state that they should operate these power brakes with one hand and use the other hand to hang onto the top rung of the ladder.

The hand brake instruction car is of great value, especially to the new brakeman. After a man has been there for a five-minute demonstration, you feel as though you have really taught that fellow something, at least how to handle the brake club. That is a big item.

MR. LOWE: My observation is that the new man gets hurt the first night or the first week. I have established, at all terminals where we have a large number of employees taken into the service, a rack about 7 feet high with a platform around it on which brakes are secured, and coupled underneath is the same rigging that they would have on the cars. Each division examiner is required to take every man that he employs over to the rack, and the group gathers around him. Each of those brakes is tried until he is satisfied that the man will go out on the midnight shift and work safely. If he isn't satisfied that he will, he won't let him go out.

I think that is the ideal answer to it. We have those racks at numerous places, and everywhere where we have grades and have to use clubs. It has proven very satisfactory.

Our greatest problem, however, is to make sure that the brake is in good operating condition. Therefore, we have two men working in pairs, a man on the ground and a man on top. The man on the ground certifies to that brake's being okay before it is allowed to be switched. If it is not in satisfactory condition, he makes no brake card on it, and the car goes over the hump. Everybody knows that the car has no brake and they don't let it go down the line alone.

MR. HOFFMAN: Contact with fixed structures is another frequent cause of fa-

talities and injuries to employees. I am going to ask Mr. Smith to state his views as to how these casualties can be avoided.

MR. SMITH: The question was put as to what percentage of the accidents of this nature occur to new men. While we haven't had a great many of those on our railroad, in thinking back over the injuries that have occurred in the last year, we'd say the preponderance of them are among new men.

Another question was, "How can you get the men to ride facing the direction of movement?" My thought about that is just the same as it is with all safety in train and engine service. That is, "put over" your rule book through education and training. Whenever you get a man rule-minded, you create a desire in that man to comply with the rules. He is going to be deliberate in his actions, and when he gets deliberate in his actions, he is not going to get hurt.

Someone asked a question as to what we were doing about keeping up with the location of close clearances. On our railroad, we do not carry in our time table the special instructions except three items. Those three items are the superiority of the trains, maximum speed, and restricted speed. All other special instructions are carried in a pamphlet supplementary to the time table.

The assistant engineer on each division is required to check all of the close clearances periodically, keep his records up-to-date whenever a change is made, and in that pamphlet of special instructions, there is a list of all close clearances, both side and overhead.

That is not the entire answer to notifying a man where there is a close clearance. It might ease our conscience a little bit in the event some fellows gets knocked off a car, and it might give the claim department a little encouragement if they have to defend a law suit. But there are so many of them that the men can't remember. We do not permit any new structures to be put up until they meet the requirements of clearance unless it is some rare case, and then it must have the personal approval of the chief operating officer.

Each section foreman if he sees a new building or anything being put up along his territory, immediately gets in touch with the roadmaster unless he has had something on it before. When the contract is made to

make any change, the section foreman, roadmaster, and agent are all notified. Every officer on our railroad is under instructions that if he sees any new building of any kind going up anywhere on the railroad, he will immediately find out whether it has been approved. In that way, we try to keep up with it. About once a year the special instructions are reissued.

MR. HOFFMAN: Operating locomotives is one of the principal causes of fatalities and accidents to employees, and I am going to ask Mr. Lowe to state how such accidents can be avoided.

MR. LOWE: I have noticed that in train service accident reports, less than 1 per cent of the fatalities in train service accidents were due to or occurred to employees while operating locomotives, and less than 6 per cent of the injured. Therefore, the total number seems to be well in hand. I think the greatest number of them are the result of accidental collisions and derailments—they cause the fatalities—and there isn't much we can do about that except to see that operating rules are enforced, particularly Rule 93, within yard limits.

One type of accident which has been rather costly in our operations this last year was a result of new men failing to secure cars in yards, with the result that they rolled out and ran into oncoming trains.

We have a method of procedure which we hope will stop that, but generally speaking that is the problem. The answer rests in close supervision, and again I say it is best controlled by all of us in the field searching for and seeing with eyes that see, and making out your reports when you see an unsafe practice.

Each of my men and all our operating officers carry pads of paper in their pockets, check off the conditions found and then turn those in. His value as an operating officer from the safety standpoint is based largely on how many of those things he sees. If he doesn't see them, he is not awake and is not getting results, and he has accidents in proportion. I think that is our ultimate problem and answer.

The principal difficulty for firemen is due to improperly handling water spouts and oil spouts, and that, again, is because we don't make them do it right. When we do, we don't have men hurt.

MR. SCHMIDT (Northern Pacific): In what respect do you use the report that you speak of in the form of discipline?

MR. LOWE: We don't use it in the form of discipline unless we get ourselves a new officer. It is an indication that the officer, also, is not keeping his own backyard clean. If he, in turn, has to go out and find a rule violation or does find a rule violation that he wants to hold an investigation on, he does, but the report itself is not brought in. That is a company matter, between the officers to whom the junior officer reports and his superior officer. It is our check on the junior officer's seeing things.

MR. SCHMIDT: Does the particular officer look for violations in his own department or does he report on all department employees, such as the trainmaster seeing something that the car inspector does or the car foreman seeing something that the yardmen do?

MR. LOWE: That's right. Any rule violation, yes. My men, of whom I have 9 on the road, cover all branches of the service, and anything that they see. A man that can't turn in a hundred or a hundred and twenty-five a month isn't getting around.

MR. SCHMIDT: But the man himself who is guilty of the violation? He is not disciplined?

MR. LOWE: Not on the strength of that report, he isn't; but if they wanted to make a case of it, that is something else.

MR. HOFFMAN: Coupling and uncoupling air and steam hose also causes a large number of casualties to employees. I am going to ask Mr. Edwards to say something on that.

MR. EDWARDS: We have found that a great many of these cases of accidents have been due, as brought out in the picture here today, to lack of instruction to the employee or his failure to assimilate the instructions which were given him. A great many cases of accidents to employees handling steam hose have occurred due to the failure of the party making the separation of the hose to turn the steam off properly and to have a proper operating valve. We have found some cases where that had failed to be carried out and the steam condensed and water came out.

Another feature has been the failure to turn the angle cock before cutting the hose. That, as you know, is a primary function and the first action to be taken in making a satisfactory cut of the connections. That is due to the inexperienced, usually, and the same thing which brings so many violations of the safety rules and so many accidents—the failure of the employee to keep his mind on the task at hand.

I might say our corrections on the Baltimore and Ohio for those specific accidents have been a concentrated effort to properly see that our employees do understand the rules pertaining to these details.

MR. HOFFMAN: We have not had a fatality in handling switches for the past eight years, but we have had several hundred employees throughout the country injured in handling switches. I am going to ask Mr. Butterfield to explain why a man should get hurt handling switches and why he should throw the ball of that lever on his foot, regardless of how many times he may have been warned.

MR. BUTTERFIELD: I think that the first thing that someone should have spoken to me about when I started to work was deflection in ground. There is a possibility that the ground next to the tie will be so high that if you hold on to the switch ball until the ball goes down, you are going to hurt yourself.

The second thing I would ask about is the possibility that the switch is not in good mechanical condition, and the possibility of its not latching, but of bounding back and hitting me if I am not clear of the switch.

As a new employee, I think someone should speak to me about the fact that if I have one hand on the lever and the other hand on the shank of the switch I may do as some of our men have—put my finger in the latch along with the shank.

The next thing that should be mentioned is clearances, and by clearances I am thinking of clearances between tracks, and also watchfulness in observing passing traffic. Then I think the position that a man stands in should be checked. I know that we have a lot of accidents which do not involve slipping, stumbling or falling, and in each instance someone has been injured by a spring. They have done the operation time and time again, and yet this injury occurs

and it seems to me that there probably is something in the position that a man takes when he throws a switch. Incidentally, I have never known of any man who ever threw the ball of a switch on his toe who did it a second time. I know that I didn't.

It seems to me that the answer is alertness, and the only way you can get alertness is through education. We have a system of checking on our men and turning in reports of improper practices, which has been spoken of here, and in addition to that we have three other things that might be of passing interest.

One is what we call "round-the-clock meetings." One week I work from eight o'clock until four—those are bankers' hours. Then the next week I work from four o'clock until midnight, and that isn't so bad. The next week I go back from midnight until eight in the morning, and that is just the thing I was doing 21 years ago. We get our men together and go over not only recent accidents but "draw the men out" to find out the accidents they remember, either to themselves or to someone else who perhaps is working in the vicinity or who has retired or died.

The only way accidents can be stopped is through education, and education is no good unless there is enforcement, and that comes around to our officers who watch the men and turn in the unsafe practice reports. Unless we do that sort of things we will never conquer this type of accidents.

MR. HOFFMAN: Accidents in train service and highway grade crossings are causing a large number of fatalities, and injuries. We will ask Mr. Bogue to tell how they can be prevented or materially reduced.

MR. BOGUE: The highway and grade crossing accident is something that has been continually with us since the automobile. The year 1940 had the largest number of killed or injured of any single year beginning from that time up to 1940.

During the five years from 1930 to 1934, there was a yearly average of 1,592 people killed and 4,322 people injured; and during the next five years from 1935 to 1939, there was an average of 1,531 killed per year and 4,386 injured.

However, beginning with the year 1940 and up to the year 1943, the number killed

in grade crossing accidents rose. In fact, the average is over 1,600 a year and the number of injured is also higher.

Naturally, it was expected that with the restrictions on gasoline of the past two years, the record would be materially lowered. We had 5,549 total casualties reported to the Interstate Commerce Commission in the year 1943 as against 6,100 in 1942 and 6,500 in 1941, but when you consider the large number of cars that were not on the roads and the slower speeds, you would naturally expect better results than that.

That is one type of accident that does not cause a high employee casualty list, and yet, going back to 1935, there are just about 65 to 75 employees involved in injuries or deaths. That, of course, is usually where the locomotive is derailed or a gas tank is ruptured and fire envelopes the engine or train.

The National Safety Council has for the last two years had an active committee on grade crossing accidents. It has worked with several of the states through law enforcement bodies, and the program has doubtless brought some results, but we have still before us the need for enforcement.

As a general rule, my observation has been that enginemen do pretty well in sounding the crossing whistle, but the greatest trouble seems to be that so many automobiles get on the track or right up to the track before they realize where they are. I think it is somewhat of a fallacy to say, "Well, he was trying to beat the train over." I think that is not true except in a limited number of cases. Usually the automobilist finds himself right on the track before he realizes it.

The highways are properly marked and it is the man's own fault. Nevertheless, the drivers are all human, and we have got a great deal to do, together with the public agencies, in securing obedience to "stop" crossing signs and respect for the crossing protection signs that the railroads have put in. If the drivers will be alert to what they are doing they can themselves reduce this terrific total.

MR. HOFFMAN: Miscellaneous train service accidents are causing a large number of fatalities and injuries. Many of which are caused by sudden stopping-start-

ing lurches or jerking of trains, locomotives or cars. I am going to ask Mr. Smith to explain what can be done to reduce or eliminate such accidents.

MR. SMITH: I think the reason we are having a number of injuries due to such causes is because of the fact that we have so many newly promoted engineers, and they haven't had the experience in handling air brakes. We do have some fellows who ride in the caboose like a loose potato. They will invariably go to get a drink of water, it seems, about the time that the man is making application of the air brake. That, again, takes some education, and we are carrying on a program daily with an air

brake instruction car, trying to get our engineers all educated in the handling of brakes.

That is something we are going to have to fight right along and we are getting new types of brakes that the men are not familiar with.

MR. HOFFMAN: There is great publicity given to train accidents, but not nearly as much to train service accidents. In the year 1943, 65 per cent of the fatalities to employees on duty resulted from train service accidents rather than from train or non-train accidents. Forty-five per cent of the reportable injuries for those three classes of accidents were train service injuries.

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Textile Progress in Safety

By NEIL NELSON

Safety Engineer, American Mutual Liability Insurance Co.

(Paper presented by L. M. Baken)

In the year 1844 a great stride forward was made toward safety in the textile industry. The Factory Act was passed and this legislation applied only to the textile industry. It contained broad and sweeping reforms and also provided for enforcement of regulations. Four factory inspectors were appointed and paid by the Government. Factory surgeons were provided for the purpose of examining workers under sixteen years as to their physical fitness for employment. The employment of children under eight years of age was prohibited in the mills and employment of female labor was restricted. Special provisions were introduced for safeguarding health and preventing accidents. To control accidents arising from clothing of women and children becoming caught in machinery, guarding of machinery was introduced and made compulsory. In addition, no children, young persons or women could be employed to clean machinery while in motion. The act also provided for investigation into causes of accidents and set up penalties for machinery unguarded after notice had been given by an inspector that the condition was deemed to be dangerous.

Thus we go back a period of one hundred years to find in actual legislation some of the important points which we are still trying to get instituted in a well-balanced program of accident control today. Even at that time pre-employment physical examinations were a requirement in the hiring of certain individuals. The added dangers attached to operation by female labor were recognized and safeguards provided. Not many years elapsed from the time of these new inventions by Margreaves and his colleagues to the establishment of mills in the United States.

During the latter part of the 19th century conditions began to improve and some of the more progressive mills saw the advantages of better and safer working conditions. However, progress came slowly until about 1911 when Workmen's Compensation laws were enacted in several states. Today, most if not all states have such legislation. Industry at first was rather

reluctant to accept this new reform but time has proved its value and industrialists are among those who now appreciate most the gains that have been made since its inception. State Labor Departments, the U. S. Department of Labor, casualty insurance companies, the National Safety Council and industry have teamed up in a gigantic effort to stem the tide of accidents and disease resulting from labors. In the short space of thirty years the progress made has been steady and sure.

In all departments of the mill accidents resulting from machine operations have been curtailed. Hazardous machines like cards and pickers have been equipped with mechanical guards over treacherous points of operations, the deadly knives of shears have been placed safely behind substantial barriers, extractors have been equipped with interlocks, and so on. Driving mechanism has undergone considerable changes for the better, machines individually driven by electric motors are fast displacing the old belt and pulley system operated from overhead line shafting and, while in the older mills there is still room for great improvement, the over-all progress is encouraging. Accidents attributable to these factors have shown considerable decrease during the past years. Hazards produced by the manual lifting of heavy warps and beams have been partially controlled by modern methods. Electric hoists operating on overhead tracks now wind their way through departments, picking up their load at one point and depositing at another with very little human exertion or effort. There are still operations which would benefit from such equipment and I have no doubt but that the well planned weave room of the future will incorporate such equipment to lift the increasingly heavy warps on to the looms.

Better Planning

More thought and planning is being given by management to mill layout. Location of machines is better proportioned to room dimensions, thus bringing about better housekeeping, surely one of the most important contributions for safer working

conditions. Modern mill construction of concrete and steel has been a boon to maintenance problems. Window area has been increased with more natural light and better ventilation. Good lighting is a definite ally of accident prevention. Many of the older mills with this still a problem may find great assistance in the new combination of modern electric lighting and scientific application of paint. Experiments have proved that even the dingiest corner with its lurking sinister shadows can be brightened like sunshine with paint. Machines painted in two-toned colors bring out the dangerous points of operation and moving parts in such vivid detail that operators no longer strain their eyes and nerves to prevent injury. This same painting has also contributed greatly to better housekeeping. Experiments have shown that when a simple bench vise has been painted a bright color the usual chaos on the bench was transformed into order, and when dingy corners are brought out from under the shadows they no longer become the repository for useless junk.

So far I have discussed mainly the progress made in the control of mechanical hazards, but it should be understood that in the textile industry less than 25% of the accidents recorded are from mechanical causes. The predominance of accidents in the so-called non-mechanical group (which of course means accidents by agencies other than direct machine operation) demands definite attention because no matter what improvements are made in the guarding of machinery, if the factors governing this group are not controlled, then the progress of safety will stall.

I have already mentioned the improvement in mill layout and contributions to better housekeeping, but unfortunately not all mills have fully extended themselves in this respect. There are still too many conditions of poor maintenance that cause unnecessary accidents every day: badly worn floors and stair treads, stairs without adequate handrails, leaky pipes and faucets, dripping oil from overhead motors and shafting, rickety ladders and platforms, unguarded elevator landings and so on. A constant campaign is necessary to control these conditions. Many mills do a splendid job; it is hoped that many more will follow suit.

In the last analysis of safety the most

important condition is the response of the man doing the job. What progress have we made in training and education of the mill hand to do his part in the march of Safety? It has long been recognized that the key man in this training program is the Overseer. To the mill hand the Overseer is the company. Whatever his actions are, whatever he takes, good or poor, to the man under him, that is the position of the company. In safety, as with all matters concerning production, management must lay out a program for the mill hand to follow. It is not sufficient for the personnel director to thrust a printed set of safety rules under the nose of a nervous new employee and expect to send a safe worker into the mill.

Accidents caused by unsafe working practice is just another way of saying accidents caused by bad habits. We all have some, and even for the most intelligent it takes time and practice to overcome them. Training and supervision are definitely the responsibility of the Overseer. Even today when labor conditions are so acute, that responsibility still holds. Any Overseer, together with his second and third hands, can institute a safety interest by good supervision, encouragement and commendation to his help that with no other safeguard will materially improve his accident experience. Add to this the mechanical and maintenance vigilance which I mentioned earlier and the improvement will be even greater.

