

U. S. DEPARTMENT OF LABOR
JAMES J. DAVIS, *Secretary*
BUREAU OF LABOR STATISTICS
ETHELBERT STEWART, *Commissioner*

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BUREAU OF LABOR STATISTICS} **No. 428**

INDUSTRIAL ACCIDENTS AND HYGIENE SERIES

PROCEEDINGS
OF THE
INDUSTRIAL ACCIDENT PREVENTION CONFERENCE

HELD AT WASHINGTON, D. C.
JULY 14-16, 1926



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PREFACE

An official call for an industrial accident prevention conference to be held at the Mayflower Hotel in Washington, D. C., July 14, 15, and 16, 1926, was issued to the governors of the various States by Secretary of Labor James J. Davis. The following is a copy of the Secretary's letter to the governors:

I am calling a conference on industrial accident prevention to be held in Washington, D. C., July 14, 15, and 16 of the present year. Invitations will be sent to the principal agencies, public and private, interested in the development of more efficient and specific methods of industrial accident prevention.

I am particularly anxious that the State governments shall be 100 per cent represented, and I am writing this to urge that you delegate some member or members of that division of your State organization which deals with accident prevention to attend this conference. If at all practicable, I shall be very much pleased if you could attend in person.

There is no adequate system of industrial accident reporting in the United States, but a conservative estimate indicates that the fatal industrial accidents probably exceed 23,000 per year and that nonfatal injuries total 2,500,000 per year. The number of days' labor lost is estimated to be 227,169,970 per annum, and the wage loss exceeds a billion dollars. I am advised by experts that fully 85 per cent of these accidents are preventable. In fact, many establishments and some industries, by close application of safety methods to the "danger spots" in their industrial plants, have been able to reduce their accidents by a percentage almost as great as this. The cooperation of all of the States and all other accident-reporting organizations will be sought, to the end that attention may be called, not in general terms, but by specific plans for the more general adoption of the safety methods which have been so successful in a few instances.

The conference will be held in the ballroom of the Mayflower Hotel, and as this room is artificially cooled there need be no fear of the inconvenience of summer heat. The manager of the Mayflower Hotel contributes the use of his hotel as a meeting place of the conference free of charge as an evidence of his interest in its purpose.

May I request that you advise me as soon as possible as to how many and whom you will send to represent the State of —.

While the importance of interesting the States was emphasized in this letter, the various industries and industrial associations were also invited. Invitation was also extended to the insurance carriers.

The following letter was sent by Ethelbert Stewart, the United States Commissioner of Labor Statistics, to industrial firms and organizations, individuals, safety councils, railroads, railway associations, and trade journals, and to others interested in safety in industry:

DEAR SIRS: I am writing to invite your organization to send a representative to the industrial accident prevention conference which the Secretary of Labor, James J. Davis, has called in Washington, D. C., July 14, 15, and 16 of the present year. Invitations are being sent to each of the States through their governor, and it is believed that the officials having to do with accident prevention and reporting will be very fully represented. Invitations are being

sent to the principal industrial associations and the principal agencies, both public and private, which have manifested an interest in the development of more efficient and specific methods of industrial accident prevention.

The conference will be held in the ballroom of the Mayflower Hotel, and as this room is artificially cooled there need be no fear of the inconvenience of summer heat. The manager of the Mayflower contributes the use of his hotel as a meeting place for the conference free of charge as an evidence of his interest in its purpose.

It is hoped that the conference will develop the best methods of accident prevention, the best methods of reporting of accidents and of accident prevention information, and the best methods of establishing a clearing house for definite statistical data which can be made usable by all in the work of accident prevention.

Will you please advise me as soon as possible as to how many representatives you will be able to send? Inclosed you will find an addressed envelope, which requires no postage.

CONTENTS

WEDNESDAY, JULY 14—MORNING SESSION

| | |
|--|-------------|
| Chairman, Ethelbert Stewart, United States Commissioner of Labor Statistics: | Page |
| Address of Hon. James J. Davis, United States Secretary of Labor..... | 1-8 |
| Should there be a national safety museum, by Louis Resnick, as- sistant to the president American Museum of Safety..... | 8-11 |
| Discussion— | |
| Charles P. Tolman, of New York..... | 12, 13 |
| New Jersey Industrial Museum of Safety, by Charles H. Weeks, deputy commissioner of labor of New Jersey..... | 14-17 |
| Discussion— | |
| George W. Knapp, jr., of Maryland..... | 17 |
| Charles H. Weeks, of New Jersey..... | 17-22 |
| Ethelbert Stewart, of Washington, D. C..... | 17-20 |
| W. H. Rademacher, of New Jersey..... | 18 |
| Frederick J. Kingsbury, of Connecticut..... | 19, 20 |
| Louis Resnick, of New York..... | 20-22 |
| John L. Thompson, of Connecticut..... | 20, 21 |
| J. F. Green, of Illinois..... | 21 |
| J. E. Walters, of Massachusetts..... | 21, 22 |
| John H. Crawford, of Kansas..... | 22 |
| A. J. Van Brunt, of New Jersey..... | 22 |
| Nathan B. Williams, of Washington, D. C..... | 23 |
| Richard H. Lansburgh, of Pennsylvania..... | 23 |

WEDNESDAY, JULY 14—AFTERNOON SESSION

| | |
|---|--------|
| Chairman, James A. Hamilton, industrial commissioner of New York: | |
| Remarks by Chairman Hamilton..... | 24-26 |
| The problem of national accident statistics, by Leonard W. Hatch, director bureau of statistics and information, New York State department of labor..... | 26-31 |
| Discussion— | |
| John P. Jackson, of New York..... | 32-35 |
| John Hopkins Hall, jr., of Virginia..... | 35 |
| The statistical factor in the accident experience of the iron and steel industry, by Lucjan W. Chaney, of the United States Bureau of Labor Statistics..... | 35-40 |
| Discussion— | |
| J. M. Larkin, of Pennsylvania..... | 40-43 |
| James M. Woltz, of Ohio..... | 43 |
| Richard H. Lansburgh, of Pennsylvania..... | 44, 45 |
| Ethelbert Stewart, of Washington, D. C..... | 44, 45 |
| Leonard W. Hatch, of New York..... | 45, 46 |
| John L. Thompson, of Connecticut..... | 45 |
| Thomas H. Carrow, of Pennsylvania..... | 45 |
| N. B. Atkins, of Virginia..... | 45, 46 |
| Workers' interest in safety problems, by Frank Morrison, secretary American Federation of Labor..... | 47-49 |
| Appointment of committees..... | 50 |

THURSDAY, JULY 15—MORNING SESSION

| | |
|---|-------------|
| Chairman, Andrew F. McBride, commissioner of labor of New Jersey: | Page |
| Statistical activities of the sections of the National Safety Council, by W. H. Cameron, managing director National Safety Council..... | 52-56 |
| Discussion— | |
| Daniel T. Meany, of New York..... | 56-60 |
| The interest of casualty insurance in accident-prevention statistics, by David Van Schaack, director bureau of inspection and accident prevention, Aetna Life Insurance Co..... | 60-66 |
| Discussion— | |
| L. L. Hall, of New York..... | 66-73 |
| Ethelbert Stewart, of Washington, D. C..... | 69-71 |
| J. H. Walker, of Illinois..... | 70, 71 |
| Isidor Silverman, of New York..... | 71 |
| John S. B. Davie, of New Hampshire..... | 72, 73 |
| Thomas J. Cahill, of New York..... | 72 |
| Dixson H. Bynum, of Indiana..... | 72 |
| What the colleges are doing for accident prevention and human safety, by Prof. Stewart Robertson, of North Carolina State College..... | 73-75 |
| Discussion— | |
| David Van Schaack, of Connecticut..... | 76 |
| John L. Thompson, of Connecticut..... | 76 |

THURSDAY, JULY 15—AFTERNOON SESSION

| | |
|---|--------|
| Chairman, John Hopkins Hall, jr., commissioner of labor and industry of Virginia: | |
| Recent statistical developments, by Carl C. Beasor, chief statisti- cian division of safety and hygiene, Industrial Commission of Ohio..... | 77-82 |
| Accident prevention in relation to efficiency, by Lewis A. De Blois, director safety engineering division, National Bureau of Casualty and Surety Underwriters..... | 82-86 |
| Discussion— | |
| J. E. Hannum, of Washington, D. C..... | 86-91 |
| John P. Jackson, of New York..... | 88, 89 |
| Ethelbert Stewart, of Washington, D. C..... | 89, 90 |
| R. J. Hoage, of Washington, D. C..... | 90, 91 |
| John Hopkins Hall, jr., of Virginia..... | 91-94 |
| Lucian W. Chaney, of Washington, D. C..... | 92 |
| Thomas H. Carrow, of Pennsylvania..... | 92-94 |
| Lewis A. De Blois, of New York..... | 93, 94 |
| Fred J. Upton, of Pennsylvania..... | 94 |
| Our use of accident statistics in Canada, by R. B. Morley, general manager Industrial Accident Prevention Associations, Toronto.... | 95-99 |

FRIDAY, JULY 16—MORNING SESSION

| | |
|--|----------|
| Chairman, Robert H. Carr, chairman Maryland State industrial accident commission: | |
| Statistical contributions to accident prevention on American rail- ways, by Lew R. Palmer, of the Equitable Life Assurance Society.. | 100-110 |
| Discussion— | |
| W. N. Doak, of Washington, D. C..... | 110-113 |
| Thomas H. Carrow, of Pennsylvania..... | 113-115 |
| Statistics for accident prevention in American mines, by W. W. Adams, statistician, Bureau of Mines, United States Department of Commerce..... | 115-119 |
| Discussion— | |
| Joseph J. Walsh, of Pennsylvania..... | 120 |
| Accident prevention in steel, iron, and nonferrous metal foundries, by T. F. Jennings, superintendent of foundries, Utah Copper Co.... | 121-124 |
| Discussion— | |
| Dixson H. Bynum, of Indiana..... | 124-126 |
| William S. Wollner, of California..... | 124, 125 |
| T. J. Jennings, of Utah..... | 125, 126 |

FRIDAY, JULY 16—MORNING SESSION—Continued

| | |
|---|-------------|
| Chairman, Robert H. Carr, chairman Maryland State industrial accident commission—Continued. | Page |
| Improved lighting as a factor in accident prevention, by W. H. Rademacher, illuminating engineer, Edison Lamp Works of General Electric Co..... | 126-131 |
| Discussion— | |
| R. E. Simpson, of Connecticut..... | 131-133 |

FRIDAY, JULY 16—AFTERNOON SESSION

Chairman, A. L. Ulrick, commissioner of labor of Iowa:

| | |
|--|----------|
| What State departments can contribute to national accident prevention statistics, by Richard H. Lansburgh, secretary of labor and industry of Pennsylvania..... | 134-139 |
| Discussion— | |
| Thomas P. Kearns, of Ohio..... | 139-141 |
| Thomas K. Lewis, of Indiana..... | 141-143 |
| Eugene B. Patton, of New York..... | 143, 144 |
| Dust explosion hazards in industrial plants, with special reference to proper reporting methods, by David J. Price, of the Bureau of Chemistry, United States Department of Agriculture..... | 145-147 |
| Discussion— | |
| George E. Lynch, of California..... | 147-149 |
| The United States Bureau of Labor Statistics and the accident prevention program, by Ethelbert Stewart, United States Commissioner of Labor Statistics..... | 149-152 |
| Discussion— | |
| James J. Davis, of Washington, D. C..... | 153 |
| Report of committee on resolutions..... | 154, 155 |
| Discussion— | |
| Ethelbert Stewart, of Washington, D. C..... | 155, 156 |
| John Hopkins Hall, jr., of Virginia..... | 155 |
| W. W. Adams, of Washington, D. C..... | 155 |
| Dixson H. Bynum, of Indiana..... | 156, 157 |
| E. Kaufmann, of New York..... | 156 |
| Remarks of Leonard W. Hatch, chairman of committee on reclassification of industries..... | 157, 158 |
| Report of committee on reclassification of industries..... | 158 |
| Discussion— | |
| Dixson H. Bynum, of Indiana..... | 159, 161 |
| Richard H. Lansburgh, of Pennsylvania..... | 159 |
| Leonard W. Hatch, of New York..... | 159-161 |
| Ethelbert Stewart, of Washington, D. C..... | 160 |
| William A. Marshall, of Oregon..... | 161 |
| John S. B. Davie, of New Hampshire..... | 161 |

APPENDIX

| | |
|---|---------|
| List of persons who attended the Industrial Accident Prevention Conference held at Washington, D. C., July 14-16, 1926..... | 163-169 |
|---|---------|

BULLETIN OF THE U. S. BUREAU OF LABOR STATISTICS

NO. 428

WASHINGTON

SEPTEMBER, 1926

PROCEEDINGS OF THE INDUSTRIAL ACCIDENT PREVENTION CONFERENCE, HELD AT WASHINGTON, D. C., JULY 14-16, 1926

WEDNESDAY, JULY 14—MORNING SESSION

CHAIRMAN, ETHELBERT STEWART, UNITED STATES COMMISSIONER OF LABOR

The CHAIRMAN. It is not my purpose to say anything at this time. We have named the chairmen of the various committees and have asked them to select their own committees, which I hope will be a better working plan.

The following were the chairmen appointed:

Resolutions.—J. H. Crawford, Kansas Public Service Commission.

Classification of industries.—L. W. Hatch, New York Department of Labor.

Determination of exposure.—L. W. Chaney, United States Bureau of Labor Statistics.

Publicity.—A. C. Carruthers, editor Safety Engineering.

I now have the honor of introducing to you the Honorable the Secretary of Labor, who will discuss the purposes of the conference.

ADDRESS OF HON. JAMES J. DAVIS, UNITED STATES SECRETARY OF LABOR

In welcoming you to Washington I speak with a sincerity and warmth I have seldom felt before. From the days when I was an ironworker and saw men at my side killed or injured I have had at heart this question of cutting down the toll of accidents in American industry. For months I have had this conference in view. It gratifies me to see here the representatives of so many States, so many organizations, alike filled with a zeal for preventing industrial accidents. We are met to consider ways and means to that end, but before coming to the purpose and program of this conference I have the honor and pleasure of reading to you a letter from the President of the United States, in which he conveys his hearty approval of the work you are here to undertake and wishes you every success.

JUNE 22, 1926.

MY DEAR MR. SECRETARY: I am pleased to note that you are calling an industrial accident prevention conference to be held at the seat of Government for the purpose of discussing remedies.

It is difficult to believe that industrial accidents have reached an irreducible minimum while the death toll is probably not under 23,000 and the nonfatal injuries approximately two and one-half million each year. Especially should we be hopeful of greater improvement in this record if those who claim that 85 per cent of those accidents are preventable are even approximately right.

I am particularly gratified at the large number of States that are to be represented by delegates coming directly from the governors of the States and the large number of delegates from associations and manufacturers particularly interested in reducing the accident records within their industries.

I thank you for the interest you have shown in this matter and wish to extend through you my best wishes to the conference and to express my hope for its every possible success.

Very truly yours,

(Signed) CALVIN COOLIDGE.

In 1924, at a meeting of the National Safety Council in Louisville, Ky., at which I had occasion to speak, I laid down three propositions which I thought to be the duty and within the province of the Secretary of Labor to set forth and to commend to our lawmakers and administrators. The propositions were:

1. To create in the Department of Labor an agency, adequately staffed, which should cooperate with existing agencies in bringing together complete accident statistics regarding industries not now covered.

2. To provide for the prompt publication of accident data and its transmission to American industry.

3. To develop in the Department of Labor an industrial safety museum which should exhibit the latest and most efficient safeguards.

You will notice at once that this is limited to an educational program. In my estimation an educational program is all that is needed to reduce this wastage of life and limb that disfigures the otherwise marvelous mechanism of American industry. I have two reasons for keeping to an educational program. In the first place, education is all that the Government can undertake; in the second place, education is all that American industry needs to correct its faults. If the management and workers of every American industry knew the extent of accident in industry as a whole, that would be sufficient to fire everyone to the utmost efforts to reduce the danger of accident in his own particular plant. As it is, each employer knows only the number of injuries and of fatalities in his own experience. Being a humane man, he takes such measures as he can to prevent them. But if every employer knew the annual grand total of loss by accident and injury I believe each one would double his efforts to reduce accident to the vanishing point. It is just that information, that education, which we must spread. I am convinced such education will do the work.

Few of us realize the truly grave need of such an enterprise as we have undertaken. Few of us realize how needful it is for us to shape some wise and comprehensive scheme for informing American industry as to just where it stands in the appalling number of accidents that still occur every year. To begin with, we have no agency whatever entitled to answer with any authority the question, "Are accidents on the increase, or are they declining?"

Some answer can be given in the cases of a few industrial groups, but when it comes to the broad, national consideration of the problem we have no means of gathering the facts in the first place and

no agency for giving them out if gathered. At this moment I have to reach to scattered sources for the facts I want. But let me give you a few of those facts as I have been able to learn them.

From the bureau of workmen's compensation of the State of Pennsylvania, I learn that in that State in a period of 10 years there were 24,699 workers killed and the appalling number of 1,811,699 workers injured. No doubt the statistics on accidents, fatal and nonfatal, in branches of labor not covered by the workmen's compensation law, if the facts were available, would add still more to this enormous sum of accidents, most of them preventable.

The official Labor Bulletin of the State of Illinois reports a total of 54,184 accidents in the single year 1924. It is true that this is a reduction of over 7,000 from the number of accidents in 1923, but it is still a ghastly number of casualties to happen in time of peace at the presumably peaceful labor of producing American goods. In reporting on this matter of accidents the Illinois Department of Labor declares that "accidents are far too numerous," and that until the present high accident rate is reduced it can not be said that the citizens of Illinois have reason to be proud of their State's record in the important matter of accident prevention.

It is true that Pennsylvania and Illinois are two of our greatest industrial States. In these States industry has been developed and extended as in few others. Their toll of injury is bound to be the highest. But if to their totals of loss were added the sum total of injury in every other State in the Union I believe the whole country would be staggered. The casualties on the battle fields of the recent war were no greater than this wastage of life and human power through carelessness in the arts of peace.

Without accurate figures we can only estimate the number of industrial fatalities we permit to happen every year. These estimates vary from 12,500 to 35,000 deaths annually. The only positive record of fact we have has been maintained by the United States Bureau of Labor Statistics. This assembles the records of the various compensation jurisdictions, namely, those of the several States and the United States Employees' Compensation Commission. The largest number of fatalities recorded by these agencies was 12,531, for the year 1918; the smallest number was 9,392, in 1921. The recorded nonfatal accidents were greatest in 1924, with a total of 1,666,522.

Even these figures, a moment's consideration will show, must be short of the facts, since the compensation laws do not cover agriculture and steam railways. It is nevertheless clear enough—only too clear—that this toll of accident has resulted in a wage loss of over \$1,000,000,000. I am firmly convinced that the shrewd American employer has only to be told of such a loss in money to be stirred to redoubled efforts to blot out this fearful and needless waste. I leave out of the reckoning the stir he must feel when reminded of what suffering this means in the ranks of his employees and their families. The loss in money alone is enough to convince the most careless that such a blot on the otherwise splendid structure of American industry should not be tolerated any longer.

Failure to give proper consideration to matters of safety, and frequent accidents and disasters within a particular plant, will have a permanent effect upon the entire industry.

A youth reared in the shadow of an industry wherein the risk of life or limb is great naturally shuns that industry. Mothers and wives, familiar with the hazards, will urge their loved ones to seek less dangerous employment. An industry that fails adequately to protect its workers will sooner or later be affected in the quality and character of workers who are attracted to it.

I recall a colliery accident which happened when I was a boy. I remember the men carrying the victims home, past the place where I lived, and the tears that came into my mother's eyes as she said to me, "I hope you will never have to go into those pits to work." That is one thing that practically kept me away from that in my earlier life, and so it is in all industries.

It is in fact impossible to exaggerate this annual loss and waste through accident both to the worker and to industry in general. We must lose no time in learning the reality and grasping the situation as we find it. Let us therefore come to grips at once with the real purpose of this conference.

After transaction of the necessary business you will find as the first item on the program the establishment of a national museum of safety. It has been said that Washington, not being an industrial city, is not a suitable place for the establishment of such a museum. Since this city is becoming more and more truly national, drawing all the people to it, this objection loses much of its force. While an industrial city might have more visitors, its visitors would not be so diversified nor so representative.

The importance of such a museum in Washington would not be conditioned on the number who came to see it. Its value would be found in no small degree in projecting to the public mind the fact that the National Government takes an interest in the preservation of its citizens from the hazards of their callings.

Think for a minute how unique such a museum would be. So far in all our museums the handiwork of man has been on display. Now we must put the worker himself on display and show how he can save himself from harm. We build vast and beautiful exhibition halls for the display of the products of man's art and skill. We take the bones of prehistoric beasts, dug up by the explorer, and house them in marble palaces. But nowhere is there evidence of the concern we should have, as a people, for the safety of the man who works. For the moral influence alone that would radiate from a museum of safety appliances, I urge its building and development. Its practical value can be seen at a glance.

You need not tell me that the American employer is not as full of humanity as he is of business enterprise. The employers of this country are concerned in the safety and health of the workers, and I believe few American employers are without human interest in the well-being of their workers, not as employers, but as men. Once set before the American employer an object lesson in safety devices and his spirit of enterprise will force him to introduce them in his factories. No American employer is willing to lag behind any other American employer. Once show him what some more progressive man is doing for his men and he will strive to outdo the other fellow in the same line of endeavor. In a safety museum such as I have in mind we should form a pool of new ideas. We should

invite every man to contribute some new idea, and the sum of all the ideas would be open for any and all to copy.

In addition to actual and practical safety devices I would have in this museum charts and tables to prove beyond the shadow of a doubt the hard-money saving there is in saving fingers, hands, limbs, and lives of these workers of ours. Safety not only is humanitarian, it is good business. We must prove both points by practical demonstration that is beyond dispute. Just now this country of ours stands at the head of the world because of its enormous productive power. Our skilled workmen are driving our high-speed machinery to the utmost, with the result that we are richer than any other people ever were in all history. But our example of prosperity is being copied. Other nations are learning the secrets of our success, and in time will become sharp competitors of ours. Against that coming competition we must look to this waste in lives and limbs. If we had no humanitarian reasons for protecting our human machines from this needless annual total breakage, the hard economic safety of the country would in time drive us to the hard business principle of saving money by saving men. This is the lesson to be taught, and we need the museum I have urged as a classroom where the entire business nation may go to school and learn.

We shall take up the problem of gathering the necessary statistics of industrial accidents. Before we can begin this campaign against accident we must know precisely what is happening, what it is with which we must grapple, and where we must go to find it. For that purpose it is proposed to create a safety section in the Bureau of Labor Statistics, where it properly belongs. It is shown from the experience of the Interstate Commerce Commission, the Bureau of Mines, and the Bureau of Labor Statistics that some central agency is imperative if we are to bring together in any useful form from every source the data on accidents we need. States, municipalities, and private concerns are all more or less limited in the range of facts they are able to collect. The problem is to get all the facts, to learn of every possible cause of accident, so that we may really know what goes on throughout the Nation's industry.

I am happy to report that certain industrial organizations have already made remarkable strides in cutting down loss to themselves and to their workers through accident. This is true of the iron and steel industry as a whole.

Finally, we must consider the worker's own side of the safety question. It is true that the employer has a major duty to perform in surrounding his workers with the proper precautions in work that involves dangerous operations or possible injury to health. But the employer can not do it all. The worker must play his part in saving himself from needless exposure to risk and injury. If employers need education in accident prevention, the worker needs it as much or more. Here, fortunately, we may play to his natural desire for self-preservation. The intelligent worker must continually be reminded of his own suffering in mind and body as a warning against the carelessness that may cost him a leg or an arm. No intelligent worker will fail to respond to the appeal to his heart when reminded of how his family will suffer in case of his death. But we must

see that these cautions are always borne in mind. We must work up a means by which every man who toils may be reminded every minute of the day of the duty he owes to himself, to his family, and to his employer, to observe due caution in handling the machine, so ever ready to do his will but so ready to do him harm at any forgetful moment.

We shall also review the statistical experience of the National Safety Council and the casualty insurance companies. We can learn a great deal from these sources, for in some lines the facts provided by these organizations are absolutely the only reliable statistics we have.

Few of you here will remember the explosion that destroyed a great flour mill in Minneapolis. The event served to focus attention on a fact not known before, namely, that when inflammable dusts are mixed with air in due proportion a violent explosive is formed. It is a curious fact that in spite of this destructive explosion in a flour mill, in spite of a series of such explosions in mines, there are mills and factories in which the same danger lurks where, until recently, no preventive measures were taken. It is strongly suspected by those who have been investigating these accidents that many which were attributed to ordinary fire hazards were really the outcome of dust explosions.

These instances serve as examples of what we must learn. It is to be hoped that our consideration of this subject of dust explosions will lead to closer study of conditions and so to accurate information that will help us to wipe out these dangers forever.

We Americans, as I say, are proud of our quickness to put to use newly acquired knowledge. Is not this pride seriously questionable when we reflect that so simple a means as rock dusting in mines for the prevention of dust explosions is only now coming into use with us, when it has long been common in other mining countries? Here we open another door to studies we need to undertake.

At one of the sessions we shall discuss a new and, to my mind, a very impressive phase of the general subject of accident prevention. This is the cash return, the money profit, in preventing injury. Our employers do the right thing when they think they can afford it, but we need to prove that safety devices are a paying investment. We need to prove that safety is profitable as well as ethical, and that saving lives in industry is good statesmanship as well as good business.

No subject has stirred keener interest than the question of the influence of accident prevention on the volume of production. The pioneer advocates of accident prevention were met on every hand with the objection that such effort would interfere with production. While in occasional instances it has been proved that increased production went along with accident prevention, it has remained an open question whether the reduced accident rate had more than a casual relation to higher production. Two important investigations are now under way for the purpose of throwing light on this matter, and at this conference we shall hear of the important knowledge gained.

On the last day of the conference a discussion of the statistical activities of two of the Federal agencies which have for many years

and in very elaborate fashion kept records of accidents on American railways and in American mines will prove most interesting. These records, carefully kept and thoroughly analyzed, have been a most important factor in helping toward accident reduction in these two industries, and I am sure that the experience gained in these two instances will help in the attack on accidents in other lines.

The matter of proper lighting of work acquires interest and importance from two considerations. An unsatisfactory lighting scheme injures the worker by damaging his eyes, and in itself it promotes accidents wherever the worker is unable to see with sufficient clearness what he is doing. Lighting has been for the most part considered as a factor in production. It has been shown in many instances that the installation of an adequate lighting system has been followed by an increased production, which very soon more than balanced the cost of the improvement. It is now appropriate that more attention be given to better lighting as a factor in reducing accident.

On Friday afternoon at our final session we shall consider the possible contributions of the State organizations to the development of national accident-prevention statistics and a final review of the functions of the United States Bureau of Labor Statistics in furthering accident prevention.

Some one has said, "An accident compensated is an apology; an accident prevented is a benediction." It has naturally been the case that the multifarious details of compensation have absorbed a large part of the time and energy of industrial officers, to the partial exclusion of the possibilities of preventing accidents in the first place. I am hopeful that this conference will strike a new note in what we all, I think, are agreed is a matter of supreme importance—the prevention of industrial accidents, which kill and maim too many Americans in the arts of peace. I have indicated the lines along which we propose to attack this pressing problem, and from the broad and responsive attendance I see gathered here from all parts of the country I feel very sure we shall see substantial results from our efforts.

At the time this conference was called I expected to be present at all its sessions. But man proposes and God disposes. The things which you are to consider are the uncertainties created by the frailties of man—thoughtlessness and carelessness. You are here to consider safeguards which may be thrown about human life until the time when the Creator shall be ready to call men forth in his own way. I shall be prevented from being with you at to-morrow's sessions, because I shall attend the funeral of my late colleague, John W. Weeks, former Secretary of War, who has been called away. In passing I want to say that Mr. Weeks was one of America's great citizens; a statesman, a wise legislator, a prudent counselor, a faithful servant of the people. He was a man both of whose feet were always on the ground, and at a time when the Nation most needed men of his character and temperament he sat in the chambers of those responsible for the Nation's destiny as a peace power. His work during the postwar reconstruction period will leave an everlasting impress upon the Nation's history. I profited by my asso-

ciation with him, as the Nation also utilized his counsel, but I shall always remember John Weeks as the man, and I believe I can pay no greater tribute to his memory than to say he knew how to be a friend. In foregoing the privilege of attending the Thursday meeting I feel I am discharging a duty, for I have indeed lost a friend.

[Hon. James J. Davis, United States Secretary of Labor, here acted as chairman.]

The CHAIRMAN. The first paper on the program this morning will be by our good friend, Louis Resnick, who will discuss the subject, "Should there be a national safety museum?"

SHOULD THERE BE A NATIONAL SAFETY MUSEUM?

BY LOUIS RESNICK, ASSISTANT TO THE PRESIDENT, AMERICAN MUSEUM OF SAFETY

The general subject of this conference is "The value of statistics for accident prevention" and the subject of this particular paper "Should there be a national safety museum?" Let me tell you briefly of a recent occurrence which, it seems to me, eloquently answers the question raised in the title of this paper and at the same time justifies the implication in the general subject of the conference.

For 150 years we have celebrated Independence Day by the shooting of fireworks, and as a result more lives have been lost in the commemoration of our independence than were lost in acquiring it. Each year since the beginning of the safety movement the usual list of Fourth of July "Don'ts" has been issued and as regularly disregarded. Last year the American Museum of Safety decided to tackle the Fourth of July accident problem in another way. In cooperation with the National Committee for the Prevention of Blindness the museum conducted the first thoroughgoing nation-wide study of the number, nature, and causes of firework casualties.

This study revealed that more than 100 persons were killed and more than 1,000 injured during the Fourth of July celebration of 1925; that 19 persons were literally blown to pieces; that 37 children were burned to death in fires started by so-called harmless sparklers; that 79 had been disfigured for life by the loss of arms, legs, or fingers, or by other mutilation; and that 150 would lose the sight of one or both eyes—all to celebrate our independence as a nation.

The detailed analysis of these 1,100 casualties, together with a statement by Arthur Williams, president of the museum, calling attention to the seriousness of the situation, was published in practically every city in America; hundreds of editorials were written; numerous other organizations and governmental agencies became actively interested in checking this annual slaughter; and even the association of fireworks manufacturers jumped into the public-safety movement, with this result—an identical study this year, though not yet completed, indicates that the Fourth of July casualties for 1926 are in number approximately half those of the year before.

In other words, there are somewhere in America to-day 50 children alive, healthy, and happy who within the last two weeks would have been killed and perhaps 500 other children who would have

been blinded, maimed, or otherwise seriously injured were it not for this one activity of a safety museum—an activity in which statistics played a vital part.

If the American Museum of Safety had done nothing else in the last 15 years, its existence would have been wholly justified by this one accomplishment, and if the value of statistics for accident prevention had not previously been demonstrated in hundreds of instances this one case would have served the purpose.