Supervisors can learn much in the mutual exchange of ideas and information and where meetings are frequently held for frank discussion of problems (with a willingness-to-be-shown attitude evidenced by top officials) the safety program will live and thrive. Another indication of leadership and interest is provision of adequate first-aid and medical facilities. Most of the large mills have very good facilities with registered nurses on full-time duty and periodic visits by medical doctors. Not only does this assure all employees of competent and sympathetic treatment in case of injury, but it plays an important part in assisting them for better health all around. The medical program is bound to expand as we make further progress.

Just recently I read a magazine article entitled, "The Weave Room Is Underground." It described a new textile mill, which is unique and revolutionary in de-

sign. A two-story brick building approximately 120' x 100', windowless, and one complete floor below the ground level. On the ground level is a cotton spinning room and underground is a complete weave room. The idea was to build a weave room underground so that the walls would not be subjected to the wide variance in temperatures from day to day and season to season. Provision was made for humidity and temperature control. For lighting, daylight fluorescent lamps are mounted in continuous troughs in the ceiling which are designed to give maximum illumination at cloth level. The ceiling of the weave room is insulated so that a conversation at slightly louder than ordinary tone can be carried on with

the looms in operation. Floors are standard maple insulated against moisture condensation and the wall interiors are faced with salt glazed tile which needs no painting and helps to diffuse light. Machines are modern and individually driven with motors. The entire mill is a safety engineer's paradise. After reading the article and viewing the pictures, I tried to visualize their safety activities. A management so progressive must have had safety a part of its program. I could see the firm's outlook on this subject not as an added chore to be indulged in when times are normal, but as part of the broad picture wherein all are protected in a well-ordered and efficient scheme of production.

What the Supervisor Should Know About Accident Prevention

A. C. PHELPS

Personnel Director, Brandon Corporation, Greenville, S. C.

First of all, a supervisor should know enough of the facts concerning accident history, statistics and theory, to know as a matter of conviction, that accidents are in the main, PREVENTABLE OCCURRENCES. In one of our plants where the frequency rate had for several years averaged from twenty-eight to thirty-eight we inaugurated a ten minute session devoted to an explanation of accident statistics, theory of occurrence, and education of supervisors on the preventable nature of accidents, as part of the regularly scheduled monthly meetings. Very little else was done at that time, or for several months later. This was started in July of 1943. The plant had its first month of no-lost-time operation in November. It had one lost-time accident in December, 1943, and its next lost-time accident in August. Apparently, it will finish up the current accident accounting year with not more than three such lost-time accidents, a reduction to less than ten per cent of the five year average. This was not the only measure taken. However, it is my firm opinion that the developed conviction of each and every supervisor that accidents are preventable, was mainly responsible for the inauguration of a successful safety movement in that plant. There is not now a single foreman at that plant who will not argue long and loud upon the subject, nor is there one

who has not attained the state of mind so often referred to as "Safety Conscious."

Along with the conviction that ACCIDENTS ARE PREVENTABLE, the supervisor should know that he is the key man in the prevention of accidents, and that his is the primary RESPONSIBILITY. He must know again, in such fashion as to amount to firm conviction, that the prevention of accidents is one of the direct obligations of Management in general, and of Supervisors in particular.

The supervisor must know his place in the scheme of ORGANIZATION, and the ORGANIZATION itself. Otherwise he cannot know his responsibility or the scope of his authority—for one goes with the other. The very scheme of the organization of his department places him in the position of AUTHORITY and RESPONSIBILITY. He must know that his entire department depends upon him for its orders and its contacts in the work of the other departments in the plant. He is the leader, and his is the responsibility for the integration of the work of his department with that of the others to form a harmonious and productive whole.

But production alone is not the whole of his responsibility. There must be SAFETY along with production. And in order to

attain safe production, the supervisor must know many things. Some of these are:—

1. The mechanics and requirements of production—in other words, the job itself.
2. The limitations of his workers in a physical sense.
3. The psychology of the individuals comprising his working force.
4. The plant safety organization and the various aids to accident prevention which it is equipped to render.
5. The care, guarding, and maintenance of machinery.

6. Knowledge of how to plan for accident prevention.

7. Some knowledge of causal analysis and record keeping.

8. Sufficient knowledge of first aid to enable him to minimize the injury effect of minor accidents.

9. Sufficient general knowledge of modern industrial relations to enable him to imbue the individual worker with "Safety Consciousness."

10. Proper training methods.

A Safety Color Code for the Textile Industry

By RUSSELL SHEPHEARD

Technical Service Engineer, The Paint Company, Cleveland

Color as a means of conveying messages through the eyes, to the brain, is not new; but industry has been slow in adapting this medium to its safety program.

Through our eyes, we gain 80 per cent of our knowledge and also control a like amount of our body movement; the sense of sight as a means of conveying safety messages, therefore, is well chosen.

Color can be recognized at a greater distance than the printed word, and when given a definite meaning, it tells the story at a single glance. For example, locomotive engineers have a system of colors and symbols peculiar to railroading; the sea captain uses a system of colored flags to signal other ships. When the traffic light flashes red, brakes screech as numerous cars come to a sudden stop. Recognition is instantaneous. The wayward motorist who crashes a red light is quickly conscious of his wrongdoing, though he may not be aware of the dangers involved.

Our ability to see is dependent on the following factors:

1. The Size of the Object
2. Duration of Exposure
3. Brightness
4. Contrast
5. Conditions of the Eye
6. Appearance of Colors

Color Blindness

Seventy-five per cent of the garment

workers have faulty eyes; most of the defects involving visual acuity rather than form and color. Fortunately, most of these defects, thanks to medical and optical sciences, can be cured by proper diagnosis and fitting with glasses. One eye condition which cannot be corrected is color blindness; about 3 per cent of women and 8 per cent of men exhibit color blindness in varying degrees. The more common form involves the confusion of red and green, but there are cases where other colors are confused, and also cases of total color blindness. It is well to note, however, that most color-blind persons have a keen sense of brightness and are able to distinguish differences not noticeable to the normal eye.

The appearance of colors under various lights is an important consideration in the selection of a safety code. The color of any object or surface is due to a selective absorption and reflection phenomenon. When white light, which is composed of the various spectrum colors, reaches any surface, part is absorbed and lost and part is reflected. The particular wave lengths of the reflected light gives the visual sensation we call the color of that object and the amount reflected determines the brightness. A white object reflects nearly all of the light while a blue object, for example, reflects only the blue portion of the white light.

If the lighting in your mill is other than normal, colors suggested should be checked under that light to determine if they still retain identity. Here also, the use of

symbols is a valuable addition to the color code. There would seldom be a case where both color and design were not distinguishable.

A safety color code satisfying all the requirements and conditions above has been developed and is proving of great value in the field of safety engineering. Faber Birren,¹ one of America's foremost color authorities, in collaboration with H. E. Williams,² chairman of the Safe Practices Pamphlet Committee of the Textile Section of the National Safety Council and other industrial safety engineers, has worked out the details of the code. Six basic standards have been chosen as a useful and practical color code, namely: yellow, orange, green, red, blue, and white (black or gray). These colors were chosen for the following reasons:

Their traditional use, their attraction, for the eye, their ability to provide contrast, and others.

Appropriate symbols were assigned to each color making the system complete and flexible enough to suit the requirements of the safety engineer.

Red has long been associated with fire protection equipment and is so widely accepted that its use is obvious.

Orange, rather than red, was selected as the danger signal because of its higher visibility and to prevent confusion with fire equipment.

Yellow, because of its visibility, is used as a warning signal to mark surfaces or objects one might strike against; also, stumbling, falling or tripping hazards. It is also used for traffic markers for restricted areas where more than usual caution is required.

Green is the traditional safety color and is used to indicate the location of safety and first aid equipment.

Blue has long been used to warn against starting or moving equipment that is being worked on. Its use should be restricted for this purpose and to designate condemned equipment or equipment requiring care in starting. The erection by repair crews of a round blue sign with the words "DO NOT OPERATE" in yellow serves as a warning to indicate repairs are being made.

White has been used to promote sanitation and to direct traffic, also to mark storage areas and aiseways. A white star or

spot indicates the location of waste containers; white corners in stair landings reduce the tendency to discard refuse in these corners; clean white suggests "keep clean."

Too great a use of highly visible colors is to be avoided as they tend to be distracting and a superfluous use lessens their value as a warning for the purpose intended.

Color Uses

RED—Symbol, Square

Red should be associated with fire protection and fire protection equipment.

Suggested Uses

1. Fire buckets should be painted red.
2. Paint a square on the wall or a band on the post to indicate the location of fire equipment. Paint floor area to discourage blocking.
3. Code numbers on sprinkler mains and post indicator valves should be in red.
4. Sprinkler pipe fittings (not spray heads) may be painted red or the whole line may be painted if insurance or fire regulators so require.

ORANGE—Symbol, Triangle or Arrow

Orange should be used to mark machine contact or electrical hazards.

Suggested Uses

1. Interior of switch boxes, panel boards and fuse boxes so that they can be easily spotted if left open.
2. Interior of machinery guards to indicate lack of protection when removed.
3. Exposed pulleys, gears, etc.
4. High voltage areas, etc., by use of symbol to designate such areas.

YELLOW—Symbol, Band or Alternate

Black-Yellow Stripes

Yellow should be used to mark strike against, stumbling or tripping hazards.

Suggested Uses

1. Protruding surfaces or parts.
2. Curbs, edges of floor pans, etc.
3. Low beams.
4. Crane and hoist hooks.
5. Edges of low tracking equipment.
6. To indicate changes in floor level, edges of platforms, and pits.
7. Railings, or ends of hand rails.

Eye Fatigue

Too great a use of these bright colors will not only be distracting, but may cry "Wolf" too often and so defeat the purpose. Their use should be confined to specific purposes and places.

Aside from their use in promoting safety as warning signals, there are other considerations for the use of colors in promoting safety. Perhaps the greatest single cause of accidents is fatigue, and anything we do to reduce fatigue is beneficial. It has been said that tired eyes make tired workers. Let us consider then what makes eyes tired. Poor light, or poorly directed light can cause eye strain with the resulting fatigue, but even in good light, if the contrast between the seeing task and the background is wrong, vision is poor. Dr. Matthew Luckiesh,³ considered one of our greatest authorities on the science of seeing, states that the "brightness contrast between the thing looked at and the immediate background should be as high as possible." "This immediate background area covers only a one degree angle in the field of vision. The brightness of the surroundings, up to a 60 degree solid angle, should be the same or slightly lower (never higher) than the visual task." "A circle, equal in diameter to the distance from the eye to the task, gives roughly a 60 degree solid angle. Beyond this, the brightness ratio can be greater without seriously affecting vision." Paint, because of the wide selection of colors and light reflection factors, is a valuable aid in creating proper brightness and color contrasts.

In most cases, the contrast of the visual task in the one degree circle of critical vision is fixed and cannot be changed; therefore, paint of the same brightness as this area should be selected and used to maintain uniformity out to the periphery or at least to the 60 degree solid angle limit. A complementary color to that of the object may be used if it has the same brightness or light reflection factor, thereby tending to focus the vision to the seeing task and also to give color change which is, in most cases, restful to the eyes. Grayed colors, rather than pure colors, are best suited in this instance.

Glare is another condition which tires the eyes and saps the strength. Workers should never be required to face windows, ex-

8. Stairway approaches; edges of movable steps; risers and edges of off-standard steps; circular stairs, etc.

9. Conveyor parts at hazardous levels.

10. Aisle marking around hazards.

11. Aisle obstructions, etc.

GREEN—Symbol, Cross

Green is the traditional symbol of safety and should be used as such.

Suggested Uses

1. To indicate first aid rooms (green cross usually).
2. First aid equipment cases and location.
3. Containers for gas masks, goggles, safety suits, etc.
4. Safety showers.

BLUE—Symbol, Circle

Blue is used to suggest precaution.

A blue marker to be placed on equipment for temporary repairs or permanently painted when operating caution is required. The addition of an appropriate legend "DO NOT OPERATE, ETC." in yellow is recommended where suitable.

Suggested Uses

1. Equipment temporarily shut down for repairs.
2. Equipment being worked on as a warning against starting.
3. Condemned equipment.
4. Valves not to be operated.
5. Electrical controls to indicate work on the line or where caution should be observed in starting.

WHITE, BLACK OR GRAY—

Symbol, Star

White is used to direct traffic and to promote good housekeeping.

Use white on dark floors; gray or black on light floors or walls.

Suggested Uses

1. Traffic lanes.
2. Aisle markings (for hazardous areas, use yellow).
3. Location of waste receptacles.
4. Areas around waste receptacles.
5. Corners.

posed lights, or contrasting areas. Anything we do to reduce the contrast ratio aids seeing and reduces fatigue. A light will have less glare against a light background than against a dark one. If the walls are light, a window will be less glaring. In many cases, a shield can be erected to cut out troublesome glare, lights can be suitably shaded, and walls can be given the proper color treatment.

A fact which is usually overlooked in seeing problems, is the opening and the closing of the pupil which regulates the amount of light entering the eye. The pupil reacts in four or five one hundredths of a second, going from dark to light, but reacts much slower in going from light to dark. If a worker is working on a dark machine or dark work and then looks up to the window for only a second and then back to his work, it will be a few seconds before he can see clearly due to the slow accommodation. In general, anything we do to lighten surfaces and objects in the line of vision is beneficial.

Much has been said about "Better Light Better Sight," and the good results of increased light have been satisfactorily demonstrated. In the Textile Industry seeing is, in most cases, both very important and difficult and requires good light. The use of mill-white paint to augment the lighting is well established. However, with the advent of fluorescent lighting and better lu-

minaries, the general plant lighting has been brought up to a point where we can now consider the use of color, especially on the walls, thus creating a cheerful, homelike atmosphere and providing a change of pace which is restful to the worker.

In general, plant interiors should be as light and soft as possible, with white on the ceiling and light tints on the walls as the best aid to illumination. A darker dado can be used, providing the reflection factor of the wall color is not more than twice that of the dado. This will look neat and be easy to keep clean. In general, grayed colors are used as they are more restful and more harmonious. In corridors, rest rooms, etc., use colors which provide a change of pace. Cool colors, such as blue and green, are calming. Warm colors, such as tan and coral, are stimulating. Blue, stippled on the windows may reduce the temperature a couple of degrees, but the psychological impression emphasizes the difference, and the worker feels cooler. Wall colors with tints of blue and green have the same effect. In rest rooms, tints of coral and rose seem to please most women, while blue is the choice of most men.

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² H. E. Williams, Safety Engineer, Marshall Field & Co., Sperry, North Carolina.

³ Matthew Lackish, Director, Lighting Research Laboratory, General Electric Company, Nela Park, Cleveland, Ohio.

WEDNESDAY AFTERNOON SESSION*

October 4, 1944.

Presiding: JOHN J. BURGER, Sec'y., Safety Committee, W. J. Dickey & Sons, Inc., Oelz, Md.

Emphasize the Benefits of Safety

By THOMAS R. SELF

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What connection is there between our instinctive desire for self-promotion and our desire to minimize the occurrence of accidental injuries? There is an inescapable connection; failure to recognize it is often the primary reason for our bewildering failures to get a more widespread acceptance of safety principles. It is necessary,

therefore, that we develop our approach on the premise that people more readily accept ideas when those ideas are presented in such a way that the personal benefits are made obvious to the individual. Proper emphasis of the benefits of safety is therefore a most important phase of a safety program.

In getting action on an organization-wide basis it is necessary that the action be incorporated as one of the company's operating policies, otherwise it may be localized in one or more departments of the organization. It is only logical, therefore, that greater and more lasting results will be achieved if the initial contacts in selling safety ideas are made in the executive group of the organization. This will insure that the safety effort, once it gets underway, will be uniform throughout the organization through top management's desire that accident prevention be made a part of the company's operating policy.

It would be a great relief to all of us if the problem of injecting safety into a business organization were as simple as explaining safety to top management. There is a lot more to it than that. Most of our textile manufacturing firms have been in business for many years. During that time certain procedures have become habitual and in many instances those procedures have included a minimum of attention to accident hazards. Habits and tradition are serious obstacles to a good safety program because most such programs are of necessity contrary to established customs in the plant. We unconsciously resist changes and we are likely to say it can't be done when a change involves interruptions to our established thinking processes. Whether selling vacuum cleaners or something that seems as intangible as safety, we must first, figuratively at least, get our foot into the door before the sale can proceed. What better way is there to ease the resisting pressure on the door than to display the personal benefits that will come to the user of our commodity?

Benefits of Safety to Management

Now what does our safety idea or plan have in the way of benefits for the executive that will arouse interest and enable us to get a fair hearing for our plan? Before answering that question it would seem desirable to develop a mental outline of the available benefits and then carefully select the outstanding one for initial presentation as an interest-creating approach. Assuming that our safety plan has been carefully thought out from the viewpoint of tailoring it to fit the needs and capabilities of the particular organization we are dealing with

(this, incidentally, is a must in every instance) what does our plan have to interest the top executive? Will it grow new hair on his rapidly enlarging bald spot, or will it improve his golf game? Hardly anything quite that personal but nevertheless we can show him the extent to which he as an individual will be relieved of much tedious detail work; that his organization as a whole will function more smoothly, and more efficiently; that considerable personal credit will come to him; and that entirely aside from the humanitarian angle which we may normally take for granted, his firm will save many through a well conceived and properly conducted plan of accident prevention.

Let's assume that our organization we are trying to help is an average one in which top management is interested in safety to the extent that quite a bit of wishful thinking has been done about accident prevention plus a few sporadic attempts to get safety work going, these attempts having bogged down as a result of inadequate planning and a lack of proper direction of the effort. After a few such false starts top management usually will throw up their hands and back away from the effort due to the detail work involved and their almost total ignorance of what to do and how to do it. A properly developed plan of accident prevention activities will relieve management of this difficulty. It is seldom that we find that top management is unwilling to go along and actively support safety if we can make things easier for them by giving them proper tools in the form of a workable plan and then showing them how to put the plan in force without confusion and with a minimum of executive time and effort. Emphasis on the latter usually gain attention.

Next, how can a well organized and effectively conducted plan of accident prevention increase the efficiency of an operating organization? It is generally recognized by those industrialists who have experienced the transition from poor to good accident records that labor-management relations have improved, there is better coordination between departments and more cooperation between individuals as the accident record improves. Stating it a bit differently, it is almost a physical impossibility for a poorly run, inefficient business organization to de-

velop an accident record that will compare favorably with the accident record of an efficient organization. And, since the same methods make both production and safety click, smoking out the reasons for poor safety records brings out the reasons for poor production records in many cases.

Who gets his name in the paper, his picture in the trade magazine or is invited to address the local civic organization when a particular plant does an outstanding job of eliminating industrial injuries? It is usually the top man in the company. And, in most cases, top management deserves the primary credit for a good accident record as the accident record in any plant is no better, on a comparative basis, than top management wants it to be. By the same yardstick top management deserves the primary blame for a poor accident record. The opportunity to avoid the stigma of callousness to human suffering reflected by a plant's continued development of poor safety records should be an additional incentive for the executive group to invite and support effective safety work in their organization.

Why should executive management have an economic interest in accident prevention, looking at the matter from a purely cold-blooded dollars and cents viewpoint? Even before industry was faced with an acute labor problem, accidents created problems of replacement of skilled employees whose services were interrupted or terminated by accidental injuries. Also, not all accidents involving potential but no actual injuries to workers can be dismissed with a shrug. Quite often accidents due to the same causes result in serious damage to equipment and protracted work stoppages but through fortuitous circumstances there are no personal injuries.

I have deliberately stressed top management's part on the premise that what management really wants in the way of safety is usually what management goes after and gets. It is only logical that the more we as safety men are able to stipulate executive management's desire to prevent accidents the greater are our contributions to the success of the plant safety work.

Benefits of Safety to Supervisors and Employees

With executive management actively interested in safety we have passed our highest

hurdle as the operating superintendents and other top bracket supervisors usually fall into line. The benefits to these men are in the form of personal recognition by top management for good performance of duty. However, this emphasis should come from the top of the organization through the usual channels as further evidence to the upper bracket supervisors that safety and production are inseparable.

When we reach the supervisor directly responsible for small groups of rank and file employees, it is quite important that the extent that these individuals can benefit from safety be strongly emphasized. This group, being only one step removed from the rank and file worker, thinks along lines quite similar to the thinking of the workers. However, in his supervisory capacity he has definite responsibilities which in no fashion are similar to the responsibilities of the individual workman. If he is possessed of the average man's ambition he will appreciate and make use of every opportunity to improve his chances of promotion. If his performance in matters of accident control is made a part of those opportunities, the benefits of accident-free operations within his jurisdiction are obvious to him. Here again these benefits must be emphasized by management through organization channels, not as a directive but in such a manner that there is left no uncertainty regarding management's interest.

The one person carrying the greatest responsibility for the safety of the individual worker is the worker's immediate supervisor. Hence that supervisor is the logical person to depend upon to get and hold the safety interest of the rank and file workers. If we do a good job of arousing and holding the active interest of the supervisor, that interest will be communicated to the workers if the supervisor is worthy of his title. The benefits of safety to the worker are numerous. His physical well-being, the retention of his earning capacity and his place in the home and community are benefits that accrue to the safe worker and can be contrasted with the physical suffering and the monetary hardships affecting the worker and his family that invariably result from serious injuries. Some plants have seen fit to emphasize safety benefits in a more tangible way through monetary awards or bonuses to all em-

ployees of a department for each month of accident-free operations. That method might be likened to the Chinese custom of paying the doctor only while the patient is well. But, like the Chinese medical arrangement, it provides a definite incentive for accomplishment and its works where it is properly administered. A good selection of signs and word posters available to industry is another good medium of stressing safety benefits to the worker.

Looking at the matter from a broad point of view we must realize the need for arousing and maintaining active interest in accident prevention from the top to the

bottom of the organization. Without this interest no amount of effort can produce lasting results. This can be accomplished by showing all members of an organization how he or she will personally benefit by doing every job safely. A satisfactory amount of safety interest can be aroused and maintained in any organization if we study the problem carefully, plan our approach logically and make full use of the ideas and material that are ours to use. Safety interest alone will accomplish nothing unless it is properly directed and coordinated in order that the interest may be transformed into directed efforts.

When the Textile Worker Goes Home

E. W. WINKLER

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The records show that nearly one and one-half times as many workers are killed by off-the-job accidents as are killed by work accidents. When the low frequency and severity rates of the textile industry are taken into account, it is reasonable to assume that the ratio of off-the-job accidents to work accidents is much greater. However, this is not the whole story. An accident in the family usually means time lost by the worker. It always results in decreased production and low efficiency on the part of the worker. In the textile industry the time lost by workers because of accidents in the family is probably greater than the time lost because of accidents in the mill.

The textile industry as a whole has made an enviable record in its attempts to reduce the accident frequency rate. Recently in North Carolina two mills were honored for completing five consecutive years of operation without a lost time accident. Many other mills throughout the industry undoubtedly have equally good records. These records exist because management and supervision have made untiring efforts to prevent accidents, and the worker has cooperated one hundred per cent. It is regrettable that all textile mills cannot boast of such fine records, but it is hoped that continued activity will improve this condition.

It would be interesting to know the number of days lost by these mills having low frequency rates because of off-the-job accidents. Likewise it would be interesting to know how many accidents occurred to members of the families of the workers in these mills. There is no doubt but that an inspirational safety program in the plant will in many cases have a desirable influence on the attitude towards safety in the home. Unfortunately, in many mills the safety program is not inspirational. It is tailored to fit the mill. It is built around machine guarding, a rule book, and specialized activity. There is very little in the program that the worker can apply directly in his home. This point can be emphasized by referring to a certain mill in North Carolina. The training director wanted to include a ten-hour general safety course in his pre-service training. The safety director objected on the grounds that a ten-hour course is entirely too short to give any effective safety instruction and hence it would be a waste of time. A ten-hour course, based on creating interest in safety, would have a very good influence on the worker, both on and off the job.

Management is too often inclined to take the attitude that the company has no responsibility in what happens off the job. If the worker's home is to be safe,

then it is up to the worker to make it safe. This assumes that each worker has the ability and initiative to organize and maintain a miniature safety program in the home. Certainly management should realize that time lost by a skilled worker because of a home accident means financial loss to the company. Management should also realize that very few men have the ability and experience to organize and maintain a safety program, even for the home. Hence there is no justification for the assumption that the average textile worker can make his home safe, particularly when he is away from home most of the day and the safety interest in the community is low.

Fundamentals Are Same

Fundamentally, a safety program for a community or for a school differs very little from a safety program in a mill. The elimination of unsafe conditions and unsafe practices are the primary objectives of each program. Both programs must be built around education, and the same fundamentals of accident prevention will apply in each case. In the mill the program must have the active support of top management if it is to be successful. Likewise the success of a community safety program will depend on the active support of the leaders of the community. Who are these community leaders? In general they are the local business men, the local city or town officials, the school teachers, the ministers and the active church workers. Very few of these have had safety training and hence cannot appreciate the value of safety education. Recently this writer offered to present a safety film and talk at a local church gathering. The leader of the group replied that they had had a safety lecture about a year ago and she did not believe the group would be interested in another. A local Parent-Teacher Association group decided that the ten-dollar fee for the National Safety Council's School Membership was too expensive. These points show that the leaders in the average community are not safety conscious, and that if the worker is to be safe off the job, some outside force must be found to stimulate safety efforts in the home.

The average textile mill has a great

opportunity to promote home and school safety. First, it has a safety organization which can be easily expanded to include home and community safety. Second, it has access to certain forms of safety literature which can be integrated into community safety education. Third, practically all mills have a certain number of supervisors who have completed the ninety-six hour safety engineering course sponsored by the Department of Labor. Many of these men would give enthusiastic support to a community safety program. It is believed that if management of the mill really got behind a home and school safety program, it would not take long for the average man or woman in the community to appreciate the value of the program.

The average textile mill can promote off-the-job safety in many ways. Each community will differ from every other community, and hence the plan suggested here may have to be modified in many cases. Geographical, climatic, racial, and population factors will have to be considered in each case. But the fundamental objectives will be the same in all cases and many of the problems of organization and promotion will be the same. If a textile mill has a safety program in operation the following features can be added:

1. Appointment of a committee on home safety:

This committee should consist of men or women who are interested in safety, who own their homes, and who live near the general center of the community. The members of this committee should be interested in civic problems. They should have access to any publications on safety which the company receives, and they should feel free to use projectors or other equipment owned by the company.

2. Appointment of a committee on school and playground safety:

This committee should be made up of men or women who have children in school. While the activities of this committee will be very similar to those of the home safety committee, it is felt that the magnitude of the problem will justify separate committees. This committee should have the same access to equipment

and publications recommended for the home safety committee, and in addition the members should have the opportunity to visit the school during school hours and thus take an active part in the program. To be most effective the committee members should be permitted to make some of their visits on company time.

3. The company would pay the membership fee of the National Safety Council School Membership for the local school. The cost of this membership is only ten dollars and would probably represent a very small percentage of the cost of the company safety program. This membership would serve as a stimulus for both the home safety and school safety committee as its activities deal with safety both in the home and in the school. It is believed that no single expenditure would return greater dividends to the company in the form of reduced time loss than the investment in the school membership.

4. The company could supply homes with safety literature. This could be in the form of publications from the National Safety Council and from the insurance company, and mimeographed material produced by the company. For a very small cost a safety calendar could be provided for every home.

5. The company could promote an annual get-together, probably in the form of a picnic, where accident prevention could be stressed through games and contests. Safety awards could be given at this meeting and the records and activities of the various groups and committees could be presented. It is believed that this type of meeting would do a great deal to create interest in safety.

Problems Always Vary

The five suggestions listed above could

be modified to fit any particular community. In many small towns the textile mills furnish employment for as much as ninety per cent of the working population. In these towns the attempts of the company to promote community safety should find willing cooperation. In the larger towns and cities the problem is more difficult because the homes of the workers are usually scattered throughout the city. Here the community safety program could begin with the school and then work back to the homes. In many cases several textile mills could cooperate in a home safety program. This cooperation should find many opportunities for rivalry and contests.

The war has shown us that we cannot afford to let accidents decrease our production and thus prolong the war. Industrial safety has been improved and accidents to workers reduced by vigorous promotion of safety education. But this emphasis has not been directed to home safety and as a result the past years record shows about 24,500 workers killed in off-the-job accidents, and a much larger number temporarily or permanently disabled. These records alone prove that there is a great need for off-the-job safety promotion. From a national point of view accidents must be prevented to shorten the war; from a humanitarian point of view accidents must be prevented to prevent physical suffering and from a spiritual point of view accidents must be prevented so that no man or woman will have to endure the anguish when accidental death takes a loved one. Promotion of off-the-job safety is both a challenge and a responsibility, and the textile industry can accept the challenge and shoulder the responsibility by expanding its safety program to prevent off-the-job accidents.

Getting Active Participation by Top Executives In an Accident Prevention Program

A Symposium

Discussion Leader: H. E. WILLIAMS, Engineering Dept., Marshall Field & Co., Spray, N. C.

A. LABOR-MANAGEMENT COMMITTEE MEMBER

MARTHA PITTEGER

Avondale Mills, Alexander City, Alabama

Our Labor Management Committee is not a "War Baby." This committee was originated during peacetime by the Chairman of the Board of Avondale Mills, Mr. Donald Comer. We were then thought of as a Mill Committee.

To date the safety record of the Bevelle Plant is three million manhours without a lost time accident. We have not dreamed up this record—we have worked for it—and we are striving to make even a greater record.

Some of the actual benefits resulting from the members' suggestions to prevent accidents are:

1. Safety guards have been put around looms at the end of the alleys. Safety guard has been put at the box platform of the quill stripper. Motors also have safety guards.
2. Unprotected fast motion shafts in the Picker Room have a red safety cap,

which stops when coming in contact with a person's clothing.

3. Self oilers have been established on all line shafting.
4. Holders for lap pins have been put at the back of the cards.
5. Slanting window sills have been put in the Spinning Room.
6. Larger bottle containers have been placed throughout the mill.
7. Fans have been put in several departments.
8. Smaller wheels are to be put on trays holding oil drums. This will prevent the oiler having to stand on the slippery rim of the tray and will save oil.
9. Chains have been put at the runway leading from the mill and are put up when it rains so that the employees will use the steps, thereby, preventing falls.

B. SAFETY DIRECTOR

DAVID Z. WALLEY

Personnel and Safety Dir., Peerless Woolen Mills, Rossville, Ga.

The executives of a plant are definitely sold on safety when they employ a Safety Director to design, systematize and stimulate a workable and effective safety program. The responsibility of management, however, does not end there. They, too, must have a designated share in the program if it is to be truly adequate.

Ways to Arouse Management's Interest

Since executives are most easily influenced by what they can see in *black and white*, an appeal to the eye or through the printed word will be the Safety Director's

best method in gaining their interest. First of all, use attractively prepared graphs and charts which explain as briefly and concisely as possible the plant accident reports and waste records. Secondly, use selected slide film and movies which illustrate and put over in a very few minutes more than the average person can in a lengthy conversation. Thirdly, use selected short topics from safety periodicals; and finally, use State and Federal laws which were made to help protect the working man. The Safety Director should be well versed in both types of law in order to interpret them intelligently to management.

"The black and white method," however, is not the only one which the Safety Director can use advantageously. There is not a single top executive in the United States who is not really sincere in wanting his employees to have a safe place in which to work, or in wanting their families to avoid needless suffering because the bread winner had an accident in his plant. Thus the humanitarian standpoint is often effective in enlisting the interest of management.

If the morale of the employees is affected by the high frequency or severity of accidents and needs a boost from a psychological viewpoint, management is always glad to lend a helping hand to reassure them.

Training Within Industry, the insurance agent and Safety Engineer, as well as other outside agencies, are often a big help to the Safety Director in arousing management's enthusiastic cooperation.

Ways Management Actively Participates

One of the most common ways to gain the active participation of management in a Safety Program is to invite the executives to the safety meetings. Their presence proves to be a great asset, arousing the interest of all present.

Many companies have committees to make regular tours of inspection throughout the plant. Needless to say, an executive adds much prestige when he accompanies the committee on its rounds.

A number of plants have schools for safety instructions. The attendance of these classes by management will not only encourage and reassure the other participants but will also transmit this feeling of enthusiasm to their fellow workers.

A safety contest announced by a signed letter from a top executive arouses a spontaneous, contagious interest. He will enjoy tremendously serving on the committee to choose the winners. And think of the

"kick" the employees will get when the management personally awards the prizes, either publicly or privately, in his office! For continued results, such presentations should be publicized with pictures in the house organ.

As for the house organ, one cannot place too much emphasis on the safety articles which it contains and which are signed by a plant executive.

Benefits Gained

If the executives actively participate in the accident prevention program, the employees will have a much safer place in which to work, as an executive will see and suggest immediate improvements that possibly the Safety Director was just hoping for in the near future. The supervision of employees will be much improved and their instructions will be more thorough with regard to safety. The first aid and medical facilities should improve in the same ratio; the morale of the employees will be higher; and the fear from financial loss due to accidents will decrease.

When top management participates, the foreman will also benefit, as he will have a more regular work force; his operating costs will be lower; in all possibility his production will increase; and he will have more pride in his department.

The rewards to management will be greater cooperation from the employees and foremen and a lower cost per manufactured unit.

The success of the Safety Director's program is assured when management and labor, with a unity of purpose, fight for a common cause—the war against accidents.

Other speakers presented the points of view of superintendents and foremen. The symposium closed with a discussion led by Mr. H. E. Williams.

Women in Industry

THURSDAY MORNING SESSION

October 5, 1944

Presiding: MAUD SWERT, Field Dir., Woman & Child Labor, Industrial Commission of Wisconsin, Milwaukee, Wis.

Work Injuries of Women

By M. D. KOSSORIS

Chief, Industrial Hazards Div., Bureau of Labor Statistics, U. S. Dept. of Labor, Washington, D. C.

Whenever men gather, the discussion—if continued long enough—invariably gets around to the subject of women. It is entirely normal, therefore, that this Congress also pay attention to this subject during its closing session.

Women have played an immensely important role in industry during the last four years. Next to boys and girls of school and college ages, women have been the largest reservoir of the labor supply needed to replace men drawn into the armed forces and to enlarge the civilian labor supply beyond normal peace time needs. Between March 1940 and February 1944, the number of women in our labor force increased from 13,008,000 to 16,630,000, or by 3,622,000. Of the country's entire female population between the ages of 14 and 64, nearly 26 per cent were gainfully employed early in 1944. That means one woman out of every four was working outside the home.