Before proceeding directly to the question "Should there be a national safety museum?" it may be well to review hurriedly the experience of the closest existing approach to such an institution. The American Museum of Safety is an educational corporation holding a special charter from the New York State Legislature. The museum proper, which is housed in the building adjoining the New York City headquarters of the State department of labor, contains several hundred exhibits of safety devices, appliances, and equipment, hundreds of photographs, charts, and blue prints, and other illustrative material through which the visitor may acquaint himself with the methods—mechanical and educational—which are proving most successful in the prevention of accidents in industries of all kinds throughout America. The demonstrator at the museum is prepared to operate any of the many working exhibits and to explain the design and method of manufacture of the many unpatented devices. The museum is prepared also to secure information concerning any existing safety devices not exhibited at the museum.

Every employer of labor and every workman who has occasion to attend the hearings on compensation claims before the New York State department has an opportunity on the way to and from the hearings to step into the museum and to learn how the accident which brought him to the hearing might have been averted. This group constitutes a large part of the museum attendance. At the other end of the visitors' scale are the young men and women just stepping into industry. For during the last year every student in every continuation school in New York City was required to visit the museum of safety as a part of the continuation-school work. "Required" is perhaps the wrong word here, for almost without exception these boys and girls—all of whom are already employed in industry—took greater interest in the exhibits than did the veteran shopmen who came to the compensation hearings, and many returned on their own initiative for a second and third visit. The museum is, however, not merely a show place. It is primarily, as indicated in its charter, an educational institution. Thus next September the museum will cooperate with New York University in the presentation of the first collegiate course in safety engineering, the details of which will appear in a public announcement within the next few weeks.

The museum has, as most of you probably know, published for more than 10 years a little magazine called *Safety*. And it has throughout its existence carried on safety educational work through the public schools and the press.

Another phase of the museum's work has been the offering of medals and certificates of award for outstanding achievements in industrial accident-prevention work and health promotion. Notable among these are: Scientific American Medal, awarded for the most efficient safety device exhibited at the museum; Louis Livingston Seaman Medal, awarded for progress and achievement in the promotion of hygiene and the mitigation of occupational disease; E. H. Harriman Memorial Medal, awarded to the steam railroad which, during the year of the award, has been the most successful in protecting the lives and health of its employees and of the public; Anthony N. Brady Memorial Medal, awarded to that electrical railway company which, for the year of the award, has done most to conserve the safety and health of the public and its employees.

It will be seen from this rather sketchy outline that a safety museum may inspire, encourage, and point the way to more effective accident prevention and that it may do this by exhibits, by research, and by propaganda and education.

The subject of this paper was, I take it, put in the form of a question because of some doubt in the mind of the Commissioner of Labor Statistics or on the part of others who prepared the program. Perhaps the commissioner wondered, for one thing, whether there were not already too many safety organizations in the field. At any rate I know that this question has often been raised, but I believe that it is easily dispelled by the history and membership rolls of the existing organizations.

There are, it is estimated, in the United States considerably more than 100,000 manufacturing and industrial plants, but not more than 5,000 or 6,000 of them are members of either the National Safety Council or the American Museum of Safety; perhaps an equal number are members of local safety councils giving serious attention to industrial accident prevention. While I do not mean to imply that membership in a safety organization is a guaranty that good safety work is being done in a plant or that it is impossible to do good safety work without being a member of a safety organization, I think this audience will agree with me in the feeling that most of the industries giving serious and permanent attention to organized accident prevention are members of some safety organization. The fact is that only 10 or 12 per cent of the industries of America are at present members of organizations actively interested in industrial accident prevention. Even if we assume that an equal number of plants, though not members of any safety organization, are doing effective safety work, we are confronted with the fact that a very large proportion of our industries are not giving the attention that they should to safeguarding the life and health of their workers. This fact is in turn reflected in the records of State industrial commissions showing increases in the frequency and severity of accidents ranging from 5 to 50 per cent in recent years—this despite the remarkable reductions in both fatal and nonfatal accidents in the properties of some of our larger corporations.

It is not necessary in an audience such as this to resort to comparisons of our yearly accident casualties with those of the war; nor

to analyze the annual billion dollar economic loss attributed to accidents. We all know, that with the exception of a few particular industries, speaking for the country as a whole, the accident-prevention job is not being fully done. There is room for an additional safety museum which might function on a national scale, but, because of its very nature, a museum of any sort renders its best service locally. The American Museum of Safety functions nationally as an educational institution but of necessity only locally as a museum. Whether such a museum should be developed and maintained by the Federal Government or by private initiative revolves, I believe, wholly around the availability of funds. There are, I am sure, in the Government service men capable of developing and maintaining such a museum with the same degree of efficiency that may be attained anywhere outside of the Government service. The protection of life and limb and the general education of the public, while primarily State rather than Federal responsibilities, are like many other fields greatly stimulated by the aid of Federal organizations. To establish and maintain a national safety museum properly would, of course, require a large initial outlay and impressive annual budgets, for a safety museum is valueless if it is allowed to become merely a display room for mechanical guards; the exhibits at the American Museum of Safety in New York are being continually changed to present the latest model of each device. As pointed out earlier in this paper, such a museum must function also as a research and educational institution and these activities require probably even greater outlays of money than the exhibits themselves. Whether funds for the establishment of such an institution are available and whether there is any assurance of their continuance from year to year are questions beyond the knowledge of the speaker. Even if funds were available, however, would it not be better for the Federal Government to aid the States in the establishment of such institutions as New York State has in the American Museum of Safety and New Jersey has in its Industrial Safety Museum.

You are perhaps already acquainted with the fact that there is now in the process of organization a national museum of peaceful arts for which a fund of more than \$2,000,000 has been set aside by Charles R. Towne. This work is progressing rapidly under the able chairmanship of George F. Kunz, one of the vice presidents of the American Museum of Safety, and it is hoped that when this museum of peaceful arts is established the American Museum of Safety may occupy one of its wings. A safety museum acting as a clearing house or parent body could be of great help to the States and smaller industrial communities in the establishment and maintenance of local safety museums.

I might add, and I am sure this goes for the entire conference, that if we do have a national safety museum under Government auspices, it belongs in the Department of Labor.

[Ethelbert Stewart, United States Commissioner of Labor Statistics, resumed the chair.]

DISCUSSION

[The following discussion of Mr. Resnick's paper by Charles P. Tolman, consulting engineer of New York City, who was not present, was read by Charles E. Baldwin:]

Mr. TOLMAN. Mr. Resnick's paper favoring a national safety museum at Washington under the auspices of the National Government carries a great weight because of his long association with safety work, both with the National Safety Council—that well-known society made up of some 4,000 industrial members employing some millions of men—and his later connection with the American Museum of Safety in New York. He is therefore speaking with authority.

From what he has said, it is apparent that such a museum, successfully to fulfill its purpose, would call for substantial initial and continued expense.

It is essential for the success of such a museum that it be a "live" thing. Industry is developing so rapidly that the modern thing of to-day is a relic to-morrow, and unless accident-prevention measures keep apace with industrial development through live contact therewith, the museum in a short space of years would be practically useless for the conservation of life and limb, and unable to render economic service to the industries of the country. A live bureau—such as we now have in the Department of Labor—would not be helped in this important work by the adjunct of a "dead" museum. Whereas the aid of a "live" museum—which might better be called "institute"—would be of invaluable assistance in rendering effective the present work of the bureau and expanding its field of activity and usefulness.

The humanitarian side of the safety movement is generally discussed to the exclusion of the economic side. Without detracting an iota from the humanitarian side, which has been characterized as "one of the greatest spiritual movements on foot in America to-day," I wish to emphasize in my discussion the cold-blooded dollars and cents side, because if the desirability of the project from the economic side can be demonstrated, the rest will go hand in hand. Furthermore, any substantial business organization always has or can find the financial means to invest in a legitimate and profitable enterprise. It has been frequently stated, and proved, that properly constituted safety work in an industrial plant always pays a substantial return on the investment. I can give many cases where the dollars-and-cents return on work undertaken from the safety standpoint has paid larger profits than that obtained from equal investment in the regular departments of manufacture.

Time does not permit detailed discussion looking to proof of this statement, so instead of attempting to recite a few instances out of the many, it may be best to examine into the basic principle, from which it will be apparent that the statement must be true.

An accident in industry—meaning by that an injury to a worker—shows that something has gone wrong. Repetitions of a particular kind of accident shows that something is habitually wrong. Thus far we are speaking only of the effect upon the worker. At the

same time the workmen are being injured the accident—that is, the unusual effect, whatever it was—is in most cases interfering with production. In practically every case the material part of the accident—that part which interferes with production—must occur a great many times before it happens to occur under the particular circumstance that finds a workman in the way to be injured. In some cases a material accident may occur several hundred times and no one be injured, each time costing money entirely apart from any question of physical injury to a workman. By correcting the condition and thereby safeguarding the worker from occasional injury, we are at the same time stopping the material accident of many times the frequency and saving the cost of this larger accident experience. This is the basis upon which so-called safety work pays its way and a profit.

Industry is a living thing and we may draw a comparison with the human body. We are well aware that if it were not for the sensory nervous system animal life would probably have disappeared from or never developed on earth. Were it not for the pain of an injury various lesions would be disregarded at the expense of life, limb, or faculties. The human being—worker—in industry may be properly regarded as the sensory nerve system of industry with respect to injury and loss of efficiency in industry. The pain suffered by the worker in an accident is the warning that something is wrong. Intelligent investigation of the cause of the pain leads to diagnosis of the trouble and cure both of the pain and the cause. The keynote in the conservation of human life from the ravages of disease to-day is preventive medicine. What the Surgeon General's department does for the physical health of the country the Department of Labor is accomplishing for the industrial life of the country. The medical research institutions and laboratories which supply the technical basis for public-health activities should have a parallel in a safety museum or institute supplying a similar basis in support and extension of the work of the Department of Labor, looking toward the economic health of our industries as well as the physical health of our industrial workers.

The CHAIRMAN. The next speaker on the program is Charles H. Weeks, deputy commissioner of New Jersey. New Jersey is the only State, as far as I know, that maintains a museum as a State institution. I want to say that my idea of Washington has materially changed in the last few years. People who go to New York go there for a specific purpose, and, with all apologies to New York representatives here, I think they get out of there just as quickly as they can. The people who come to Washington, as I have observed for a number of years, may have some specific job to do, which they can do and do quickly; then they want to see what is here—they want to look around. They generally bring their wives with them, and they want to go to Mount Vernon and to stay here and see what they want to see. I have changed by mind very much as to the advisability of Washington as the location for a national museum. I just want to say that in regard to the location. New Jersey has done things along the way of making the museum a practical fact, and we will now hear from Mr. Weeks as to what it has done.

NEW JERSEY INDUSTRIAL MUSEUM OF SAFETY

BY CHARLES H. WEEKS, DEPUTY COMMISSIONER OF LABOR OF NEW JERSEY

It is indeed a privilege to have this opportunity of presenting to this conference a paper on the New Jersey Industrial Museum of Safety. We are proud of the fact that we have in New Jersey the only real industrial safety museum of its kind in existence operated by a State department of labor, but we feel that more of them should be established, as they are worth while and provide excellent safety educational material.

In establishing a safety museum, there are many important subjects to be considered, such as the location of the museum, facilities for properly placing exhibits, selection of the different types of exhibits, the proper demonstration of the exhibits, keeping the exhibits up to date, and making the museum a popular place to visit. In selecting exhibits for a museum of safety nothing should be considered unless it can produce a real, sure-enough lesson for safety education. Relics, freaks, and experimental devices should not be considered in a live, up-to-date industrial exhibit. There are other types of museums adopted for such displays and all efforts in connection with an industrial museum should be confined to demonstrating how accidents take place and how to prevent them. These are the fundamental principles of a successful museum of safety.

Because health, accident, and fire prevention, as well as satisfactory working conditions, are of interest to all the employees and workers of the State of New Jersey, the department of labor is conducting a clearing house of practical information on these subjects by means of exhibits in the New Jersey State Industrial Safety Museum Building, located at 571-575 Jersey Avenue, Jersey City, four blocks from the Grove Street station of the Hudson-Manhattan Tube.

The museum is located in a four-story brick and steel building, in which hundreds of safety exhibits are displayed which are of interest to manufacturers, factory owners, workers, safety and welfare organizations, and the general public. Lectures, moving pictures, free consulting service, and demonstrations of the safety equipment are also provided for in this museum.

The Department of Labor of New Jersey has established definite industrial standards of safety for the protection of workmen from fire, moving machinery, improper steam-power operating practices, electrical apparatus, structural devices, poisonous trade substances, industrial dust, noxious fumes, excessive heat, and bad sanitary conditions in industry. The Industrial Museum of Safety is being used to translate these standards into types of visual instruction through the medium of practical first-class exhibits.

The museum contains practical exhibits on structural industrial building requirements, standard fireproof windows, doors, and partitions, fire-escape construction as prescribed in the New Jersey fire protection law, scaffolding, safety ladders, panic bolts, metal frames, and wire glass.

An elevator fully equipped with all safety appliances, fire doors, and interlocks is on exhibit. This elevator travels from two levels

a distance of 3 feet 6 inches, allowing a demonstration of the operation of the different safety appliances in connection with elevator installations. The elevator is inclosed with specimens of different types of safe elevator inclosures and the openings provided with different types of approved fire doors. In addition to this elevator, there are several other exhibits of elevator safety doors, fire doors, and safety locks.

In an effort to be of maximum service as a safety engineering division to industry, the department of labor undertook in the broadest possible manner to present, under actual working conditions, those machines and processes responsible for the greater percentage of industrial injury, loss of life, and the impairment of body functions, in our museum building which so readily lends itself to the visualization of a plan possessing practically all of the elements of an institute for the broadcasting of educational matter dealing with the manifold subjects under the heading of safety engineering.

In this State industrial museum of safety will be found information on every standard affecting the industrial worker. I make particular reference first to the mechanical division of our museum. In this division will be found machines in the metal, wood, laundry, paper, and rubber trades, each with effective standardized safeguards fully eliminating belt, pulley, gear, and similar exposures, and what are termed point-of-operation safeguards or controls designed to prevent or reduce the possibility of the worker coming into or remaining in the danger zone of operation.

My second reference is to the electrical division, under which heading electric-power control equipment of the externally operated safety type may be found in great profusion, each class of control bearing mute evidence of the desirability of its use because of the completely inclosed current-carrying parts. Also in this division, but not the least important, falls the great problem of adequate industrial illumination. Under the high pressure of present-day industrial activity, altogether insufficient consideration is given to the relationship of adequate lighting facilities to the big problem "production" and it is most difficult for the average observer to associate industrial accidents with poor lighting; nevertheless, we find authority for the statement that there is some foundation for assuming that 18 per cent of our industrial accidents are directly or indirectly due to defects in lighting installations. On that basis, according to the same authority, the services of approximately 108,000 men for one year are lost annually in the United States because the illumination provided is not adequate for the safety of the workmen. It has also been determined through research work and the maintenance of statistical records that the advantages of adequate lighting result in the following:

Reduction of accidents.

Greater accuracy in workmanship.

Increased production for the same labor cost.

Less eyestrain.

Promote better working and living conditions.

Produce greater contentment to the workmen.

Promote order and neatness in the plant.

Supervision of the workers made easier.

Interesting examples of completely lighted areas which represent factory conditions have been placed in service throughout the four floors of our industrial museum building in order to convey to the mind an actual picture of equipment and lighting intensity known to produce the most practical results as affecting the many processes which must of necessity be treated in our vast manufacturing field.

A very prominent section of our museum contains extensive exhibits of steam boilers, refrigerating equipment, valves, steel mixture, and other appliances to demonstrate practically the proper method under the New Jersey law of construction and installation of such equipment to be used in our State; also, material used in the fabrication of steam boilers by manufacturers must conform chemically to our specifications in accordance with the New Jersey Standard Boiler Code, adopted by the New Jersey Board of Boiler Rules and enforced by the Steam Boiler Inspection Bureau of New Jersey.

Refrigerating equipment is installed for constructional information and the application of the necessary safety appliances. Valves and other auxiliaries are exhibited primarily to demonstrate the proper design, thickness, and grade of material to be used in and becoming part of the equipment of steam boilers. The purpose of the exhibit is to demonstrate in a practical way to manufacturers of steam boilers and other appliances, to proposed purchasers of same, to engineers and inspectors, what they must do and with what they must comply when installing equipment of this nature. In other words, the exhibit eliminates any doubt, obviating the possibility of anyone pleading ignorance.

There is also on display in this industrial museum building exhaust systems showing how dust, foul air, and noxious fumes may be eliminated. Full-sized exhaust equipment is on exhibition in connection with chemical tanks, dipping tanks, grinding wheels, polishing wheels, jewelry machinery, woodworking machinery, laundry machinery, and lacquering booths.

Improved safety sanitary arrangements are shown, such as shower and washing equipment for foundries, also washing and toilet equipment for industrial plants.

Displays of approved industrial fire equipment, which includes fire extinguishers, safety cans, chemical engines, fire buckets, and safety waste cans, are also in the different parts of the building.

I might add that all machinery and exhaust grinding and polishing wheel equipment are under power and can be at any time practically demonstrated.

In addition to the visual instruction that may be gained at the industrial museum, a lecture service is carried on that radiates an influence to every part of the State. Lectures are given in the museum to factory representatives, safety committees, factory chiefs, schools, and foremen's committees.

It is apparent that in the rapid strides of modern safety engineering, much work of an educational character must be undertaken in order to accomplish the most practical results, and therefore the greatest degree of cooperation must of necessity exist between the industries as a whole and the supervising body, the department of labor, which is in effect the safety engineering division of each and every industrial plant in our State.

The business of the New Jersey State Industrial Safety Museum is under the direct supervision of Andrew F. McBride, M. D., commissioner of labor. The approval of equipment is conducted by the bureau of structural inspection, bureau of hygiene and sanitation, bureau of electrical and mechanical equipment, bureau of engineer's license and steam boiler inspection of the department of labor. There are six committees, composed of manufacturers of the State of New Jersey, which transact the general business of the museum—known as executive committee, finance committee, industrial hygiene committee, safety, public and industrial committee, fire prevention committee, and exhibits committee. These committees work in cooperation with the commissioner of labor and the different bureaus.

All equipment, after being approved by the department of labor, is placed in the museum on consignment by the manufacturers. It is estimated that there is about \$175,000 worth of safety equipment on display.

We consider the museum building at Jersey City a wonderful institution for the following reasons: In the museum it is shown how accidents can be prevented; the workmen's compensation department arranges for compensation for the injured; the rehabilitation division provides, if possible, for the return of some of the earning capacity of the injured; the employment division secures a position for the injured persons if they are not in condition to return to their former occupation. This makes an entirely cooperative method of preventing accidents and aiding the unfortunate should an accident occur.

Before closing, I want to mention the rehabilitation clinic, in our New Jersey Industrial Museum, especially the part devoted to the Zander apparatus. Doctor McBride, commissioner of labor and New Jersey director of rehabilitation, has had a functional apparatus installed that has been pronounced the most complete in existence. Half of it is power driven, and when demonstrations are going on in the building we always desire to include this valuable part of the clinic in our demonstration.

In closing, I want to say that the commissioner of labor extends a cordial invitation to the representatives at this conference to visit the Industrial Museum of Safety, 571-575 Jersey Avenue, Jersey City, to view what has been outlined in this paper.

DISCUSSION

The CHAIRMAN. I would like to ask for any discussion from the floor on this subject; I would like to hear from anyone who wishes to discuss this question of the morning.

Mr. KNAPP. Could Mr. Weeks give us some idea of what appropriation is made to keep up that museum?

Mr. WEEKS. The State of New Jersey has, for the past several years, appropriated \$1,500 for the carrying on of the work in our museum. That money is for clerical hire, transportation of exhibits, framing exhibits, etc. All our live exhibits are placed there by manufacturers free of charge, no expense at all for that; they are on consignment, with the privilege of removing the exhibit at any time.

The CHAIRMAN. Is that amount simply for the clerical hire immediately connected with the museum? You do not mean to say

that that covers the overhead, the amount of time that the various divisions give to that—in other words, that is not the whole cost?

Mr. WEEKS. No, there are different bureaus; in fact, the entire department of labor cooperates with the museum, and the clerical hire I spoke of is simply that of the clerk who answers the telephone, replies to telegrams, etc.

The CHAIRMAN. And you do not subdivide—for instance, you do not charge the time of other chiefs to that bureau?

Mr. WEEKS. No, that is not charged to the museum. Every member of the department of labor is notified regularly to keep in touch with anything new, or anything live, or anything that means something in regard to safety, and to report it to the different bureaus along with their regular work.

The CHAIRMAN. The research work is done by the different departments, the department of health, etc.?

Mr. WEEKS. Yes; that is an advantage we have, having the department of labor under a single head and all the different branches—compensation, employment, and rehabilitation—under a single head.

The CHAIRMAN. I think that would be generally true of any National or State department, that none of the bureaus stand on their own feet; that is to say, you can not say what it costs to run any particular thing, because there is not a division of pay roll. We try to do it as best we can, but in the nature of things there can not be a very close subdivision of cost.

Mr. RADEMACHER. I wonder if Mr. Weeks has any figures on the approximate yearly attendance at the museum, and also if he can tell us what means they take to develop the museum and get people there to see the displays?

Mr. WEEKS. The question was to find out how many people visited the museum and how we advertised it?

Mr. RADEMACHER. What measures you used.

Mr. WEEKS. We planned a general safety campaign in New Jersey among all our manufacturers. We have organized safety committees, foremen's clubs, etc., which meet at our industrial museum. They appear there and the different devices, whatever would be of interest to them, are demonstrated and they are shown how they can prevent accidents; for instance, if they are the owners of brewery plants, they inspect the brewery machinery equipment, etc., and the same with the metals, the textiles, or any other type of industry. Our factory inspectors continually advertise the museum and endeavor to have people visit it. We are having schools of young people there, teaching them and explaining to them what safety and safety devices mean, and showing them how accidents take place on any particular thing. Only the other day a man was killed on a shaft, and we had that photographed. We show that in our museum, how the man was killed and how he need not have been killed had the necessary safety equipment been provided. Last year's figures on the museum attendance I should have brought with me, and did not, but I can say that the museum is attended regularly by a large number of people.

The CHAIRMAN. Can you give us an estimate?

Mr. WEEKS. I should say that in our museum, not considering the summer months, we have probably about six or seven hundred people a month.

Mr. KINGSBURY. The statement was made here this morning that only 25 per cent of the industries in this country were apparently very much interested in preventive measures in connection with accidents. It seems rather an extraordinary statement, because in these days almost every industry is interested in the prevention of accidents. I say that from my contact with other manufacturers and a pretty fair knowledge of the industry of the country. It has been a question of intense interest. I would like to know whether in New Jersey, where you have a museum of that kind, you have any means of knowing how much additional interest you arouse among the manufacturers of New Jersey, whether there is any greater precaution taken in accident prevention than before you had the institute? In other words, do you feel that you could give figures actually showing a large dividend on your investment? You must have to pay something for that building. From your description I could not tell whether it was a new or an old one, but at any rate you had to fix it up for that purpose. I was wondering whether you really knew whether New Jersey before that was taking a great interest and whether the institution has created a still more intense interest in accident prevention?

Mr. WEEKS. A week ago we had a meeting in our industrial museum of the executive committee, at which there were about 22 representatives of our largest industries. The commissioner put to each individual member that very question. He wanted to know, wanted to hear from him, if the museum was worth while and what good it had done to his particular industry. That brought out the fact that most of them were trying hard for a no-accident record in their plants; and they were having their foremen, their master mechanics, and other people interested in safety work visit our museum to get a line on what was needed for further protection. They all pronounced it an excellent help to them, and wanted to go further and have other leading manufacturers have meetings there in the museum—that is, appear before them at their meetings so it could be thoroughly discussed in the same way it was before them as members of the committee. In reference to the building you speak of, we not only use that building for an industrial museum but we also have therein a vocational court, a formal and informal compensation courtroom, an employment office for males and females, a compensation adjustment department, and the offices of the department of labor. Therefore we get our appropriation from the State to carry that building through those different departments, using part of the first floor and the entire top floor, which is very large—half as big as this room—for our general exhibiting purposes. Do I answer that question?

Mr. KINGSBURY. Yes; but might I ask one other question? Did you consider before you started this museum that New Jersey was perhaps below the average in her interest in this question of industrial accidents; was she rather lax? Did you feel that she was so lax that a thing of this kind was necessary?

Mr. WEEKS. We did not feel that we were lax; we felt that the entire country was that way, and that we all needed something of that kind.

Mr. KINGSBURY. I wondered because I was very much surprised at the statement that only 25 per cent of the industries in this country were interested in the prevention of accidents. My idea is that a great many more are intensely interested, and so that percentage seems very low to me.

The CHAIRMAN. Haven't you put rather an exaggerated construction on what was said?

Mr. KINGSBURY. Possibly so; I would like to be corrected.

The CHAIRMAN. It was said that about 8 per cent of the manufacturers are members of an association. That does not mean that the manufacturer who is not a member of an association is not interested in accident-prevention work. The estimates I have received—frankly, I think they are all estimates—are that anywhere from 8, 10, and 12 per cent of the manufacturers, large and small, are members of these associations that have for their specific work the prevention of accidents. I do not think that you can deduce from that, or that that means in any way that 88 or 90 or 92 per cent of the manufacturers are not interested in accident prevention. They are not members of these associations that are making particular drives, that is all.

Mr. KINGSBURY. I misunderstood you then; I understood your percentage in regard to membership, but I got the impression somewhere that some one said 8 or 10 per cent and some one said 25 per cent.

Mr. RESNICK. I think I can clear that up if you will give me permission to read one paragraph from my paper.

There are, it is estimated, in the United States considerably more than 100,000 manufacturing and industrial plants, but not more than 5,000 or 6,000 of them are members of either the National Safety Council or the American Museum of Safety; perhaps an equal number are members of local safety councils giving serious attention to industrial accident prevention. While I do not mean to imply that membership in a safety organization is a guaranty that good safety work is being done in a plant or that it is impossible to do good safety work without being a member of a safety organization, I think this audience will agree with me in the feeling that most of the industries giving serious and permanent attention to organized accident prevention are members of some safety organization.

The point I am making is this, that the cost of membership in either the National Safety Council or the American Museum of Safety is so insignificant and the service rendered so valuable in comparison, that it is a pretty fair assumption that most of the organizations doing good safety work are members of either of those two organizations, and while I know of a number of industrial corporations that are doing good safety work that are not members of those organizations or any local safety council, I would like to hear from the audience whether I am right in the feeling that most of the people doing good safety work are members of some organization. If that is so, less than 25 per cent are doing good safety work.

Mr. THOMPSON, Travelers Insurance Co. I would like to answer your question a little, and perhaps supplement what Mr. Weeks said. Naturally we do a good deal of business in New Jersey, and we find

that the museum in New Jersey has been a big help. We have occasionally called upon it for speakers to go out to some of our risks and give safety talks. It has been a help; it has helped to educate a good many of the foremen in the plants that we insure. It is a going proposition. A like proposition in any State will do good, and a big proposition of some kind in Washington can not help but do good. Answering your question a bit specifically as regards the interest taken, Mr. Kingsbury, of course, we push this organized safety work a good deal; we insure a good many big plants, but I can not say at this minute that, of the big plants that we insure, 75 per cent are interested in safety work; and when I say interested to that extent, I mean interested to the extent of organizing safety work, not a guess and by gosh method, but really interested and carrying it on, backing it up financially, getting results, stopping accidents.

Mr. GREEN. I have been located in Illinois for about two years. I happened to be in New Jersey from six to eight years, with the United States Government. While in the Government service I was transferred from place to place and naturally got in touch with a number of accidents, especially around South Amboy, N. J., and at other places in the surrounding community, owing to numerous explosive and ammunition plants located there. After leaving New Jersey, I went with the Western Cartridge Co., East Alton, Ill., the concern I am now with. I believe what the gentleman on my right wants to know is, How great was the interest in the State of New Jersey prior to the starting of the museum? I do not want to condemn any State, but I believe that the State of New Jersey is somewhat above the average when it comes to interest in safety. I do not mean to say that the State of Illinois is not interested in safety, because it is.

I am, however, located in a district where there are a number of steel and other corporations, and from my association with safety engineers and others, I know that some of the concerns show great lack in going about their safety work as they ought to. The concern I am with decreased its accidents, from a severity standpoint, at least 50 per cent in the last two years, which shows that safety work pays in any plant. I believe that the State of New Jersey is showing greater interest than the average State, from experiences in making investigations at different times when accidents occurred. In some other plants it was just a happening and that was about all there was to it. I believe that is one way that interest can be judged in different States. Generally speaking, however, in my opinion it is not the State or the manufacturer so much as the lack of efficiency due to lack of proper type of men at the head of the safety department. It seems, however, that the loss of life is considered greater in some States than in others.

Mr. WALTERS, General Electric Co. Taking another view of the research and museum work, we have developed at our electric light plant what we styled in the beginning a human engineering department. We have abandoned that name as not quite fitting the case and at the present time are simply calling it a test. By the way, this has been developed within the last three years by Dr. Johnson O'Connor, a graduate of Harvard University, and a museum or institute of the same kind is now being developed by him at the

West Philadelphia works. Any of you who go to the centennial might find it of interest to stop in at the West Philadelphia works and look it over. Especially, if you visit the West Lynn plant, you will find it in a greater stage of development. The point that we are driving at in this institute is testing the individual. Every individual applying for work is given a test along various lines, particularly as to dexterity and temperament. When I tell you that with a pay roll of over 3,000 employees we have maintained since that an accident rate of less than 1.5 to the hundred I think we prove our point that we are making safe employees by taking these people and assigning them to jobs. In other words, instead of fitting the job to the man or the woman, we are fitting the woman or the man to the job. We are in hopes of seeing this work grow, and I think any of you in this institute work who are interested and will come to our Lynn plant will agree with me that it is one of the forward movements of safety work.

Mr. CRAWFORD. I want to ask Mr. Weeks that question in a little different way. Granting, for the sake of argument, that all of your employers in New Jersey are interested in accident-prevention work, do you not find that your safety museum and your safety organization crystallize and intensify their sentiments and provide a standard method throughout the State of taking care of those things and teaching accident prevention where before such work just ran along, every fellow for himself.

Mr. WEEKS. Why, certainly, that is one of the principal reasons that we thought the museum worth while. If we order a certain safeguard to be installed at a plant, we can simply go to the plant and order it done, but in this way it shows not only the individual but the manufacturer what we want; it shows what our specification calls for, what the law calls for; it places before them a sample of what we expect in that particular plant.

Mr. VAN BRUNT. I think Mr. Resnick's estimate is decidedly below the facts and that the percentage who are members of the various safety organizations is much higher than that he mentioned. In regard to our State, New Jersey, there is no question that that particular museum has, as Mr. Weeks said, crystallized the efforts of everybody in the State. Mr. Resnick forgets, possibly, that there are other organizations than those he mentioned. I think he forgot our New Jersey State Museum. He did mention the National Safety Council. He very possibly forgot that there were local safety councils organized. We have three in the State of New Jersey that are functioning, and functioning right. We also have something that makes for safety in the home and carries it from that into the factory—the safety patrols in the schools. In 63 of the municipalities in New Jersey every school has a safety patrol. In addition to that a large amount of work is being done among the general public by various corporations in New Jersey.

Mr. RESNICK. I did specifically mention local safety councils and assumed that the local safety councils doing industrial safety work have as many members as the National Safety Council and the American Museum of Safety, but even including these we will find that less than 25 per cent are members of safety organizations.