Most of the increase came in the age groups above 34 years. The increase in the age groups below 35 barely exceeded the expected normal peace time growth. But the increase in the age groups of 35 years and over was one and one-half millions in excess of the normal growth.

Two and one-half million women were added to our civilian work force in the single year between April, 1942 and April, 1943. To fully appreciate what this means, it should be noted that this gain in the female labor force equals the gain during the entire decade between 1930 and 1940.

With the sharp increase in the relative proportion of women in our civilian labor force, it was inevitable that they should suffer more disabling work injuries than before. Although there are no comprehensive figures on this subject, the statistics of state workmen's compensation boards are illuminating.

In Illinois, 3,077 injuries to women workers were reported in 1940. (This number, incidentally, does not include disabilities of less than eight days' duration, and probably does not represent more than 50 per cent of the total of disabling injuries.) In 1943, 6,792. Whereas these injuries in 1940 comprised 7.9 per cent of the total injuries reported, they comprised 12.4 per cent in 1943.

In Wisconsin, the reports to the Industrial Commission in 1940 indicated that women had 7.1 per cent of all reported work injuries. In 1943, however, the number of injuries reported for women was nearly three times as large, and amounted to 14.0 per cent of the total. In May of 1944, they had risen to 17.1 per cent.

The experiences of other states tell much the same story. The upward trend in the total number of accidents to women was inevitable with the sharp increase in their employment.

How does the accident record of women compare with that of men? If overall frequency rates are an indication, the experiences of women workers generally are no worse than those of men, and frequently they are better.

Data Scarce

Data on the accident experiences of women workers are scarce. Few plants find it necessary to compile separately the injury rates of their male and female employees. To get more light on the problem, the BLS canvassed a number of plants and received usable data from 68 establishments. These covered a wide variety of activities, most of them in manufacturing. Included, for example, were 8 plants in the paper industry, 2 in aircraft production and plants in the printing, salt, tractor, chemical, trailer, steel conversion, and rubber industries.

The frequency rates of these plants bear out the statement made earlier about the accident experience of women. In a group of 5 paper plants in the East, the composite frequency rate for men for 1943 was 15.6. That for women was 11.3. For the first six months of 1944, the frequency rate for men rose slightly to 15.9, and that for women went to 12.6.

For another paper plant, this one in the middle west, the 1943 rate for men was 30.0 and that for women 11.2. For the first six months of 1944, the rate for the men remained practically constant (30.6) while that for women rose sharply to 29.5, bringing it up almost to the level of the men.

In a metalworking plant, the comparative rates for men and women during the first quarter of 1944 were 43.6 and 31.6 respectively. During the second quarter, the rate for the men dropped to 36.2, while that for the women went down to 5.1.

For a sizeable group of rubber plants, the 1943 frequency rate for men was 14.9, against a rate of only 6.4 for women.

Most of the reporting plants indicated that the accident frequency of women workers was as good or better than that of the men.

In response to specific questions, a large proportion of the plants indicated that women took time out for injuries which normally would not cause men to take time off. Similarly, they indicated that women tended to report to the first aid room for treatments of minor injuries which men tended to ignore.

On the other hand, a large proportion of the plants reported that there was no difference between the sexes on both of these questions.

The most frequent complaint voiced was the difficulty of getting women to wear proper shoes and adequate protection for their hair. In one plant, women workers refused to wear protective caps furnished by the company because they were all of one color. Only after the company had provided a variety of colors, and gave each woman the choice of the color she thought most becoming to her, did the company succeed in enforcing its safety rule.

Another report commented: "We have experienced some difficulty in getting girls to wear hair nets or safety caps when working with machinery. We have been only partially able in overcoming this. Steps taken to overcome this have been largely to persuade them that their personal appearance while at work would not suffer and that it certainly would stand less chance of being damaged for other occasions."

Another report commented: "Have had difficulty in getting women to wear head covering and steel toe safety shoes. Have succeeded about 100 per cent on head covering and about 50 per cent on the wearing of safety shoes."

And still another: "Strict enforcement policy seems to be the only solution; women prefer to dress and act differently from others of the sex."

That the danger from improper hair protection is a serious one is attested by the figures of the New York State Department of Labor which reported for 1943 eleven serious head injuries to women when their hair caught in revolving machines.

On the other hand, one safety director made this significant comment: "When properly trained and selected for the job, I find they are cleaner and more safety conscious than men, possibly because of their desire to prevent any injury that may detract from their feminine charms. With this attitude they also pay particular attention to their safety equipment and use it constantly."

The trick apparently lies in persuading women that their appearance outside the plant depends on proper precautions inside the plant.

Incidentally, the employment of women sometimes results in work injuries to men. The following experience of a foundry is a good illustration of this type of hazard.

For a number of years, this foundry had employed three male welders. These men were well trained in the safety fundamentals of their jobs. In all the years of their employment they had never experienced a welder's flash.

With the advent of the war, one of the three men left. Unable to replace him with another man, and with orders running high, the plant hired a woman welder. On the very first day she reported for work, both of the men welders reported to the first-aid room for treatment for welder's flash.

An analysis of the plant reports and the reports of state workmen's compensation boards indicates that, on the whole, the types of accidents suffered by women are not substantially different from those suffered by men. A plant that is safe for men generally is a plant that is safe for women.

However, there are some differences. One difference is that women appear to have a greater susceptibility toward dermatitis when exposed to various types of chemicals. Again, they appear to be more subject to strains than men. Most plants do not put them at jobs that require heavy lifting, and, as you know, state laws frequently prescribe the maximum weights women may be required to lift. In some plants the jobs performed by women have been "tailored" especially for them. Others use them only for selected occupations, and still others do not use them at all because of the nature of the work performed in such plants.

Illuminating Analysis

The analysis of the accident experience of one of the reporting plants—a large paper mill—is illuminating. During an 18 month period, women in this mill had 24 disabling injuries. Of these, 5 were strains due to lifting. But 8 accidents, fully one-third of the total, were due to slipping and falling.

The accident experience of women in shipyards, about which I shall tell you more shortly, sheds a little more light on these slipping accidents. Work on the ways requires a good deal of walking around and stepping over air hoses, electric lines, and various other materials lying around. Safety engineers in shipyards frequently made the observation that women had a greater tendency to slip or stumble because their home duties have not accustomed them

to lift their feet high enough and to climb over impediments. While this reflects better housekeeping in the home than is usually found in many industrial plants, and certainly in many shipyards, it nevertheless makes women more prone to these types of accidents.

All of this, and much more that could be said, adds up to the well known fact that it is extremely difficult to introduce into industry millions of persons—both women and men—who have never worked in industrial plants before, who are a little nervous and apprehensive about their new employments, and often are considerably confused.

The statistics I have quoted thus far applied primarily to manufacturing activities. In these, as I have pointed out, women were placed at jobs for which they could readily be trained. Some of these jobs were especially selected for them or tailored to their needs. A few of the reporting plants, however, made it clear that women performed the same jobs as men and under the identical conditions. And even here their accident experiences were as good or better than those of the men.

In nearly all of these plants, however, women were performing routine and repetitive operations. What happens to the injury record of women when required to perform work which is not of this character was brought out in the shipyard study to which I referred earlier.

The U. S. Bureau of Labor Statistics made a study of work injuries to women in 9 large shipyards. The study was conducted at the request of the Maritime Commission. The purpose was to find out if accidents hazards for women differed appreciably from those for men in shipbuilding, and in what respects they differed.

As you know, employment in shipyards has grown enormously during the last few years. Most of the new workers had never worked in shipyards before. Consequently most men and all of the women were green to their jobs. Many of the new men, however, had worked in other industrial pursuits, while many of the women came from homes, offices and salesrooms, without any prior plant experience.

Work on the ways involves a good deal of climbing, bending, stooping, stretching, and sometimes working in cramped posi-

tions in crowded or close quarters. At these jobs women are somewhat at a disadvantage because their usual modes of life and work do not harden them to these more strenuous activities. This is particularly true of welding and burning operations.

For a total exposure of nearly 38 million hours, male welders averaged 41.3 disabling injuries per million employee-hours worked. The frequency rate for women welders, with a total exposure of more than 16 million hours, was 64.6. In other words, for every 2 accidents to male welders, female welders experienced 3. Their accident performance was about 50 per cent worse than that of the men. In only 1 of the 9 yards was the record of the women welders better than that of the men—and even here the difference was not very great, as the comparative rates of 41.4 and 36.9 indicate. On the other end of the scale, the rate for women welders and burners in one of the yards, with an exposure of 1,135,000 hours for these female employees, was as high as 123.4. In this yard, however, male welders, with an exposure of over 2 million hours, also ran up the surprising frequency rate of 92.4.

A somewhat similar situation was found for assembly operations. Men averaged a frequency rate of 58.5—women, a rate of 74.6.

Disparity Disappears

When we shift from these types of operations to those in the electrical shops, where work usually is light and repetitious, the great disparity between the frequency rates of the sexes practically disappears. For the yards surveyed, the frequency rates of male employees in this department averaged 35.6. The comparable rate for women workers was 39.1—still somewhat higher, but not appreciably so.

Part of the explanation for the adverse experiences of female employees in welding, burning, and assembly operations lies in the lack of industrial experience already mentioned. That part of it may be due to a tendency of women workers to take time out for injuries which men would not regard disabling, is suggested by a comparison of the ratios of nondisabling injuries in 3 of the yards. For 511 disabling injuries, men reported 41,065 nondisabling injuries, or 80 for every disabling injury. For 425 disabling injuries, women

reported 19,980 nondisabling injuries, or 47 for every disabling injury. With the job hazards the same for both sexes, it is reasonable to suppose that women would have about the same proportionate number of nondisabling injuries as the men. The fact that the ratio of nondisabling injuries to disabling injuries was nearly twice as high for men as for women, or putting it conversely: that women had twice the number of disabling injuries per 1,000 nondisabling injuries as the men, strongly suggests that many of the injuries for which women took time off were the kind which men would have disregarded and would have stayed on the job.

The study, among other things, indicated that in shipyards women were apt to pay less attention to the necessity for first aid, which apparently is another reason for the lower ratio of nondisabling to disabling injuries. While they absented themselves from work more often because of injuries, they apparently did so frequently without reporting to the first aid station. The per cent of work injuries which resulted in infection was 2.6 per cent for men, and 4.4 per cent for women. This is contrary to the experience of manufacturing plants, many of which replied that women reported for first aid more frequently than men, and generally were more fastidious and concerned about themselves. In explaining this point, the safety engineer of one of the yards pointed out that women generally were much more careful than men when they first reported for work, and that this was particularly so if they attended training school. But after a while the caution wore off, and the women were as bad as the men. Just another instance in which familiarity bred contempt.

An analysis between the unsafe acts involved in shipyard accidents pointed to some interesting differences between the sexes. In the assembling department, the unsafe pulling of welding lines caused 2.9 per cent of the injuries to men, but 9.5 per cent of the injuries to women. On the other hand, the insecure gripping of objects, or taking a wrong hold, was responsible for 11.1 per cent of the injuries to men, but only 4.8 per cent to women. Men apparently disregarded their personal safety to a greater degree than women by not using personal safety devices: fully 33.8 per cent of their injuries resulted from this unsafe

act, against only 20.5 per cent for women. On the other hand, women were more likely to assume unsafe positions or postures: 37.3 per cent of their injuries were due to this act, against 28.3 per cent for their male co-workers. Outstanding in this group of unsafe acts was the one I referred to earlier: inattention to footing, which accounted for more than three quarters of the injuries in this group, against only a fraction of this for the men.

The statistics for the welding and burning operations tell much the same story. An outstanding feature in these operations is the differences in the injury distribution because of the failure to wear goggles as a protection against flying particles. Only 4.9 per cent of the injuries to women were traced to this unsafe act, as against 12.7 per cent for the men. But 4.0 per cent of the women's injuries were due to improper shoes, against only 1.6 per cent for the men.

Women fell more frequently on level surfaces than men. Out of 1,056 disabling injuries to women in welding operations, 15.7 per cent were due to such falls. Men had only 9.4 per cent of falls out of a total of 1,554 injuries.

Similarly, women had a greater percentage of falls to lower levels, exceeding that of the men by one-third, as the figures of 16.2 and 12.2 indicate. But women generally protected themselves better from flying sparks. Against 14.0 per cent of the men's injuries due to this cause, women had only 9.5 per cent.

Except for these differences, the experiences of men and women were much alike.

Because of women's greater tendency to wear improper shoes, they had half again as frequent injuries to their feet. Men's feet were injured in 10.3 per cent of the injuries to welders and burners, but women's feet, 15.5 per cent. The same difference was noted in assembly operations, where the percentages of foot injuries to women was 15.7 per cent, against 11.0 per cent for men.

Women also had relatively more back strains, almost half again as many as the men. In welding and burning, the relative percentages of back strains for women was

12.2; that for men, 8.2. These figures were closely matched by those for assembly work, which were 11.0 per cent and 7.3 per cent.

In summary, what may we conclude from those experiences?

In my opinion, the following is a fair approximation:

4. In manufacturing plants in which most work is repetitive and does not require much moving about in congested areas and no heavy lifting, and in which workers are subject to fairly continuous supervision, women are as safe or safer workers than men because—

1. they are more apt to follow instructions closely;
2. they are more concerned about their looks and more afraid of getting hurt;
3. they are anxious to make good and to prove they are as good as the men; and
4. they are less apt than men to show off by taking unnecessary chances.

8. In heavier operations, such as those in assembling, and welding and burning in shipyards, which require considerable moving about and working in awkward or strained position, and for which direct supervision is more difficult, women's accident experience is worse than that of men. The principal reasons for this appear to be:

1. that women's muscles are not accustomed to the types of activities involved;
2. that women are more apt to fall from elevations; and
3. that women have a greater tendency to fall over obstacles because they are not accustomed to step or climb over them.

With the end of the war, there is apt to be a sharp curtailment in shipbuilding. Similarly, most of our manufacturing plants will return to the production of peacetime products. In these plants women have demonstrated by their performances during the last few years that they have earned the right to be regarded as safety minded, if not more so, than their male co-workers.

Safety in the Training Program for Women Employees

By RUTH M. LEACH

Vice-President, International Business Machines Corporation, New York City

In 2 years and 7 months of participation of our country in World War II, our Armed Forces suffered losses of 63,000 killed and 46,000 missing, a total of 109,000. The death toll of our civilian population by accidents in two years and seven months at a current rate amounts to more than 240,000.

I do not wish to belittle the heroism and sacrifices of the men and women in our Armed Forces. When we consider that their losses have been borne by about 4,000,000 on the fighting fronts, and the civilian accident rate applies to about 125,000,000 people, we get some idea of the terrible risks taken by those who are fighting for the preservation of our liberty. From the standpoint of society, thousands of useless death are of like consequence whether caused by war or by accidents.

My part in this discussion is "Safety in the Training Program for Women Employees." Obviously, this area of the accident prevention program comes into the foreground at this time because of the influx of women into industry in connection with the war effort.

In March, 1940, 9,000,000 women were employed; now there are nearly 18,000,000. While I believe that the great majority of women will return after the war to the status of homemakers, there still will be at least two million more women at work than ever before in peacetime.

When we consider the program of safety for women, one thing which can be said is that in any event the women at work are likely to be safer than they were before. For of 9,200,000 accidents annually in this country, 4,600,000, or one-half of the total, are home accidents. The number of deaths from home accidents is 30,000 a year compared with 18,000 occupational accidents. I cannot conscientiously go on to discuss job training for safety without getting in some statement in regard to the need for education to make our homes safe.

Psychology in Industrial Safety

For the safety program in industry,

whether for men or women, I believe we ought to take advantage of the services of our best psychologists. It makes a great difference how we put ideas into the human mind. Sometimes a negative idea will have the reverse action. One of the factors of psychology which can be used to advantage in safety education is the power of suggestion. I believe we should emphasize the importance of making positive suggestions. This is a matter of repetition rather than reason, of dining an idea into the mind until the mind reacts in a certain way without thinking about it. Through posters and slogans we say a thousand times "do it this way." The manufacturers of chewing gum, aspirin, and other commodities, are willing to spend millions of dollars to apply the power of suggestion. Prizes for safety posters and slogans are money well invested, for not only do they develop safety ideas through the power of suggestion of those who see them, but they also develop a vast amount of safety-thinking on the part of those who submit ideas in such contests.

Psychologists have developed many types of aptitude tests. Probably the work which has been done in placing men in various branches of military service will prove most valuable after the war when the experiments in that field can be studied and analyzed. It should be possible to devise some reasonably simple tests to determine whether or not an individual is prone to carelessness, and by this means it should be possible to place such persons where there is less risk of accident.

Pride in the group, the psychology of the "team" in accomplishment, is another approach to the safety program. To a visitor at the main plant of my own company at Endicott, New York, one of the ideas which usually makes an impression is the signs in the various departments of the date of the last lost-time accident. When a department displays a sign such as "This department has not had a lost-time accident since 1933," each individual worker in the department feels that he

does not wish to be the one to spoil the record of his fellows. In fact, he may feel more strongly about that than about his personal safety. Furthermore, there is a tendency on the part of the older workers to watch and help the beginners to avoid hazards and thus maintain the departmental good standing.