Mr. WILLIAMS. I want to make an observation on the estimate of the small number of manufacturers presumed to be interested in safety work. Practically every State, certainly every industrial State except one or two in the United States, has workmen's compensation laws, and every manufacturer of importance is paying industrial compensation insurance premiums, and to say that because he does not belong to a particular organization he is not interested in safety work is to indict his economic sense.

Mr. LANSBURGH. While we are considering the establishment of a museum of safety, I think it would be very unfortunate if we should limit our consideration to safeguards and safety devices. I think that the word "institute," which was recommended in one of the papers this morning, would represent what a national safety museum should be, rather than the word "museum." Most of the discussion this morning has referred to the guarding of machinery and to safeguards of one kind and another. It is of course known to most of the representatives here that the safeguarding of machinery has gotten to be a very small item in the safety program of our industries and of our industrial States, and just to bring that to your attention, I am going to quote to you a few figures on the causes of accidents in the great industrial State of Pennsylvania during the year 1925. The major cause of accidents was handling objects, 34,000. The second cause of accidents was cars and engines, 20,000. Now these accidents due to cars and engines might seem to be due to machinery, but they are not. Most of them are due to men slipping and falling under cars and engines and are accidents which, in the main, can not be handled by any kind of guarding, but rather come under the category of safety education. The third cause of accidents is falls of persons, 17,000. Of course, some of those falls are due to the lack of a safeguard, such as a guard rail of some kind or other on a scaffold. The fourth cause of accidents is moving machinery, which is the matter we have spent most of the time speaking about this morning, the number of accidents from that cause being a few hundreds less than falls of persons. The next cause is the use of hand tools, 16,000. We should never forget that included in our huge total of industrial accidents, which after all mean compensable accidents—accidents while on the job—are the new hazards which can be reached only through safety education of the community at large, such as the hazard due to the growth of motor vehicles. Thus we find that in Pennsylvania last year 8,000 so-called industrial accidents, or half of the accidents which were due to moving machinery, were due to motor vehicles. So, when we are talking about a safety museum or institute, if such finally be brought to consummation, as I hope it will be, should it not take as one of its primary duties the job of acquainting the United States with the steps now being taken by our leading industrial corporations and by our leading States—with the education not only of the worker but of the whole community in the State, which constitutes safety? It seems to me that that is an extremely important part of our duty and should be a part of the exhibit of any safety museum or safety institute.

(Meeting adjourned.)

WEDNESDAY, JULY 14—AFTERNOON SESSION

CHAIRMAN, JAMES A. HAMILTON, INDUSTRIAL COMMISSIONER OF NEW YORK

Secretary DAVIS. I wish to introduce the chairman of the afternoon session, James A. Hamilton.

The CHAIRMAN. In the call for this conference by Secretary Davis it was noted that "there is no adequate system of industrial accident reporting in the United States" and that in this conference "the co-operation of all of the States and all other accident reporting organizations will be sought, to the end that attention may be called" to problems of accident prevention. The conference is entitled an "industrial accident prevention conference" and the general subject for it is given as "Value of statistics for accident prevention."

There seem to be two points of emphasis in this. One is that the conference is to interest itself particularly in the subject of proper and adequate accident statistics as a necessary aid to effective accident-prevention work; the other that cooperation of State and Federal Governments is needed to provide that aid. In each of those ideas, as well as in their combination, on this occasion, it is possible to see signs that must be regarded as auspicious for the safety movement, particularly, for the movement as governmental agencies are concerned in it.

Industrial accident prevention as a government function is no new thing in this country. State legislation on the subject goes back more than 40 years. The State governments were the first safety promoters. Their functions in this field have undergone a notable development in the generation or more since they began. This development has been quite similar in different States. Two stages in such development may be clearly distinguished. The earlier was marked by safety regulations of a general character embodied in statute law; the later is notable for the development of administrative rules having the force of law, supplemental to statutory requirements and designed to make the latter more effective by more detailed regulations fitted more exactly to particular hazards or conditions. This development has been clearly in the direction not only of more complete and thorough control of conditions but of more technically practical regulation.

In other words, this development from more general statutory regulation to more particular regulation by industrial code rules represents an advance to more scientific methods in State industrial accident prevention, and, if more scientific in the true sense of that word, then more intelligent and effective.

What now is the next general development needed in connection with safety work to carry it forward to greater effectiveness? What is it other than better knowledge of what we have accomplished, what we still have to do, and where we need to do it, in order to make sure that our efforts are being applied where the need is greatest and when applied are producing results? In other words, as our gov-

ernmental regulations for safety become more numerous and complex, we more and more need the guidance of accurate knowledge both of what we are dealing with, namely, the different accident hazards in different industries and occupations, and of what results we are achieving, namely, whether and how much accident hazards are being reduced. Put in a word, we now need to advance another step in scientific method and have more accurate analyses of our problem and our results. Not only is that scientific, but it is good business method also, and at the same time it is the surest road to what is paramount to all other considerations, namely, largest results in the conservation of human life and limb.

The only means of acquiring this modern kind of aid to our accident-prevention work is, of course, adequate statistics of accidents. It is therefore most appropriate that this conference should make that the prominent subject in its program. It is bringing to the fore the present needed and logical next step in the development of government industrial accident prevention. Not that State safety work can not go on without it, but it can undoubtedly go forward far more surely, more effectively, and more speedily with that aid.

The second auspicious feature of this accident-prevention conference is the cooperative idea that evidently dominates it. The State governments particularly, as well as private interests, are asked to sit down with the Federal Government and take account of ways and means to coordinate efforts to make safety work more fruitful. Two points in that connection strike one on a little reflection. One is that here at least is a matter on which the tender question of conflict of Federal and State jurisdiction has no occasion to even be suggested. The cause to be furthered is so certainly one on which there can not be two opinions and in which as a matter of fact Federal and State functions are so clearly differentiated and understood that no jealousy of function or prerogative can interfere with getting together on whatever features of accident-prevention work can be shown to require, or to be better furthered by, cooperative arrangements.

The other point as to this cooperative idea is that it too, like the scientific element, is in line with the more recent developments in State safety work. One of the significant features about industrial code rules is the cooperative method by which they are formulated. The process of such formulation is practically standardized on the principle of cooperative study, conference, and agreement of the parties concerned, namely, employers, employees, safety engineers, and public authorities. They embody the idea of cooperative effort to prevent industrial accidents. Here again, therefore, this conference is soundly in line with the later developments in State safety work.

If one not concerned in its inception may venture to characterize this conference from the point of view of a State official deeply interested in every move promising better things for industrial accident prevention, I see in it an effort that is in line with the development of scientific and cooperative method by which State safety work has advanced, and which accordingly offers hope of helpful aid to greater progress in that all-important work.

On the general topic of accident statistics or accident prevention the State of New York is happy indeed to contribute to this conference. We in our State are gratified to have had one in charge of our labor department for almost 20 years who has rendered faithful, valuable, and scientifically accurate service, and for that reason we have brought along to-day from the Empire State Leonard W. Hatch, chief of our bureau of statistics, who will discuss the problem of national accident statistics.

THE PROBLEM OF NATIONAL ACCIDENT STATISTICS

BY LEONARD W. HATCH, DIRECTOR BUREAU OF STATISTICS AND INFORMATION, NEW YORK STATE DEPARTMENT OF LABOR

Ten years ago the then United States Commissioner of Labor Statistics stated in a public address, "Industrial accident statistics for the United States do not exist."¹ Early in this decade a complete and very thoroughly considered plan for standard accident statistics in the different States designed to afford national statistics by combination of uniform State figures was completed. And yet the present commissioner, if called upon to state the situation to-day, would have to say about the same thing as was said 10 years ago. Evidently, there is "a problem" in this matter. Both its importance and its difficulties are recognized by the fact that the program of this conference is devoted mainly to that subject.

What is the matter? Do we not want national accident statistics? If we do, do we know how to get them? Again, if we want them and know how to get them, what is preventing our getting them? And finally, assuming we are going after them, what is the next thing to be done? I take it that a little frank discussion of these practical questions is what is desired under the subject which has been assigned to me.

DO WE NEED NATIONAL ACCIDENT STATISTICS?

This question should not detain us long. Accident statistics are the necessary means of guiding and measuring progress in accident prevention. That is not their only service, but it is a chief one and the one under particular consideration in this conference. So few industries are confined, even in major part, to any one State that national statistics are necessary for the guidance of individual industries or for comparison of one industry with another. Again, national statistics are necessary to enable the individual States to compare experience in the industries within their borders with that in other States and to afford comparisons of one State's experience as a whole with that of other States. Comprehensively stated as a matter of sound method, Doctor Chaney has put it "that for setting up reliable standards of performances national accident rates are necessary." "Such standards," he points out, "to be satisfactory, must be derived from a sufficiently wide experience that they may be trusted not to be unduly influenced by local and temporary conditions. The concerns of a single jurisdiction, even if it be one of the larger industrial States, do not afford a sufficient coverage to permit

¹ U. S. Bureau of Labor Statistics Bul. No. 210, p. 91.

their being used as a general standard."² Put in a word as nearly as may be perhaps, we need national base lines in our accident statistics for comprehensive comparisons of experience.

DO WE KNOW HOW TO GET NATIONAL FIGURES?

It is the problem with reference to Government accident statistics that we have for consideration here. Obviously, national statistics will have to be provided by the Federal Government. The United States Bureau of Labor Statistics can secure the necessary material in one or two ways—either directly from individual employers in the various States or through the appropriate departments of State governments which require from employers the same sort of information. Two reasons seem sufficient to direct choice between these two to the latter, if not actually to compel that choice. On the one hand, to go directly to employers for industries generally would seem to involve such an amount of work and expense for one agency for the whole country as to make it impracticable. It is true the United States Bureau's figures for the iron and steel industry, the best accident statistics in the country so far, are so secured. But exceptional concentration of employees in great plants make this method far more feasible in that industry than would be true for others where much greater numbers of firms would have to be covered to secure adequately representative figures. On the other hand, and more fundamentally, the States themselves must have the same sort of material, and for the Federal Government also to secure it directly from employers, simply means duplicate reporting by employers, a thing which should not be imposed unless absolutely necessary, which it can not be said to be. The States can not, of course, step aside and depend on the Federal Government for what they need. Their exclusive function as administrators of labor laws, formulators and enforcers of safety code rules, and administrators of workmen's compensation laws, puts their need of accident records and reports foremost. No other conclusion seems possible than that the necessary route for the required material is from the employers to State departments and then to the United States department.

Allusion was made above to a plan for standard accident statistics. That plan was for Government statistics. It was developed by the committee on statistics of the International Association of Industrial Accident Boards and Commissions. It was worked out over a period of five years, from 1914 to 1919, after numerous conferences and careful study by statisticians representing both the State and Federal Governments. Standard definitions of terms; standard classifications for industries, causes, nature of injury, and extent of disability; standard methods of measuring exposure and computing frequency and severity rates; and standard table forms for presenting the figures, were all worked out, the whole plan being finally set forth in full in Bulletin No. 276 of the United States Bureau of Labor Statistics. Incidentally, it may be noted that, in addition to being indorsed by the International Association of Industrial Accident Boards and Commissions, the plan has received, in whole or in part, also the tacit indorsement of private organizations interested in

² U. S. Bureau of Labor Statistics Bul. No. 406, p. 118.

accident statistics by being followed by them in their own compilations.

It can not be said that the whole purpose of this plan was to make national figures possible. It had and has two purposes: First, to guide individual States in the preparation of what is believed to be generally the best kind of statistics for their own use, and second, to lay the foundation for national figures by combination of State figures. Here, however, the point to be emphasized is that this second purpose was always prominently in mind as one aim of the plan and, what is more to the point here, the plan if carried out in the various States would have afforded, by very simple combination of State figures, national figures of the fullest scope. This plan then is a complete answer in the affirmative, so far as technical process is concerned, to the question of whether we know how to get national figures. We have all the plans and specifications for full national figures and have had for several years.

WHY ARE NATIONAL FIGURES STILL LACKING?

Apparently then, we need national figures, and we know full well how to get them. Still we do not have them. What then is the matter? That seems the next question to answer in this diagnosis of the situation.

It is already implied in what has been said that the failure of the standard plan to produce national figures must run back to lack of development of the foundation for such figures in the figures of the individual States. In other words, the actual application of the plan in individual States has not yet gone far enough to produce combinable uniform figures. The question becomes, then, What has held back development of standard accident statistics in the States?

At this point it should be said that the lack of development of accident statistics along the lines of the standard plan sufficient to afford national figures is not to be interpreted as spelling complete failure of that plan in the States. It has been useful and influential here and there along the lines of its first purpose (above pointed out) of aiding in the improvement of State figures in more or less conformity with the plan. But any general uniformity, necessary for anything like national figures (the plan's second purpose), is still woefully lacking.

Returning to the question of why development in the several States has been so backward in this matter, let us for a moment turn from the national point of view to that of an individual State department dealing with its own problem of accident statistics. It is worth while to point out, in the first place, that it can not be expected that national accident statistics shall take first place in importance with such a State department as compared with its own State accident statistics. It must not be forgotten that the State department in most cases is itself doing the very work which accident statistics, State or national, are designed to aid. As itself engaged in accident prevention and compensation administration each State will inevitably rate as of first importance statistics to throw light on its own experience as a guide for its own safety or compensation administration or legislation. Statistics in scope and

form dictated by its particular provisions of law or peculiarities of administrative procedure are the very natural result.

In the second place, it is to some extent true that State needs may to a considerable extent be pretty well met, possibly even in some points better met, and may be more easily met by statistics varying from those of other States by reason of peculiarities in their own laws or procedure than by statistics modified therefrom so as to produce interstate uniformity.

The above two points are not brought out to justify lack of State uniformity in this matter, but only to indicate that State inertia toward interstate uniformity is not unnatural from the purely State point of view. They suggest, too, that such national uniformity will have to be "sold" to the States on the score of benefits to be derived by the States themselves.

To other points, of a more practical sort, need to be noted to understand the State situation. One of these is that accident statistics are not the only statistical material which the State departments have to compile to meet their own needs or the demands of their public. The other is that the State departments are anything but free to expend on statistical work the money that they might desire to or that they know would be well worth while for the best interests of the public. Appropriations for statistical work are notoriously difficult to secure from legislatures. Limitations of resources are a prosaic but very real difficulty which the States have to contend with in regard to accident statistics as well as other statistics (not to mention other matters).

These four considerations pretty well explain what has held back the development of State accident statistics along standard and uniform lines. What it all comes to is that the several States are so preoccupied with their own immediate needs, in the face of limited means to cover them, that modification of their statistical work or additions to it with a view to national statistics make a secondary appeal or do not seem within the capacity of their resources.

WHAT SHALL WE DO ABOUT IT?

What does the foregoing diagnosis of the existing situation suggest as the most practical thing to do next? Evidently, the problem is in general one of education. The State departments, or the State authorities back of them which control their policies and funds, have to be shown the value of proper accident statistics of their own and the greater value of such statistics when developed so that not only State-wide, but also nation-wide, comparisons can be made. Much teaching along this line has been done in the last few years through the reports of the committee above referred to and public addresses or articles by those who understand and are interested in the matter, and particularly by representatives of the United States Bureau of Labor Statistics in negotiations with individual State departments. Evidently, however, more impressive propaganda is required, and if I am not mistaken in my interpretation of the purpose of this conference, one of its chief aims is to serve that very purpose. At any rate, one of the useful things it can do is to give a fresh and more powerful impetus to the development of proper State and national accident statistics.

Obviously, the more specific and pointed the pressure this conference can exert the better. Now, it so happens that one particular kind of accident statistics is the one which the States almost totally lack, and which they most ought to have, and which also is most needed in national figures. This is accident rates per unit of employment or exposure, by industries. I shall not pause to point out the need of accident statistics in this form. This is simply the only form in which accident figures will really tell us where we are, how far we have come, and how far we have to go in safety work, whether it be viewed in a plant, an industry, a city, a State, or the Nation.

Not only is this the kind of accident statistics which we most lack, but, unfortunately, it is what is hardest for a State department to get. That is because, while under compensation laws records of accident occurrence come to a State department as a necessary incident of compensation administration, the figures for employment do not so come in and have to be specially collected, and if at all comprehensive in a State of any size industrially such collection is a considerable undertaking. But the need of accident rates make such collection imperative, nevertheless. If it can not be undertaken on a scale to cover all establishments, then as a beginning it should be done for groups of representative firms. In some States such employment returns for representative firms are collected and published for information about employment conditions. In these it would be a natural starting point for accident rates to coordinate the accident and employment figures for such already established representative lists.

As a matter of fact, the foregoing, arrived at by analysis of the fundamentals of the matter, brings us precisely to the point at which we make contact with what the United States Bureau of Labor Statistics has already under way as a beginning of national accident statistics. For some time there has been in operation a cooperative arrangement between that bureau and a number of the State departments for the collection of uniform reports of employment from representative lists of firms in manufacturing. Under this arrangement, where the State and the Federal Government cover the same firms, the State collects the reports and supplies the Federal bureau with copies, a plan which is economical for all concerned and which serves the purposes of both State and national statistics of employment. In this is the foundation for accident rates for representative firms, above noted as what at least should be utilized as a start toward proper accident-rate statistics. Commissioner Stewart has already begun building some national figures of this scope by securing from some of the States the corresponding records of accidents for selected lists of these firms for which employment reporting was previously established. Obviously, this is going at the problem in a practical way at the most logical and most feasible point. To whatever extent it may be fruitful, it will be, of course, only a partial and incomplete solution of the problem of accident rates, either State or national, but it will require only expansion of the reporting of employment and compiling of the accident records for larger and larger lists of firms to make it grow toward the ultimate goal of complete accident rates for all firms.

For purposes of discussion, therefore, if for nothing more, I am going to venture a recommendation that this conference specifically

and emphatically indorse and urge the cooperation of the State departments with the United States department in the development of both State and national accident rates along this line. It will, as a matter of fact, further two sorts of statistics relating to labor which are established as standard, namely, employment statistics and accident statistics. Such indorsement will be of service to the States as well as to the Nation.

Before I close, permit me to say just a word as to the situation in New York State on this matter. I am happy to say that while the work required to accomplish it, with New York records and manner of compensation procedure what they are and with the size of the field to be covered, has heretofore delayed New York's falling in line to furnish the accident records for representative firms such as Commissioner Stewart calls for (although the employment returns have been furnished for a number of years), this year a beginning on the former has been made. The accident figures for a limited list of New York firms requested by the United States bureau have just been furnished for 1924 and will soon be furnished for 1925, and are planned for annually hereafter.

But this by no means gives the whole story of where New York stands on this matter of accident rates. The present Industrial Commissioner of New York, who is your presiding officer to-day, during the past winter undertook to give the whole matter its proper place and authoritative backing by advocating an amendment of the law relating to employers' accident records and reports so as to require not only record and report of accidents, but record and report of employment by all employers subject to the compensation law. A bill for this purpose was drafted and received the unanimous indorsement of the State industrial council, a body representing employers and employees which is advisory to the industrial commissioner. The bill was introduced in the legislature and was pressed for passage by the industrial commissioner, but although not apparently opposed was left over, along with most other bills relating to labor laws at that session, for consideration by a special legislative commission on labor legislation which is to report next year. Notwithstanding the postponement of action on this bill, it is notable as marking the first attempt, so far as I am aware, to put accident rates where they belong in the public information about industrial accidents which every State should have. As one of the memoranda supporting the measure, which was filed with the legislature by Commissioner Hamilton, put it, it proposed "to remedy the present defects in public accident statistics in a comprehensive and constructive way by the only method, and through the proper agency, to provide what is now lacking and what there is a wide public demand for."

In closing I am going to suggest for consideration of this conference whether, if sound accident statistics are as important as we believe, and if national accident rates must be built on State data, it might not well recommend to the States that the New York course should be followed generally and that a foundation of specific legislative authority should be secured for the building up of such accident statistics as will furnish the best aid to prevention of accidents, as well as to the solution of other problems connected with industrial accidents.

DISCUSSION

The CHAIRMAN. The discussion on Doctor Hatch's paper will be led by Col. John P. Jackson, of the New York Edison Co., and former commissioner of labor of the State of Pennsylvania.

Col. JOHN PRICE JACKSON. I received on Saturday a note from Commissioner Stewart stating that I was to open the discussion on Mr. Hatch's valuable and informative paper. I must speak extemporarily since there has not been as much available time as I should have liked to prepare a written discussion. I have some thoughts, however, on Mr. Hatch's subject, which I believe may prove of value.

Before taking up my subject I wish to say that it is a privilege to have the opportunity of expressing appreciation to Secretary Davis and Commissioner Stewart for having arranged this important meeting. Their action is opportune and was impelled by conditions in this country, which, in their awfulness, as the Secretary pointed out, are akin to those of war. It has been estimated by high authority that 70,000 accidental fatalities occurred last year in the United States—of men, women, and children—including those caused by industry. There were even a greater number of casualties in the form of serious permanent mutilations, and millions received slighter injuries. These figures are terrible enough to be startling—those that the Secretary gave for industry alone are sufficient to stir us.

But it must be borne in mind that this work of human destruction goes on continuously; therefore, the suffering in one year of orphans and widows, of those who are blinded, of the occupants of wheel chairs, of the wearers of crutches, and of the families torn and rent through the scourge of accidents, forms no adequate picture of the human destruction. To gain a truer picture of the situation, consider a period of, say, 10 years; gather together the widows and orphans and the mutilated who have been created through accidents during these 10 years and who are now living quietly and unheralded among us, and they will number enough to make a great city, a city equal to the population of Washington and Baltimore combined, with a good many left over. I emphasize the cumulative nature of the ill effects of accidents, because it has been indelibly impressed upon me. I was once asked to go to a meeting of a single craft in a small city, and when I got there, there were in the room about as many cripples, blind, and others permanently and seriously injured as there are persons in this meeting here to-day. I was astounded. Finally, the meeting was called to order, and the chairman said, "that we got these people together, commissioner, for the purpose of teaching you a lesson." I learned the lesson! Those cripples were accident derelicts from that one craft in that one small city. Some of them had been injured as long as 25 years ago. This cumulative phase of the accident situation is worthy of continuous emphasis.

There is plenty of reason, both because of the annual toll of accidents and their cumulative effect, just mentioned, for this conference, and it is to be hoped that it may be considered as a strong, new, national attack in the campaign to wipe out our preventable

accidents and put us at least on a level with Europe. When it is considered that the cost of industrial accidents to the country is, according to Secretary Davis, over a billion dollars annually, and that this must be doubled or trebled if public accidents and all auxiliary costs are taken into account, economy as well as humanity warrant our getting together, as we are to-day, to revivify our accident campaign.

I am here this afternoon, however, primarily to discuss Mr. Hatch's paper. Mr. Hatch has made a sound and accurate analysis of the situation with regard to accident statistics, for which we are all indebted. His statement is timely, since accurate accident statistics are as important to the success of accident-prevention work as is the intelligent keeping of books to successful promotion of a business. America seemingly has not yet appreciated this fact, in spite of the activity of the National Safety Council, the Department of Labor, and a host of other organizations and individuals.

Mr. Hatch is entirely right in quoting the United States Secretary of Labor, who said, "Industrial-accident statistics for the United States do not exist." This was said several years ago, but it is still accurate. Four years ago Dr. Lucian Chaney made this exceedingly clear when, in 1922, he wrote his memorable pamphlet for the Department of Labor on the Statistics of Industrial Accidents in the United States. This fundamental bulletin is a résumé of the accidents of the Nation, and it was compiled largely from information received from the States. In his principal table the author was compelled to insert notes to indicate the condition of the data obtained from the various States. I have a list of them in my hand to indicate the difficulties of the author in trying to build up a good national statistical table. He had to add a special column to his table to explain the scope of the data from each State, but even that was not sufficient and resort was necessary to copious footnotes. This column and the footnotes include such statements as "Estimated fatal accidents, the number of which was not reported," "Covers 10 months only," "Records destroyed by fire," etc. The explanatory matter also indicates a wide variety in the character of accidents reported, running all the way from States keeping records of only such accidents as are compensable to States having full information on all accidents from which a day or more is lost. This pamphlet is in itself sufficient proof that there are no national accident statistics; that is no discredit to the Department of Labor, because it did its best, and Doctor Chaney's pamphlet is of much value.

The situation in the several States, as may be inferred from the statements just made, is also as a whole quite unsatisfactory. When I took the official position spoken of by the chairman in 1913 (Pennsylvania commissioner of labor and industry), I found available in my State no satisfactory compilations covering accident statistics and nothing which was applicable to any suitable degree in other States. The need of information of this character was promptly felt for carrying on our accident prevention work, and when the workmen's compensation law was passed data of this kind became imperative. We, therefore, devised and set up our own system. We were compelled to do this largely without precedent as we were pioneers. The fact that I have seen the resultant Penn-

sylvania accident statistics for the years immediately preceding the World War more quoted than those of other States would indicate shortage elsewhere. The comments and notes in the bulletin of the Bureau of Labor statistics, to which reference was made, show that as late as 1922 only a few other States had begun to make reasonably satisfactory records. Although to-day there are quite a number which keep excellent statistics, the majority are still without adequate records for their guidance in accident prevention. Even those States which have records which are quite satisfactory for their own purposes differ in their methods so much among themselves as to make adequate interstate comparisons difficult or impossible.

In industry much the same unsatisfactory situation exists. Many of our industries, in fact a majority excepting railroads, mines, and the iron and steel industries, do not have proper statistics for comparison of one establishment with another even in the same industry. I am very happy to have been able to promote the passage of a resolution by the safety committee of the association of one of our largest and most carefully run industries under which it will take up the problem of accident statistics. I hope that every industry in this country that has not already done so will shortly take similar steps. Within a recent period I studied the direct effect of accurate and intelligent accident statistics in a single industry. After the statistical information began to be distributed accidents began to decrease. Scores of similar instances doubtlessly could be pointed to by many men in this audience from their own experience.

Mr. Hatch states that there should be more uniform laws with regard to State accident reports, and that an active educational campaign should be carried on to this end. As may be inferred from previous remarks, I fully agree with him in this. He suggests that this can largely be accomplished by activity on the part of National and State officials. I believe he is right in part in this, but he does not sufficiently emphasize the importance of the influence that might also be obtained from the great industrial associations. These great associations more closely touch the people in their work and can thus more readily create the right public sentiment than is possible through governmental agencies, and without the proper public interest and sentiment it will be difficult to unify laws relating to accidents for the various States, and to enforce them. This has been quite clearly demonstrated in the attempt to enforce recently created sumptuary laws in this country.

Would it not be well, then, to push the educational work from both ends? The official and the nonofficial machinery is at hand. The American Engineering Standards Committee contains representation from a wide range of industries. Labor sits upon it, and there are representatives within its membership from both the National and State Governments. It has already done a great and generally approved work in creating safety and other standards. Why not ask this truly representative American body to approve, with modifications if need be, the statistical safety standards forms of report, forms of tabulation, and forms of analysis as they have already been prepared by the International Association of Accident Boards and Commissions referred to by Mr. Hatch? By so doing, industry will be strongly influenced to adopt these standards voluntarily. Under

such conditions they are borne, not only from the Government but from industry itself, and if the State laws do not conform therewith, the potent influence of all elements affected will demand changes.

Following up my argument, I would recommend that the committee on resolutions, in addition to passing resolutions such as Mr. Hatch has proposed, carefully consider reporting a resolution which calls upon the American Engineering Standards Committee to assume leadership in the project of standardizing and unifying accident, statistical practice for industry, the public, the States, and the Nation; and that this be done in connection with the National Safety Council, the International Association of Accident Boards and Commissions, and the other appropriate allied bodies, both labor and management including the engineering societies, which are associated therewith. With such powerful and broad backing we should rapidly approach the point where it would be impossible for a Secretary in the President's cabinet to say truthfully that industrial accident statistics in the United States do not exist, and where people of the United States will have available data which is imperatively needed for accident prevention. I can see no other plan which will do so much to aid us as a Nation to rectify existing inhuman and indefensible conditions.

The CHAIRMAN. Mr. Hatch's paper is open for further discussion. Is there anyone now who desires the floor?

Mr. HALL. As a matter of information, I will say, as a representative of the Association of Governmental Labor Officials of the United States and Canada, that at our convention in Columbus last month we adopted a report submitted by a committee which recommends that as a basis all the States try to have uniform statistical data submitted.

The CHAIRMAN. Is there any further discussion or any other remarks on Doctor Hatch's paper? If not, the next subject for discussion this afternoon is "The statistical factor in the accident experience of the iron and steel industry," by Dr. L. W. Chaney, of the United States Bureau of Labor Statistics.

THE STATISTICAL FACTOR IN THE ACCIDENT EXPERIENCE OF THE IRON AND STEEL INDUSTRY

BY LUCIAN W. CHANEY, OF THE UNITED STATES BUREAU OF LABOR STATISTICS

In 1906 the head of the legal department of the United States Steel Corporation called a conference of the casualty managers of the subsidiary companies. One purpose of the conference was to consider the statistics of accident occurrence. From that day to this the corporation has assembled and published statistical data concerning accidents, some details of which will be discussed a little later.

What it is now desired to emphasize is that the whole accident-prevention program of the steel corporation, which has succeeded so remarkably in maintaining a steadily declining accident rate, began with statistics, has continued with statistics, and is now dependent upon statistics.

There was very sound reason for calling that conference of casualty managers. The statistics disclosed that since the formation of the corporation accident conditions had gone from bad to worse, reaching a climax in 1906. They further disclosed that plants doing apparently the same sort of work were astonishingly variable in the matter of accidents. The year 1906 was probably the most serious period in the history of the business. A large plant of one of the corporation subsidiaries, which now regards a single death as a matter of most serious concern and which rarely has more than 5 fatal cases annually, had in 1906 a total of 40 cases. Not long before this time an article had appeared in a popular magazine under the title "Making steel and killing men," which set forth in a very emphatic manner the high mortality of the steel industry.

It is worth while to consider for a moment the causes which tended to give this bad preeminence to this year of 1906: (1) It was a year of unexampled industrial activity; (2) a larger portion of inexperienced non-English speaking workers were employed than before or since; (3) the safeguarding machinery was of a crude and unsatisfactory sort. The situation disclosed was sufficiently serious to demand the best attention possible to give.

Aside from humane considerations the condition was one involving very heavy financial obligations. Just how heavy this burden was had never been fully realized while the units of the corporation were going their separate ways and each caring for the maimed and mutilated according to its own plans. When these scattered members were united into a gigantic whole the size and importance of some of the elements, such as the accident problem, began to assume new significance.

The casualty men were sent home with a very earnest exhortation to find ways and means for checking the rising tide of accident occurrence and reversing it if possible. Several steps followed, so overlapping that they can not be stated in order.

A. An extensive survey was made and large expenditures authorized to put the plants in better condition from the standpoint of safeguarding.

B. A general safety committee for the corporation was formed with representatives from the subsidiaries.

C. Plant and department committees began to be formed. The first of these was set up in the blast furnaces at the South Works of the Illinois Steel Co., in March, 1908. In April, 1908, a complete set of departmental committees was established in the Lorain Works of the National Tube Co. In August, the South Works, having found the committee useful in the blast furnaces, extended the committee organization to all departments.