Foremen Play Important Role

In the last analysis, nothing can take the place of a good foreman. Foremen who are trained in safety work and who are made to realize that safety is as important as production, can do more than any other agency to maintain safe practices. But here again psychology is important. Saying "don't" and "hawking people out" if they do, is not the method which makes for success. The foreman should feel that it is his duty to help people rather than to boss them.

Foremen should of course have regular courses in accident prevention. All employees should be brought into these safety studies from time to time. For that purpose I believe, nothing is better than motion pictures or slides. When you tell a worker, for example, about the danger of sauntering down the factory aisle while reading a blueprint, the telling does little good unless the worker actually visualizes that worker reading the blueprint and being run down by a truck coming up a cross aisle. With a motion picture we can create the proper mental image and put it directly into the mind of the person being taught. I cannot get away from the falsity of negative ideas. Always show people the right way rather than warning them against the wrong way.

Safety for Women Workers

There is a difference in the safety of machines for men and for women. Women, on the average, have less physical strength than men, and an operation which may be safe for a man who must exert only 50% of his strength to perform, may become hazardous for women who must exert 75% or 80% of her strength to perform it. Women on the average are not as tall as men and the levers and wheels at a height to be used advantageously by the average man may be slightly too high for the average woman.

Surely we have come a long way in the improvement of machinery. I believe it would be a good idea if everyone of us could occasionally see a moving picture of the machine shop of the early 1900's with its overhead slanting and flying belts. The first mechanical safety device was the steam whistle for locomotives, suggested by Stephenson in 1833 to reduce accidents at railroad crossings. But about accidents in the shop of overhead shafting and flying belts, nothing was done until 1912 when a small group of men met in Milwaukee under the auspices of the Association of Iron and Steel Electrical Engineers to consider a program for the reduction of industrial accidents. Out of that meeting grew the idea which led to the organization of the National Safety Council.

Safety education of employees and the development of safer tools and machines have shown encouraging results. In 1913, the year in which the National Safety Council for Industrial Safety was organized, the death rate from accidents in the United States, that is for all kinds of accidents, was 85.5 per 100,000 population. In 1943, despite all of our rush of war work and the expansion of the most hazardous occupations, the rate was 72.3 deaths per 100,000 population.

I know that something further can be accomplished in remodeling some of our machines especially for use by women. We can reduce the physical strength required to operate them and we can make them more convenient for women to operate. Knowing the initiative and ingenuity of our makers of machine tools I have no doubt that marked improvements will be made in the postwar equipment of this country.

Before closing there is one point to which I wish to call attention with respect to the safety record of women. In March, 1940, the non-agricultural employment in the United States was 36,600,000, the work-week averaged 38.1 hours in that year, and the deaths from occupational accidents amounted to 17,000. That is an average of one death from an industrial accident for each 4,100,000 man-hours worked. In the year 1943, the average non-agricultural employment was 38,200,000, the work-week was 45.5 hours and the number of occupational accident

deaths was 18,000. That is, there was one occupational accident death for each 4,800,000 man-hours. I realize that these figures are somewhat crude in that the factory work-week has been applied to all non-agricultural workers. But there is no doubt that the number of deaths from occupational accidents in proportion to the number of persons at work and the hours worked by them was lower in 1943 than in 1940.

Between 1940 and 1943 millions of men were taken from civilian occupations for military service and nearly nine million women left their homes to take over jobs in industry. These women were almost entirely without training or experience. Every kind of work was speeded up. In the speedup of the war effort, we have placed millions of women in industrial jobs in place of millions of trained men, yet the death rate from occupational accidents has actually declined.

So far as I can see there are only two possible conclusions to be drawn from that fact: Either women are inherently

more conscientious and careful than men or they respond much more quickly to training. Probably both conclusions are justified. But there are further reasons for believing that women do respond more quickly to training. From the 17,000 occupational accident deaths in 1940, the number increased to 18,500 in 1942 when large numbers of inexperienced women began taking over industrial jobs, but in 1943, despite the further increase in employment of women and the further increase in hours worked, the occupational accident deaths declined to 18,000.

That augurs well for the future. Instead of the increase in employment of women in industry in the postwar years being a special problem from the standpoint of safety, it becomes a hopeful symbol. With more women in industry after the war than we had before the war, we may reasonably expect our safety program will be stimulated and improved. I do not hesitate to predict that we shall find them setting the pace of industrial safety in the postwar years.

Management of the Pregnant Woman in Industry

By LT. COL. R. D. MUDD

Post Surgeon, San Antonio Air Service Command, AAF, Kelly Field, Texas

The old saying that there is nothing new under the sun is just about true with respect to the problem we are about to consider namely, that of the pregnant woman in industry. There is hardly a thought, an angle or fact of this problem which has not been quite fully covered, either in publications of official agencies or by specialists in the field of obstetrics, gynecology and industrial medicine. Women are in industry in larger numbers than ever before. They are not changed because they are in industry, nor is the process of pregnancy changed. But there is one thing that is, or should be different. An industry manned by women is no longer or should not be, the industry manned by men. Personnel methods change; safety, industrial medicine, sanitation and hygiene are changed by women, and especially pregnant women, being in industry.

The Need for Female Workers

The need for female workers began long

before the war in the period we then called the "Present Emergency." A form of prosperity descended on the country as a result of the increased industrial activity incident to the War in Europe and Asia and more jobs for women gravitated to jobs normally performed by men. In the beginning the jobs taken by women were of the traditionally light type but as the shortage of male labor became acute, women took on many jobs of the heavier type in trades, manufacturing, transportation, etc. The shortage of manpower in recent months has necessitated the hiring and continued employment of many pregnant women and the experiences resulting therefrom will be of value in the handling of this problem in the future. Women are showing that they can perform efficiently not only the traditionally light jobs but also in heavier jobs and that pregnancy is not a serious bar to efficient performance of duty.

In December, 1942, 12,500,000 women were at work in industry in this country.

About 3,500,000 were added during 1943, and by July, 1944, it was estimated there were 16,440,000 women employed in gainful occupations, exclusive of agriculture. The distribution by age of the female labor force as of March, 1944 was, under 20, 13.1%; 20 to 24, 18.8%; 25 to 34, 23%; 35 to 44, 21.5%; 45 and over, 23.5%. This included 400,000 unemployed.

The birth rate in the United States has increased every year from the low in 1933, when the rate was the lowest in the history of the United States, viz.: 16.6% per 1,000, to 1942, when it was 21% per 1,000. The rate has begun to decrease and every month of 1944 is lower than for the corresponding month of 1933.* It should be noted that the rapid wartime rise in birth rate was due to more women having their first baby, while the birth rate in families with five or more children has continued its pre-war downward trend. In spite of the increase in wartime babies, large families in the United States seem doomed. The conclusion is that the young women who are better able to withstand work while pregnant form the majority of cases of pregnant women at work.

At Kelly Field, Texas, a little more than 1/4 of the 18,000 employees are women. It is interesting to note that 99 1/2% of these women are married. Various estimates of the pregnant women run from 3% to 6%. Therefore, it is estimated that there are 480,000 to 960,000 pregnant women in industry. Until all industries adopt a sensible and wholesome policy with respect to the pregnant employee, it will be impossible to determine the extent of this problem because many, if not most women, in the face of an adverse policy will conceal their pregnancy as long as possible.

The entrance examination of all women in industry (in my opinion, which is not based on any War Department policy), should include a careful pelvic examination. We should consider our health education to be lacking in completeness until we can say that women will request or at least consent to a complete examination at time of employment. Needless to say, the examiner must be competent to perform the examination. At Kelly Field, we learned very early in the present War that there were hundreds of women being hired who had never had an examination, and the an-

tipathy was so great we employed a full time woman's physician to perform these examinations. Her findings have demonstrated the wisdom of that decision. The examiner should be thoroughly familiar with the industry or plant to which the applicant will work in order that the examination will be worth while and the applicant or employee have confidence therein.

Whether an employer will accept a new applicant who is pregnant is a matter for each employer to decide. Certainly he, as well as the employee herself, has a right to know whether or not an applicant is pregnant, if it can be reasonably determined. During the present manpower shortage the hiring of known women in the early weeks of pregnancy would seem to be indicated. But to hire an untrained pregnant applicant would not seem to be justified. In the absence of manpower shortage, the hiring of a known pregnant applicant would hardly seem justified unless she has unusual qualifications for a specific job.

Policy with Respect to Pregnancy

This paper is not concerned with the various policies that may exist with respect to employment and continued employment of pregnant women but it is concerned more with suggesting what should be a proper policy for the good of all concerned.

I feel that the War Department has adopted a splendid policy with respect to pregnancy. It is contained in War Department Circular No. 288, Sect. IV, dated July 10, 1944, in brief it provides as follows:

"A pregnant woman should not be employed after the 32nd week of pregnancy or should not return to work until six weeks after delivery and then only with the approval of her physician. They should report their condition to the Industrial Medical Department when pregnancy is determined and then report for examination and/or consultation every two weeks. The industrial doctor will then report to the employee's private physician any unfavorable conditions. The pregnant woman should not work between the hours of 12 midnight and 6 a.m. nor more than 48 hours a week. Where possible, two ten minute rest periods should be arranged. They should not be assigned to work requiring heavy lifting or

*U. S. Dept. of Commerce, Bureau of Census, Monthly Vital Statistics Bulletin—Vol. 7, No. 8—Aug. 11, 1944.

strain or work which in the opinion of the industrial doctor or employee's family physician would constitute a hazard. Maternity leave should not jeopardize the employee's job or her seniority privileges unnecessarily."

This policy was arrived at only after considerable consideration and study of all existing information and recommendations. It is a fine policy and is recommended to you for your adoption. In addition to the above, it is suggested that the pregnant employee be assigned regular hours.

The above quoted policy was followed, August 1, 1944, by a War Department Civilian Personnel Circular, No. 86, which deals with the subject of the pregnant woman in industry. I also agree heartily with the policy contained therein. In effect it states:

"Special consideration should be given to the utilization of the services of women during pregnancy. Inasmuch as their employment is temporary, they will not be assigned to work requiring extensive training (ten days or more). They will not be assigned to jobs inimical to their general health. With proper precaution on the part of the placement officer and with employee cooperation in making the fact of pregnancy known, assignments can be made with mutual benefit. When ever possible, the services of employees who become pregnant after employment will be utilized to the maximum extent consistent with their condition. The determination of the work they can do should be made only after consultation with the medical department or with the employee's own physician. The Medical Department or Civilian Personnel officers should so far as may be necessary assist employees in making contacts with established community agencies giving prenatal advice and care. No employee will be asked to resign on account of pregnancy. In the event it is not possible to utilize her services she should be placed on maternity leave."

Effect of Policy

The employer who says he will continue the employment of pregnant employees will be well advised to have a highly qualified doctor or group of doctors on his pay-roll. It is difficult enough to diagnose pregnancy in first six to eight weeks thereof, even with the cooperation of the patient. In these

early weeks diagnosis is fraught with many errors and concealment is easy. We have overlooked for years that miscarriages occur most readily in the first three months of pregnancy, that is in the so-called first trimester and least often in the second three months or second trimester. To refuse to continue employment to pregnant women will result in women concealing their pregnancy in the weeks that their safety is most often endangered. It also results in an unknown, but possibly large, number of abortions. The end result is that the industry suffers the loss of an employee. The employee's life and health and that of the baby are endangered and the community itself suffers. It is reported that in the years 1936-1940, 750,000 deaths were due to pregnancy and childbirth. This is a challenge to a Democratic nation. The reduction of this death rate should be our goal. This tremendous loss to society should cease. Unless all women are to be excluded from industry and this is neither practical, advisable or possible, everything must be done to encourage women to report their condition to management and the latter must make determined efforts to place the pregnant employee properly.

I was able to find very little information relating to compensation losses due to employment of pregnant women. I reviewed the lost time accidents of the San Antonio Air Depot since March, 1942, and was unable to locate a single instance where pregnancy had been the cause or contributed to a lost time accident. Women are prone to be more careful during pregnancy. This may be the reason for such a good safety record among them.

In one state it was found that on the average only two claims a year resulted in cases associated with pregnancy. There may be some in this audience who have different figures on this.

Work Supervision of the Pregnant Woman

The concealment of pregnancy which occurs as a result of an improper attitude towards this problem makes it impossible for the industrial doctor or nurse to provide, or advise the provision of, proper work supervision of the pregnant employee. On the contrary, a wholesome policy regarding the pregnant employee makes it possible to place her properly. In general, the pregnant

woman should avoid heavy lifting, constant standing, continued bending, stretching, exposure to toxic substances, marked vibrations, occupations requiring considerable sense of balance, as for example: work on ladders and stairs; punch press work; power-driven, wood-working machines and other machines where there is an unusual hazard.

Pregnancy throws an additional load on all organs of the body but mainly on the liver, kidneys and blood forming organs. Therefore, toxic substances that affect these organs should be avoided during pregnancy. Some of the more common are: lead and compounds thereof, radio active substances, turpentine, phosphorus, mercury and its compounds, carbon monoxide, carbon-bisulphide, chlorinated hydrocarbons, volatile oils and explosives.

It is not safe to assume that a pregnant woman can work in a toxic substance because the concentration in the atmosphere is "safe" for normal persons because so-called "safe limits" are not safe for the pregnant employee. So much for the physiological factors affecting the employment and placement of the pregnant employee. There are purely physical factors as well.

During pregnancy variations occur in respiration and pulse rate. The work of the heart is increased, the volume of blood is increased, the amplitude of respiratory movement and muscular power are decreased. Research has shown that the safest and most economical load to lift is about thirty-five per cent of the body weight. In pregnancy this ratio should be markedly reduced and the constant carrying of any appreciable load, particularly upstairs or on an incline, should be advised against. State limits, as for example, those of California, should never be exceeded at any time. Riveting and the use of other pneumatic tools are occupations that should be avoided during pregnancy. Limited studies of these occupations have demonstrated the possible damage to the pelvic organs that can result either directly or indirectly, even in so-called "normal" women.

In order that jobs may be available for the employee who becomes pregnant, a continuing study should be made of all jobs in a plant or industry suitable for such employees in order that placement will be readily effected when necessary. It has

been suggested, and I believe it to be reasonable, that there should not be a "pregnant department," i.e., one where a large concentration of pregnant employees are at work. The psychology of such a situation is not good.

Medical Supervision of the Pregnant Employee

The medical supervision of the pregnant employee is well outlined in a joint statement made by the Children's Bureau and the Women's Bureau of the U. S. Department of Labor in 1942. In brief it suggests that adequate prenatal medical care should be available for every pregnant employee and the employee should be advised how and where she can get such care. The same hours of employment referred to previously are suggested in that report, except that the forty hour week is preferred to the forty-eight. The types of employment advised against are referred to substantially, as I have stated previously, and a minimum of six weeks leave before delivery should be provided for. This is a good basic program. It needs some elaboration however.

I am sure that all of us agree that the private physician is the key-stone of a proper obstetrical program in or out of industry. His prerogatives should not be sidetracked. If there is a doctor in the plant or shop employing the woman, he should immediately determine from the employee whether or not she has a physician and if she has not to advise her to select one at once. Having selected her doctor, it should be determined which plan will be the most practical for prenatal care—the immediate supervision of her physician, that of a local health clinic, or an industrial prenatal clinic. The hours of work, distance from her physician, ability to pay, willingness of her physician to delegate prenatal supervision to a local or industrial clinic, are factors determining the choice of prenatal service. Under present conditions, with scarcity of private physicians, difficulty in transportation and six day work schedules, prenatal care in the larger industrial plants are greatly to be desired. This predisposes the willingness of management to provide this service and the ability and willingness of industrial physician and management to conduct the clinic.

It should be self evident that the very

continuation of employment itself is dependent upon the opinion and wishes of the employee's physician and the industry and the industrial doctor should be protected by having on file the agreement of the employee's physician in this regard, or at least, a letter to the employee's physician explaining that her continuation at work is his responsibility as well as her cessation of work, providing, of course, that under no circumstances will employment continue after the thirty-second week.

Even though an industrial clinic does provide prenatal care, the employee's physician must assume responsibility for such factors as test for syphilis, pelvic measurements, care of intermittent disabilities, and the broad direction of the prenatal program. The industrial or health agency clinic should concern itself with continued proper placement, general dietary advice, advice as to clothing, examination of the urine, checking of hemoglobin level, and possibly bleeding time, and determination that the employee is cooperating with her own physician. Mental and personal hygiene should also be considered.

A form letter should be prepared and handed to each pregnant employee outlining the policy of the company, the services that are offered, the cooperation between the industrial doctor, health clinic and private physician and any other matters peculiar to the particular industry or location.

A careful history form should be prepared and the employee, for her own benefit, urged to complete it honestly. History of previous miscarriages, abortions, toxemias of pregnancy, and difficult deliveries, should advise against continued employment. Such conditions as malposition or premature detachment of the placenta and continued vomiting are contraindications for continued employment. Interesting studies now being made on the factor in human blood will, in the near future, afford excellent evidence as to the possibility of miscarriages in some cases that heretofore have not been understood. These experiments have gone so far that miscarriages or a serious disease of the newborn child can be predicted. This is a complicated subject that need not be further discussed in this paper. It can be seen that the control of the pregnant employee in industry is a complicated matter, requiring the coopera-

tion of many people. It would be advisable, therefore, to form a committee to be known as the "Women's Health & Safety Committee" or some other similar title to consider this and similar problems. In 1942, we formed such a committee at the San Antonio Air Depot and, I am sure, it has had a wholesome effect. Where there are pregnant employees, proper rest rooms, eating places, rest periods, and transportation, medical facilities have increased significance. Such a committee can dig into all such problems and exert a fine influence on health, safety and morale.