D. Company committees were formed with representatives from the several plants operated by the company.

In the deliberation of these several committees there was of course constant use of statistical procedure. In fact, such procedure must of necessity be a major factor in any careful study of accident prevention.

Your attention is now directed to the experience of the entire corporation from 1906 to 1925. This includes "serious accidents." The corporation also publishes a graph in which all "lost-time"

accidents are included but it does not go back as far as 1906 and it is desirable to show the extremes. In the few instances where an increase is shown we know that industrial conditions were such as to favor such increase. Whenever industrial revival occurs the building up of the force involves the taking on of relatively inexperienced workers and such workers always have a higher accident rate than an experienced group. If 1906 be compared with 1925 a reduction of 60 per cent is found to have occurred. If lost-time cases are noted the reduction from 1912 to 1925 is 80 per cent. Let it be supposed that conditions of 1906 were continued down to the present time; 46,863 more workers would have suffered serious injury than so suffered actually. If 1912 conditions had been continued it would have meant 322,468 more disabling injuries than actually occurred.

Sometimes criticism has been directed toward this method of stating the results. It is true that it rests upon a supposition but the supposition is a perfectly appropriate one to make. In fact it is impossible to get a clear idea of what an accident-prevention program really is without looking at it from some such angle. As stated above this presentation is a composite of the entire corporation. It might easily be the case that some elements of this composite had so extraordinary a change as entirely to cover up less satisfactory conditions existing in associated groups. It is desirable to examine the statistics with reference to this phase of the subject. The classification now to be considered divides the group already presented in accordance with the principal product. This is not wholly satisfactory since some of the companies include in their processes blast furnaces, steel works, and rolling mills which do not properly belong under the heading of their leading product.

ACCIDENT FREQUENCY RATES (PER 1,000,000 HOURS' EXPOSURE) FOR THE UNITED STATES STEEL CORPORATION, 1913 TO 1921, BY YEARS

| Year | Fabricated products | Sheets | Wire products | Tubes | Miscellaneous steel products | | Total |
|-----------|---------------------|--------|---------------|-------|------------------------------|---------|-------|
| | | | | | Group A | Group B | |
| 1913..... | 100.3 | 61.6 | 59.3 | 27.2 | 70.9 | 41.3 | 60.3 |
| 1914..... | 59.0 | 47.2 | 46.2 | 12.5 | 50.7 | 27.6 | 43.5 |
| 1915..... | 53.5 | 37.3 | 52.4 | 10.8 | 51.9 | 23.0 | 41.5 |
| 1916..... | 52.1 | 34.0 | 48.2 | 12.4 | 67.6 | 28.2 | 44.4 |
| 1917..... | 51.3 | 33.9 | 32.5 | 10.2 | 51.3 | 20.5 | 34.5 |
| 1918..... | 38.2 | 25.9 | 18.8 | 9.1 | 42.0 | 31.4 | 28.8 |
| 1919..... | 32.8 | 25.8 | 12.5 | 9.1 | 39.7 | 23.0 | 26.1 |
| 1920..... | 35.3 | 22.7 | 12.0 | 8.9 | 35.3 | 18.6 | 22.9 |
| 1921..... | 28.4 | 17.5 | 7.5 | 6.1 | 15.8 | 12.1 | 13.2 |

The rates in the above table are the number of cases of accident per 1,000,000 hours' exposure and are taken from a more extended table contained in Bulletin 425 of the United States Bureau of Labor Statistics, which is soon to be published.

Note, first, how the rates run for the different products in 1913: Fabricated products, 100.3; sheets, 61.6; wire products, 59.3; tubes, 27.2; miscellaneous steel products, Group A, 70.9; miscellaneous steel products, Group B, 41.3. After eight years—in 1921—the rates run as follows: Fabricated products, 28.4; sheets, 17.5; wire

products, 7.5; tubes, 6.1; miscellaneous steel products, Group A, 15.8; miscellaneous steel products, Group B, 12.1. These rates represent in this period the following percentages of decline: Fabricated products, 72; sheets 72; wire products, 88; tubes, 78; miscellaneous steel products, Group A, 78; miscellaneous steel products, Group B, 71.

It is noticeable that while the actual rates in each industrial group are quite varied the percentages of decline fall within rather narrow limits. This means that the accident-prevention efforts in each of these groups were uniformly successful. It would not have been surprising had this been otherwise, since the intrinsic hazard in some groups is certainly greater than in others. The conditions disclosed justify the conclusion that no matter how difficult the situation it can be in large measure controlled by intelligent and persistent effort.

The statistics utilized in accident prevention in approximately 50 per cent of the iron and steel industry have now been considered from two points of view—namely, the group as a whole and the group analyzed with reference to various classes of product.

There is a third aspect of these statistics which is possibly of greater importance than either of those already presented. This is an analysis by causes. It is not enough to determine the number of cases attributable to each cause. The cases must be related to the exposure, giving rates for each cause.

The main cause groups had the following relations in frequency rates to each other in 1913: Machinery, 7.3; vehicles, 2.3; hot substances, 5.4; falls of person, 4.5; handling, 26.7; miscellaneous, 12.9. It at once appears that "handling" is far and away the most prolific cause of injuries. Unfortunately it is not possible to test these classes in the matter of severity. It is known from other sources that when severity is considered, machinery is almost invariably the most serious menace.

In eight years the rates for the causes changed to the following: Machinery, 1.8; vehicles, 0.5; hot substances, 1.2; falls of person, 1.7; handling, 6.5; miscellaneous, 1.3. The declines are: Machinery, 75 per cent; vehicles, 78 per cent; hot substances, 78 per cent; falls of person, 62 per cent; handling, 76 per cent; miscellaneous, 90 per cent. The relation of these percentages of decline to each other again demonstrates the pervasive effect of the methods adopted.

Some of the subordinate causes are worth a moment's attention. For example, in the machinery group working machines have a rate of 3.8 in 1913, while cranes have a rate of 3.5, declining in 8 years for working machines to 0.8 and for cranes to 1.0. Among hot substances, hot metal is naturally the most important item, with a rate of 3.6 in 1913, declining to 0.8. Handling has already been noted as being chiefly prolific in number of cases. Of 26.7 cases per 1,000,000 hours' exposure in 1913, 11.2 cases were the result of dropping objects in handling. The decline from 11.2 to 2.6 is largely related to the substitution of mechanical for manual methods. For example, not so long ago the pigs of iron at the blast furnace were picked up, carried, and piled by hand. This process has been largely superseded by the use of magnets or by casting the iron in pig

machines from which delivery is often made direct to cars for shipment. It is also noticeable how large a proportion of the cases of falls of person are due to insecure footing. The decline in rates from 3.8 to 1.4 reflects the effect of the improvement of walkways.

The foregoing gives an idea of the relations of the main and subordinate cause groups as disclosed by the study of the experience of the entire steel corporation. A further insight will be afforded by considering how the causes are distributed to the production units. The rates for machinery fall into the following order: Fabrication, miscellaneous steel products; Group A, wire products, miscellaneous steel products; Group B, tubes.

It is easy to see how such an analysis lends itself to the determination of where special effort is necessary and gives some clew to the kind of effort necessary. Thus far consideration has been confined to the statistics kept and used by the steel corporation. It is recognized that even so large an organization as this does not always afford sufficient volume to be perfectly reliable. Further the steel corporation has not been convinced of the utility of severity rates and so has not maintained records from which severity rates can be computed.

In order to get an idea of the trend of accident rates, both frequency and severity, they have been computed for 5-year intervals for the industry and for several of its departments. The data on which these rates are based include those for the steel corporation.

For the five-year period ending in 1911 the accident frequency rates run as follows: Industry, 69.2; blast furnaces, 76.1; open hearths, 84.2; foundries, 60.1; heavy rolling mills, 61.0; plate mills, 69.4; sheet mills, 44.1. In the five-year period ending 1924 the record is: Industry, 33.6; blast furnace, 30.7; open hearths, 32.9; foundries, 62.7; heavy rolling mills, 21.2; plate mills, 29.4; sheet mills, 35.1.

TREND OF ACCIDENT FREQUENCY RATES (PER 1,000,000 HOURS' EXPOSURE) IN SPECIFIED DEPARTMENTS OF THE IRON AND STEEL INDUSTRY, BY FIVE-YEAR PERIODS

| Five-year period ending in— | The industry | Blast furnaces | Open hearths | Foundries | Heavy rolling mills | Plate mills | Sheet mills |
|-----------------------------|--------------|----------------|--------------|-----------|---------------------|-------------|-------------|
| 1911 | 69.2 | 76.1 | 84.2 | 60.1 | 61.0 | 69.4 | 44.1 |
| 1912 | 65.1 | 67.7 | 79.5 | 61.5 | 57.0 | 60.8 | 47.9 |
| 1913 | 62.1 | 62.4 | 78.6 | 65.1 | 51.7 | 55.9 | 49.1 |
| 1914 | 59.2 | 62.3 | 75.0 | 63.6 | 46.1 | 49.9 | 51.1 |
| 1915 | 53.3 | 50.3 | 67.6 | 59.3 | 39.4 | 44.7 | 48.1 |
| 1916 | 51.3 | 47.8 | 64.8 | 57.8 | 37.3 | 41.5 | 47.4 |
| 1917 | 48.2 | 44.1 | 58.4 | 60.4 | 32.1 | 36.6 | 41.3 |
| 1918 | 43.6 | 40.5 | 53.5 | 57.0 | 31.1 | 39.8 | 35.8 |
| 1919 | 41.6 | 39.0 | 50.5 | 61.0 | 32.4 | 39.2 | 32.7 |
| 1920 | 41.1 | 38.0 | 50.2 | 61.0 | 31.4 | 38.4 | 33.7 |
| 1921 | 39.5 | 36.3 | 44.8 | 63.1 | 29.9 | 37.6 | 33.4 |
| 1922 | 36.5 | 34.0 | 41.3 | 60.4 | 27.6 | 36.7 | 35.2 |
| 1923 | 34.9 | 32.9 | 33.0 | 61.7 | 23.8 | 31.4 | 37.2 |
| 1924 | 33.6 | 30.7 | 32.9 | 62.7 | 21.2 | 29.4 | 35.1 |

This process of computing rates for overlapping periods tends to smooth out local and temporary variations and to give an indication of the general trend not obtainable without the use of some such method.

The disappointing item in this showing is foundries. The frequency rate for the last five-year period is slightly higher than the first and nowhere along the line is there any indication of a tendency to improve.

The severity rates for the five-year period ending with 1911 are: Industry, 5; blast furnaces, 10.6; open hearths, 7.5; foundries, 2.7; heavy rolling mills, 4.4; plate mills, 5.1; sheet mills, 3.1. In the five-year period ending with 1924 severity rates are: Industry, 2.8; blast furnaces, 4.5; open hearths, 4.2; foundries, 2.8; heavy rolling mills, 2.3; plate mills, 2.4; sheet mills, 2.1.

TREND OF ACCIDENT SEVERITY RATES (PER 1,000 HOURS' EXPOSURE) IN SPECIFIED DEPARTMENTS OF THE IRON AND STEEL INDUSTRY, BY FIVE-YEAR PERIODS

| Five-year period ending— | The industry | Blast furnaces | Open hearths | Foundries | Heavy rolling mills | Plate mills | Sheet mills |
|--------------------------|--------------|----------------|--------------|-----------|---------------------|-------------|-------------|
| 1911..... | 5.0 | 10.6 | 7.5 | 2.7 | 4.4 | 5.1 | 3.1 |
| 1912..... | 4.3 | 8.8 | 6.6 | 3.1 | 4.2 | 4.1 | 2.8 |
| 1913..... | 4.4 | 8.3 | 6.8 | 3.5 | 4.0 | 3.8 | 3.0 |
| 1914..... | 4.1 | 7.0 | 6.6 | 3.6 | 3.6 | 3.9 | 2.6 |
| 1915..... | 3.6 | 6.2 | 5.8 | 3.3 | 3.4 | 3.1 | 2.2 |
| 1916..... | 3.7 | 5.8 | 5.5 | 3.1 | 3.5 | 2.8 | 2.3 |
| 1917..... | 3.7 | 5.6 | 5.1 | 3.3 | 3.6 | 2.6 | 2.1 |
| 1918..... | 3.5 | 5.4 | 5.8 | 3.2 | 3.4 | 2.6 | 1.8 |
| 1919..... | 3.6 | 5.8 | 6.5 | 3.4 | 3.9 | 2.5 | 1.5 |
| 1920..... | 3.5 | 5.7 | 6.3 | 3.2 | 3.5 | 2.6 | 1.8 |
| 1921..... | 3.4 | 5.7 | 5.8 | 3.2 | 3.3 | 2.5 | 1.7 |
| 1922..... | 3.1 | 5.5 | 5.3 | 2.7 | 2.9 | 2.5 | 1.8 |
| 1923..... | 3.0 | 5.0 | 4.2 | 2.7 | 2.4 | 2.4 | 1.9 |
| 1924..... | 2.8 | 4.5 | 4.2 | 2.8 | 2.3 | 2.4 | 2.1 |

DISCUSSION

It sometimes happens that the frequency and severity rates are at variance with each other. In such cases the severity rate is to be regarded as the more exact measure of hazard. In the present instance both rates indicate a practically uniform condition in foundries. This is the more unsatisfactory since among these foundries are some companies which have made an excellent record, which is wholly covered up by the record of those which have made no progress.

It may be regarded as established that the right kind of statistics are an indispensable factor in successful accident prevention as illustrated by the experience of the iron and steel industry and particularly by that of the steel corporation. It will be pertinent, in conclusion, to summarize the particulars in which this factor serves a useful purpose.

1. Statistics serve to set standards of accomplishment.
2. They indicate whether or not progress is being made.
3. They serve to show where there is need of special effort.
4. They may be utilized in the effort to rouse interest in the problem.

The CHAIRMAN. The discussion of Doctor Chaney's paper will be led by J. M. Larkin, of the Bethlehem Steel Corporation.

Mr. LARKIN. Doctor Chaney's account of the fine achievements of the United States Steel Corporation and the steel industry as a whole toward the elimination of accidents is a record which heartens

us all to further accomplishment. It is interesting to note, however, that this record could not have been told without employing statistics, and so if nothing further were said his paper would sufficiently prove the value of statistics in accident prevention.

During the past 10 years the number of accidents in the plants and mines of Bethlehem Steel Corporation has been reduced by about 50 per cent, yet the accidents that happen in our plants from day to day are witness to the fact that we still have room for improvement.

Analyzing the figures stating the causes of present accidents shows that we are fast approaching the utmost that can be done in the way of preventing accidents through mechanical means. To illustrate, in Bethlehem plants in 1925, 22 per cent of the accidents were incident to handling material and 16 per cent resulted from falling or tripping, while only 5 per cent were incident to working with machinery. (It is worthy of note that accidents to eyes had been practically eliminated.)

We have discovered the antiaccident serum in this country and have now before us the job of educating people to the importance of using this serum.

In almost every shop and factory in the country to-day some one is studying the ways and means of preventing accidents in that shop or factory, and that same person is endeavoring to instruct men in the ways and means of avoiding accidents. In this educational work, however, as in any other educational work, the teacher must have full facts at his command in order to do his job effectively, and in doing this job effectively American industry will obliterate one of the largest items of avoidable waste in manufacturing costs.

Even the loss of a billion dollars a year in wages does not, however, justify unbridled expense in overcoming the loss. Increasing keenness of competition in present-day industry leads to ever greater pressure for economy in industrial management and for the reduction of overhead expenses. All expenses of supervision are closely scrutinized, nonproductive labor is being lopped off, and every department and function in present-day American industry is forced to justify its existence by proving that it is actually profitable.

The making and keeping of statistics and records comes in for a sharp examination. Managers rightly insist upon knowing exactly what each set of statistics is used for and what harm, if any, would result if it were eliminated.

Accident statistics, like all other figures and records compiled as a part of industrial management, must be charged on the basis of utility. Nothing is to be gained by keeping accident records just for the sake of keeping them or because they have always been kept in a particular form.

What, then, are the purposes and uses of accident statistics?

In our company we compile accident statistics mainly, if not wholly, for the purpose of improving our safety practices in the interest of employees. If we did not think the statistics did this we would discontinue them. We find that the compilation of data on accidents shows plant engineers how accidents may be further eliminated and indicates to safety supervisors the points of danger which must be stressed to the men in the plant. Furthermore, the

exchange of comparative records encourages safety work in individual departments and individual plants. No plant manager or department superintendent likes to see his record inferior to that of the others. If his plant makes a bad accident showing in one month he takes good care to see that there is improvement the next month. Thus the use of accident statistics in our plants, mines, and quarries enables us to find the weak spots in our safety practice and to cure them.

In one of our large steel plants a safety trophy is awarded each month to the department having the best record. There is keen rivalry among the departments and among the men in the departments for the possession of this trophy. Awards of this kind are encouraged by the company because of their value in keeping alive interest in accident prevention.

Throughout our properties every accident is listed and classified according to the days lost, the occupation, and the detailed cause. In the case of each serious accident a special report is sent in, and an investigation is made to determine what if anything could have been done in the way of prevention. These individual reports are then codified and summarized according to departments, plants, and occupation.

A series of accidents in a particular department or a particular process or a particular occupation may show that certain methods or certain machines are unsafe and need to be replaced by others. Under different circumstances we may find that the employees in a certain department are careless and that the program of safety education needs stiffening. Or, again, the records may indicate that the foreman in a shop is not sufficiently interested in the protection of his men. In fact, there is almost no limit to the useful things that may be found out by analysis of accidents as to causes, places, and circumstances.

Not long ago a representative of one of our large corporations said he had decided to keep all of his accident statistics in terms of cost per \$100 of pay roll, in order to impress the operating officials with the desirability of safety from the standpoint of economy. While I am not sure that this is a proper method of keeping accident statistics, there is no question about the value of the dollars and cents demonstration for the benefit of the production man who is largely interested in costs.

In our corporation accident statistics are an important part of our safety work. Without them we would not know where we stood. Just as a company keeps abreast of its financial status by the use of statistics, so it needs to have data covering its accident records. The preparation and study and analysis of these statistics within a corporation is one of the greatest aids to its safety program, and in our company every executive follows with keen interest the story which these statistics tell.

These statistics are not only studied by our management but they are scrutinized with interest by the employees themselves. At the regular meetings of employees elected representatives under the employee representation plan and at meetings of employees especially chosen to further the accident prevention campaign, as well as among the 7,000 employees who have received first-aid instruction,

the statistics bearing upon accident prevention are of the utmost value.

Thus we are striving to make the greatest practical widespread application of records, realizing that the records constitute the balance sheet of a needless waste, and in the hope that they will act as an incentive to even greater accomplishment.

In a message to employees summarizing accident-prevention work, our president recently said:

Accident-prevention work pays threefold returns—there is a return to the employer in lower costs, a return to the employee in a physical and monetary saving, and a return to the community through a lessening of care for the maimed and disabled. Any one of these alone justifies the furtherance of the work, but taken in the aggregate they constitute one of the most important planks in the platform of good business.

The CHAIRMAN. Doctor Chaney's paper will be further discussed by J. M. Woltz, safety director of the Youngstown Sheet & Tube Co.

Mr. WOLTZ. I really can not see the need of discussing this very excellent paper of Doctor Chaney's. It seems to me that the points brought out are so conclusive that it is foolish for one to attempt to controvert them, if such were possible. I shall content myself with a few remarks covering the importance of statistics as regarded by our company. My first acquaintance with Doctor Chaney was in 1913, when he was in our plant, securing, I think, some of the first statistics of the iron and steel industry used in the Department of Labor, and our acquaintance has kept up since that time. He has been the means of giving us most important information on points relative to places to look for our accidents. We are interested in the statistics not only from the point of showing the frequency and severity of accidents but also as to the nationality of the workers, the days and the hours of the day, the month of the year, and various other things, such as the parts of the body injured, etc. I think that all of these things must be taken into consideration if you are really going to study your accidents from a statistical standpoint. It is most difficult to make comparisons of accident statistics even in your own organization because of the variance of the conditions, the work done in the different plants, and the different methods by which computations are made. I believe that is true of the whole industry, and when that condition is true in an industry, it means when the statistics of all industry are brought together it is almost impossible to find a real comparable basis upon which to prepare the figures. Our records go back to 1905, but I have here some figures from 1915 to date—the days lost per employee, based on the average daily working force, the fatalities being counted as 6,000 days. In 1915 the average number of days lost was 12 per employee; the highest was in 1916, 28 days—at that time we were engaged in a great deal of construction work. Last year, 1925, it went down to 5. The number of days lost in the year, per lost-time accident, fatalities being estimated as 6,000 days, in 1915 was 13; last year, 1925, it was 46. We had 1,808 lost-time accidents in 1915 and 1,017 in 1925. I think that covers the point that Doctor Chaney wished to make—that the severity of lost-time accidents has increased while the frequency has been reduced.

The CHAIRMAN. Are there any others who desire to discuss Doctor Chaney's paper?

Mr. LANSBURGH. I am rising only because of something which Doctor Chaney said in his paper and which seemed to indicate that he might possibly have disagreed with something I said this morning with reference to the relative importance of various causes of accidents. I am inclined to agree with Doctor Chaney, as I always want to agree with Doctor Chaney, that severity is the measure rather than frequency. I do, however, want to point out that as to the Pennsylvania experience which I read this morning, what I had to say about frequency is doubly true of severity—it is not machinery which is causing our accidents. I think that is particularly important as we endeavor to eliminate these accidents. All that I can do to prove the fact is to read the figures, though I am sorry to burden this group with figures again. Certainly fatal accidents are severe accidents, and as we have 2,000 of them a year in Pennsylvania—more than in any other State—we have a fair sample from which to draw. The first class of fatal accidents is those caused by falling objects in mines and quarries. That, of course, includes falling roofs. Of course, there are certain provisions and also arrangements for guarding that can be made to prevent that, but that is not guarding machinery. The second cause of fatal accidents is cars and engines. As I indicated this morning, that was the first cause in frequency. Most fatal accidents due to cars and engines are not due to defects in machinery but to men falling in front of cars and engines while handling their jobs. The third cause in Pennsylvania is falling of persons. The fourth is explosion, mostly in mines. The fifth is motor vehicles—the kind of street accident you see every day recorded as nonindustrial accident—138 killed in Pennsylvania last year by motor vehicles. And so on down until the eighth cause, machinery, with 74 fatal accidents. Now, taking days lost, based on the severity table of which Doctor Hatch told us this afternoon, namely, the table of the International Association of Industrial Accident Boards and Commissions, which we use in developing our figures, the first cause is cars and engines, 2,950,000 days lost. The second cause is falling objects in mines and quarries, 2,742,000 days lost. The third cause is falling of persons, 1,513,000 days lost. Machinery is the fourth cause, 1,253,000 days lost. Motor vehicles follow immediately after machinery, 1,015,000 days lost. Falling objects, 733,000 days lost, and handling objects, 850,000 days lost, together amount to over 1,500,000 days lost, and machinery only to 1,200,000 days lost. So it appears to me that on the basis of these figures, any way you take them, guarding machinery is not the important factor in preventing industrial accidents.

Commissioner STEWART. May I ask, Mr. Lansburgh, as to whether these statistics of cars and engines include railroad accidents?

Mr. LANSBURGH. In Pennsylvania, Mr. Stewart, we have a record of every accident in the State, whether or not it is in interstate commerce, and that does include railroad accidents but not railroad accidents in interstate commerce.

Commissioner STEWART. It also includes accidents in mines?

Mr. LANSBURGH. Yes, sir.

Commissioner STEWART. It also includes accidents of cars on the street?

Mr. LANSBURGH. That is a separate heading; motor vehicles.

Commissioner STEWART. Do you not see that your statistics cover three groups in which the question of handling machines is not included in Doctor Chancey's figures? His figures are purely industrial accident figures. By industrial we mean manufacturing; they do not include railroad accidents at all. Therefore, the difference between your figures and Doctor Chancey's, is only apparent, because they cover two entirely different fields.

Mr. HATCH. I want to point a moral. When we get the right kind of accident statistics on a proper form basis, we will not have so much discussion, in conferences like this, where people get up and speak about two different things which show opposite results, but we will all be talking about the same kind of thing in the same kind of way, and it will save us an awful lot of time.

The CHAIRMAN. Is there any further discussion?

Mr. THOMPSON. Mr. Chaney's figures were about steel only, while Mr. Lansburgh's figures were about everything else; it is not a fair comparison.

Mr. CARROW, American Railway Association. I want to call attention to a possible error that might be developed here by this discussion of statistics. The detail is not particularly important, except for example, in railroads; we show them by occupation, by general causes, by railroads, by frequency, and every other way. The necessary thing, it seems to me, is to make some arrangement by which you will know the actual number of deaths and injuries that occur in American industry. All of this detail stuff is very fine, because we have it in the railroad business—we have had it for 15 years—but the thing we want to find out is whether John Jones's factory has 10 fatalities and 500 injuries, and John Smith's factory has 2 fatalities and 30 injuries. On the railroads we find that if you just set up a statement of the injuries and fatalities, or the injuries where there are no fatalities, and pit one shop against another shop and one railroad against another railroad, why, as a matter of course, the accidents go down. I do not think that we ought to waste too much time on these delicate shadings of frequency, etc., but we ought to concentrate on the matter of getting the actual number of casualties and the results of casualties. It seems to me that an inference might be drawn from the discussion here to-day, that if we get this beautiful set of statistics we are going to have accident prevention as a matter of course. I want to say to you that if we can only get the manufacturers interested in accident prevention and get the supervisory forces of this country interested—get them to do as we are doing on the railroads—put up a score board with the number of accidents that occur in specified periods, the accidents will go down.

The CHAIRMAN. Is there any further discussion of Doctor Chaney's paper?

Mr. ATKINS. I have been listening to the statistics very intently but have not heard a great deal about how to prevent these accidents. At the Virginia Bridge & Iron Co. we began to keep statistics about

10 years ago. Fifteen years ago our factory was dubbed a slaughter plant. I was made superintendent there about 18 years ago, and about 16 years ago I organized a safety committee consisting of a few of my foremen; we have now a safety committee of 54 members and we have reduced our accidents, the serious accidents, probably 60 per cent. The minor accidents stand about the same, but as to the serious accidents we just do not have them any more, and we did it by education. We bring the men in and talk to them once a month, and then this standing committee has a meeting of the men under them. We found that we had these serious accidents when we hired new men, just as Doctor Chaney told us a while ago. They were put on piecework gangs and on those piecework gangs they were pushed to the limit, and as they are generally boys off of farms who come to our place, everything looked alike to them and they would run under this moving material. That is where the serious accidents would occur—hardly ever was a man hurt by the machines. We have the machines all made as nearly accident proof as possible. When we educated these boys, and when the safety committee talked to them and told them not to do those things, we eliminated our serious accidents. It was all done by education.

Mr. HATCH. May I cover one more point? I do not quite agree with my friend on the left as to not needing anything but the number of accidents and that by quoting that you will automatically, by the interest drawn to those figures, pull the accidents down. You have to have in addition, the cause of accidents. This is what I am doing every day—analyzing the cause of accidents—and if I find out what is the matter, what caused it, I distribute that information to 500 men in the field. They have in front of them the cause of an accident and how to cure it, and they go into every plant under their supervision and apply that cure. That is the value of statistics; you learn a cause, you learn how to cure it, and you will try to cure it. You need a central organization to find out what the cure is and a central organization to distribute that cure all over the Nation; that is the point of statistics. Like Mr. Lansburgh, I think it is always difficult to disagree with Doctor Chaney, and I am not standing up for the purpose of disagreeing with him, but merely to cite the New York experience in the matter of severity. I did not bring with me the figures for the year ending June 30, 1925, but I have them for 1924, and the actual, not the estimated weeks of disability, in New York for the year ending June 30, 1924, for accidents in which the cause was machinery was 516,000 weeks, which was the largest number of weeks for which compensation was awarded for any set of causes. In Doctor Chaney's paper he states it this way: That handling is far and away the most prolific cause of injury. That is borne out by our record; during that year there were 19,000 accidents due to handling of objects as against 13,000 due to machinery. The statement is also made in Doctor Chaney's paper that the machinery accidents are more severe. That statement is also borne out by our figures, but I understood Doctor Chaney to say that he had never seen an instance in which the machinery accidents were not at least twice as great in point of severity as the others. Briefly, in New York, 516,000 weeks' compensation was awarded during that year

for accidents due to machinery; the second largest group was falling of persons, 502,000 weeks; others were, falling objects, 145,000 weeks, and hand tools, 87,000 weeks. That is the actual number of weeks, except that in fatal accidents we made an allowance of 6,000 days lost time; in all other cases it is the actual number of days lost.

The CHAIRMAN. Is there any further discussion? If not, we will be glad to hear now from Frank Morrison, secretary of the American Federation of Labor, on the "Workers' interest in safety problems."

WORKERS' INTEREST IN SAFETY PROBLEMS

BY FRANK MORRISON, SECRETARY OF THE AMERICAN FEDERATION OF LABOR

Industrial accidents primarily concern the workers. Whether an accident results in a temporary or permanent disability, it is the worker who suffers, and suffers to a degree for which the benefits of workers' compensation laws do not at all compensate.

In the tens of thousands of cases where the worker's earning capacity is decreased or destroyed, not only does his family suffer a lowered standard of living but their aspirations and rights along educational lines are destroyed because of the permanent decrease of income from the father's earning capacity. And in the case of fatal accidents it is again the worker and his family dependents who pay for the great loss.

The employer suffers no physical injury himself because of industrial accidents to his employees. His earning capacity is not decreased. His family does not suffer. His dividends are not curtailed because of accidents in the plants which he owns. In States which have workmen's compensation laws, a modest insurance premium, paid out of the wealth produced by the very workers who are injured, settles his responsibility for the maimed workers. He charges the insurance premium to overhead expenses as a part of the cost of production, bills it to the dealer to whom he sells his commodities, and the dealer collects it from the ultimate consumer in retail prices.

In States which do not have workmen's compensation, the injured worker's resort for justice is to the courts, and experience shows that in court procedure the employer has such a great advantage that adequate compensation is seldom secured for the worker, and then at such a high cost for counsel and court charges that much of the compensation award never reaches him.

The statistical aspect of the industrial-accident question simply appalls one who lives among the workers and feels with them the injustice they suffer in producing and distributing the wealth that makes up America's prosperity.

In the official call for this industrial accident conference the Secretary of Labor states that "a conservative estimate indicates that the fatal industrial accidents (in the United States) probably exceed 23,000 per year, and that nonfatal injuries total 2,500,000 per year." Reduced to a picture which the average mind can visualize, this means that during every one of the 300 working days in a year 77 workers are killed and 8,331 are injured in this warfare which the workers are compelled to wage against machine production.

Ghastly as is this picture of the mortality and casualty rate in industry, it is not by any means the most shocking aspect of the question. In the official call for this conference the Secretary of Labor also asserts that his experts advise him that "fully 85 per cent of these accidents are preventable." This estimate means that every year 19,550 workers are needlessly killed and 2,125,000 needlessly injured in industrial accidents. Or, expressing the facts in the form of daily mortality and casualty figures, 64 workers are needlessly killed in industry during every one of the 300 working-days of the year and 7,080 are needlessly injured.

The wage loss of this army of industry workers is estimated to be \$1,000,000,000 a year, not more than one-quarter of which is covered by compensation insurance.

If the United States were at war and the reports from the front declared that every day 77 soldiers were killed, 64 of whose lives could have been saved with proper military safeguards, and that 8,331 soldiers were wounded every day, 7,080 of whom would not have been wounded if there had been proper safeguards—if such reports came from the military battle front, there would be a nation-wide protest and a wholesale impeachment of the responsible military authorities. But an equally unnecessary slaughter and injury of human beings engaged in industry does not bring a nation-wide protest and the responsible industrial and political authorities keep up their deadly warfare against the workers.

I have referred to the responsible industrial and political authorities. This brings up the question of who is in fact responsible for the greater part of the 85 per cent of industrial accidents which the expert advisers of the Secretary of Labor declare could be prevented. It is quite apparent that the major responsibility rests with the employers and the State governments.

An illustration from one industry—the coal-mining industry—will throw a flood of light on the responsibility of employers and State governments. In the last 10 years more than 25,000 miners have been killed in coal-mine explosions in the United States. Competent experts declare that rock dusting is a well-known, thoroughly tested, and adequate method of preventing coal-dust explosions. The United States Bureau of Mines began its experiments with rock dusting prior to 1911, demonstrated the high qualities of this method for the prevention of explosions, and has urged its universal adoption by mining companies in the United States as an effective method to save the lives of coal miners. What has been the net result of this urging? In a bulletin entitled "Stone Dusting or Rock Dusting to Prevent Coal-Dust Explosions, as Practiced in Great Britain and France," the bureau says:

Although the Bureau of Mines has recommended rock dusting, only a few operators in the United States, one in Colorado, and several in Illinois have adopted it, and they but to a limited extent.

This was in 1924. Some progress has been made in rock dusting since then, but the fact remains that in the United States to-day large numbers of miners are subjected to the dangers of explosions because the mining companies refuse to accept the recommendations of the Bureau of Mines and install rock-dusting systems.

Rock dusting can be made compulsory by State legislatures. To the extent that it is not compulsory, the State legislatures are responsible for the death of miners in mine explosions. The responsibility of mine accidents due to explosions rests, therefore, on the private corporations who own the mines and refuse to install rock dusting and also on State legislatures that refuse to enact compulsory legislation.

To a great extent the responsibility for industrial accidents in other industries rests with the employers who refuse to adopt up-to-date accident-prevention methods and devices and upon State legislatures that refuse to enact compulsory legislation.

The major responsibility rests with the employers and the States. When these delinquencies are remedied then we may emphasize the alleged delinquencies of the workers, many of whom, it is often claimed, deliberately court both injury and death by carelessness.

In the light of the terrible toll in both fatal and nonfatal accidents which the workers now suffer after so many years of accident-prevention laws, accident-prevention policies conceived and applied by the employers, and accident-prevention movements of many kinds, it is apparent to me that the workers will probably never be adequately protected until they protect themselves by strong trade-unions. Experience shows that the workers can not rely either on legislatures, politically appointed enforcement officers, or the employers to safeguard their lives and limbs in industry.

Industrial accidents maim and kill the workers. It is the workers who pay the penalties for inadequate laws, inadequate enforcement, and inadequate employer accident-prevention schemes. Until the workers assert their own organized power for adequate protection for themselves they will evidently continue to pay the price in both fatal and nonfatal accidents.

An indispensable auxiliary to these checks of human wastage in industry is the need for the development of a sound public opinion. This development, in truth, is the foundation for the successful application of remedial legislation. If our democracy is to function, we can not assign changes of such sweeping character to our legislative representatives. They must be supported by a united people, who must insist that not only the letter, but likewise the spirit of the law, shall be complied with.

Every public-opinion-molding force must play its part in this development. Not only individual citizens but the public press and social, civic, industrial, and religious organizations should continuously point out the evil consequences that follow our disregard for human life on the industrial field. This thought must be impressed on the consciousness of each citizen. The value of human life must be emphasized, and the social waste that results in the unnecessary loss of one human being must be continually pointed out. To approximate this goal we should dedicate our energies.

The CHAIRMAN. Are there any remarks or any discussion in regard to Mr. Morrison's paper? If not, are there any announcements that Commissioner Stewart would like to make?

Committee appointments were announced by the chairman of the various committees, as follows:

Publicity Committee.—A. C. Carruthers, editor Safety Engineering, New York, chairman; Clarence E. Spayd, consulting safety engineer, Brooklyn Edison Co., Brooklyn, N. Y.; Louis Resnick, American Museum of Safety, New York, N. Y.

Resolutions Committee.—J. H. Crawford, Kansas Public Service Commission, Topeka, Kans., chairman; W. W. Adams, United States Bureau of Mines, Washington, D. C.; John Hopkins Hall, jr., commissioner, bureau of labor and industry, Richmond, Va.; R. H. Lansburgh, secretary of labor and industry, Harrisburg, Pa.; C. H. Gram, commissioner, bureau of labor, Portland, Oreg.

Committee on Classification of Industries.—L. W. Hatch, New York Department of Labor, New York, N. Y., chairman; Charles E. Baldwin, United States Bureau of Labor Statistics, Washington, D. C.; William J. Maguire, department of labor, Harrisburg, Pa.; Carl C. Beasor, department of industrial relations, Columbus, Ohio; L. L. Hall, National Council on Compensation Insurance, New York, N. Y.; C. B. Auel, Westinghouse Electric Manufacturing Co., Pittsburgh, Pa.

Committee on Determination of Exposure.—L. W. Chaney, United States Bureau of Labor Statistics, Washington, D. C., chairman; E. B. Patton, department of labor, New York, N. Y.; Carl C. Beasor, department of industrial relations, Columbus, Ohio; W. W. Adams, United States Bureau of Mines, Washington, D. C.; William A. Marshall, industrial accident commission, Salem, Oreg.

(Meeting adjourned.)

THURSDAY, JULY 15—MORNING SESSION

CHAIRMAN, ANDREW F. McBRIDE, COMMISSIONER OF LABOR OF NEW JERSEY

Commissioner STEWART. I want to say what I meant to say yesterday, and that is that we feel very much gratified with the response of the governors to this call. From Maine to Oregon and California the governors have responded so wonderfully well that night before last our list contained 22 States, with 49 representatives appointed by the governors.

Frankly, what I wanted to say at this conference is that it is our desire to get the States interested in getting down to a uniform and efficient system of accident reporting. We have never before been able to get representatives of so many States together, and not only that but the associations have been wonderfully responsive. Mr. Jennings, who comes as a representative of the State of Utah and of the Utah Copper Co., appointed by Governor Dern, is asked to represent "Our Association" at the Washington Safety Conference—"Our Association" means the American Foundrymen's Association—and a number of other persons represent more than one organization here, so that I feel that we have a very large representation present.

Your chairman this morning is Doctor McBride, commissioner of labor of the State of New Jersey. He took hold in the State of New Jersey in a way that has made us all sit up and take notice.

The CHAIRMAN. I feel highly honored in being asked to preside at this conference this morning, and I want to commend Mr. Stewart and Secretary of Labor Davis for making possible the bringing together of so many people who are interested in the very important question of accident prevention.

I have practised medicine intensively for a great many years, and I do not know anybody who is committed to safety and safe practices more than the average doctor. For that reason the field was not new to me, because I had dealt with the results of industrial accidents for a great many years. I do not think that too much of one's time can be given to this important question. I do not know of any more important question that confronts our Nation to-day than that of cutting down this useless toll of accidents which takes place in the various States every minute of the day and every day of the year. I believe that it is worthy of the most careful thought of everybody connected with the work, which should, I think, be done intelligently, comprehensively, and systematically. I do not think you can approach the question in any haphazard way, and a conference of this kind is going to do much good, as I visualize it. I hope the day may come when every State in the Nation will take the interest that it should in this subject.

I personally do not think that accident prevention can be an accomplished fact without many elements entering into the work. I do

not think the safeguarding of machinery alone will eliminate accidents, or that any other one factor will. The greatest thing we need is the education of the Nation in the importance of employing every available means and method for this work. That is why I say that I believe a conference of this kind must be productive of good. I do not think that anybody, no matter how low his mentality, would willingly suffer an accident, even though accidents do occur so frequently through carelessness and thoughtlessness. As I said before, I believe that no one thing will bring about accident prevention or the elimination of accidents, but a combination of circumstances, the most important of which is educating the average person up to the importance of the work; I believe that everybody should participate in this work, not only the men engaged in production—I am talking about the manufacturer now—but every person from the head of the concern down to the last individual employed by the concern, and all should appreciate equally their responsibility in the work.

I believe that accident prevention can not be carried on successfully without the proper place being given to real statistics. That probably is as important, if not more important, than any other element that enters into the work. If we have proper statistics covering the field of accidents we will approach the question much more intelligently.

The first paper on the program this morning is "Statistical activities of the sections of the National Safety Council," by W. H. Cameron, managing director.

STATISTICAL ACTIVITIES OF THE SECTIONS OF THE NATIONAL SAFETY COUNCIL

BY W. H. CAMERON, MANAGING DIRECTOR NATIONAL SAFETY COUNCIL

The primary purpose of the National Safety Council is to assist its members in the interchange of accident experience—to make available to them the accumulated experience of their fellow members and the solutions they have devised for perplexing accident problems. This is accomplished through the National Safety News and other publications and through the consultation service—comprising a clearing house of information on accident prevention.

In dealing with the question of statistical activities it should be understood that the council is a purely voluntary cooperative association. It has no means of compelling its members to keep accident records or to send the records to its headquarters. The statistical tabulations compiled by the sections are made possible only by the voluntary cooperation of members willing to aid the cause by contributing the records of their experience—good or bad.

Although the original constitution and by-laws of the council provide for the grouping of members into trade sections, the officers and committees have no means of compelling uniformity, nor do the terms of membership imply that all of the accident experience be contributed on a uniform basis.

As the council's membership has been expanded and the income from dues has grown to provide enough money to employ safety engineers competent to assist the voluntary committeemen, an ef-

fort has been made to induce the members within certain groups of industries to send their statistical data to our headquarters' officers for tabulation and comparison. The time is coming when each of the trade sectional groups will have salaried staffs to assist the voluntary officers and committees to dig deeper into the accident experience of each member within the group. It is now apparent that more data of this character can be secured through greater pressure upon the members, by visualizing to them the advantages of comparing experiences, and by encouraging those employers having bad records to study the methods of those having good records and eventually to correct the conditions that lead to high accident frequency and severity rates. These statistical records and comparisons of the members of the National Safety Council will never have the same comprehensive and inclusive comparative bases as the statistical reports of the National and State governmental bureaus. The council is a propagandist institution. It aims to teach the public in a nonpartisan way how serious the accident situation is nationally and to encourage employers and workers to wake up to the seriousness of the situation and to take steps to organize definitely for the prevention of accidents.

Even though the membership of the National Safety Council may increase greatly, and though it may be possible through persuasive methods to have a large percentage of the members interchange their statistical records, nevertheless it is probable that one of the continuing functions of the council will be to encourage its members and others to comply generously with the National and State requirements for statistical records. Employers will be glad to give proof of their accomplishments when it is realized that a creditable accident record is an asset to the conduct of their business. The stigma of accidents is not yet a factor in industrial operations. The council can help the administrators of the law to bring about this sensitiveness to public obligation.

It may interest you to hear the brief story of the council's efforts to collect and present the accident statistical records of 11 of the sectional groups now contributing statistical information. These are: Automotive, chemical, construction, metals, packers and tanners, paper and pulp, petroleum, quarry, rubber, textile, and woodworking. Six other industrial sections are already sending their statistical compilations to other agencies, and the council is not making an effort to compete nor to duplicate these reports. They are: Steam railroads, now reporting to the Interstate Commerce Commission; the public utilities, reporting to the American Gas Association and the National Electric Light Association; the mining companies to the United States Bureau of Mines; the electric street railway companies to the American Electric Railway Association; and the cement companies to the Portland Cement Association.

The members in the 11 industrial groups enumerated use the council's standard report form requiring answers to the following four questions:

- (a) Average number of employees for the year.
- (b) Total number of hours worked by all employees.
- (c) Number of accidents causing loss of time beyond day or shift.
- (d) Number of days lost because of the above accidents.

The answers to the questions make it possible for our engineers to calculate the accident frequency and severity rates for each member reporting. Of course, these rates are figured on the nationally approved basis and provided for in our Safe Practices pamphlet No. 21, entitled, "Accident Records." Three of these sectional groups—construction, rubber, and textile—have gone one step farther. The members in these groups, in addition to tabulating their accidents according to the standard report form, tabulate them according to a standard cause classification. Of course, the recorded experiences of these three groups are more valuable and efforts are being made to have the other eight groups also adopt standardized cause classifications. The council will be glad to send to any inquirer copies of the textile, rubber, and construction forms showing the standardized accident causes.

In the correspondence with the member, the council points out that there are six reasons for collecting and comparing these accident statistics, viz: (a) To promote uniformity; (b) To arouse pride of industry; (c) To secure direct comparisons; (d) To trace the national trend of accident experience; (e) To interest other companies in accident prevention; and (f) To help each individual company in analyzing and correcting its own accident causes.

The council impresses upon the member the need for uniformity in compiling accident records, emphasizing the fact that these uniform methods of calculation from year to year should be maintained in spite of changes in the personnel of the statistical department; that frequent changes in the method of compilation create confusion and misunderstanding. Uniformity makes it possible to compare the record of one plant with the record of others having similar accident records.

To illustrate what it means to arouse the pride of an industry, I may say that the cement industry claims credit for making greater progress in accident prevention during the past few years than any other industry in the country. This industrial group is proud of its record and broadcasts the information to all of its workers.

When publishing the tabulated accident records of a particular industry the council gives the record of each operating plant. The names of the plants, however, are not revealed. Each plant is given a key number which is known only to the officials of that plant and to the engineering staff of the council. These comparisons make it possible for the plant executives to see their standing with reference to other plants in their same class. The plants at the top of the list are encouraged to continue to improve their present accident-prevention methods, and those companies not doing so well are urged to do more and better work.

Keen interest has been developed among the paper and pulp members of the council by offering a "Paper industry" silver loving cup to that mill having the best accident record for the first six months of 1926. The operating plant in this industry having the best record will be entitled to claim the honor of having the safest paper mill in America.

Of course, the compilation of these statistics makes it possible to trace the national trend of accidents within certain industries and leads to greater effort to ascertain the causes for increases or de-

creases. For example, the 67 companies in the automotive group reporting for the two years 1923 and 1924 show an average increase of 22 per cent in the frequency rate and an average increase of 167 in the severity rate. This record has stimulated these companies to greater effort and the council is given the opportunity to hammer away at the industry as a whole and at the companies that are not getting results. The following additional comparative records may interest you:

Nine companies in the chemical industry reporting accidents for 1923-24 show decreases of 29 per cent in frequency and 27 per cent in severity.

Fifteen companies in the petroleum industry reporting accidents for 1922-23 show increases of 1 per cent in frequency and 20 per cent in severity.

Five construction companies reporting for 1922-23 show a decrease of 23 per cent in frequency but an increase of 28 per cent in severity.

Thirty-one paper and pulp companies reporting for 1922, 1923, and 1924 show in three years decreases of 35 per cent in frequency and 16 per cent in severity.

Thirty-nine companies in the woodworking industry reporting for 1923-24 show decreases of 29 per cent in frequency and 7 per cent in severity.

Seventy-seven companies in the metals industry reporting for 1923-24 show decreases of 15 per cent in frequency and 2 per cent in severity.

Typical reasons given for increases are: "Speeding up of production"; "necessity for cheaper production means that less attention is given to safety"; "increased labor turnover"; "too much attention to safety education and not enough to the problem of safeguarding new equipment."

These sectional statistics are used to secure the interest of individual companies not now taking an active interest in accident prevention. Many companies become interested by comparing their own safety records with those of other companies in the same industry. This leads to organized effort to combat the accident situation.

Statistical records also help the safety man to study his own records more closely. They help him to select the most important accident causes and to apply the most necessary remedies. The safety man also uses these statistical records to emphasize to the executives and workers of the plant the need for more safety effort. It is becoming clearer to the managers of industry that statistical charts, tabulations, curves, etc., are invaluable in showing up the experience and in leading to constructive effort.

The council is distributing widely its pamphlets giving the approved methods of compiling accident statistics. It is preparing another pamphlet to be entitled, "Competition as an aid in promoting accident prevention." A section of this pamphlet will present methods for using these statistical records in accident-prevention contests. Copies of this new pamphlet will be available to inquirers.

No one will deny the value of recording accident experiences. The problem is to convince industry, and particularly the 92 per cent that employ less than 100 workers, that such recorded experience

will reveal disgraceful economic and human losses. The extension of the United States Bureau of Labor Statistics machinery to collect, tabulate, and analyze the data on industrial accidents in the United States will be a step in the right direction. Such institutions as the National Safety Council will cordially assist in the educational problem of keeping the records and in achieving the goal of minimizing the terrific and unnecessary losses of life and money.

DISCUSSION

The CHAIRMAN. This splendid paper of Mr. Cameron's is now open for discussion. I am going to ask D. T. Meany, of the International Paper Co., to lead the discussion.

Mr. MEANY. Mr. Cameron has given us a very interesting talk on the statistical activities of the National Safety Council. In a general way it serves a twofold purpose: First, it has given sufficient proof to those of you who are not members of the council that you would profit by membership in it; and second, he has reminded those who are members of the council that the council is always ready to assist them in the work of accident prevention, a fact we are apt to lose sight of or to forget in our day-to-day safety work.

The pulp and paper section, of which Mr. Cameron spoke, has been carrying on for the past six months a very active campaign of accident prevention. Its last news letter states that three paper companies have gone that long without a lost-time accident. That is a splendid record. However, he forgot to tell you that there was some difficulty in gathering the statistical data of the contest. Some paper companies failed to report on the scheduled data and others failed to report after the first month or two. This was probably due to having a poor accident experience, and they just dropped out.

The International Paper Co. has been engaged in safety work for the past 10 years and has established uniform methods for recording accidents. We have issued form instructions governing them in order that the men might report to us the correct data for compiling our accident statistics. These reports are entirely separate from our insurance reports.

There can be only one real purpose for these statistics, and that is that we may profit by our past experience and do better safety work in the future, cutting out the causes of accidents in particular parts of our mills. The fundamental purpose of accident reports is to get the cause of the accident. That is what the safety man works with; it is the meat of his work. By using that he can go out and prevent similar accidents, or he can get assistance from other departments of his company in working out a method whereby he can prevent such accidents.

We compile our data in the form of quarterly and yearly reports showing the relative standing of each mill for the period reported, based on "days lost per 100 employees." This report also gives a comparative summary for the same period of the previous year. I have here our quarterly report for the three months ending June 30, 1926, and I tell you frankly it is nothing to be proud of. The summary for that period is as follows:

LOST-TIME ACCIDENTS IN THE MANUFACTURING DEPARTMENTS OF THE
INTERNATIONAL PAPER CO. FOR QUARTER ENDING JUNE 30, 1926

| Item | 1925 | 1926 | Increase |
|--|--------|--------|-------------------|
| Number of employees..... | 5, 153 | 6, 338 | 1, 185 |
| Lost-time accidents..... | 109 | 117 | 8 |
| Days lost..... | 1, 893 | 2, 045 | 152 |
| Days lost per 100 employees..... | 36.73 | 32.26 | ¹ 4.47 |
| Lost-time accidents per 100 employees..... | 2.11 | 1.84 | ¹ .27 |
| Fatal accidents..... | 0 | 1 | 1 |
| Penalty days charged..... | 0 | 1, 000 | 1, 000 |

¹ Decrease.

We show also the record of each individual mill as compared with that of other mills of the company. This table is for the executive officers of the company and the mill managers. I am just going to take the relative standing of the larger mills of our company. Ranking first is a small pulp mill of 52 employees. It went through three months without a lost-time accident. Second is the Otis Mill, which has 932 employees. It runs two separate pulp mills, one 2 miles from the main mill and the other 5 miles from the main mill, and has about 11 paper machines. It had 1 lost-time accident, and lost 21 days. Its rate for days lost per 100 employees was 2.25. Standing fifth in the list is our Three Rivers Mill at Three Rivers, Province of Quebec, Canada. That is the largest paper mill in the world. We employ there 1,199 men, mostly French Canadians; that is, the larger percentage of the men who work in that mill speak French, and the supervising force is comprised mostly of English-speaking men, who have in the four or five years they have been there learned to jabber the French language pretty well. This mill had 14 lost-time accidents and the days lost were 219. Its rate per 100 employees is 18.18.

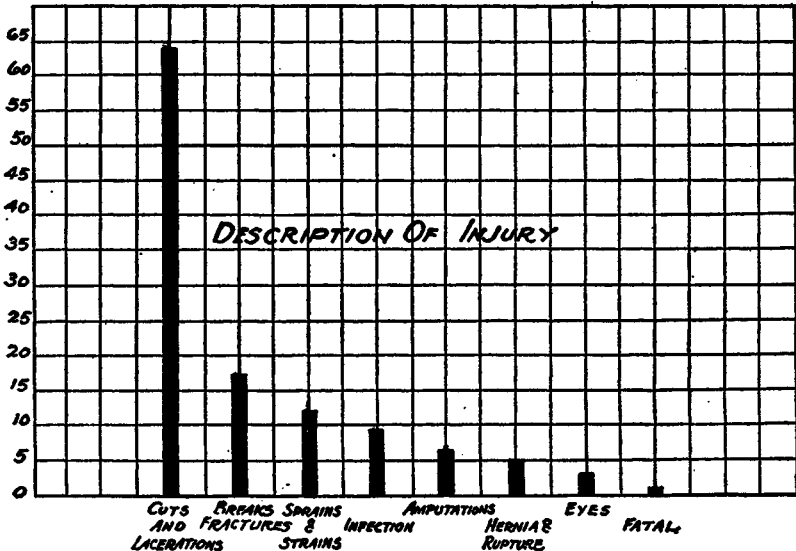
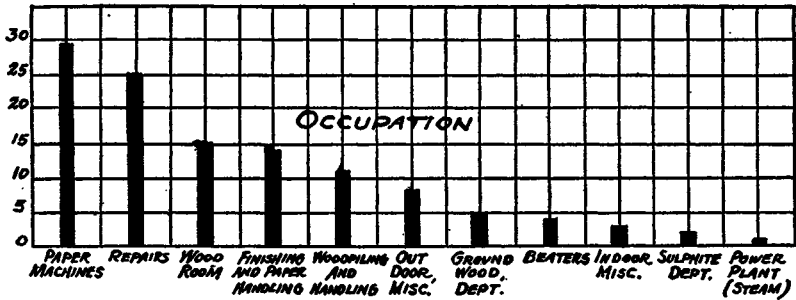
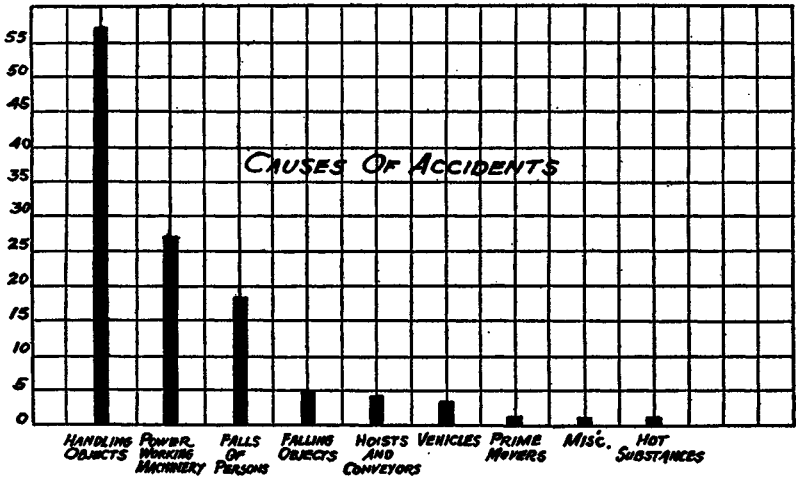
Another large mill of the company, our Hudson River Mill, rates sixth in the relative standing. It is in New York State up on the Hudson River at Palmer, and employs 855 men. It had 8 lost-time accidents, and lost 204 days. Its rate per 100 employees is 23.5.

It seems that we can arouse and maintain greater interest in safety work in our bigger mills than in our smaller mills. The mill at the bottom of the list—I will not tell you which it was—had 201 employees and 6 lost-time accidents, and 210 days lost. The days lost per 100 employees was 104.48.

The question arises, does that statistical data arouse interest in the executive officers, the safety man, and the employees? The report also contains a chart which includes (1) Causes of accidents; (2) occupation at time of injury; and (3) description of injury. This I think gives us better results, especially the section showing causes of accidents. That is what the safety man needs. It shows that the total lost-time accidents in that quarter were 117. Those caused by handling of objects were about 57; by power-working machinery, about 26; by falls of persons, about 17; by falling objects, 5; by hoists and conveyors, 4; by vehicles, 3; by prime movers, 1; by hot substances, 1; and miscellaneous, 1.

CHART SHOWING LOST-TIME ACCIDENTS IN MILLS OF THE INTERNATIONAL PAPER CO. FOR QUARTER ENDING JUNE 30, 1926

[Scale equals total number (117) of the lost-time accidents]



I try to get away from "miscellaneous," but if anyone here can classify this accident for me he is a world beater. This is what happened. It is a more or less common practice for men around paper machines to go barefoot, and the man who was injured was barefoot. He was getting off the step on the side of the paper machine and brushed his foot against a broom that was standing beside the machine. That broom had a low tin cover on the top which was a little worn, and he scratched his foot. He went to the first-aid room and had the wound dressed, and the nurse told him to wear his shoes when around the paper machine and to keep dirt out of the wound. He did not do it nor did he come back to the first-aid room, and an infection set in. That was the "miscellaneous" accident.

Using this section of the chart on causes of accidents the safety man at the mill can, by taking his own accident experience, make the necessary comparison, and likewise he can guard against accidents at his mill similar to those which the records show occurred in other mills.

There is just one other thing which I want to show you that the chart will bring out. The section on occupation shows a high percentage of accidents in our wood room—something like 15. When we go back to the mills where the accidents occurred we find that one mill had 375 employees, 28 lost-time accidents, and 278 days lost, showing both a high severity rate and a high frequency rate. The trouble was in its wood room, and we are planning to change that wood room in order to prevent other accidents there of a similar nature.

Another experience of longer standing—and the accident hazard is still prevalent in many paper mills of the country—was in connection with the use of rope on the winder shafts. This rope, about 2 or 3 yards long, is used, when starting the roll on the re-winder, to prevent the roll from bulging out. The danger in using this rope is either that the operator may get his finger caught with the draw of the rope and have it cut off or he may be pulled into the winder. We found out, not alone from our statistical records, that we had a number of accidents from that cause, and after investigation of the mills we developed a device whereby we do not have to use the rope at all. The men like it better, they can work safer with it, and besides they can work quicker—the production results are better. So much for the causes, although they play the most important part in the work of the safety man.

What interest has the mill manager in these charts and tables? The mill manager who finds he is on the bad side is going to take safety measures for the next three months that will get results, and greater stress will be put on accident prevention in all its phases.

There is one thing that as an individual company we can contribute to both State and National statistics, and that is we must give those people accurate and correct information.

Returning to Mr. Cameron's paper, he stated that the frequency rates and severity rates used by the National Safety Council are on the nationally approved basis in which death is counted as equivalent to 6,000 days lost. That is the standard by which, perhaps, you are going to work out this whole system of statistics on a national

basis. My company does not believe that the method used in calculating days lost or for fatal accidents is fair. We grant that in a general way it is fine for comparative purposes, but in reality it destroys the individual company record. I think I can show you that. First of all, 6,000 days represent almost 20 working years. The fallacy in this standard is twofold: First, if the stitistician sets this arbitrary figure of 6,000 days, what is to prevent the lawmaking bodies of the various States in which we operate from taking this standard for methods of paying compensation? In fact, we are leading the way for this when we adopt that as a standard. That is a fact, I think, that is really worth consideration by men who are employers.

Second, that rate is high. Taking the maximum weeks of compensation paid for deaths, or fatal accidents, in five of the States in which we operate—Maine, Vermont, New Hampshire, Massachusetts, and Louisiana—the average is less than 2,000 days. There is a difference of 4,000 days, and yet you use 6,000 days on which to base the rest of your table. You can see how taking 6,000 days distorts the whole severity rate and shows a much worse condition than really exists.

I think that is worthy of consideration by the committee on determination of exposure, and I ask that committee to give it earnest consideration and to give us a fair basis whereby an individual company can collect its data and present same to a State or the National government for national statistics.

The CHAIRMAN. Mr. Comeron's paper is excellent and the discussion was very full and complete. We will now listen to David Van Schaack, of the *Ætna* Life Insurance Co. on the "Interest of casualty insurance in accident prevention statistics."

THE INTEREST OF CASUALTY INSURANCE IN ACCIDENT-PREVENTION STATISTICS

BY DAVID VAN SCHAAK, DIRECTOR, BUREAU OF INSPECTION AND ACCIDENT PREVENTION, *ÆTNA* LIFE INSURANCE CO.

Casualty insurance has much more than an interest in statistics, for it is absolutely dependent upon them for the successful conduct of its business. It might seem that in making this statement I am departing from the subject assigned me, the interest of casualty insurance in accident-prevention statistics, but all statistics in which casualty insurance is concerned have necessarily an accident-prevention relation as the word "accident" is commonly interpreted. To be strictly accurate in the light of a true definition of the word "accident," some of the branches of casualty insurance would not properly come within this statement. A burglary or theft can scarcely be considered a fortuitous event. It may, in a way, be due to the operation of chance, but it is certainly not an undesigned contingency or a happening without intentional causation. There are other branches of casualty insurance which also come within this same class, but generally speaking most of the branches of casualty insurance, as for instance automobile insurance and compensation insurance, are deeply concerned in statistics as having a direct rela-

tionship not only to the formulation of rates but also to the prevention of accidents affecting those rates.

Casualty insurance is no exception in the wide and increasing field of insurance, nor in the broader field of human endeavor generally, in its absolute dependence upon statistics not only to show where it is at any particular time but also to point the way to improvement. It is a commonly accepted truism to-day, I believe, that every worth-while enterprise must be established and kept upon a sound statistical foundation. This is certainly, and perhaps especially, true of insurance. Perhaps the most outstanding example in the insurance field is found in the life insurance mortality tables, which point very clearly, except for the occasional visitation of pestilence or plague, to the pure premium which should be the basis of the full premium to be charged a man insurable at any particular age. These tables are so well founded upon past experience that an insurance company knows that of 100,000 persons insured at age 30, not more than so many will die during the first year thereafter, so many the second year, and so on until, according to the expiration of the table, all are, so far as insurance purposes are concerned, dead. It is an easy matter in the light of these statistics to figure out the net premium, dependent upon the method of making payments thereof and the time when the face of the policy is to be paid, which at a given rate of interest will produce this necessary sum of money at the end of the expectancy period or other time.

It is not possible to attain such a degree of accuracy in the case of casualty insurance statistics, for too many uncertain elements enter into the problem, but the value of dependable statistics is so evident in connection with casualty insurance that every effort possible is made to develop as definite a statistical basis as is practically possible.