Absenteeism

It must be expected that the extent of absenteeism in the case of the pregnant woman will be greater than that of the non-pregnant, in spite of the diminished absenteeism that results from cessation of menstruation. This increased absence can be controlled somewhat by the health education and control methods referred to previously in this paper. The pregnant employee who is on a six-day schedule should be permitted an occasional half-day off to see her physician, for example, rather than to arrange for night appointments. It is not the purpose of this paper to discuss the assistance to be given the pregnant employee who has small children to supervise in her "free" hours. The committee we referred to previously should look into this also. Day nurseries have sprung up in every large city. We early saw the need for them in San Antonio and there are several in operation. The nurse or doctor in industry should carefully evaluate the problem of the individual pregnant employee. In the usual case continuation of work by such employees with small children to be cared for on a "second shift" at home is an almost impossible task and other arrangements than industrial employment should be worked out.

It seems to me that it is the duty of every employer to encourage his employees to subscribe to an insurance program whereby doctor bills, hospital costs and loss of time from work are compensated for. If at all possible, each plant, in my opinion, should subscribe to some one plan in order that by joint action as low a cost as possible can be arrived at. Such a plan should provide for reimbursement of average costs of delivery and for loss of time from work.

The absence of anxiety, stress and resultant worry decreases absenteeism and lowers mortality for both mother and baby, and induced abortions. The good of the entire community results.

Maternity leave should be the privilege of every pregnant worker and she should retain her seniority as of the date of her cessation of work. It is noted that some union contracts provide for a continuation of seniority during maternity leave. Her job should be protected for her for a reasonable time after delivery. This agreement will vary according to local custom and thinking on the subject. The United States Department of Labor has suggested a standard wording for union contracts concerning maternity leave. It embodies substantially the program we have outlined herein.

Return to Work

The new mother should not return to work prior to six weeks after delivery and should not return in any case until her physician approves. The lactating mother, of course, should not work.

Whether there is war or peace, women will continue to have babies and they will continue to be employed in industry. When the labor market is good, I feel that pregnant women should be discouraged from accepting employment but the wisdom of having a blanket objection to continued employment of pregnant women results in the vicious circle we have mentioned before. There can be little reason for promptly releasing a pregnant employee until her physician or the industrial doctor or both decide on her release. Many writers and speakers on this subject stress the matter of the investment that the employee represents to management. I don't feel that any definite estimate of this investment can be made. The figure of \$500.00 is most often stated. It is not good business, therefore, to release such persons until it is necessary.

An attempt has been made to outline a broad program which has been found acceptable to labor, management, insurers, government agencies and specialists in the field of medicine.

Wood Products Section

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TUESDAY AFTERNOON SESSION

October 3, 1944

Presiding: GENERAL CHAIRMAN S. T. DIBSDALE, Safety Eng., The J. G. Brill Co., Philadelphia, Pa.

Safety in Wood Box Manufacture

By JACK DUNMAN

Safety Director, The Mengle Co., Louisville, Ky.

For the benefit of members who are not familiar with wood box manufacture, I should like to tell you just how our production lines run on this particular item.

Lumber for the wood boxes is shipped into our mills from the south. Safety begins at our unloading platforms in our lumber yards. Lumber handlers wear heavy leather gloves and leather aprons to protect themselves from slivers. The lumber is brought from the car directly on the lowerators. These lowerators are kept at working level while the lumber is being unloaded from the car. This does away with the unnecessary lifting and makes the job easier and safer. The lumber is then pulled by winch from the lowerators to electric transfer cars and then into the dry kilns.

Our dry kilns are automatic in operation with sliding doors. These doors are all hung so that the guide cannot come off the track. After the lumber is dried it is again placed on electric transfer cars and is either placed in dry storage or brought to the swinging cross-cut saws. Again this lumber is placed on a lowerator at the saw so that the saw operator does not have to bend over to lift heavy planks to the saw table. Each cross-cut saw is provided with a guard and exhaust hood for removing saw dust.

Automatic Switches Help

We have stop-switches that automatically lock on the saw housings when saw is stopped. This prevents the starting of the saw and accidents while blade is being changed.

This material moves from the saws to automatic rip saws which are chain fed and guards are placed over the chains so that the helper cannot reach into them. Kick-back fingers are also installed on all rip saws to prevent the kick back of slivers and thin pieces of material.

Stop switches are placed on both sides of the rip saws so that either the operator or the helper can stop the machine at will. From the rip saws the material goes to Linderman machines. These machines require complete coverage of cutting heads and guards must be used to prevent kick backs from the automatic feeds. Stop switches are placed at the three operating points of these machines.

From the Linderman machines the material goes into the Straiter planer. We have placed gravity conveyors from the Linderman machines to the planer. These eliminate danger of strain and hernia because the lumber is at working level and does not have to be lifted from the floor. These planers are provided with excellent chip breakers and hood guards over the planer.

The lumber then goes by conveyor from planer to the double-end equalizer. The material being too light in weight it was necessary to place spring hold-downs on the equalizer to prevent kick backs. The heads on the equalizer are completely covered by guards extending into the exhaust system. Anti-kick-backs have been installed on the outside of the saws to prevent the kick back of offal. The material coming from the equalizer is placed on flats and is moved as needed by hydraulic hoist commonly known to most lumbermen as a dolly.

Sides and ends from the equalizer are routed then to the printing presses. These printing presses are full automatic feed with all gears and rollers completely covered with guards.

Danger Points Are Painted

Our nailing machines are set up into a unit production line equipped with conveyors from one machine to the next. Danger points such as the hammer bars and hold downs are painted red and each operator is care-

fully instructed as to the danger of injury from these two painted parts of the machine.

Lock type stop switches have been placed on the nailing machines facing the operator so that when machine is stopped there will be no danger of tripping the machine from the foot pedal.

The ends of the box are bored for rope handles on single spindle automatic boring machines. To eliminate the danger of being caught by bits all boring is done in boring jigs. I would like to leave box manufacture for just a few minutes to say that boring jigs, even though they are costly will do more to increase efficiency and safety on boring machines than most any other thing you can do. We are now using boring jigs on all multiple spindle boring machines as well as the single spindle throughout our mills.

After the boxes are assembled they are carried by conveyor to the stain department. We use a water mix Dowicide stain. As you know Dowicide causes a severe skin rash when it comes in contact with skin surfaces. To prevent this our people who mix this stain wear a gas mask, complete face covering, heavy rubber aprons, rubber shoes and rubber gloves. The people who are dipping the boxes into the stain wear rubber shoes, rubber aprons and rubber gloves. They keep their faces and necks coated with a protective cream.

The boxes move from the stain department by conveyor to final inspection and from inspection to shipping docks they are moved by four wheel push trucks.

I suppose you wonder why I have talked machines up to this point. I was trying to impress you with the fact that layout, design, engineering and guards do have their place in the plants.

We are vitally interested in machine guarding but we are more interested in layout, method and safety training. When a new job such as the wood box was started we immediately approached both the Engineering and the Production departments as to the layout. With layout prints available it was very easy to spot "tight places," aisle bottle necks, machine spacing, trucking room in machine areas etc. We at The Mengle Company are very fortunate in having an alert management and a Chief Engineer very interested in the Safety Program, so that the Safety Department has a hand in all

machine movements, etc., occurring in the plants.

We found it necessary to change layout on the lines not once but on several occasions to better both production and Safety. In the case of guards for the equalizers the master mechanic along with the operator, the supervisor and the safety director designed the spring hold downs, the anti-kick back features and movable hood guards for the cutting heads. This was quite a problem due to the fact that cutting on the machine varied from 2" to 54". Universal joints were used in the exhaust pipes above the frame of the machine so that when the heads were moved from one position to another, the hood guards traveled with the machine heads.

Nip Points Are Guarded

Another trouble spot was the use of nail clinchers. These machines were built in our own shops from obsolete glue spreaders. All gears had to be covered, tables welded to take-off side, and motor belts completely covered. Measurements were taken to find the nip point on the rolls, and metal guards were so placed that the fingers could not reach the rolls. In fact the tip of a finger is 4 1/2" from the rolls, when pushed against the guard.

But, let's leave the machines for a bit and see how the personnel was trained to handle old obsolete machines on a new job.

Route sheets were carefully studied to find the sequence of operations. The safety department then made job break-downs of each operation listing the operations step by step and also listing hazards involved with each operating step. This not only showed the method but made it possible for hazards to be eliminated before the job was started. Naturally as the production on the boxes began we ran into faults. These were corrected as found and soon a smooth operating department was in production.

To do this it was not only necessary to train the foremen; it was necessary to train women, cripples and new employees to do their jobs both on the machines and in hand work.

Goggles of plastic were issued to the nailers and to people working in the nailing area. People were taught the correct method to use a claw hammer, to hold it by the end of the handle to prevent palmer

surface blisters and to use spiral screw drivers so as not to pinch the hands while operating them.

I believe what I have told you about our safety experience in box making is applicable to any wood working operation. The machines must be guarded to prevent hands

and fingers being injured in transmission and feed mechanisms and at the point of operation. Layout and mounting must be planned with safety as well as efficiency in mind. Good job instruction and supervision complete the job. All these steps are necessary to safety.

A New Safety Code for Woodworking Machinery

By HENRY G. LAMB

Safety Engineer, American Standards Association, New York City

On February 25 of this year the ASA approved the American Standard Safety Code for Woodworking Machinery. This is a revision of a previous standard which was approved in 1930. Perhaps the most fundamental change between these two documents was brought about through an action of the Safety Code Correlating Committee which enlarged the scope of this project from "woodworking plants" to "woodworking machinery." The previous document applied only to plants which were primarily engaged in some form of woodworking, whereas the present document is now intended to apply to woodworking machinery wherever located. Because of the wide use of a few woodworking machines, such as, circular saws, band saws and jointers in the shipping and maintenance departments of many large plants, this change is a definite broadening of the scope.

As far as the technical content of the standard is concerned, we believe that the sectional committee has done an excellent job in bringing this document into conformity with present developments in the art of woodworking and the guarding of these machines. The committee has prepared this document to be particularly helpful by preparing not only the text of the standard code, but also an appendix which discusses many of the important items and gives additional suggestions for the prevention of certain types of accidents which could not properly be included in the approved standard. Perhaps one of the most interesting things we could do this afternoon would be to discuss the reasons behind some of the provisions which have been included in the code.

Warns of Crowding

The present document includes a section on plant layout. This section is particularly important for woodworking plants which in the past have had a tendency toward crowding and where accidents undoubtedly have been caused from employees having to stand in aislesways in order to operate their machines. The standard also gives many suggestions on the construction of machines such as providing saw frames with limits cast into the frames in order that too large a saw cannot be mounted on the mandrel. Whereas the standard recommends individual drive for each machine, they clearly recognize that many plants are still working from belts, pulleys and overhead shafting. The standard has specified that where belts and shafting are used a locking type belt shifter or an equivalent positive device shall be used to prevent the accidental starting of the machine.

The speed for circular saws was given considerable discussion in the committee. It will be recalled that the previous standard contained a table of speeds for various size saws which was based upon a maximum peripheral speed of 10,000 fpm. The old code also provided an additional table which was permissible for so-called high speed saws based on 14,000 peripheral fpm. It was brought out in the committee meetings that the safe speed of a saw depended a great deal upon its construction and also upon its tensioning by the manufacturer. Even the same blade might, under one tension, be good for only 10,000 fpm, whereas if it were rehammered by the manufacturer it might be entirely safe to use it at a higher speed. The revised standard has, therefore,

stated that circular saws shall not be operated at a speed in excess of 10,000 fpm, unless especially tensioned for higher speeds with the maximum speed etched upon the blade by the manufacturer.

As far as guarding the point of operation is concerned, the section on circular rip and crosscut saws has been brought into line with generally accepted practice providing for a hood and spreader and non-kickback fingers. It is also specified that the hood shall be automatically adjustable to the thickness of the wood being cut. Perhaps the most radical change in point of operation guarding has been with regard to swing saws. In the past the hoods on swing saws have been mounted rigidly and have been designed to cover the top half of the saw and the outside end of the arbor. The present standard states that the hood shall be hinged at the back and provided with an extension at the front so that when the saw is returned to the back of the table the hood will rise on top of the fence, and when the saw is moved forward the hood will drop on top of, and remain in contact with, the material being cut.

Hood Guard Is Advised

The specifications for the jointer guard have also been changed in such a way as to discourage the use of the old mutton-leg guard in favor of a hood which will adjust both horizontally and vertically in accordance with work being performed. This change was made particularly because of the dangers in jointing wide boards where the operator is pressing down on the board, probably with both hands. Here, if the guard is swung out to one side and does not come over the top of the board, then any kickback of the board or sudden movement might drop an operator's hands onto the revolving blades before the horizontal swinging guard could return to its position over the knife blades.

There is a separate section of the standard concerning planer machinery. The biggest change in this section is concerned with the loading and unloading of steam vats and soaking pits in order to prevent an employee from falling into a vat filled with hot water. Here several alternate methods of operation are provided; such as, special non-slip floors, life belts and life lines for the operators,

mechanical handling equipment, or hydraulic equipment so that the vats may be drained before the logs are removed.

The section on operating rules has been considerably extended from the previous edition. Here the most prominent change has been a requirement that all cracked circular saws shall be removed from service. The appendix includes quite a discussion of this subject of cracked saws. This is of comparatively little importance to small saws, let us say less than 10 inches or a foot in diameter, but when you consider the larger saws up to three or four feet in diameter, each saw blade represents a considerable investment and if such a blade cracks the owner undoubtedly would want to do something in order to save the blade. In the past, many people felt that if a small hole were drilled or punched through the saw at the base of the crack it would prevent the crack from spreading further into the body of the saw, and there is no question but that many times this procedure did produce the desired result. They probably got their idea from people who did the same stunt in order to repair steam boilers back in the old days. With the changing times this situation also has changed. Today when a crack develops in a boiler, a welder is brought in and he welds the crack. By the same token, we are told that today men with the proper kind of experience are able to weld cracks in saw steel. Unquestionably the saw manufacturers have also found out more about the causes of cracked saws and it is, therefore, possible in most cases to prevent these saws from cracking in the first place rather than to repair the crack after it has developed. In the appendix it is recommended that whenever a crack develops so that it is visible to the naked eye, the blade should be repaired either by welding the crack or by grinding the teeth all around the saw so as to eliminate the crack, or by cutting a slot into the blade to entirely relieve the pressure on both sides of the crack and at the same time by cutting other slots around the edge of the saw in order to keep it in balance. It is also recommended that whenever a saw has been either welded or slotted, it should be retensioned by a skilled sawsmith. It would appear that one of the important causes of cracking is from a saw heating up, either due to improper tension or improper set of the teeth.

The sectional committee has provided one other feature in this standard which we believe will be of real help to safety engineers, particularly to those who have had comparatively little experience with woodworking machinery. This has been the inclusion of sketches of some of the point of operation guards. In the case of the swing saw hood which I mentioned previously, they have even included three sketches in order to show the relative position of this hood with the saw at rest at the back of the table, the saw part way through a piece of wood, and also with the nose of the guard resting upon the table at the completion of the cut. It is hoped that this type of illus-

tration will be helpful in visualizing the operation of some of these guards.

Probably everyone here at this meeting is interested in preventing accidents from the use of woodworking machines. Although this standard has been prepared by a committee of technical experts and although the final document has been printed and given wide publicity; it will not do much actually to prevent accidents until the ideas which it presents are carried down to the management and the men in the plants so that these ideas are put into practical application. Here is where you men can do a real job which cannot be done by an ASA Committee or any one else but yourselves.

THURSDAY AFTERNOON SESSION

October 5, 1944

Presiding: GENERAL CHAIRMAN S. T. DIXDALE, Safety Eng., The J. G. Brill Co., Philadelphia, Pa.

Making the Sawmill a Safe Place to Work

By R. F. CALDWELL

Attorney, Frost Lumber Industries, Inc., Shreveport, La.

One would assume, from the subject assigned to me to present to you today, that a sawmill is not a safe place in which to work. None but an amateur would venture to say that it is. Sawmilling is one of the oldest major industries in the Nation. It has never been safe work, and, to be perfectly frank with you, I don't know how to make it safe, but, I am going to try and give you some of my ideas on the subject which I have long had in mind.

Consistently, year after year, logging and lumbering are on the bottom of the list in both frequency and severity. Why is this so? Briefly, there are three basic causes:

1. From the raw product, to the finished product, there are probably more actual hand and machine operations in the manufacture of lumber than in any other material.
2. There has been little, if any, improvement of the means of mechanical process in this industry for many years.

3. Logging and lumbering are now, and always have been, a low wage industry, and a large per cent of the labor is unskilled.

It will require but a few moments for me to show briefly how many actual hand operations, and machine operations, are necessary in the manufacture of the finished product.

The first step is the brushing of the area in which the logs are to be cut. They are cut, divided, then skidded and bunched by means of teams, or tractors, at the points where they are to be loaded on trucks, or the log train.

When they reach the mill, they are unloaded at a ramp, or dumped into the pond, depending upon whether they are pine or hardwood. They are then floated, or boomed, to the log chain, and carried into the mill to the log deck, from which they are kicked over to the carriage.