It would be impossible within the limits of such a paper as this to deal with the whole range of casualty insurance statistics. On the assumption that you are particularly interested in accident statistics as applicable to workmen's compensation insurance, I shall confine myself to a brief discussion of casualty insurance's interest in them. The casualty companies have a general interest in all industrial accident statistics, even though of mere occurrence, as they give some indication at least of the hazards which are covered by insurance. The real concern of the casualty companies, however, is with the statistics of loss cost, for it is upon them that their rates are based, and they are the figures which point the way to adjustment of rates.

The manual rates for workmen's compensation insurance, which rates naturally must vary in the several States according to the different provisions of their workmen's compensation laws, are developed according to classifications of industry. The basic pure premium for any classification depends upon the amount of money per hundred dollars of pay roll which is necessary, as shown by experience, to cover the loss cost developing from the operation of that classification of industry. The basic pure premium is reverted to a given State-law requirement, and then loaded for taxes, expense of handling claims, inspection, pay-roll audit, acquisition, and gen-

eral administrative expense. It is not loaded for profits, although insurance companies, like all other business enterprises, are in business to make a profit. In the present state of the workmen's compensation business, the only chance the casualty insurance companies have to derive a profit from it is through that part of interest earnings upon loss reserves held in trust for the payment of incurred losses as they come due from time to time which is not required to maintain those reserves, and from interest earnings upon the unearned premium reserve carrying over from year to year.

It is rather a common misconception of the facts—far too common at any rate—that insurance companies are the owners of all of the very large amounts of money which they show as assets in their annual statements. A glance at the other side of the balance sheet of these annual statements will show that the greater part by far of these assets is offset by liabilities in the form of loss and premium reserves, which, of course, are merely trust funds only temporarily in the possession of the insurance companies.

Not only are loss-cost statistics necessary to develop the basic pure premium for each classification of industry under workmen's compensation insurance, but they are requisite to the modifications of the loaded basic premium which have come to be an essential part of this form of insurance. Neither schedule nor experience rating could be applied to compensation risks were it not for sufficiently dependable statistics. Casualty insurance companies early recognized the unfairness of charging the same rate to all assured coming under any one classification, and it was with a view to eliminating this unfairness so far as would be practically possible that schedule rating and experience rating, collectively known as the merit-rating system, were devised.

Briefly, schedule rating undertakes to modify the classification rate in the case of a particular assured because of the extent to which accident-producing conditions in his plant vary from the average. Schedule rating originally covered a considerable number of items, but in the light of experience these items have been substantially reduced in number, concentrating as rapidly as possible upon those accident-producing conditions which loss-cost experience showed to be outstanding. The point of operation of machines, for instance, is a great accident-producing cause now in many branches of industry, and it therefore occupies an especially prominent place in the scheme of schedule rating. From the constantly increasing evidence that organization for accident-prevention work and for medical treatment of injuries is a most important factor influencing compensation-loss cost, credits for these are also prominent in the schedule-rating plan.

Schedule rating has played a very important part in the development of workmen's compensation insurance, not only because of its undertaking to vary the rate for the individual plant according to the actual accident-producing conditions existing therein, but also because of the incentive which it gives an assured to take effective measures through organization and through safeguarding to reduce his accident experience. Schedule rating, however, did not go far enough in all fairness to the assured, so experience rating was de-

vised to give him additional benefit, dependent upon the actual results of accident-prevention work in his plant.

In order not only to develop rates which will apply in all fairness to assured under workmen's compensation insurance but also to create the proper atmosphere for successful accident-prevention work, it is necessary—

1. To bring home to the general public the large burden it must bear due to the enormous actual cost of accidents.

2. To bring fully before the assured the exact status of his risk and the part it plays in the general cost of accidents.

3. To gather the necessary information regarding the nature and the causes of accidents in order that safety work may be done effectively.

The statistical departments of casualty insurance companies, therefore, keep these three distinct records for the above purposes: (1) General classification experience—Schedule Z; (2) individual risk experience; (3) individual accident analysis experience. Let us consider each of these three records in turn.

1. *General classification experience—Schedule Z.*—Workmen's compensation insurance at this stage in the onward march of civilization is a necessary although expensive institution. It behooves all, particularly those more directly concerned in molding its infant career, to bring it to an increasingly efficient and economic basis. To accomplish this it is necessary to know its exact cost not only as a whole but also for each of the approximately 750 classifications into which industry has been divided. Inefficient methods influencing accident costs must be located by assigning to each industry the actual cost of its part of the wastage due to accidents to employees.

To attain this end it is necessary for a casualty company's statistical department to keep such detailed records as will enable it to allocate pay rolls, premiums, and accident costs to each of the approximately 750 classifications. These records, which must be kept by States and by policy years, are submitted to central organizations, where the reports of all carriers are combined and the results presented for rate-making purposes.

By this procedure as accurate a check as possible is given to the figures developed by the casualty companies' experience. The exhibits show figures of pay rolls and losses taken from the carriers' authenticated records. Not only are these carriers' records subject to examination by the insurance departments but in many cases these figures may be independently checked by records furnished the insurance department by the assured. All decisions regarding the processes used in the compilation and the selection of pure premiums, or the determination of any other factor which affects the ultimate cost, are made in meetings which are open to representatives of the insurance department, and which are presided over by a representative of the insurance convention.

2. *Individual risk experience.*—To bring the cost of casualty insurance ultimately to the lowest economic basis, it is not enough that the actual cost be allocated correctly to each individual classification, but also that so far as possible the proper rate be assigned to each risk. It is necessary to reward individual risks properly and

adequately for good experience through the medium of an effective merit-rating system, or to penalize them suitably for poor experience.

To put inducements for the development of good risks into practice, the casualty companies have to keep detailed records of individual risks of their assured. Only through the study and examination of such individual risk records can the underwriters ferret out any weak spots, and with the cooperation of the safety engineers make the necessary recommendations to the assured so that his experience may be bettered. Should the assured fail to cooperate in reducing bad experience, he should, in the interests of all other assured in his classification, be properly penalized.

The individual risk experience also furnishes the data necessary to apply schedule rating and experience rating so that the assured may be adequately rewarded for prospectively good experience and properly penalized for poor experience.

3. *Individual accident analysis.*—The prevention of industrial accidents requires a knowledge of individual accidents in greater detail than the total cost by nature of injury for each classification or the information that may be derived from the classification experience. Successful accident-prevention work requires the possession of information relative to the causes which produce accidents, the kinds of machines or the sort of work in connection with which they are most likely to occur, the part of the body injured, and the severity of these various accidents.

To enable casualty companies to get this information, the statistical departments keep detailed records of individual accidents, which show the cause of the accident, the machine or work to which it has been assigned, the severity, and the total cost. This information is reported on punch cards for every compensable accident to a central organization where it is compiled.

I have outlined briefly in its several divisions the statistical work which casualty insurance companies find it necessary to do in order to conduct their workmen's compensation business properly. The necessity for this amount of careful detailed work is clearly indicative of the absolute dependence of casualty insurance upon statistics for the maintenance of proper rates and for the furtherance of accident prevention. When workmen's compensation was substituted for the inequitable employers' liability system, which governed for many years the handling of industrial accidents, the casualty companies immediately recognized that they could not and should not be content with insuring employers against hazards as they then existed, but that it was their privilege as well as their duty to seek to stimulate and aid in an effort to minimize accidents so far as might be possible. It was clearly evident that casualty insurance could not restrict itself to being a fiduciary institution spreading the cost of industrial accidents over a wide range so that it would not fall with crushing force in any one place, but that it must become, so far as opportunity was afforded it, an active social force. It has endeavored to live up to this obligation, and, I am glad to say, with increasing success.

In living up to the obligation, casualty insurance has to make use of the most dependable statistics which it can develop, not only to give its assured proper rates for their insurance but to stimulate its

assured to that organized accident prevention work the results of which will be reflected in their experience and thereby carried ultimately into the rates applying to their insurance. The schedule-rating system would not be the encouragement to an assured to undertake accident-prevention work that it is if it were not based upon the best statistics justifying not only its possibility but the method of its application. Experience rating could not be safely or fairly applied to a risk if there were not accurate statistics upon which its application could be based. The same statistics which justify the application of both schedule rating and experience rating also point the way to the most intelligent working of organized accident-prevention methods. It is only by careful analysis of the accident-cost experience of the individual risk and of classes of risks that the outstanding causes of accident loss are developed so that accident-prevention work may be applied to them.

If it is found, for instance, by careful accident-cost analysis that the power-press hazard is developing a considerable part of the cost of accidents in a plant or an industry, accident-prevention work should necessarily be applied intensively to this hazard. The statistics showing the relativity of cost due to these particular causes are not only convincing to the insurance company, but as a rule they are also convincing to the manager of the risk, and lead both to the evolution and the adoption of the most effective remedial measures possible. A mere say so or general deduction does not compare in effect with the production of incontrovertible cost statistics.

Accident-cost analysis also shows whether that increasingly large factor, the cost of medical handling of accidents, is exceeding in the case of the individual risk the normal indicated by experience. Medical care should, theoretically at least, be unlimited, as the most important thing in the working of compensation insurance, next to the prevention of accidents, is to get the injured man back to work as quickly as possible, and as nearly as may be in the same condition as prior to the accident, but in the common interest of employer, insurer, and society, excessive cost of proper care should be eliminated and the accident frequency which often plays a large part in that excessive cost should be controlled as fully as may be through organization and cooperation.

The casualty companies are interested in all industrial-accident statistics because there is none of them, even those of mere occurrence, which does not mean something, but they naturally are most particularly interested, and as I have said dependent, upon their own statistics of accident-loss cost just as much for accident-prevention purposes as for purposes of rate making. And I believe that, owing to the wide range of their operations, they enjoy an unequalled opportunity to stimulate and aid that work of accident prevention which is, as it should be, the chief objective of the system of workmen's compensation. I am glad to say that it was a casualty insurance company official who summed up the proper trend of workmen's compensation in the pithy sentence, "Prevention is a benefaction; compensation is an apology." A well-deserved apology, of course, for there is no question that the cost of industrial accidents should be distributed, so far as is practicable, among the ultimate consumers

through the agency of industry itself and the cooperation of insurance; but the necessity for such apology, no matter how well deserved, should be continually reduced through the joint efforts of all who can have any part in that reduction.

DISCUSSION

The CHAIRMAN. Mr. Van Schaack has given us a very excellent paper, and we are going to have that paper discussed by L. L. Hall of the National Council on Compensation Insurance.

Mr. HALL. Mr. Van Schaack has set forth very ably the various uses of statistics in the rate-making procedure and their application in producing a schedule-rating plan. As to accident prevention, a further word may be said perhaps, of what an insurance company can do to lessen accidents and to decrease its hazard and consequently its losses. Insurance companies have commonly given much attention to the subject, partly doubtless from self-interest and, I think it may fairly be said, in some degree out of a desire to fill a useful and beneficent part in the community; for some of their activities in this line are fairly remote from any possible direct personal advantage. The ordinary accident-prevention activities are along the following lines.

1. *Schedule rating.*—This is designed to penalize conditions likely to cause accidents and to reward conditions likely to diminish accidents or to mitigate their consequences. The schedule deals with two different subjects—mechanical items and the so-called morale items. As to mechanical items, it prescribes for certain important loss producing causes standard safeguards, and by a series of charges and credits rewards their presence and penalizes their absence, thus giving the employer who does certain definite acts calculated to make his plant safe a rate advantage over the employer who does not.

The morale items deal with—(a) Education of the workmen in care of injured employees; (b) Provisions of medical equipment for care of injured employees. On this side there are no charges. The employer who does these things gets a credit and if his experience shows that his plant operates at a smaller accident cost than the average risk of the same class, he gets an added credit. The tangible reward offered by the rate differential does a great deal to encourage safety work. Equally valuable, perhaps, is the presentation to the employer of the facts with regard to his plant, indicating that in certain matters he is falling behind the average.

2. *Experience rating.*—This has its accident-prevention side as well. If a plant has a good loss experience, it earns an experience credit; if a bad experience, an experience charge. These differentials are, as a rule, more marked than schedule differentials, especially after a risk reaches a certain size, and, in proportion as they are more marked, furnish a stronger incentive to better one's experience. This plan supplements the schedule, for the schedule covers at best only the outstanding loss-producing elements that can be seen and estimated. It may be possible to summarize these two plans by the statement that schedule rating says to the employer that if he will attempt to prevent accidents by doing certain things which, in the

opinion of his insurance carrier, will bring about that result, he will receive a rate reduction, while experience rating says to the employer that if he will prevent accidents either by the method suggested by the insurance carrier or by his own methods the results will be reflected in his rate.

3. *Safety engineering.*—A careful company will seek to better its risks, not only by the general plans outlined but by giving careful study to each individual risk. This policy works in well with the experience-rating plan. The carrier can point out the spots where accidents are likely to occur and indicate the changes to be made. It can indicate better methods of handling materials and work in process and point out conditions of maintenance which ought to be rectified, and encourage and direct accident-prevention and safety-first campaigns. There are cases where a carrier makes a safety inspection as often as once a month, and inspections several times in the year are not uncommon.

It might be desirable also to add a few words concerning statistics in general, and, in particular, statistics which do not originate in the offices of the casualty insurance carriers. A casualty insurance carrier is not primarily a statistical gathering organization. As a part of its business, it finds it necessary and desirable to keep certain statistics of the results of its operations. There are, however, many statistics which come from other sources. Insurance, in general, is based upon the theory that history repeats itself and hence that statistics as to the past are indicative of the future. This theory is sound only to the extent that conditions underlying past results will be found in the future. We must bear in mind that accident statistics are useful but not infallible. Their chief flaw is that they are not available until some time after the events have happened. Accordingly, casualty insurance is interested in analyzing such phases of current industrial conditions as have an effect on the business in order to be in a position to determine more accurately what future conditions will be.

This necessitates an analysis of cause of accidents. In one sense this means statistics that show which hazards are the immediate causes of accidents, but in the broadest sense it means information as to the various social, economic, and psychological conditions which affect that kaleidoscopic phenomenon that we call American industry. General statistics as to the immediate causes of accidents are very valuable, because, as Mr. Van Schaack points out, they enable the casualty insurance carrier to determine which accident causes should appear in the rating schedule, and in conjunction with inspection data showing the frequency of occurrence of such causes make it possible to determine the rate value of the individual occurrence. They also give the carrier information as to which causes should receive intensive consideration if accident experience generally is to be improved. Similarly, I might repeat for emphasis Mr. Van Schaack's statement that a statistical exhibit as to the causes of past accidents in a particular plant makes a very forceful argument in attempts to have the employer remove or guard the cause. There are, however, many kinds of data which are not thought of as accident statistics but which, nevertheless, are entitled to consideration as such and which are of much interest to casualty insur-

ance and, in fact, to everyone interested in the study of industry and the accidents it produces. Information as to power consumption and production appears to be very important.

We have commonly used a denominator representing men as a measure of exposure. Insurance carriers have used wages, while other interested organizations have used man-hours. It is probable that neither of these shows the entire picture. Just a short time ago, I was reliably informed that in Great Britain the coal-mine accidents per man were less than in this country but that the accidents per ton were much greater than here. I have not as yet had an opportunity to verify that through the United States Bureau of Mines but am attempting to do so now through correspondence. Obviously, if it is true it means that the man-exposure per ton is much greater over there; in other words, that it takes more men to produce each ton of coal than it does here. But does that mean that the British coal miner is less efficient than his American contemporary? Knowing that in America we use the undercutting machine, the power loader, and mechanical haulage much more extensively than in Great Britain, does it not mean that the American miner is aided by mechanical methods to a greater extent and also possibly that in introducing mechanical or other labor-saving methods in American mines we have in the main eliminated those engaged in the nonhazardous, rather than the hazardous, employments? In other words, without increasing the number of men who get hurt, we may have decreased the number of those who do not.

You can look on this problem, if you like, as a problem in fractions. The total number of men who get hurt represents your numerator; your total exposure in men represents your denominator. In considering a problem of accident statistics you must look at both your numerator and your denominator. If, for instance, without affecting your numerator, you decrease your denominator, the obvious result is that you get a higher answer, which means a higher accident rate.

The summary of the Census of Manufactures for 1923 published by the United States Bureau of the Census shows that for the year 1914 establishments reporting to the bureau employed approximately 7,000,000 wage earners and utilized approximately 22,000,000 primary horsepower. During the year 1923, establishments reporting to the bureau showed wage earners numbering 8,778,000 and utilized approximately 33,000,000 horsepower. Thus we have between the two years an increase of 25 per cent in employment and 50 per cent in the amount of power used.

I believe that this situation is worthy of study. It may show that industry, although becoming more hazardous to the individual employee, is able to effect the same volume of production with a diminished human wastage. If the nonhazardous employee is gradually being eliminated it will show that safety activities must be redoubled in order to do more than keep even and to avoid the charge that we are rapidly becoming a group of industrial Frankensteins.

The CHAIRMAN. We have had two splendid papers, by Mr. Van Schaack and Mr. Hall. Commissioner Stewart now wants to make an announcement.

Commissioner STEWART. No; I want to ask some questions. I do not think there is a man living who is going to question for one minute that the casualty insurance companies are doing a wonderful work in accident prevention. I do not think there's a man living who knows anything about the subject who will not admit that they are doing perhaps more than any other agency. Admittedly they must base their rates upon statistics, base them upon pay rolls. All, or practically all, of their schemes are based upon volume of pay roll. I suppose that in their accident-prevention work they come up against the fact that it is not the pay roll that gets hurt and that they must have some line on the exposure, the man-hour exposure or the man-day exposure. So far as the pay roll is concerned, it is absolutely vital, it is the objective of the insurance company; but what happens when, as in the building trades, wages are very high and accidents are also very high? The truth is, you do not know how high they are, but because of your high wages you get an accident rate, based on pay roll, way below that of an industry where the wages are low and the accidents not nearly so high. I believe it is true that most of the insurance companies which are doing good accident-prevention work realize that a rate based upon exposure is the only guide, or practically the only guide, for their accident-prevention work.

So far as what we are driving at here is concerned, most of the States have access to accident reports, and know how many accidents occur. They know the severity in most cases. They know all they want to know except the exposure on which to base accident rates. The exposure they have not got, and so far as the States and the Government are concerned, there is no possibility of getting it under the present circumstances.

I am not going to ask Mr. Van Schaack or Mr. Hall to answer this question, because they may not want to, but I want to suggest this proposition, that if in getting your statistics of accidents and pay roll you will, in addition thereto, get the exposure, as you do in a number of instances now—make it a rule to get exposure—and then be willing to furnish that exposure record to the States and to the Federal Government, our problems will all be solved. Everything will be done that we want done. What we want that we can not and do not now get is exposure. I simply want to leave that idea with you, that what the States and Federal Government want in this accident business is within your power, not possibly in every instance just now but with a minimum of time and expense, to give to us.

Mr. HALL. Commissioner Stewart said that he did not expect either Mr. Van Schaack or myself to answer his question. I would like to offer an answer. In the first place, the casualty insurance carriers have enough trouble as it is getting the pay roll. They do not always get that. In the second place, there is already a very considerable expense attached to the so-called service item in connection with the distribution of compensation. During the past three or four years the casualty insurance carriers of this country have lost quite a number of millions of dollars. I can not tell you the exact figures offhand, but I would be willing to bet that it is somewhere near \$15,000,000. When we go out in a number of the States and point out this condition, showing that with this loss

there is need for increased rates, many of the employers get together and say, "Well, you are doing too many things; you are going through too many motions; you are keeping too many kinds of information. That costs you money. You are doing all these unnecessary things."

I have personally appeared at a number of hearings throughout this country, and I know what the sentiment is. They are at us to cut down on the various activities which help to build up the expense. I am pretty sure that casualty insurance carriers would be more than willing to have additional statistics, but when they are being constantly pounded from the top to keep the expense down it is pretty difficult for them to afford to get them.

Mr. WALKER. Mr. Hall, in speaking of the apparent accident ratio between Great Britain and the United States, said he was seeking information by correspondence on that subject. I thought perhaps I might give him some. I have worked over there and I have worked here. During the four years I worked over there at different times and places I worked in a vein that averaged less than 2 feet in thickness. In our country we do not ordinarily operate veins of that thickness. We are so rich in coal resources that, at least up to the present time, there are hardly any veins operated unless they are double that thickness and on up to perhaps 50 feet in thickness. Over there practically all the mining is done by hand, but more and more our mining is being done by machinery. There is a greater output per man here, due to the machinery and to the thicker veins of coal, as compared with the thin veins of coal and the hand-mining method over there. That does make a good deal of difference. Perhaps the casualty companies are trying to get information from the point of view of a humanitarian institution, for the purpose of making industry absolutely safe in our country, but the individual companies that attempted that would find themselves in disfavor, at least with companies which did not want that information made known, and besides, seeking that information would naturally cost something and would, of course, result in their being required to charge increased rates as compared with companies that did not do that work, which would operate to their disadvantage. I was wondering whether the Government could do that or not. I know, too, that you have to keep yourself in a certain position as a Government official or you can not function, and in that respect perhaps it might bring some disfavor if you sought that information and made it public, particularly as applied to individual companies. There is no doubt that the basic purpose of this meeting and of these activities is ultimately to eliminate accidents entirely, if that can be done, or at least to reduce them, so far as it can be done, to a minimum. If we are going to do that we have to get that information. I was wondering if a survey had ever been made to show what relation the amount of profits that an operating company makes—I do not mean a company that has perhaps a monopoly, but a company that is really operating competitively—has to the number of accidents that occur in the industry. I wondered if there had ever been a survey as to whether the standards of education or the workers' general intelligence bore any relation to the number

of accidents that take place in the industry. My guess about it is that the higher standards of education carry with them higher standards of intelligence and that the higher those standards are the fewer accidents there are in the industry. I was wondering also whether or not a survey may have been made as to unusual strains—whether speeding up—that is, speeding up beyond what the ordinary person can reasonably do without going further than he should in extraordinary physical effort—bears any relation to the number of accidents that take place in industry; whether or not in industries where simply the normal activity of the worker is required there are not fewer accidents in proportion than where speeding up beyond reasonable activity on the part of the worker obtains.

I wanted to make these suggestions in view of the discussion that took place between the chairman and Mr. Hall. I wanted you to have that in mind as well.

Mr. SILVERMAN. On the question of obtaining information from the insurance companies as to accidents, an answer was given that too many things are pounded on them. Why is it that when in Albany the labor man appeared and asked that a State fund be given power to control all the insurance and the paying of bills, these very companies claimed that nothing can be given away, and now when it comes up here in Washington they claim that too many things are pounded on them? That is the question I am asking. Why do they object to the State of New York having its own State fund regulating this and controlling the entire insurance fund, paying out insurance to the workers?

Commissioner STEWART. I would like to answer Mr. Walker, of Illinois, this way. We are perfectly willing to admit that exposure, with the cause and place of accident, is not the whole story, but we do feel that it is so much of the story that it is hardly worth while to tell the story without it. What few figures we have along those lines certainly indicate, and I think every manufacturer here will concede, that the percentage of accidents among the new men employed, within the first two weeks we will say, is greater than it is for the long-time employee. In other words, labor turnover is a very potent element in this thing, and stabilization would come from a forceful presentation of that fact. At present all the figures that the Bureau of Labor Statistics has tend to show that; but they are so few, the sample is so small, that we would be laughed at if we undertook to show that in so many establishments employing so many people the labor turnover had such and such an effect. The ability to understand English has its effect. As far as they go, our figures show that, but the sample is too small for us to get out on the housetop and make much fuss about it.

So far as speeding-up is concerned, to a certain extent that is an open question. A fellow who is going so fast that he has to put all of his attention and time looking at what he is doing, if you do not carry that too far, is less apt to get hurt than the fellow who has not much to do. On the speeding-up side I think there are two sides. I do not believe there is a man here who would question that there is a line where speeding becomes dangerous, and on the other hand, there is a line where slowing becomes dangerous.

The CHAIRMAN. If there is no further discussion we will go on to the next paper.

Mr. DAVIE. I would like to say just a word. I have listened with a great deal of interest to the last two papers presented here. Being one of those individuals who have some supervision in accident prevention, and understanding through the paper presented by the casualty insurance man that certain credits are allowed, I ask this question: Why is it when our men are doing the accident-prevention work and we explain to them that a just credit will be due them for all improvements made in their plant, that the insurance company does not do something along that line; actually do it?

Mr. CAHILL. I came in during the statement made by the preceding speaker that in the building construction line (in which I am interested), where the employees are receiving the highest pay, there are a greater number of accidents than in some of the poorer paid lines. There must be a cause for that, and I am here seeking a little information and if possible to offer a suggestion. I think that one reason why we have more accidents in the building construction line is because the employers are mostly to blame. They do not consider that it is really necessary to supply good equipment in the line of scaffolds and ladders, things that do not seem very important to the outside man but are of great importance to the men employed on the building. In the construction of a building, a scaffold, as we all know, is really essential for the employees to work on, and if that scaffold is not built safe, and if there are no laws laid down for the construction of that scaffold and ladders, we are going to have accidents. If people who are erecting buildings at the present time are not shown quite clearly and forcibly that it is really essential to build good scaffolds and ladders, we are going to have a great many more accidents than we have at the present time. In New York State we have a pretty good scaffolding code, and we are very proud of it. I think it has prevented quite a number of accidents in the four years it has been in force, and I would suggest to this body that it keep that thought in mind and instruct some of these careless contractors and also the employees that it is very important to see that we have good ladders and good scaffolds and good equipment in the erection of buildings.

Mr. BYNUM. I want to say this to Mr. Stewart: I am deeply appreciative of the efforts of the Federal Government. We of the States have to look to the Government for much of our information. With that in mind I want to ask this, Mr. Stewart: We have in Indiana some 200 self-insurers, and if you want any particular information would it not be possible to send to the various States and let them submit those questions to the self-insurers for data? I am sure I should be glad to do so in Indiana, if that would be of any help.

The CHAIRMAN. If there is no further discussion—

Mr. DAVIE. I asked a question here that has not been answered. We have been drifting away from it, but being Scotch I do not intend to let you do it. I made the statement that theoretically insurance companies gave certain credits for improved conditions in their plants. Now we have good men here who can tell us just

exactly what they would be. I think it would be educational to the men engaged in that protective work to have one of these gentlemen explain the method, how they really do it.

The CHAIRMAN. Mr. Hall, I thought you gave that in your paper a little while ago.

Mr. HALL. I thought so, too, and while I am perfectly willing to answer any questions I do not want to be put in the position of helping to turn this meeting into a discussion of the merits of compensation insurance of various types. I do not think that is really pertinent to the purposes of this meeting.

The CHAIRMAN. I rather thought that was covered in your paper; I may be wrong.

Mr. HALL. I would be very glad to discuss the subject at any time the Chair may designate, either publicly or privately, but I do not want to monopolize the time of these gentlemen discussing subjects which are perhaps not particularly pertinent to this particular problem.

Mr. DAVIE. Compensation may not be pertinent to industrial accidents, but I think that it is very pertinent.

The CHAIRMAN. What particular question did you want answered?

Mr. DAVIE. To clear up the situation, I may state that every man engaged in practical inspection refutes the argument of employers that they do not get credit from the insurance company.

The CHAIRMAN. But it is a well-known fact that they do give credits. You know that in your State.

Mr. DAVIE. Theoretically they do.

The CHAIRMAN. No, no; practically they really do. I have no objection to your answering that question, Mr. Hall, if you can. I mean in a general way; I think there is nothing specific.

Mr. DAVIE. Mr. Chairman, do you rule me out of order?

The CHAIRMAN. No; I do not rule you out of order. I do not want to do that for a minute, Mr. Davie, but I think after our next paper, if we have time, we will gladly have that question answered, if it can be, to your satisfaction. We will now go on with the regular order of business and ask Prof. Stewart Robertson, of North Carolina State College, to read his paper on "What the colleges are doing for accident prevention and human safety."

WHAT THE COLLEGES ARE DOING FOR ACCIDENT PREVENTION AND HUMAN SAFETY

BY PROF. STEWART ROBERTSON, OF NORTH CAROLINA STATE COLLEGE

Industrial safety is the subject of considerable attention in the educational institutions. The professional schools of the universities, the technical institutes, and the experiment stations are making valuable contributions to the safety movement by their researches in various problems related to industrial safety, by technical instruction in accident prevention and the elimination of hazards, and by developing in the minds of the undergraduates proper attitudes and a

right sense of values. These institutions lay special emphasis on the promotion of safety and the reduction of accident frequency because of their social and economic significance.

The work of the schools of engineering may be mentioned as representative of the contributions being made to industrial safety by the colleges. The element of safety is continually emphasized in engineering education. This instruction is supplemented by research studies in the engineering experiment stations conducted for the purpose of eliminating waste through improvement in design, by invention, and by studies of the strength and durability of materials.

The engineering undergraduate develops a set of attitudes and a technique that are carried over into industry, and make him a leader in industrial safety work. In a certain sense every engineer is a trained safety engineer. Some of the projects that have been conducted in engineering might be mentioned. A valuable piece of research in which the element of safety is of prime importance has been carried on since 1919 by the University of Illinois in cooperation with the National Research Council and several manufacturing firms. It is an investigation into the fatigue of metals. Certain results have already been obtained and published in bulletin form. This study is making a great contribution to safety work and safety education.

The University of Arizona has published fully a score of bulletins under the general title "State Safety News." These bulletins give results of technical safety and accident-prevention studies.

Engineering experiment stations in many of the States have conducted investigations looking to protection against fire, lightning, and diseases caused by faulty water and sewerage systems. Other projects have dealt with automobile headlights, dust prevention, safety of steel and reinforced structures, and safety appliances for hazardous machines. These purposeful and intensive studies by experts seeking improvement in the prevention of accidents and the promotion of safety are having a very definite effect on the minds of the undergraduates in the engineering schools of the country. But the effect does not stop there. It is rapidly being carried over into the industrial enterprises, for on these technical experts the management must largely rely for guidance and assistance in matters touching the welfare of employees as well as of the physical plant.

An example of the far-reaching effect of safety education is the tremendous influence exerted on the southern textile mills by the instruction acquired by safety workers and others from the South in the Massachusetts Institute of Technology and brought back to bear fruit in the southern mills.

The safety movement in industry has come to be recognized largely as a problem in management, and its future is therefore in the hands of the industrial executives. These men can not be expected to respond to every appeal that is made to do something for the movement. The problem of securing their interest should be handled in a scientific way.

Most organizations have already greatly increased their overhead by installing costly appliances and devices for guarding and insulating dangerous machinery and have taken other steps which have greatly increased their costs. What is the proper return for such

expenditures? Increases in fixed costs need to be balanced against saving in the direct cost of operation. The guiding men of industrial companies are properly concerned with the saving or gain to be expected from increased outlay.

The experiences of certain industrial organizations show in a general way that accident prevention and safety pay, but results of experiences in isolated cases do not furnish reliable data from which to generalize. The complete cooperation of the management of the various industries may be expected only when the gain from the safety movement becomes a demonstrable fact.

Appliances for reducing hazards, like most labor-saving devices of a mechanical sort, call for an investment in some machinery or equipment, but it remains to be determined in the case of safety appliances whether such improvements reduce or increase the cost of operation, and whether they effect a saving or a loss on every unit of output.

If the appliance is one that means a huge saving, or one that has come to be regarded as fundamentally necessary to efficient operation, it will pay to install it even though the plant is small. In measuring the results of investments in safety appliances or other costs in the interests of industrial safety, the relation of the improvements to the health and strength of the employees, physical, mental, and moral, must be considered. These are the basis of industrial efficiency, on which the production of material wealth depends, and the manager can not long evade this problem, even if he wishes to. This situation, however, ought not to deprive him of his inalienable right to get all the light on the problem that he can.

Among the variables which govern industrial efficiency, accident frequencies and fluctuations in health conditions may be truly said to be the least tangible of those which affect overhead costs, because of their social influences both in the factory proper and in the community outside. This very fact demonstrates without any detailed analysis the need for scientific studies, both of the experimental and statistical type.

Such studies can best be made by cooperative research projects between the industrial enterprisers and the scientists in the educational institutions, because it is in the colleges that the scientific method has been most completely developed and employed. No one acquainted with the recent developments in scientific method, both experimental and statistical, can fail to realize the advantages that would come from such coordinated studies. But they should of course be undertaken in the true scientific spirit; that is, free from bias or preconceived notions. The leaders in the safety movement should use their influence to enlist the joint interests of the industrial executives and the scientists to make this contribution to the advancement of the movement.

DISCUSSION

The CHAIRMAN. Now, so that there may be no misunderstanding I would like to have, if it is the desire of those assembled here, Mr. Hall answer Mr. Davie's question, if he can. Mr. Davie, I understand, says that theoretically your statement is true but that prac-

tically it does not work out; at least, that is the statement of some of the industries.

Mr. VAN SCHAACK. Mr. Hall has gone to a meeting of the committee on classification, but I might say just a word in that connection. The insurance companies do give the credits under schedule rating. In New York State last year there were over 9,000 risks which were schedule rated, of which about 3,000 took charges and actual credits were given to over 6,000, and my recollection is that the credit was slightly over 9 per cent.

The CHAIRMAN. Does that answer your question Mr. Davie?

Mr. DAVIE. That is exactly what I wanted. I thank you very much.

Mr. THOMPSON. As Mr. Hall told you, the casualty insurance rate is influenced by two factors, schedule rating and experience rating. The two together may reduce the rate or they may increase the rate. A man might have a case like the following, for instance, and think that the insurance company agrees to reduce his rate theoretically and then in actual practice it does not reduce it. The trouble is this: A schedule rate is made of a risk and it reduces it, but the experience in that plant has been unfavorable. It has had a number of serious, or perhaps one or two fatal, accidents. The experience rate then produces a charge which is in excess of the schedule rate. The plant owner thinks he has earned something under the schedule rate, but it is more than counterbalanced by the charge that is produced by the unfavorable experience under the experience rate, so that in the end his rate is increased, although he has done a lot of safety work. The plan so works that both of them have to work in unison. The experience has to be good along with good plant conditions, established safety organizations, and that sort of thing; then, combining those two things favorably, the operator can cut his rate in half.

(Meeting adjourned.)

THURSDAY, JULY 15—AFTERNOON SESSION

CHAIRMAN, JOHN HOPKINS HALL, JR., COMMISSIONER OF LABOR OF VIRGINIA

Commissioner STEWART. I want to introduce to you the chairman of this afternoon, John Hopkins Hall, who is commissioner of labor of Virginia, and who, to my personal knowledge, has been doing a lot of good work in old Virginia.

The CHAIRMAN. I take it we are all here to discuss these things frankly and that we all agree on the broad principle that we want to avoid accidents. The only discussion seems to be as to methods, as to what is the best method of avoiding accidents. If we can not agree on details we can probably agree on some general basis of operation—as Einstein would say, it is all a matter of relativity anyway. If we get too much detail, what might fit in an industry in one State might not fit in the same industry in another State. As an example, in Virginia, my native State, we have practically no foreign labor problem, but we have the negro labor problem, which in the same industry would present quite a different phase from that in another State which had a different type of labor. Consequently, we all have to adapt the methods to the conditions in our own particular State, but there are certain fundamentals we can all agree upon, and I hope that this conference will arrive at some such conclusion. It depends largely on the point of view, as one gentleman brought out this morning. Sometimes what is a question of safety to-day would not apply to the same industry to-morrow because of the progress in industry. The controversy, as I see it, between industry and the lawmaking bodies is because the legal authorities look to precedent, what occurred a hundred or two hundred years ago—what did Blackstone or Marshall say?—whereas industry looks forward, looks to improvements, looks to the future. Consequently, the lawmaking bodies never keep pace with industrial development. If industry had assumed the same attitude we would still have the tallow candle and the oxcart instead of the incandescent light and the airplane and the automobile. We must look forward and try to improve on existing conditions, and try through education to convince the legislators and the public generally that they must keep pace with industry, if we want to keep down the accidents which are an unnecessary toll in our industrial development.

I take pleasure in introducing as the first speaker of the afternoon Carl C. Beasor, who is with the division of safety and hygiene of the Industrial Commission of the State of Ohio.

RECENT STATISTICAL DEVELOPMENTS IN THE INDUSTRIAL COMMISSION OF OHIO, WITH SPECIAL REFERENCE TO ACCIDENT RECORDS

BY CARL C. BEASOR, CHIEF STATISTICIAN, DIVISION OF SAFETY AND HYGIENE, INDUSTRIAL COMMISSION OF OHIO

Until comparatively recently there was little or nothing known about the injuries occurring to workmen in the industries of Ohio

or the industrial diseases many of Ohio's workers were contracting. Because of this fact, because industry in Ohio was increasing with leaps and bounds, and because the many industrial accidents and diseases occurring in Ohio were costing immense sums for the payment of compensation, hospital and medical bills, and the loss of man power as well as an enormous loss of wages and inestimable suffering, employers and employees in Ohio felt the urgent need of something to cut this gigantic waste of money, time, and man power to a minimum. They therefore, through their organizations and representatives, worked out a plan to have an agency created in the State government which would make studies of these industrial accidents and diseases and recommend remedies for their reduction and elimination.

These two representative bodies felt there was no better place to have this agency than directly under the supervision of the industrial commission, since this commission had charge of the collecting and disbursing of all moneys for compensation purposes.

Accordingly they drew a bill and presented it to the last legislature. It was passed by that body without any amendments and signed by the governor April 27, 1925. This bill was enacted as a supplement to section 1465-89 of the General Code of Ohio and has thereafter been known as section 1465-89A, which in part is as follows:

The Industrial Commission of Ohio having, by virtue of the provisions of section 35 of Article II of the Constitution of Ohio, the expenditure of the fund therein created for the investigation and prevention of industrial accidents and diseases, shall, in the exercise of such authority and in the performance of such duty, employ a superintendent and such experts, engineers, investigators, clerks, and stenographers, as in its opinion may be deemed necessary and proper for the efficient operation of a bureau for the prevention of industrial accidents and diseases, hereby created, and, subject to the approval of the governor, fix the schedule of compensation for such employees.

The commission shall set aside such portion of the contributions paid by employers, not to exceed 1 per centum thereof in any year, as in its judgment may be necessary for the payment of the salaries of such superintendent and the compensation of the other employees of such bureau, and the expenses of such investigations and researches for the prevention of industrial accidents and diseases, as the commission shall deem proper. The superintendent, under the direction of the commission, shall conduct investigations and researches for the prevention of industrial accidents and diseases, and shall, from time to time, print and distribute such information as may be of benefit to employers and employees.

With this authority and in the performance of such duty the Industrial Commission of Ohio has organized, not in full, however, what is now known as the division of safety and hygiene of the Industrial Commission of Ohio.

Although the organizing of the division was started late last summer, due to the formulation of plans, the drawing up of new codes and forms to be used in the work, the changing of report forms then in use and the securing of machinery equipment, it was found impossible to start the regular statistical work of the division until the beginning of this year.

The work of the division is really divided into three subdivisions, namely, educational, engineering, and statistical. We hope to add a medical subdivision in the near future. The educational program we are instituting at present is the teaching and preaching of safety

in establishments and places where little or no work along this line has been done, the organizing of safety groups in industrial communities, particularly among chambers of commerce, employers' organizations, etc., which do not have any such organizations and the compilation of a set of safe practices and first-aid suggestions to be issued shortly in bulletin form.

The engineering work being done is the making of surveys of plants and operations, to determine the need of safeguards, safe practices, etc., and to recommend to the employer such changes as our engineer feels will reduce the accident hazard of the particular plant or operation he is studying. The employer whose plant is studied gets the services of a trained man in accident-prevention work and engineering practices and will be benefited materially if he will follow the advice of our engineer.

The statistical work, in which I am particularly interested, is all based upon the claims filed for industrial injuries and diseases. In volume the average number of claims received each full working-day during January was 720; February, 734; March, 694; April, 697; May, 791; June, 791.

Each claim, as it is received, is examined and coded for 15 different items or fields of our code. These fields are as follows: (1) Type of claim; (2) county or city; (3) weekly wages; (4) sex and social conditions; (5) age; (6) nationality; (7) dependents; (8) occupation; (9) cause; (10) injury; (11) days lost; (12) compensation incurred; (13) medical cost; (14) manual number; (15) risk number.

The first field—type of claim—designates the case to be a State medical case, a self-insured medical case, a public employee case, etc. In all there are nine different types of claims used.

The second field—county or city—gives us the geographical location of where the accident occurred. In addition to the 88 counties of the State we carry 30 of the principal industrial cities in this field. Being able to segregate the accidents by cities is particularly advantageous when more than one industrial center occurs in any one county. We have one case where three industrial cities, having similar industries, are in one county—Alliance, Canton, and Massillon are all in Stark County.

The third field carries the weekly wages of the injured or deceased.

The fourth field shows the sex of the injured and in addition whether he or she is single, married, widowed, or divorced.

The fifth field shows the age of the injured at time of injury.

The sixth field carries 11 nationalities which according to the last census appeared most frequently in Ohio industries.

The seventh field shows the number and kind of dependents the injured or deceased had.

The eighth field is a list of some 200 occupations which are found in industry. This, of course, does not cover every occupation that may be found in industry but it is approximately enough to allow a close substitute for those that are not on the list. For example, you will not find instructor or professor but you will find teacher. You will not find doubler, catcher, or rougher, but you will find rolling-mill workers.

The ninth or cause field, is of course the chief source of information for accident-prevention work and it is in this field where the

greatest amount of detailed coding is done. The cause code we use is a 5-column code and is first broken up into 22 divisions or general cause heads. These are as follows: Machinery; boilers; pumps; compressors and prime movers; transmission apparatus; elevators; cranes and derricks; cars and engines; motor vehicles; horse vehicles; hand trucks; water craft; handling objects; hand tools; electricity; explosives and explosions; hot, corrosive and poisonous substances; falling objects; falling objects (mines and quarries); falls of persons; stepping upon or striking against objects; occupational diseases; miscellaneous. Each one of these cause heads is further broken down which can best be explained from the code itself. [Explanation.]

The tenth, or injury field, has four subdivisions, namely, nature of injury, part of body, infection development, and degree. The natures of injury used are: Traumatic amputations, asphyxiation, burns and scalds, crushes and bruises, concussions, cuts and lacerations, drowning, fractures, punctures, sprains and strains, dislocations, and unclassified. The parts of the body are grouped under head, face and neck, trunk, upper extremities, and lower extremities. In all, these groups carry 104 parts and combinations of parts of the body.

Each case that develops any infection from the injury is coded and punched (1) in the fourth column of the injury field, while those that show no infection are punched (0).

In the fourth subfield the degrees used are fatal; permanent total disability—dismemberment; permanent total disability—other; permanent partial disability—dismemberment; permanent partial disability—total loss of use; permanent partial disability—impairment of use; permanent partial disability—disfigurement; permanent partial disability—other; temporary total disability; and temporary partial disability.

Field 11 carries the days lost due to the injury. In all fatal and permanent cases the standard table of weights recommended by the International Association of Industrial Accident Boards and Commissions is used.

Field 12 carries the amount of compensation incurred in dollars, but is not used much on our accident card.

Field 13 shows the medical cost, and it, like the compensation cost, is shown in dollars.

Field 14 is the manual field and is composed of over 700 different classifications or lines of work. These we group into 27 general industrial classifications, as follows: Agriculture; building erection and demolition; construction (not building erection); chemicals and allied products; clay, glass, and stone products; foods and beverages; laundries; leather and leather goods; lumber and wood products; metal industries, classified by blast furnaces, steel works, rolling mills, and ore refining; assembling and erecting machinery; machinery manufacture; metal goods; vehicles; paper and printing industry; rubber and composition goods; textiles and clothing manufacture; miscellaneous industries; mining; quarries and stone crushing; transportation; utilities; cartage and trucking; commercial; clerical and professional employments; care and custody of buildings and grounds; and public employees.

The fifteenth or last field carries the risk number of the employer reporting the accident. There are some 37,000 risks in the State fund and several hundred self-insurers, but this field allows us to segregate each risk's experience. It is our hope to supply the employer with his own experience so that he may compare the record of his plant or company with the industry as a whole. The ideal way to do this, of course, is to put both the frequency and severity rates upon a man-hour basis, and it is toward this end that we are working.

We appreciate it is a matter of education with a large majority of our employers, so we make it one of our recommendations when our engineers make their surveys. We feel that if we can get the employer interested in keeping some record of the accidents in his own plant, we will go a long way toward getting him interested in trying to reduce that record by accident-prevention work.

It has been frequently said that the pocketbook argument is of little use any more. In truth, it is useless in some cases, but there are plenty of instances where it is the one argument to put forth. Because of this fact we are keeping an entirely separate set of punched cards for all compensable cases, from which we can get accurate compensation and medical costs. These cards will allow us to tie the cost up with any other field on the card. Our accident and compensation card forms are identical, with the exception of the color of the card. In each instance the full information is punched on the card, so that the status of the card is governed by the color. Any additional information or costs to be added to the case is carried on pink-striped cards, subtractational amounts being on green-striped cards.

I feel that the cost of maintaining this additional set of cards for the compensation cases is offset considerably by the ease with which later tabulations are made and the reduction of the actual machine work in the tabulating room. It is also a help to us, due to the manner in which we must get the information we desire from the actual cases. The basic records are filed with the department of industrial relations and are passed from one division to another in that department for actuarial and auditing purposes. We must therefore get them while they are en route, which necessitates our keeping a fairly strict schedule, the greatest length of that schedule being one day. Some types of claims we are limited in the time we can hold them to four hours. These, of course, are given priority over all others as soon as we get them.

Thus far we have not been able to get many reports in printed form before the public excepting the monthly tables showing the number of fatal and nonfatal claims filed and time lost by general industrial classifications and cause heads. We feel that we have many individual needs in Ohio and must try to meet as many of those as possible first of all. It is our intention, however, to follow as closely as possible the prescribed tables set forth by the United States Bureau of Labor Statistics in its Bulletin No. 276 for comparative purposes.

Knowing that we have a real job on our hands in Ohio we will welcome any constructive criticism that will help us with that job, for we feel that everyone here has but one question, which stands

head and shoulders above everything else and that is, How can we eliminate or reduce the terrible toll to the lives and limbs of our fellow workers here in America?

The CHAIRMAN. I am sure we have all enjoyed the valuable paper just read. Ohio is making fine progress, and this paper by Mr. Beasor indicates that that progress will continue. I was very much impressed by a slogan they have on their monthly bulletin which I am fortunate enough to receive, and that is—I do not know whether it is original or not but it is a good one—"Safety is better than compensation." I believe it might be a good slogan for us all to follow.

Mr. Beasor referred to Bulletin No. 276. That has been referred to several times here in this conference. Mr. Stewart informs me that there are copies on a table outside this hall, and I hope as many of you as are interested will get a copy, because we can make valuable progress by studying the same. I would like to open this meeting for discussion of any points or questions that might be asked, but Mr. Stewart suggests that we go on with the program and have the discussion afterwards. The question occurred to me as to whether there were not too many different classifications and I just want to note that suggestion in case we want to discuss it later on.

The next paper on the program is "Accident prevention in relation to efficiency," by Lewis A. De Blois, of the National Bureau of Casualty and Surety Underwriters, and I now take pleasure in introducing Mr. De Blois to you.

ACCIDENT PREVENTION IN RELATION TO EFFICIENCY

BY LEWIS A. DE BLOIS, DIRECTOR SAFETY ENGINEERING DIVISION, NATIONAL BUREAU OF CASUALTY AND SURETY UNDERWRITERS; PAST PRESIDENT NATIONAL SAFETY COUNCIL

Among the earliest discourses on industrial safety one encounters the statement: "A safe plant is an efficient plant." In one form or another this thought has been expressed so repeatedly that it has become embodied in the working creed of the safety engineer. The truth of it seems to have been accepted without question—as real truths often are—without critical analysis, without attempt at proof.

In one aspect its truth is quite obvious. When an employee is injured he loses more or less time from work, to which is added the lost time of fellow employees who are, for the moment, distracted from their usual productive occupations. Furthermore, a serious accident, or the constant repetition of accidents, may temporarily injure the morale of the entire establishment, with resulting distraction and loss of time. Loss of time is, of course, reflected in diminished production.

Diminished production, regardless of cause, is attended by a falling off in production efficiency. Efficiency, as we all know, is the relation of output to input. Output is input less losses. Since the decrease in production efficiency due to interruptions is real and not a figure of speech, and because the nature of the losses is not always clearly understood, it will perhaps pay us to discuss the matter more in detail.

In every industrial establishment there are "fixed losses" which persist at a rate that is practically independent of the rate of production output. Examples of these are interest on plant investment, depreciation of plant from age or action of the elements, condensation and leakage losses in pipe lines, and certain losses in electric lines that take place whether or not current is being used. Such losses go on continuously. They should not be confused with what we may call "variable losses." The latter are losses which fluctuate more or less proportionately with use, input, or consumption of plant, power, and ingredients. We all know that something quite similar happens with our automobiles—they depreciate in mechanical efficiency and economic value as result of use—that is, a result of variable losses; but also, as result of fixed losses, they depreciate when not in use. So it is with our clothing, with our homes—even with our bodies. Lowered production, use, output, or whatever term we employ, must always, therefore, be accompanied by decreased efficiency, since the fixed losses become of relatively greater importance.

Interruption to the production cycle, whether expected or unexpected, avoidable or unavoidable, therefore diminishes output and, by throwing the fixed losses into greater prominence, decreases production efficiency. Accidents are unexpected interruptions—indeed, the commonest form of unexpected interruption. We must remember, however, that in speaking thus of accidents we do not mean accidental injuries but the unexpected occurrences from which injuries may result. As safety engineers we have become somewhat nearsighted in the matter of accidents. We are very apt to concentrate our attention on accidental injuries—largely on tabulatable injuries—overlooking minor injuries and near-injury accidents. As for the occurrence of noninjury accidents that we do not happen to regard as near-injuries, we are quite oblivious to them, forgetting that they constitute by far the largest class and that each of these unexpected events has its own measure of injury potentiality.

I have not been able to uncover any very dependable figures on the occurrence of the latter class but we may set down the following ratios for purposes of discussion:

| | |
|---|-----------|
| Number of fatal accidents..... | 1 |
| Number of permanent disability cases..... | 5 |
| Number of tabulatable temporary disability cases..... | 110 |
| Number of minor injury cases..... | 34,800 |
| Number of noninjury accidents..... | 3,480,000 |

The values for permanent and temporary disability cases are reasonably reliable, being Hookstadt's modifications of the accepted American experience table. The value for minor-injury cases is taken from the average experience of seven plants of E. I. du Pont de Nemours & Co., all known to be reporting minor injuries with reasonable consistency. The value for noninjury accidents, in which I have assumed a ratio of 100:1, is pure conjecture. Even if we could obtain the actual value from experience it would represent merely a gross average, since industrial conditions vary and the expectancy must be modified in accordance. For example, the expectancy of a noninjury accident from smoking over an open powder

keg would be low while the expectancy for smoking over a can of heavy oil would be comparatively high. For the sake of argument, however, it is sufficient to assume that for every tabulatable injury accident there may be 30,000 noninjury accidents.

We have seen that accidents, functioning as process interruptions, diminish operation efficiency and decrease output. Assume that we have 1,000 men employed in an industrial process and that these men have an injury frequency rate of 20 per thousand workers per year. If our assumption on the relative number of noninjury accidents was correct, there would be 600,020 accidental process interruptions during the year. If their duration averaged only one minute the aggregate lost time would amount to 10,000 hours! Obviously, then, the prevention of accidents, as distinct from the prevention of accidental injuries, has real economic possibilities.

When we prevent accidental injury by protecting the body of the man we do not usually eliminate the accident capable of causing injury. We know that the application of protection alone does not greatly reduce injury occurrence and can not, of itself, make a safe plant. Engineering revision of the plant and revision of the workers' mental attitude can accomplish it. When we prevent injuries by eliminating the accident cause, as takes place when revision is applied, we not only extirpate injuries and accidents but materially diminish lost time from unexpected process interruptions. This, to my mind, is the major reason for believing that a safe plant, that is, a plant that has largely eliminated injuries, is an efficient plant since it has probably largely eliminated unexpected process interruptions.

Most accidents, however, are the result, not of a single cause, but of the coincidence of a number of contributing causes, each of which may be, in turn, the culmination of a long series of events. They may have to do with the plant and its equipment or with the ingredients or process. In each of these some element of production inefficiency may be introduced—improper maintenance, poor housekeeping, defective construction, bad design, for example. On the other hand, they may concern the personal element and here we encounter poor technique, lack of skill, inattention, absence of proper supervision, fatigue, defective vision, improper illumination, and a host of other contributing causes that affect both safety and production efficiency. Eliminate all or any one of them for the sake of preventing accidents, or for any other reason, and efficiency can not help but be improved.

There is, moreover, an indirect relationship. It requires the highest grade of intelligent plant management and responsive personnel to eliminate accidents and maintain a long no-accident record. There must be effective organization, cooperation, and spirit. Exactly the same requirements must be fulfilled in order to attain a high degree of operating efficiency. The industrial establishment that has attained the one goal will, or can, attain the other.

Instances of the total elimination of all classes of tabulatable injuries for long periods of time are now familiar to all. The accomplishment of 1,000,000 man-hours without accidental injuries is not infrequent, and in one case the high point of 8,000,000 man-hours has been attained. These no-accident records confirm the

truth of the adage that accidents do not happen but are caused. We are facing the fact that the only unpreventable industrial accidents are those caused by natural phenomena, such as earthquakes, tornadoes, etc., and they, after all, are not really industrial accidents.

It is not generally so well known that certain plants that have experienced remarkable no-accident records have also attained co-incident improvements in operating efficiency or increases in quantity production. For example, one plant practically eliminated punch-press accidents and was rewarded with a 65 per cent increase in production per press. So many rather similar instances have occurred, and the matter is of such economic importance, that a national research into the subject has been undertaken by the American Engineering Council.

To be sure, accident prevention is its own justification quite aside from any direct or indirect effect which it may have upon industrial production. Up to this time the safety movement has been accepted largely at face value. Its humanitarian appeal, its effect on compensation and liability rates, and its general "worth-whileness" have carried it forward. While its progress has been little short of remarkable, if one considers the breadth and diversity of American industry and the rapid changes that have been taking place within it, disappointment greets us when we consider its progress from another aspect, for the annual number of accidental industrial deaths, in so far as it is possible to estimate them, has not yet commenced materially to diminish.

We are prone to regard American industry as typified by large and progressive corporations, because it is usually with these that we have our most intimate contacts. As a matter of fact, only one-half of 1 per cent of our 290,000 manufacturing establishments employ over 1,000 persons and 90 per cent of them employ less than 100. American industry, therefore, is composed essentially of a great number of small establishments. Relatively few of them, we may conjecture, are under the type of progressive, enlightened management that is likely to propose and undertake effective accident-prevention work of its own volition. Because these establishments are small, accidents do not seem to their managers to occur with alarming frequency and the insurance costs are not excessive; in other words, the incentive for doing effective safety work is largely absent, even if its advantages were fully known and appreciated. This is probably one reason why our national accident record has not shown any consistent improvement; in other words, effective safety work has been generally confined to a relatively few large establishments.

To reach the managers of these thousands of small establishments and to energize the more reluctant or less progressive among the managers of large establishments, we must have stronger arguments at hand for the adoption of safety work than we have possessed heretofore. Actual proof that a definite relationship exists between safety and production efficiency will furnish us with this. In the past we have talked of safety in terms of lives saved, lower compensation costs, or smaller insurance premiums; if we are able to translate it into terms of production we shall reach a vast number of industrial executives who heretofore have regarded accident

prevention as a matter of secondary importance—even a mere trimming on the fabric of industrial management. Production is the language they know best and to convince them we must employ it when we talk safety. It is hoped that the results of the research by the American Engineering Council will enable us to do this.

These are the reasons, it seems to me, why the relationship of accident prevention to industrial production is, at the moment, of exceeding importance. It may well be that the future progress of the safety movement depends, to no small extent, on our reaching a clear understanding of this fundamental matter.

DISCUSSION

The CHAIRMAN. I am sure we all recognize the valuable addition made in this paper, which throws a different light on this question from any that we have considered heretofore, and a very potent one. I want now to introduce to you J. E. Hannum, of the American Engineering Council, who will lead the discussion on this paper.

Mr. HANNUM. My discussion of Mr. De Blois's paper will be confined to a brief presentment of the study of safety in production which is being conducted by the American Engineering Council. As Mr. De Blois has stated, this investigation is being made for the purpose of determining the relationship between safety and production.

Some months ago when the American Engineering Council agreed to undertake the study, upon the request of the National Bureau of Casualty and Surety Underwriters, a committee of prominent engineers and industrial executives was appointed to formulate the plans and to determine the scope of the study. This committee on safety and production, as it is called, is headed by A. W. Berresford, who is a past president of the American Institute of Electrical Engineers; L. P. Alfred, editor of Manufacturing Industries, is vice chairman. The other members are Mr. De Blois, past president of the National Safety Council; Leonard W. Hatch, director of the Bureau of Statistics and Information of the New York State Department of Labor; John Price Jackson, former commissioner of labor and industry of Pennsylvania; Charles F. Loweth, past president of the American Society of Civil Engineers; W. W. Nichols, vice president of the Society of Industrial Engineers; Bradley Stoughton, past president of the American Institute of Mining and Metallurgical Engineers. L. W. Wallace, executive secretary of the American Engineering Council, is secretary of this committee.

There are two phases of the problem which will be studied intensively. First, the accident rate and the production rate will be measured from the experience records of plants over as long periods as records permit, and the trend of accidents and the trend of production will be studied and compared for individual plants, for groups of plants, and for separate industries. The second part of the problem is a study to determine exactly what takes place when industrial accidents occur as measured in terms of lost time and lost production.

The committee at its earlier meetings decided to confine the investigation to 10 major industries. Iron and steel, steam railways,

mining, and cement are being studied from available statistical reports; and the required data for the remaining six industries, namely, machine building and metal working, woodworking, paper and pulp, textile, building construction, and electric utilities, are being gathered by extensively organized field work from the records of several thousand individual plants.

In 15 large industrial centers field engineers are gathering the data by calling personally upon executives of plants within their respective territories. In each of these 15 investigation centers a local subcommittee of the main safety and production committee has been formed to assist the field engineers. These local committees are also made up of prominent industrial executives, safety supervisors, engineers, and other prominent men in their respective communities.

The territory covered by the field engineers is that geographical area bounded by lines extending from Boston to Milwaukee, thence to St. Louis, thence to Pittsburgh, and thence to Atlanta. This, of course, takes in only a portion of the industrial activities of the entire country, and in order to cover more adequately the entire country and to make the study a truly national one in its scope, additional subcommittees have been established or are being formed in 55 other important manufacturing centers situated outside of the field engineers' territory, and still further in addition there will be approximately 1,000 plants which can not be conveniently reached either by the field engineers or the local committee which will be asked by direct correspondence to furnish data. Due to the functioning of the main committee and the local subcommittees the American Engineering Council will have the advantage of the thought, experience, and observation of several hundred prominent engineers, industrial executives, and safety men throughout the country.

A data sheet prepared by the committee on safety and production is being used for recording the experience of individual plants. A minimum amount of information is called for on this data sheet, this information consisting of the following items to be reported on an annual basis for the entire plant, or by departments wherever this is possible: The first item is the average number of employees; the second, total number of man-hours worked; the third, total production expressed in some physical unit; the fourth, number of lost-time accidents, which is subdivided into deaths and permanent disabilities; and, fifth, total number of days lost due to accidents, which is also subdivided into days lost due to deaths and days lost due to permanent disabilities. These items are defined on the back of the data sheet in accordance with the practice of the National Safety Council, and there is also given on the back of the data sheet a table for calculating the number of days lost due to deaths and permanent disabilities. This table is that adopted by the International Association of Industrial Accident Boards and Commissions, in this way obviating any deviation from the accepted standard practice. Accident frequency and accident severity rates and production rates will be calculated from the data obtained in order to show the trend and correlation of safety and production.

Through the courtesy and cooperation of such organizations as the National Safety Council with its affiliated community safety councils, compensation insurance carriers, State industrial commis-

sions, trade associations and chambers of commerce, a list of approximately 4,000 companies, who are more or less actively engaged in accident-prevention work, will be canvassed, from which a large body of actual data is anticipated.

A significant part of the investigation is that which has to do with the determination of what actually takes place when accidents occur. A number of large industrial firms throughout the country, representing a wide range of industrial activities, have already expressed their willingness to cooperate with the American Engineering Council by making this phase of the study. The observations made will determine the exact amount of lost time due to each accident that occurs, and the resulting curtailment of production will be measured by such factors as the absence of the injured employee, the impairment of the productive ability of the employee when able to resume work, the distraction of other workers from their work at the time the accident occurs, the effect of the accident upon the morale of other workers, and the inefficiency of the new employee hired to replace the injured worker. All data gathered for the entire study will be carefully analyzed, and a statistical and engineering report of the relationship of industrial accidents to economy of production will be prepared and published in book form. I might say that the plans are to have this book published very close to the end of this year. The success of the study will depend in a large measure upon the willingness of industrial executives and supervisors of safety to furnish the information desired. The fullest cooperation of all those who in any way are contributing to the advancement of the safety movement in American industry is earnestly solicited.

I want to add that the data which have already come in to us from our field engineers are very encouraging, and we are certainly grateful to those companies which are furnishing them.

On behalf of the members of the safety and production committee of the American Engineering Council and all who are intimately associated in this study, I wish to thank Commissioner Stewart for his kind invitation to speak here this afternoon and for the opportunity of telling you something about this important piece of work.

The CHAIRMAN. I am going to ask if anyone wishes to discuss these papers.

Colonel JACKSON. I am impelled to say a word or two, because it seems to me that this work of the National Engineering Council has possibilities of very great importance. Indeed, it strikes me that the possibilities of this investigation are almost as great as those of getting our National, State, and industrial statistics upon a sane, sound, and intelligible basis, which is not the case to-day.

During the past year and a half, I have been several times under the necessity of endeavoring to find out the total cost of accidents. I have gone to the insurance companies and have found the medical cost and the actual compensation cost. I have procured similar data from establishments with which I have been connected and from other institutions, but such data do not represent the *total* cost of accidents. Every man here who is connected with safety work in a corporation knows perfectly well that many of the other losses of which Mr. Hannum and Mr. De Blois spoke may exceed quite exten-

sively the actual compensation and medical cost. For instance, the time lost by the group in a rather serious accident may be quite expensive. This can not be helped; we are human beings, and we are interested. The time lost in rearranging the group, if men have been seriously injured, or even if they have not been seriously injured, merely off a day or two, makes quite an item in the cost of the project. If the injury is serious, the possible loss to the group of a trained man may for some time affect the efficiency of that group.