The log is placed on the carriage and is passed through the saw. Boards which are sawed off are stripped and go onto the live rolls, which carry them to the

edgerman, who passes them through the edger.

Boards are next guided to the trimmer table, and cut into various even lengths by the trimmer saws. From there they move on the green chain from which they are pulled and stacked on jitneys or wagons. The next step is to the yard, or kilns, depending upon the kind of lumber. The lumber which goes to the yard is stacked, and that which goes to the kilns is pre-stacked on kiln trucks and then dried in the kilns.

After drying, lumber which is to be shipped rough goes directly to the car but if it is to be shipped dressed, it is carried to the planer, where it is dressed, and bundled, in some instances, and then sent to the dry shed, or to the car.

In this process, the material is actually handled 29 times, and passes through 22 machine operations, or a total of 51 different operations. This does not include the incidental operations of saw filers, millwrights, oilers, engineers, firemen, clean-up men, tram-repairs, and many others.

Now, with each of these operations, there are one, or more, exposures—in performing each step, one or more workers are subject to hazards—in each process, there are those temptations which the unthinking, or chance-taking employee will not overcome.

I do not know why there has been so little improvement in the machine, or mechanical process of the manufacture of lumber, nor why labor saving devices, and methods, have not as extensively entered this field as in other of our major industries, but such reasons, whatever they are, go beyond the scope of this paper. At any rate, the same equipment is being used today, in the manufacture of lumber, that was used a generation ago.

All High-Speed

All machinery in use in sawmills is high-speed machinery, and in any high-speed machine, wear is greater, and replacements and repairs are more frequently needed. Guard units to sawmill machines, saws, etc., must be purchased separately, or devised and made by the foreman of the department, if he has that

much initiative. Generally, such units are not standard accessories.

The many types of machinery used in the various departments of a sawmill, are of a type which can be used for an indefinite time, provided that replacements of used parts are made, and that certain repairs are periodically made. They are somewhat like an old Model T Ford, it will run just as long as you keep it in repair and install new parts. Because the machines are of this type, in the majority of instances, when a new sawmill is built, the builders will scour the country for machines from mills which have cut out, or burned out, and when the new mill is finally built, its machinery will have been in use for many years, in other mills. It can be readily understood why these practices, and conditions, are deterring factors to safety.

It is rather difficult to explain why the fact that this industry is a low wage industry has anything to do with the safety of its employees today, but to one who has had the experience I have had with sawmill employees in accident prevention work, the reason is readily understood. We, in the sawmill business, are faced with difficult competition, so far as the labor market is concerned. Our workers have left our mills for higher wage jobs. They were replaced by young 4F workers, by old inexperienced workers, by colored women, by farmers during off season periods. When the labor scarcity first began to appear, most of our mill managers would give an employee a release if he would ask for it. But, the practice of securing releases became so widespread, that soon the managers had to refuse to let any one have a release. As a result, when a worker would ask for a release, and it was refused, he would go back on the job because he had to. There probably have been many instances when such a worker would actually want to be fired. It did not take many of the workers long to realize that they were not going to be fired, and some of them took advantage of that fact. As a result, extensive absenteeism very frequently tears up our crews and leaves them short handed.

Now that we have considered in a broad manner the three underlying reasons why this industry has such a high

frequency and severity rate let us see what the cure should be. It would be very impractical to consider for even a moment reducing the number of hand and machine operations, installing new and modern equipment, and raising wages extensively. We cannot approach the problem by such means. Therefore, the alternative must be to cope with the situation by means of more practical methods which are available to us.

Up to this point, this paper might possibly appear to you to be an attempt to justify the accident experience of this industry, but such is not the fact. I have gone at length into the difficulties with which we are faced in accident prevention in Logging and Lumbering, or Sawmilling, in order to convey the idea that we are, in this industry, greatly limited in our activities in attempting to reduce accidents, or in making the sawmill a safe place in which to work. Now, here is my partial solution to the problem.

Generally speaking, there are three basic, specific causes of industrial accidents in this industry, the mechanical cause, the personal cause, and a combination of both. A very large percentage of the accidents are the result of the latter two causes. To illustrate this conclusion, here is a short summary of the accidents that occurred at one of our mills, employing about 300 men, during the first seven months of this year. Some are Lost Time, and others No Lost Time. As I read this list, you can draw your own conclusions as to the causes involved:

Cleaning up saw dust with broom and got dust in eye.

Stuck axe in log and it fell off on foot.

While loading rail, it dropped on foot. Jacking up truck, and jack block jumped out and hit eye.

Went up on boiler to cut off steam, and while coming down, slipped and struck arm on hot pipe.

While tightening bolt, wrench slipped and hit guard.

Operating rip saw and saw struck stick, throwing it out and against operator.

Prizing fly wheel off starting motor and fell against track.

Trimming box stock with pull cross cut saw and finger hit saw.

Transferring kiln cars and stepped in hole in tram.

Walking across loose sill on repair job, and sill slipped off foundation, throwing man to ground.

Unloading green oak off buggy, and it slipped off wheel.

Pushing load of lumber, when piece fell off on foot.

Carrying decking, and slipped on wet ground.

Cutting hub off pulley with chisel, and chip steel hit eye.

Repairing steel boom, and hit hand instead of punch, with hammer.

Feeding shorts to moulder and tripped on short piece on floor.

Placing lumber in car, and push in man shoved in another board before loader was ready for it.

Rolling lumber buggy by shoving on wheel, and caught thumb between wheel and load.

You all will agree that most of these accidents could have been prevented by the correct personal factor and this fact is true of the majority of our accidents. Therefore, since most of our accidents are the result of the personal cause, our main activity should be directed toward the elimination of that cause.

Mr. Caldwell then presented many interesting points on preventing the personal causes of accidents. These included good supervision, education of foremen, instruction of employees and activities for maintaining safety interest.

Safety in Sash and Door and Planing Mills

F. A. FREDERICKSON

Chief Factory Inspector, Industrial Commission of Wisconsin

Woodworking machinery and tools used in the sash and door and planing mills have undergone the same careful development on the part of the manufacturer as has the machinery and tools in other classes of business. The quality of the steel used in the various types of saws and cutters, and the design of the machines themselves all have continued to improve. Automatic feed has replaced hand feed on most of the machines. The constant urge to improve the saws, cutters and tools and the design and methods of production no doubt will go on until the hazard to the operator will be entirely eliminated.

There are those in industry who will say, "this is a beautiful theory" but impossible of accomplishment. Yet, practically all machines and tools now on the market for use in sash and door plants show improvements and changes, which have helped to make the operator's job easier and safer.

Back in the year 1918 when I first became interested in safety, it seemed that every employee of sash and door plants and planing mills had fingers on hands missing and that even included superintendents and foremen.

Accidents were occurring at an alarming rate and very little was done to prevent them. It seemed to be the general opinion of management and men that very little, if anything, could be done to prevent accidents in woodworking plants. Accidents were looked upon as necessary evils accompanying the job. I felt then that there was a job to be done.

The first problem was to sell the management or owners. It was difficult at first to sell them safety because they had been operating for many years without any thought of safety. This was also true of employees. They were reluctant to accept suggestions from anyone. They felt any safety device would interfere with production. They believed their efficiency would decrease if they could not always see the tool they were using. We still

have many such managers and employees today.

Regulations were adopted by the various states and the insurance companies to provide safety devices for these machines but it was still difficult to secure the cooperation of company officials because there were few, if any, manufacturers of point of operation guards for woodworking machines. It was necessary to enlist the help of employees in designing guards for such machines as circle saws, jointers, shapers and planers.

I was surprised at the results obtained by workers, taking hold and working out safety devices. Most of the guards were crude looking and made of wood but they prevented injuries. I often inquire of a superintendent who the employee was who had designed a guard or furnished the idea, then find this employee and compliment him and possibly suggest some slight improvement.

I believe if you will follow this out in your own plants you will create in the minds of the workers a pride in their work and a real interest in the prevention of accidents.

A foreman of a plant employing about 250 men and women recently said that guards are all right for the big shop where there is quantity production but that in this shop where a variety of work is done on the table saw; for example, dadoing, grooving and notching, it is impossible to use a guard. It is an accepted fact, however that a rip or cut-off saw may be guarded effectively by the installation of an automatic guard which completely covers the saw disc over the top and sides and automatically adjusts itself to the thickness of the material being cut, together with a spreader to prevent the material from bending on the saw and preventing kickbacks.

Many of these saw guards are on the market today and have prevented many injuries. They are considered by the safety engineers as the type of guard best suited for ripping operations. Some em-

ployers feel however that when they have purchased these guards they have done their part since they have complied with recommendations made by their factory inspector or their insurance company. They don't consider that this saw may be used for other purposes. They may install dado knives and cut a dado in a sash or frame or do any other operation where an automatic spreader-type guard can not be used. The result is, the guard is removed and nothing provided to protect the employee from contact with the cutters or saws.

The point is that present guards for the circle saw are not all-purpose guards. If the saw table is used for operations for which it was not originally intended, then I would urge every employer to secure a guard to meet the job he is going to do on this saw. This is true of both cross cut saws and the rip saws.

The circle saw is responsible for more injuries than any other machine in the woodworking industry. Here is an analysis of 143 machine accidents in ten selected sash and door plants in Wisconsin for the period 1940-1943. All these plants had a good accident experience. Eighty-nine of these cases occurred at the point of operation; 25 occurred from kickbacks, 7 occurred from contact with belts and pulleys. The circle saw cases were the largest in number, with 62 cases, of which 39 occurred at the point of operation and 15 from kickbacks. There were nine shaper accidents and four jointer accidents, all occurring at the point of operation.

Investigates Accident

Only recently, I investigated an accident to an operator who was dadoing a window arch. The slots were $\frac{1}{4}$ " deep and $\frac{1}{8}$ " wide. The arch was 5' in diameter and $\frac{1}{2}$ " wide. He was holding it against the gauge with his left hand and trying to feed it with his right hand. The end where he was feeding was almost through and the other end, after making the circle, touched him on the shoulder. He became frightened and his hand slipped onto the dado blades. If the operator had set an auxiliary gauge or fence on the opposite side, it would have helped in guiding the material through and

he could have performed the operation with less effort and with safety.

Next to the circle saw as an accident maker is the wood shaper. Again, many operations are performed on the wood shaper that rightfully should be done on a moulder or stickler. These machines are usually fairly safe because the cutting heads are covered by exhaust hoods and the feeding is automatic.

Many operations can, however, be done safely on shapers if serious thought is given to safety. An enclosure guard can cover the revolving knives and head, allowing only space under the guard for the work. If this type of guard cannot be used, a form to hold the work can be built with substantial handles entirely protected by a barrier around the front and sides to prevent contact with the knives or spindle. In such cases it is necessary to provide a form to fit each particular job. If this is done, the shaper can be made as safe as any other of the woodworking machines.

Another serious accident maker is the hand feed jointer. Nine out of ten jointer accidents can be prevented by efficient guarding. The injuries occurring on jointers do not all happen at the front or feeding side of the gauge but often occur on the knife head at the rear of the gauge. Both ends of the knife are required to be protected with automatically operated guards.

The most commonly used type of guard is the automatic wing type guard. This guard, most of you know, is operated by feeding the material to the guard, forcing it out to the width of the material being cut. This guard has prevented many accidents, especially when jointing edges, because the space between the guard and fence is narrow but in surfacing the flat side of material this type of guard will not protect the operator should a board kick back. A kickback often causes the operator to come in contact with the knives before the guard closes. A guard which, when edging, would be forced back to the thickness of the material and, when surfacing, would be raised so as to ride the stock is safer. Such guards can be secured. There are operations where a permanently fixed guard completely covering the knife head could be used. This, however, is for the employer, through his superintendent and foremen to decide, dependent on the work performed on these machines.

I have mentioned in this paper the hazards connected with some of the machines commonly used in the sash and door and planing mills. I would miss my calling if I failed to mention slipping which is often the cause of operators being injured on machines. The floors around and in front of woodworking machinery often become worn and slippery because of saw dust and shavings falling from the machines and constant movement of the operator in front of the machine. There are a number of ways to guard against this hazard which are inexpensive and simple to provide.

In some sash and door plants coarse sand sprinkled in glue or other adhesive on the floor, rubber mats, and heavy gravel roofing paper securely glued to the floor are being used. Where rubber mats or roofing paper are used special precautions should be taken to replace them when worn so that they will not be a tripping hazard.

Hazards are not great on band saws, sticklers, moulders, notchers and mortisers, because for the most part they are automatically fed and the cutting heads are well protected by exhaust hoods.

In our State of Wisconsin there are many sash and door and planing mills, some of which are large plants employing many hundreds of men and women. In the past year, 1943, 1600 accidents occurred in the whole woodworking industry. These cases are only those that come under compensation where injured suffered a loss of three or more days time. Of the 1600 cases, 400 or 25% of the total occurred in sash and door and planing mills. If all disabling cases were considered, many more would be added and the lost time would be materially increased.

Woodworking machines need to be given our major consideration as they produce a great number of injuries. They are widely used in plants other than the sash and door and planing mills. A large proportion of the woodworking equipment is in use in small plants where there is little or no supervision, where the men operate them at will without any regard for safety.

Skill Not High

The skill of the average operator in the

small plant is not high and this creates a problem because the management has not been sufficiently sold on safety and therefore the frequency is high. This is true of all small plants in other industries as well. It becomes a real job for you and me to sell safety to the small plant.

In the larger sash and door plants management can usually be made safety conscious. To a degree you can sell them the idea of providing the guards for the points of operation on machines and provide the necessary guards for belts, pulleys, feed rolls, sheaves, gears and other moving parts. But in spite of the fact that they seem ready and willing to provide these safeguards, they seem to feel that they have gone as far as they can go. Management in many plants does not realize that safety means more than providing protection for the man against the hazard of the machine. The management should also insist on the use of all safety devices provided. This is a problem of safety education.

Woodworking machine accidents, taken as a whole, are definitely preventable. Many of the sash and door plants using every type of woodworking machines, have made some outstanding records.

I am convinced that the real reason why woodworking accidents are not being lessened or prevented is that we are not stressing the engineering part of the job along with the educational part.

We must consider engineering, the installation of safety devices on the machine by the manufacturer and then follow with safety education. They must go hand in hand.

In the installation of guards, it is necessary to provide the best guards obtainable. I have found that home-made guards which have not been properly designed have sometimes caused accidents. When considering the installation of point of operation guards on woodworking machines, the first step should be to call in an engineer who has many years of experience in designing point of operation protection. A good safety device is the most inexpensive in both life and service.

Safety in Plywood Manufacture

B. W. MURRAY

Safety Engineer, Hartford Accident and Indemnity Company

There are two parts to the problem of safety in plywood manufacture. The first is that of veneer cutting, which I think you will find covers more territory, and its operations have more people employed than does the other end of the industry, namely, the matching and glueing end of the business. This statement is made guardedly, however, as I have no facts or figures to back up the statement. The only reason I make it is that in the Middle West most of our large exposures are engaged purely in the field of producing the veneer or sheet material for the plywood itself. Other sections of the country such as the Pacific Northwest and the South may have both operations in one plant.

A successful safety program in a plywood manufacturing plant, or in a veneer cutting plant, rests primarily on the management going out all the way with no reservations whatever regarding the prevention of accidents. The only way it can do this is to realize that accident prevention is a part of production—*That an injured workman represents a mistake in the production planning and scheduling.* When and only when this attitude becomes the policy of the management, then you are going to have your machinery of proper type and have such machinery safely located and guarded.

In several plants I am servicing, there is an enforced rule that no new machine can be placed in operation until the safety director has approved its location and safeguarding. This removes the possibility of the machine being operated in an unguarded condition.

The supervision must also learn that the responsibility delegated to them by management for efficient production means that *production must also be as accident free as possible.* One plant in my territory has adopted a plan whereby every accident is investigated whether an injury to a worker results or not. This is meeting management's responsibility for safe production.

I think the primary work in an industry such as the veneer cutting industry is essen-

tially that of removing physical hazards. This means the mechanical guarding of machinery and removing hazards in such work as the handling of logs, veneer, hand trucks, and cases. The more this can be done, the surer you are to reduce amputations and sprains.

The log yard is a place to which too little attention is paid. Men are often placed at work here who are too old for the job and are allowed to work without sufficiently close supervision. I know of no place where a death or a bad injury can result faster than when unloading logs from trucks or railroad cars onto the log piles and when taking logs from storage piles into the mill.

In this connection attention should be given to hand tools, especially canthooks. During the past year in one plant, we have had two bad accidents as the result of canthook handles breaking, and, in both cases, the canthook was hung against the grain. Only the blacksmith or tool repair man who knows wood grain and has had experience in putting on new handles should be allowed to rehandle the canthooks. He should never use handles that are pulpy. The hook point or gaff should be kept sharp and be made of a good grade of tool steel, properly tempered, and straight pointed.

Chains should be efficiently handled, inspected often, and the hooks and points kept in first class condition. Cables on derricks and jammers should be carefully watched and replaced when they have 25% or more breakage. To determine this breakage, the maintenance man can establish the percentage by taking the number of wires broken per complete twist, and the formula used is:

The Wires Broken

$\text{Total No. of Wires} \times 100 = \text{Percentage per Complete Twist}$

When this percentage is 25% or over, the cables must be replaced, and we do not recommend cutting out the broken portion of the cable and splicing a new piece. The entire cable must be replaced. Some of you gentlemen may think that this is a

drastic measure. However, how many plants in this particular time have a man who is capable of splicing the wires so that they can be positive that the cable will not break?

Log Piles Drained

Log piles should be on solid ground and be kept drained. Often drainage water is allowed to run under log piles. It takes no stretch of the imagination to realize what would happen were an unbalanced pile of logs, some 20 to 25 feet high, to tip over or roll onto a group of men adding to or taking off the pile. This happened only a short time ago. The only reason no men were caught was that it occurred on Sunday when no one was in the log yard near the pile.

Log vats are bad actors. The covers over the vats must be constantly policed and kept in good condition. Broken boards should be immediately replaced to keep men from breaking through them. The workmen should be equipped with hip boots if the large, flat vats are used. To date, only slight progress has been made in this section of the country to find a successful method of eliminating the vapor over the vats in cold weather. The layout of the vats, however, appears to hold possibilities. Bolts are placed in one end, and the logs are taken out the other end onto the peeling floor. The peeling floor or peeling room can then be practically ventilated because it can be effectively heated. With the log vat loaded from one end, and the removals being made from the other, it is not necessary for workmen to walk over the vat tops to remove logs. There are several effective barriers which can be placed over the location from which the logs are being removed to keep the workmen from slipping into the vats.

Steam vats which are rapidly coming into general use greatly eliminate the accidents such as scalds, etc. This has been found so true that their installation and use can be recommended for the elimination of accidents that result now from hot water vats. Of course, this may raise the question of steam scalds; however, these steam vats are so built and so ventilated that workmen do not come in direct contact with the steam itself.

The problem of preventing accidents in the peeling room is largely a matter of

having the logs properly prepared so that the bark is soft, and the installation of mechanical equipment for handling the logs from the vates to the peeling room and from there to the veneer lathes.

Efforts should also be made to sell workmen on the idea of hard toed shoes to protect their toes. The same procedure which I discussed at length regarding the canthooks should be followed in maintaining the peeling spuds.

Workmen should not be permitted to double up on the same log, or in other words, two men should not peel the same log from opposite ends. The reason for this is quite apparent because the slipping of a spud in the hands of a workman can cause severe cuts and injuries to other workmen.

Housekeeping is very important. The floors should be kept as free of bark as possible even though it may mean the hire of a workman to do nothing but clean the floor.

Veneer lathes, because of the heavy driving units, should have the driving mechanism totally enclosed by solid barricades, or the individual gears and drives guarded by suitable enclosures. The thread bars for the spindles can be effectively guarded by slipping galvanized furnace pipe over them and anchoring them in place by stands from the floor and brackets on the machine. It is preferable that the log cores be dropped from the machine onto an incline so that they will roll clear of the base of the machine.

Veneer clippers present the greatest hazard of any machinery used in this industry. A volume could be written regarding the elimination of hazards on these machines if one were to cover them all. I will only endeavor to touch upon the ones which have proven most frequent.

Like the punch press in a metal industry, the most important part of a veneer clipper is the clutch. If repeats are to be eliminated, attention must be paid to the adjustment of the clutch and its maintenance. Daily inspections should be made of the machine by competent maintenance men so that the desired operation can be accomplished.

I think most of the owners of clippers have had considerable difficulty with opera-

tors and their helpers getting cut in the knives of this machine. At the present time the experience proves that basically the hand operated clipper is the safest because a two-handed device can be most easily installed. It is my frank opinion that the return of the foot trip pedal by the manufacturer is a step backward. The reason for making this statement is that with the man using the foot pedal, there is no way of keeping the workman's hands occupied and out of the path of the knife during the clipping stroke as you will find when the operator is using the hand trip machine with the two handed device.

Guards Installed

It therefore seems apparent that point of operation guards will have to be installed in order to protect both operator and helper. If you will refer to the blackboard, you will see I have sketched a number of point of operation guards which have been developed in Wisconsin to do this work. All of these point of operation guards, however, are defective in that when the curled veneer is fed under the clipper knife, the operator or helper has a tendency to push the veneer under the knife with his hands, thereby standing the chance of getting his fingers clipped off or getting badly cut by coming in contact with the knife even though the blade is stationary.

The State of Wisconsin has recently developed a standard for distances in guarding the point of operation on clippers which has proven effective. They require that the guard be a maximum of 1½ inches above the table and a minimum of 4 inches away from the knife. It is quite obvious from this requirement that this removes the workman's hands from the danger zone of the knife. Considerable difficulty is met in some plants with the trimming of the veneer on the take-off side. This can be easily remedied by building the take-off platform a maximum of ½ inch away from the cutting blocks. I might say at this moment also that point of operation guards should be built on both sides of the knife.

Considerable difficulty has been encountered during the war in obtaining the proper type of whetstones on which they

sharpen knives of lathes and clippers. Several plants in our territory have developed wooden blocks with handles on them on which they set the whetstones so that the men sharpening the knives will not get their hands too close to the blade. It is not good safety practice to endeavor to whet knives when they become too dull. They should then be removed and ground.

This about covers the field of main hazards found in the veneer cutting end of the plywood industry. Now we shall discuss briefly the matter of drying, matching, and gluing of the cut veneer, and the final processing of the finished plywood.

Most of the accidents in and around dryers are the outgrowth of unplanned feeding and take-off processes. This results in sore backs and arms due to stooping and reaching plus the fact that the dryers are set at an uncomfortable level for the men and women engaged in feeding and taking off the veneer.

The small splinters which are picked up in the fingers and hands of the people handling this operation cause minor infections. These can be eliminated to some extent by taping the fingers with adhesive tape. Gloves have not proven a successful remedy for this difficulty.

Proper ventilation of the room in which ovens are located is necessary especially in warm weather when there is a chance of heat prostration. Salt tablets should be provided for the employees' use in this department.

The veneer gluing and the veneer splicing machinery as constructed today presents little or no danger to the operators. The feeders should be protected against contact with the feed wheels, however.

The gluing process and the type of gluing presses used vary a great deal from plant to plant, and this is largely a matter of close consideration given to the operation and the proper setting of the veneer pressing and clamping machines.

I have presented only the mechanical side of this problem and have omitted all reference to the education of workers. Employee education is indeed important but management's first consideration should be given to making the plant safe.

Safety Exposition Exhibitors

EXHIBITION HALL—SHERMAN HOTEL

Alphabetical List of Exhibitors of Industrial Safety Equipment

- Acton Casualty & Surety Co., Hartford, Conn.**
Insurance Underwriters.
- American Abrasive Metals Co., Irvington, N. J.**
Safety Treads, Abrasive Paints.
- American Allsafe Co., Inc., Buffalo, N. Y.**
Industrial Safety and Fire Protection Equipment.
- American-LeFrance-Foamite Corp., Elmira, N. Y.**
Fire Protection Equipment.
- American Mat Corp., Toledo, O.**
Safety Matting and Switchboard Matting.
- American Optical Co., Southbridge, Mass.**
Industrial Safety Goggles, Respiratory Devices, and Protective Clothing.
- American Safety Tank Co., Kansas City, Mo.**
Safety Fuel Tanks for Trucks.
- Ampco Metal, Inc., Milwaukee, Wis.**
Beryllium-Copper Non-Sparking Safety Tools.
- Automatic Canteen Co. of America, Chicago, Ill.**
Food Services.
- Bausch & Lomb Optical Co., Rochester, N. Y.**
Safety Lenses and Goggles.
- Beair Manufacturing Co., Rock Island, Ill.**
Motor Vehicle Inspection and Correction Equipment; Static and Dynamic Balancing Machines.
- Benjamin Electric Mfg. Co., Des Plaines, Ill.**
Industrial Lighting Equipment; Call and Warning Devices; Punch Press Safety Device Equipment.
- Boyer-Campbell Co., Detroit, Mich.**
Face Shields, Welding Helmets, Safety Tongs, Grinder Guards, Inspection Lights, Protective Clothing.
- John H. Breck, Inc., Springfield, Mass.**
Protective Creams and Hand Cleaner.
- Brown Shoe Co., Chicago, Ill.**
Safety Shoes.
- R. H. Buhrke Co., Chicago, Ill.**
Safety Equipment and Allied Products for Construction and Maintenance Work.
- E. D. Bullard Co., San Francisco, Cal.**
Safety Equipment.
- Burroughs, Wellcome & Co. (U.S.A.) New York, N. Y.**
First Aid Equipment.

- Carbisulphoil Co., Dallas, Tex.
Antiseptic Emulsion, Ointment, Liquid Soap.
- Cardox Corp., Chicago, Ill.
Fire Extinguishing Systems, Fire Trucks, and Mobile Extinguishing Equipment.
- Celanese Celluloid Corp., New York, N. Y.
Plastics for Safety Devices.
- A. B. Chance Co., Centralia, Mo.
Live Line Maintenance Tools and Equipment.
- Chicago Eye Shield Co., Chicago, Ill.
Head and Eye Protective Equipment.
- Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Chain and Chain Hoists.
- C-O-Two Fire Equip. Co., Newark, N. J.
Carbon Dioxide Fire Extinguishers, Hose Units, Manual-Automatic Systems, Smoke Detecting Systems.
- Davis Emergency Equip. Co., Inc., Newark, N. J.
Respiratory Protection. Combustible Gas Indicators, General Safety and First Aid Equipment.
- Dickson Safety Products Co., Los Angeles, Cal.
Personal Protective Equipment.
- Dionol Co., Kalamazoo, Mich.
Ointment, Protective Creams, Salt Tablets.
- Dockson Corp., Detroit, Mich.
Industrial Head and Eye Protection.
- C. B. Dolge Co., Westport, Conn.
Fungicides, Protective Creams, Skin Cleaner, Cutting Oil Germicides.
- Dugas Engineering Co., Marinette, Wis.
Fire Protection Equipment.
- Dunn Products, Chicago, Ill.
Industrial Protective Clothing Made from Rubber, Asbestos Cloth and Leather.
- Duo-Safety Ladder Corp., Oshkosh, Wis.
Safety and Fire Ladders, Ladder Shoes.
- E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hand Protective Creams, Industrial Hand Creams, Neoprene Products, Rayon Yarn.
- E. & J. Manufacturing Co., Philadelphia, Pa.
Resuscitator Inhalator and Aspirator.
- Elliott Service Co., New York, N. Y.
Foremanship Training Material, Bulletin Board Displays on Safety, Quality and Waste; Suggestion Systems.
- J. H. Emerson Co., Cambridge, Mass.
Automatic Resuscitation and Respiration Equipment.
- Finnell System, Inc., Elkhart, Ind.
Floor-Care Machines and Floor Treatments.
- Franklin Research Co., Philadelphia, Pa.
Anti-Skid Floor Maintenance Materials.
- General-Detroit Corp., Detroit, Mich.
Fire Protection Equipment.

- Goodyear Tire & Rubber Co., Akron, O.
Non-Slip Surfacing Materials.
- Holcomb Safety Garment Co., Chicago, Ill.
Protective Clothing Made of Asbestos, Leather and Fire-Proofed Duck.
- Hollywood Turban Products Co., Chicago, Ill.
Protective Headwear for Women Industrial Workers.
- Hynson, Westcott & Dunning, Inc., Baltimore, Md.
Mercurochrome and Thant's Lozenges.
- Industrial Gloves Co., Danville, Ill.
Protective Clothing, Gloves, Mittens, Headguards, Leggings, Flame-Proof Suits.
- International Cellucotton Products Co., Chicago, Ill.
Menstruation Materials for Women in Industry.
- International Shoe Co., St. Louis, Mo.
Safety Shoes.
- Iron Age Div., H. Childs & Co., Inc., Pittsburgh, Pa.
Safety Shoes.
- C. Walker Jones Co., Philadelphia, Pa.
Industrial Knitted Specialties, Protective Clothing.
- Junkin Safety Appliance Co., Louisville, Ky.
Safety Guards for Punch Presses, Splint Type Stretchers.
- Justrite Manufacturing Co., Chicago, Ill.
Safety Cans, Safety Flashlights, Electric Lanterns.
- Karel First Aid Supply Co., Chicago, Ill.
Industrial Hospital Supplies, First Aid Supplies.
- Keystone View Co., Meadville, Pa.
Industrial Vision Tests.
- Walker Kidde & Co., New York, N. Y.
Fire Prevention and Extinguishing Equipment and Systems.
- Kimball Safety Products Co., Cleveland, O.
Protective Clothing, Gloves and Goggles.
- Klear-Vu Products Co., Newark, N. J.
Safety Caps, Hair Guards, Arm Guards, Aprons.
- Walter G. Legge Co., Inc., New York, N. Y.
Non-Slip Floor Polishes and Treatment, Non-Sparking Floor Treatment.
- Lehigh Safety Shoe Co., Inc., Allentown, Pa.
Safety Shoes and Rubber Boots.
- Lies Chemical Corp., Chicago, Ill.
Soaps, Cleaning Compounds, Disinfectants, Insecticides Deodorants, Maintenance Supplies.
- Lightfoot Schmls Co., New York, N. Y.
Powdered Hand Soap for Industrial Use.
- Loom Mfg. Co., Inc., Indianapolis, Ind.
Blow Guns, Spraying and Cleaning Guns, Water Savers.
- MacWhyte Co., Kenosha, Wis.
Wire Rope and Wire Rope Slings.
- Thom McAn Safety Shoe Co., New York, N. Y.
Safety Shoes.

B. F. McDonald Co., Los Angeles, Cal.
Industrial Safety Equipment.

Medical Supply Co., Chicago, Ill.
First Aid Kits and Supplies.

McCl-Blumberg Corp., New Holstein, Wis.
Safety Line Markers for Roads, Streets, Airports, and Industrial Plants.

Metropolitan Life Insurance Co., New York, N. Y.
Life, Health, Accident, Annuities and Group Insurance.

Melflex Products, Akron, O.
Flooring Materials, Treads and Standing Mats.

Milburn Co., Detroit, Mich.
Protective Creams and Plastic Safety Clothing.

Mine Safety Appliances Co., Pittsburgh, Pa.
Safety Equipment for Personal and Plant Protection.

E. R. Moore Co., Chicago, Ill.
Work Clothes for Women.

National Safety Council, Inc., Chicago, Ill.
Services and Material for Safety Education.

National Society for the Prevention of Blindness, New York, N. Y.
Conservation and Utilization of Eyesight in Industry.

Oil-Dri Co. of America, Chicago, Ill.
Oil and Grease Absorbent.

Onox, Inc., San Francisco, Cal.
Athlete's Foot Preventive.

G. H. Packwood Mfg. Co., St. Louis, Mo.
Skin Cleansers, Soap Dispensers, Cleansing Cream.

Patent Scaffolding Co., Chicago, Ill.
Safety Ladders, Scaffolding and Work Stands.

Phister Mfg. Co., Newark, N. J.
Maintained Air Pressure Liquid Fire Extinguishers.

Protectoseal Co., Chicago, Ill.
Safety Devices for Hazardous Liquids.

Pyrene Mfg. Co., Newark, N. J.
Fire Extinguishers, Compounds and Systems.

Rose Mfg. Co., Denver, Colo.
Industrial Safety Equipment.

Safety Clothing & Equipment Co., Cleveland, O.
Industrial Safety Equipment.

Safety Engineering, New York, N. Y.
Publishers, Safety Engineering Magazine.

Safety First Shoe Co., Holliston, Mass.
Safety Shoes.

W. H. Salisbury & Co., Chicago, Ill.
Linemen's Rubber Protective Equipment.

A. Schrader's Son, Brooklyn, N. Y.
Pneumatic Safety Control Devices.

Sellstrom Mfg. Co., Chicago, Ill.
Face and Eye Protective Equipment.

Spencer Turbine Co., Hartford, Conn.
Industrial Vacuum Cleaners and Dust Collecting Equipment.

Standard Safety Equipment Co., Chicago, Ill.
Personal Safety Protective Equipment.

Stopan Chemical Co., Chicago, Ill.
Skin Cleanser.

Stonehouse Signs, Inc., Denver, Colo.
Accident Prevention Signs.

The Strauss Co., Pittsburgh, Pa.
Personal Protective Equipment.

Sugar Beets Products Co., Saginaw, Mich.
Skin Cleanser and Cleaner; Non-Slip Floor Treatment.

Sarty Mfg. Co., Inc., Chicago, Ill.
Safety Appliances for Machines and Underfoot Hazards.

G. H. Tennant Co., Minneapolis, Minn.
Floor Cleaning Machines, Floor Seal and Floor Wax.

Trimont Mfg. Co., Roxbury (Boston), Mass.
Forged Steel Safety Tools.

United States Army, Washington, D. C.

U. S. Safety Service Co., Kansas City, Mo.
Industrial Safety Equipment.

Wagner Electric Corp., Brooklyn, N. Y.
Industrial Hydraulic Brakes.

Wahlert Products Corp., Brooklyn, N. Y.
Industrial Safety and Fire Equipment.

Watchemoket Optical Co., Inc., Providence, R. I.
Industrial Safety Goggles.

Waverly Petroleum Products Co., Philadelphia, Pa.
Oil Absorption Material.

Weaver Mfg. Co., Chicago, Ill.
Automatic Brake Testers "Safety Lanes."

West Disinfecting Co., Long Island City, N. Y.
Personal Protection Safeguards and Plant Sanitation Products.

F. H. Wheeler Mfg. Co., Chicago, Ill.
Protective Apparel.

Willson Products, Inc., Reading, Pa.
Personal Protective Equipment, Instruments.

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