For instance, suppose a gang of a dozen men has one man very seriously maimed. What happens if it is in a well-organized establishment? The probability is that there is another man in the gang who can step into his place. The chances are, if the injured is a man of some rank, there will be several step-ups. You get the advantage of promotion through the very bad cause of an accident, but down at the bottom somewhere you will have to put on another employee, if the injured man be out for good, due to permanent partial disability, or total disability, or death. Now, the training of a new man is a very expensive process, or else some studies I have been making are entirely at fault. So when you get together all the costs which result from an accident you begin to get the cost of that process of interruption, as Mr. De Blois called it, and I am inclined to believe that Mr. Hannum and his committee are going to find that the process of interruption is going to be nearly as costly as the mere medical expense and the compensation paid to the injured.

Another thing I wish to speak of is the instance, the very striking instance, given by Mr. De Blois of the 65 per cent increase in production by a punch-press gang. We do not know, from what Mr. De Blois said, from what that comes. We have no intimation, but I believe most of the safety men here will agree with the general proposition that, whereas in that case they had a long period of no-time-lost accidents—I presume Mr. De Blois meant by “no-time” accident no lost time; did you not, Mr. De Blois?

Mr. DE BLOIS. That is it; not tabulatable.

Colonel JACKSON. That where you have such excellent safety work and it is so thoroughly carried out that you have for a long period no lost time in as dangerous a business as that of the punch press, even with all the guards installed, you have won the interest of your men. Now the interest of the men in making a no-lost-time accident record also interests them in the company, in the production, and in every phase of that corporation's welfare, and I am rather inclined to believe we will find that this increase of production has come largely through the incidental effect on the spirit of the workmen in the gang.

Commissioner STEWART. I would like to say just one word about this work. Several months ago a representative of this organization—if I mistake not it was Mr. Hannum, although I am not sure about that—came and told me what they wanted to do. At that time not a word was said about the average number of employees or the man-hours. My point at that time was that you can not get efficiency unless you have the man-hours. Your record of accidents

is not worth a whoop unless you have the man-hours. Let us see what efficiency in relation to accidents is. In the first place, accidents do not produce efficiency—it is not the accidents that turn out the pig iron—and when you relate accidents to efficiency and leave out your man you have done nothing, as I see it now and saw it then. For instance, we have pig-iron furnaces in this country to-day that are producing a ton of iron per 12 man-hours, just as they were 20 years ago. We have pig-iron furnaces producing a ton of iron per man-hour. How are you going to relate accidents to your efficiency unless you have got that man-hour. As a statistician I can not see it. In many blast furnaces to-day we have the old bottom filler with his wheelbarrow, and then you pull the wheelbarrow up and there is the fellow at the top who dumps the contents into the top. He is the top filler; and so on. Scores of blast furnaces are run that way. Even—to be perfectly frank—the company that is producing pig iron at the rate of a ton every 56 minutes of one man's time has plants which are producing a ton of pig iron every 13 hours of one man's time. It does not run that furnace very often but it does run it. It does seem to me that you not only have to connect up your man and your man-hours, as you have admitted in reading your schedule, but you have to relate your efficiency through your man-hours. Now, if an organization is doing the amount of work that Mr. Hannum states, it is getting a volume of figures of accidents and man-hours from which we can make our rates. After all, gentlemen, all that we are asking for is a report of accidents and man-hours, and I do not care a rap who gets them. The Bureau of Labor Statistics has not the time nor the money to get one-thousandth part of them, and we do not care who gets them so long as they are turned in to the bureau on a basis of industries. And why can't we agree? Why can't we line up—I was going to say here and now, but I will let that pass—so that these various organizations which are getting just what we want, what the Federal Government wants, what the States want, will be able to get it some from this source, some from that source, and so on, until we get it.

Mr. HOAGE. What Mr. Stewart has just been relating is perfectly true, that there is not much connection between accidents and efficiency except in a negative way. Accidents produce inefficiency, but as I understand it the subject this afternoon was accident prevention in relation to efficiency. My experience as a statistician and as a safety engineer has led me to several conclusions about that particular subject. I remember that in some of the plants in which I was engaged during the war as a safety engineer I found that the employers were very anxious not only that I should prevent accidents but also that I should put on an efficiency campaign. One of the things they particularly asked me to do was to provide material for their men to study that would make them better men. I can illustrate that better by stating that the superintendent of a wood-working factory asked me if I would not get the best magazines and the best literature I could upon methods of operation, so that the men might be made better men for the occupation as well as learn safety practices, and half of my time was devoted to teaching these men better methods in the factory so that they might become more efficient.

Now if a man working in a factory is careless about his personal appearance, wearing ragged clothes, and careless about throwing his tools around on the floor, he is careless about piling the material that he handles from the machine upon the truck, he is careless about his trucks, not keeping them in good order, and, if he has charge of a machine, he is careless about lacing the belts and keeping the machine in order. All this carelessness produces accidents and makes the men feel that they do not care whether they are doing things right or not. But the man who piles his stuff upon the truck carefully is not going to have it tumbling down over the machinists; the man who keeps his truck in shape is not going to have the truck falling down and tipping over and causing accidents in that way; and the man who keeps his belts well laced is not going to have his belts loosening up and injuring men. All these things not only aid efficiency but they keep the factory running in better shape and better condition. It is a case where accident prevention has a big relation to efficiency in production. It seems to me that we are talking on one side of the question almost entirely in this conference. We are using as a basis what we try to do but have not done, are we not? That we are trying to prevent accidents but have not prevented them, we are using as a basis to convince people that we are on the right track. Well, that is all right as far as it goes. That is good; it is the only cudgel we have to knock a man's head open to get an idea into it. That is all right; that is the first process; we have to open his head if we have to do it with a shillalah, and this is the shillalah—statistics. It seems to me, however, that in this conference one of the big things to stress is that there is a relation between accident prevention and efficiency. You have to use that to put accident prevention across and sell it to the public at large—you must prove that there is a relation between accident prevention and efficiency. It seems to me that it is one of the simplest things to prove, because we can show in the operations where carelessness does produce accidents and where carefulness does produce efficiency. I hope before we are done we will make some suggestion that can be used in selling the proposition that we are trying to sell at this time.

Mr. HANNUM. I should like to answer the commissioner's question as to why the average number of employees and also the number of man-hours were put on our data sheet. What we are after in this study is a large volume of data and in order to get that large volume of data our committee felt that if it should confine the data sheet to asking only for the number of man-hours worked that might preclude getting data from a great many people who were not able to furnish us with that figure but who would be able to furnish us with a figure as to the average number of employees; so that is put in there for that purpose. We have the commissioner to thank for pointing out to us in the very early days in the planning of this study the importance of figuring our rate upon the basis of man-hours.

The CHAIRMAN. There was one phase of Mr. De Blois's paper that I have not heard discussed yet which I think is very important, and that is the near-injury accidents. I think that is of extreme importance. It is in my limited experience. I have known of cases,

particularly in the mines, where in man haulage a part of the roof would drop down, maybe catching no one at that particular time, but it was a serious process interruption and would have been a very serious accident if anybody had happened to be along at that particular time. It did interrupt efficiency and does interrupt efficiency of the operation. I would like to hear a discussion on that phase of the subject by somebody at this time.

Mr. CHANEY. On the question which you have just raised as to the near-accident occurrence, I started out with the idea that I ought to have everything that happened in the way of an accident, taking the definition which the insurance companies had long used—every case no matter how trivial. That does not include the near accident but it includes a lot that later we did not attempt to include. The difficulty with attempting to include the minor injuries of less than a day's disability was that you could not get an accurate record of them. Over and over again I found that the record was absolutely inaccurate and without value, and that was the reason why the Bureau of Labor Statistics finally pinned itself down to cases where some actual disability was involved. We could be tolerably sure that if a man was off from his work a record would be made of it, but we could not be sure of cases coming to the emergency room, and various other things of that sort. I can illustrate what happens in certain cases by the statement of the solicitor of the United States Steel Corporation. He said, "I hesitate a great deal about giving you this information. What happened to us last year? We put on a chief surgeon and immediately we doubled the number of accidents." That simply meant that a whole lot of accidents were being reported which had not been reported before. For the purposes of statistical procedure you have to adopt something by which you can get the basic data with a fair assurance that you are right about it. If you do not do that you will go far wrong, and I should be inclined to think that if this study of efficiency undertakes to include cases less than the tabulatable case, there will be the difficulty of having a mass of material whose value is very doubtful.

Mr. CARROW. I want to call attention to the fact I have undertaken to emphasize in railroad circles, that the most important aspect of accident prevention is preventing accidents that have not happened. As to the near accidents, it seems to me that the tabulation of an infinite number of reports where no time is lost is one of the most futile, unnecessary things that could be imagined. I recall some years ago that we had a conference in our office preliminary to determining what sort of reports we should have, and one gentleman said, "I think we ought to have a report of every scratch." "Well, then," I said, "if you carry that thing to its logical conclusion, if a man goes up on a ladder and leaves a monkey wrench on it and you walk under it, you ought to have a report of that because it might have dropped down and broken your head, ad infinitum." I want to stress just one thing, and that is that the trouble with most safety people and with most leaders in safety is that they do not emphasize the necessity for using our imagination without visible evidence. In other words, in the steel industry, the railroads, and all the other industries there are dangers that are imminent, that have been present

ever since the industry started. Now that does not require—if you sit down and look over the field of accident statistics—that you get the no-disability accidents or the one-day accidents or the three-day accidents.

In my judgment, if you take more than three days you have sufficient, and if you are not having accidents, all you have to do is to be sensible enough to use a little imagination, like you do when going out on a cloudy day you take your umbrella. In railroad circles we are laying great emphasis on the fact that in the midst of life we are in danger. We are preaching "Watch your step" on the basis of knowledge we have already accumulated from many, many sources. Take the crossing accident, for example. Few persons would hardly realize that a locomotive will cross a crossing 150,000 times on the average before there is a single accident. The very infrequency of them is what leads us astray, and that is the thing it seems to me we need to emphasize. If we get together, like scientific men ought to do, and get a tabulation of accidents, for example, in plant B and plant C in the various industries, and determine certain hazards of particular plants, it does not matter whether we have accidents or not—there are the dangers. It does not matter whether during January, February, and March you had three accidents and during April, May, and June you did not have any. You were aware of, you knew about, the danger. So all the figures you get are very useful, but the most useful thing is to have imagination enough to picture danger where it has not been manifested, and that is working out in connection with our efficiency tests on the railroad. We do not wait for a collision or a derailment or a violation of the blue flag, or anything of that sort, and we make thousands of checks a month on every large railroad in the country. It seems to me—I am a statistician, I have handled statistics for 15 years—what most of us are trying to do is to become actuated by statistics when we ought to do it by constructive imagination.

A little further illustration along that line will, it seems to me, substantiate my position. We have shops on our railroad where we used to average 40 to 50 injuries a month, but now they call me on the phone and say, "We got through the whole month without a single injury"; and Mr. De Blois spoke about a million man-hours being made without a single injury. How in the name of common sense are we ever going to get along if we do not have any more injuries? Pretty soon we safety fellows won't know what to do to prevent them and there won't be any job for us. That is one of the stumblingblocks in the safety movement. We make a good record; we do not have any accidents; nobody gets killed; there are no violations of the blue flag; nobody gets anything in their eyes from failing to wear goggles; and we let the thing down. I maintain that the hardest job a safety man has is not to get his shop safe—that seems to me to be the easiest thing of the whole proposition—but when you do get your house in order to keep it there. What you have to do is to take the statistics of the past and your constructive, intelligent imagination and take action where accidents have not occurred.

Mr. DE BLOIS. May I attempt to reply to two of the speakers at the same time? To Mr. Carrow I would like to offer this thought.

As regards reporting, not near-injury accidents, but minor injuries (which is obviously the place to begin), if there is a fixed numerical relationship—mind you, I do not say that there is—between minor injuries and major injuries, by ascertaining the frequency of the former we ought to be able to learn as much from one day's minor injury experience as we now learn in a year. This is based on the assumption that there exists some such relationship as 300 to 1, and that this or some similar relationship maintains for each line of industry. I am offering this thought because many of us do not know precisely what our plants are really doing until a year's experience has been obtained.

In reference to the question brought up by Commissioner Jackson: The 65 per cent increase in efficiency was the experience of the Simmons Co. at Kenosha on a battery of about 300 punch presses. I want to emphasize the point that the accidents were eliminated and production efficiency increased without the addition of any punch press guards; it was purely a matter of changing the type of feed and the method of removing the finished material from the presses. Prevention by protection did not enter into the matter. When the exposure of the hands between the dies of the presses was obviated, the efficiency increased and accidents to fingers were eliminated over a long period; I believe, four years. This was essentially an instance of successful engineering revision.

The CHAIRMAN. After all, removing the cause is the real reason and I think that the deductions of Mr. De Blois are well founded, because a mere injury accident is just as serious from a production standpoint as an actual casualty accident.

Any further discussion of this paper?

Mr. UPRON, Pittsburgh Steel Co. A thought came to my mind a moment ago in regard to the reporting of a minor accident. We employ approximately 7,500 men, and one of the worst, or I might say the most poisonous, things in our steel mill is a nail sliver. If any of you are acquainted with the nail business you know what I mean by a scratch from a nail sliver. About three weeks ago our doctor called me to the hospital and showed me a case of a boy 17 years old who had scratched his hand with a nail sliver. The boy did not report it. He was off from work for a week before he reported sick, and at the end of a week—probably, I might say, 10 days—his mother brought him to the hospital, and when I was called there they had just cut his hand. They had split his hand from where the fingers go on back to here [indicating]. It was swollen to probably four times its natural size; it was stuffed with gauze and stuck out like a slice of a watermelon. Doctor Griffith told me that he would do the best he could to save that boy's hand but the chances were that he would have to take it off; but, thank goodness, he saved it. It seems so now, at least; but the thought came to my mind when the gentleman spoke of minor injuries that here was a case where if the boy had at once reported to the hospital—naturally, that hand will be crippled for the rest of his life—it could all have been very easily prevented.

Mr. CARROW. The case that he cites proves my contention, because in every first-class establishment in the United States to-day

they have a first-aid room and they are treating cases by the hundreds. If the United States Steel Corporation, or the Pennsylvania Railroad, or the Baltimore & Ohio Railroad, or any other big institution recorded all the cases that go to their first-aid room, there would be 10 times as many reports as there are—actual reports of accidents.

The CHAIRMAN. The next subject on the program is "Our use of accident statistics in Canada," by R. B. Morley, and I take great pleasure in introducing Mr. Morley.

OUR USE OF ACCIDENT STATISTICS IN CANADA

BY R. B. MORLEY, GENERAL MANAGER, INDUSTRIAL ACCIDENT PREVENTION ASSOCIATIONS, TORONTO

In the first place, may I express to you gentlemen my sincere appreciation for your courtesy in extending an invitation to be present at this important conference and my thanks for the chance to tell you something of the use we are making of the available statistics in our work in Canada. It has always pleased me particularly to find that safety work knows no boundaries and that safety men have an international spirit.

For something over 12 years I have earned my daily bread through accident-prevention work, so that anything I have to say regarding statistics is based on the practical application of statistics, but I am quite willing to admit at the outset that I have not the statistical mind.

ORGANIZATION FOR SAFETY WORK

In order to give you a proper understanding of our use of statistics relating to accident prevention, it is necessary for me to paint in a certain background and to state that reference is made chiefly to the Province of Ontario and its industries there.

Our compensation act divides industries into schedules 1 and 2 and Crown cases. The Crown cases are those of the Provincial or Federal Governments. Schedule 2 covers the municipalities, steam and electric railways, telegraph and telephone companies, school boards, etc. These are self-insurers. Schedule 1 consists of the various manufacturing plants under compensation and includes as well lumbering and construction work. The classes in Schedule 1 have been grouped together by the workmen's compensation board for assessment purposes, and each of these classes is in effect a mutual insurance company.

When the late Sir William Ralph Meredith, Chief Justice of Ontario, was preparing his report to the Government in 1914 on the laws relating to the liability of employers, it was suggested by industry that there should be arrangements made for accident-prevention work. Acting on this, the chief justice included a section in the proposed act which authorized the industries in any of the classes grouped together by the workmen's compensation board to create accident-prevention organizations, which might be maintained out of the accident fund of the compensation board. Under the authority given in section 101 of our act, 18 out of the 24 classes

under compensation have set up such associations and these secure their funds from the workmen's compensation board.

Of the 18 classes organized for accident prevention, 15 federated some years ago, for purposes of economy and better general direction of effort, in the Industrial Accident Prevention Associations. The membership of the organization consists of nearly 7,500 industries and these industries have a total of slightly over two-thirds of the pay roll of 24 classes under compensation. The directors of the Industrial Accident Prevention Associations are elected each year at the annual general meeting and represent not only the various phases of industry included in our membership but also the Province geographically.

The work of the Associations is divided roughly into two headings:

(1) Engineering and inspection services in the individual plants; and (2) Educational propaganda. There is, I take it, at a meeting such as this no need to enlarge on either of these two phases other than to state that the inspection force are trained for accident-prevention purposes. They do not go into plants to enforce rules and regulations but for the purpose of cutting down accidents for the benefit of employer and employee.

COMPENSATION BENEFITS

Under the Ontario act we have a seven-day waiting period. In death cases the widow, if any, receives a payment of \$40 a month for life or until remarriage and there is an allowance of \$10 a month for each child under 16. In nonfatal cases the injured worker is entitled to 66 $\frac{2}{3}$ per cent of his average earnings, any earnings in excess of \$2,000 per annum being discarded in making the calculation. Pensions are, of course, awarded for permanent disabilities, and it is quite possible for the cost of a permanent total disability under the Ontario act to run up to \$24,000 or \$25,000. It will be seen from this that the benefits are unusually high and that this in itself must tend to encourage effective accident-prevention work. Rates of assessment in Ontario vary from 10 cents to \$10 per \$100 of pay roll.

I should add to this that the testing of flying machines is the only industry that pays the \$10 rate in Ontario. The average rate of all in Ontario is \$1.13 and hundreds of plants in our classes are paying the 10-cent rate.

ACCIDENT REPORTS

Every week we receive from the workmen's compensation board accident reports covering all cases involving the loss of seven days' time, or more, in the classes included in our membership. This material is extremely valuable and is the basis of the statistics on which I particularly wish to speak to-day. The accident memo, as it is termed, gives us the name and address of the employer; the name, age, occupation, allegiance, etc., of the injured worker; the hour and the date of the accident; and a brief statement of the cause and the nature of the injury. We receive from 12,000 to 15,000 of these accident memos every year. The information contained is of the

greatest possible value in accident-prevention work. It shows us where accidents are happening, how accidents are happening, and gives the individual plant experience as well as the class experience on a general frequency basis. Each industry on our lists has its own separate card, and as the accident memos are received from the board they are entered on the backs of these cards. The face of the card contains information regarding the firm, the names of executive officials, the class of business, and details of the inspector's last visit, including the number of employees and the attitude toward safety work. Each entry on a card calls for a check of the number of accident memos received against this particular plant in the previous 12 months. A standard has been established, and cards are thrown out for check by our chief inspector when the frequency is above the average. An individually typed letter is forwarded to each industry that has high-accident frequency, pointing out to the employer that assessments are determined directly by accident costs, and stating that high-accident frequency and high money cost do not necessarily go together but that high frequency is an indication of a condition that should be corrected. At the time the letter is forwarded a memorandum is sent to the inspector on whose list the plant appears, advising him and instructing him that he check conditions, and we get satisfaction.

At the outset I made the remark that I have not the statistical mind, and here I want to say that I have no use for figures as such. Calculations of any type are of no value in the work of industrial accident prevention unless some practical use is made of them. The compilation of statistics and the publishing of these without an effort being made to correct the conditions disclosed by the figures is, I believe, an absolute waste of time.

I am glad to say to you that our investigations and correspondence have proven well worth while, and also are an intensely practical method of using accident statistics. You will notice also the effect of this statistical information on our field force. The inspector's value to the organization is determined by the condition of the plants on his lists. The responsibility for plant conditions is laid partly on his shoulders.

Our frequency letter has produced some most interesting correspondence with executive officials. I remember, in one instance, one day at luncheon meeting the general manager of a plant employing 300 workers to whom I had written regarding his high accident frequency. He told me that he was interested in the letter but that my figures were wrong. I suggested a further check and was asked if I would call at his plant some time in the near future. About a fortnight later, when I called, the first thing he said was, "I was wrong; I did not know what was happening in my own plant." This man became converted to accident prevention and insisted on results from that time on. I told him that, based on our analysis of his accident reports, his trouble was lack of supervision, and his reply indicated that the investigation which he had made in the previous two weeks had already disclosed this fact for his own information.

We pay a great deal of attention to accident frequency, taking frequency as the first test of plant conditions. For accident-preven-

tion purposes one severe accident in a plant does not provide the same test of conditions as accident frequency.

Enough has been said about the accident memos to bring to your attention the importance of information through this source. At the beginning of each week, every inspector sends to the office a statement as to where he will be the following week and the names of the plants on which he intends calling. Before he calls at these plants he has in his hands from our office a statement showing the number of compensated accidents for the past 12 months in each of the plants to be visited that week. This provides him with a most valuable opening for any discussion with the executive officials of the plant and at the same time offers him a chance to go into the question of records and to encourage employers who are not keeping satisfactory records of accidents to do so.

MERIT RATING

The Ontario act provides for a system of merit rating. Under this clause of the act merit rating is now calculated on a three-year basis and it is possible for an employer to receive a refund of 30 per cent of his assessment for good experience or to be charged an additional 25 per cent of his assessment for bad experience. At the expiration of the last three-year period, the chairman of the workmen's compensation board supplied us with the figures for the 400 firms in our membership who had a bad money experience. They say that money talks and I believe that it is so, because the subsequent correspondence with these firms who had had a bad money experience was intensely illuminating and resulted in greatly increased interest in accident-prevention work. No president or general manager likes to be told that his accident cost has been unusually high and that his plant has been responsible for throwing a burden on the other employers in the class, and it is worth while remarking that the bulk of the replies that came in from these 400 firms were signed by presidents or general managers.

STATISTICS FOR EXECUTIVES

You will gather from what has already been said that the workmen's compensation board is most generous in giving us information. It has been considered part of our duty to convey certain phases of this information to executive officials for the purpose of keeping them keenly interested in accident-prevention work. Each month we distribute to our entire membership a letter known as the Monthly Memorandum for Industry and with that we put out safety bulletins, pay-envelope inserts, leaflets, etc. The monthly memorandum contains information regarding accident records, statistics for the previous month, money costs, etc., and there are various ways of putting out this information that are calculated to arouse interest. For instance, at the beginning of this year we made the statement that 502,014 accidents had been reported to the Workmen's Compensation Board in Ontario in the past 11 years and that these figures included 4,328 fatalities. Five hundred thousand odd is a large figure and may or may not be grasped by the average

individual. On the other hand, when you say that there were 4,328 fatalities in 11 years and that in the same time there were 4,018 days, you have put your figures on a basis that anyone can follow.

Another interesting piece of information that has come out of the statistics compiled has been that something less than 1 per cent of the accidents reported to the board are fatalities and that these involve nearly 25 per cent of the total cost of compensation; that about 4 per cent of the accidents reported are permanent disabilities, either total or partial, and that these involve nearly 50 per cent of the cost; or, to put it on another basis, about 5 per cent of the accidents reported are responsible for nearly 75 per cent of the cost of compensation. You will all appreciate the value of these figures.

The average plant with us in Canada, as with you in the United States, is the small unit. The question of directing accident prevention in those units is a most important matter. You have many different executives through which to work, but I believe that the system adopted years ago in Ontario and since carried on so successfully has demonstrated fully that executives can be kept interested in this work.

I believe that accident prevention is one of the most important questions that industry can touch, and I take the liberty at this time of congratulating the Hon. Mr. Davis on calling this conference in Washington. You know and we know that accidents can be prevented. We all know that statistics prove this and I want to cite two of the outstanding examples we have in Ontario. The Canada Cement Co., Port Colbourne, operating a cement mill and a quarry with an average of 245 men, ran for 521 days without a single loss-of-time accident and won the Portland Cement Trophy for 1925. The International Harvester Co., Chatham Works, with an average of 115 men, operated for 908 days without a lost-time accident.

We are preaching in our industries five things for accident prevention: (1) Faith in the safety movement, (2) protection of hazards, (3) supervision, (4) good housekeeping, and (5) safety education; and we are getting results.

I say to you in all earnestness to-day that what we need to secure industrial accident prevention is not more statistics, but more intensive work in industry based on the statistics that are now available.

(Meeting adjourned.)

FRIDAY, JULY 16—MORNING SESSION

CHAIRMAN, ROBERT H. CARR, CHAIRMAN MARYLAND STATE INDUSTRIAL ACCIDENT COMMISSION

Commissioner STEWART. I want to introduce to you our chairman, who is the commissioner of the Maryland Industrial Commission. I want to say of Maryland that it is one of the States which has cooperated with the Bureau of Labor Statistics in furnishing us the background of man-hours as against the accidents in establishments. We asked them to furnish that for us and it is the only State that did all the work. We have to go out and get it ourselves from the other States, although I think that condition is remedying itself very rapidly. I introduce to you the chairman of the morning session, Mr. Carr, of Maryland.

The CHAIRMAN. It is indeed a great pleasure to be here to-day under an appointment from our worthy governor, Albert C. Ritchie, in response to the invitation issued to him by the Secretary of Labor and by Mr. Stewart. We also have here from Maryland representatives of the State industrial accident commission, the chairman of the Baltimore Safety Council, and the Safety Engineers' Club, and we have been much interested in the proceedings during the past two days. We are here and willing to do what we have tried to do in cooperation with the Commissioner of Labor Statistics, Mr. Stewart, who some time back outlined to us what he would like the State commission to do in the way of preparing our statistics and in furnishing to him information of the kind that would be useful in accident prevention.

During the last two days you have been, I am sure, much interested, and I think the third day promises at least to equal in interest the proceedings of the two previous days. We have with us as the first speaker Lew R. Palmer, of the Equitable Life Assurance Society, who will address the conference on "Statistical contributions to accident prevention on American railways."

STATISTICAL CONTRIBUTIONS TO ACCIDENT PREVENTION ON AMERICAN RAILWAYS

BY LEW R. PALMER OF THE EQUITABLE LIFE ASSURANCE SOCIETY

With others working for the conservation of life, I am interested in accident statistics only in so far as they may be developed, presented, and utilized in such a way as to serve as a definite agency of prevention. It is apparent that one must know the facts to work out any problem, and no one to-day denies that accident prevention is a real problem.

Statistics (tabulated facts) have played a very important part in railroad safety. It is most fortunate that there has been available,

through the records of the Interstate Commerce Commission, a fund of information without parallel in any of the industries of this country. The extent of coverage (some four and one-half billion man-hours for 1924) and the standardization of records have made these accident statistics invaluable to the railroad safety men and their superior officers. Dependable information has pointed to definite causes in a wide field of exposure, serving as guide for the application of preventive measures. The very fact of the enormous loss due to this broad exposure has aided the preventionist in selling his safety program to the executive, and in many cases the progressive official has needed no urging to extend the support necessary to make safety a definite part of railroad operation.

The Interstate Commerce Commission accident statistics as we find them to-day are the result of healthy evolution—standardized classification and tabulation by principal causes, nature of injury, and occupations, with their attending frequencies, killed and injured, according to adopted units of exposure.

For the year 1921 we find published in Interstate Commerce Commission Accident Bulletin No. 82, Table 100, the adoption of the million-passenger-mile as a unit of exposure for accidents to passengers (train and train-service) listed alphabetically by roads for eastern, western, and southern districts, and summarized for all Class I roads. However, the information available at that time was apparently not sufficient from which to determine the rate killed, and the rate injured was extended to include only one decimal place. We also find in this table the adoption of the man-hour unit of exposure in connection with employees on duty (train, train-service, and nontrain accidents), with rates killed and injured per unit of exposure carried to include only one decimal place. It is generally conceded that million-passenger miles and million man-hours furnish the truest exposure for these classes of accidents.

In Accident Bulletin No. 87, covering the calendar year 1922, we find Table 100 presented as in Bulletin No. 82 just referred to, with additional information as regards rate of passengers killed per million-passenger miles, carried three decimal places, and employees on duty killed per million man-hours, also carried to three decimal places.

In Accident Bulletin No. 92, covering the calendar year 1923, Table 100 has been presented in the same manner as in Bulletin No. 87.

In Accident Bulletin No. 93, calendar year 1924, two separate tables appear—Nos. 99 and 100—which contain information previously submitted in Table 100, as well as additional information, Table 99 giving summary, by roads and by classes of occupation, of casualties to employees on duty in train, train-service, and nontrain accidents, showing for Class I roads casualty rates per million man-hours under the following groups of occupations:

- Group I. Executives, officials and staff assistants; and Group II. Professional, clerical, and general;
- Group III. Maintenance of way and structures;
- Group IV. Maintenance of equipment and stores;
- Group V. Transportation (other than train, engine, and yard);
- Group VIa. Transportation (yardmasters, switch tenders, and hostlers);

Group VIb. Transportation (train and engine).

This table 99, in conjunction with Table 55, supplies detailed information regarding killed and injured by principal causes, covering some 150 classes of occupations on Class I railroads. Against these occupations, involving 4,472,049,000 man-hours, 122,315 casualties were charged for the year 1924. Surely, this furnishes the railroad safety men with positive evidence as to where and how accidents happen on our American railways.

Following is a table of the six major occupational groups, comparing the year 1925 with the year 1924, and showing the result for the two years combined. An analysis of this table reveals the risk factors of the respective groups, indicating where the efforts of our railroad safety men can best be applied in order to effect the greatest saving in lives and limbs.

TRAIN, TRAIN-SERVICE, AND NONTRAIN ACCIDENTS TO EMPLOYEES ON DUTY—
TOTAL CLASS I RAILROADS

| Group and year | Killed | Injured | Total casualties | Man-hours (million) | Casualties per million man-hours |
|-------------------------|--------------|----------------|------------------|---------------------|----------------------------------|
| Groups I and II: | | | | | |
| 1924..... | 42 | 1,883 | 1,925 | 728,485 | 2.64 |
| 1925..... | 28 | 1,760 | 1,788 | 724,358 | 2.47 |
| Total..... | 70 | 3,643 | 3,713 | 1,452,843 | 2.56 |
| Group III: | | | | | |
| 1924..... | 427 | 26,018 | 26,445 | 961,423 | 27.50 |
| 1925..... | 451 | 26,161 | 26,612 | 972,572 | 27.36 |
| Total..... | 878 | 52,179 | 53,057 | 1,933,995 | 27.43 |
| Group IV: | | | | | |
| 1924..... | 219 | 52,227 | 52,446 | 1,318,639 | 39.78 |
| 1925..... | 193 | 45,629 | 45,822 | 1,292,754 | 35.45 |
| Total..... | 412 | 97,856 | 98,268 | 2,611,393 | 37.63 |
| Group V: | | | | | |
| 1924..... | 66 | 9,893 | 9,959 | 565,090 | 17.61 |
| 1925..... | 76 | 10,568 | 10,644 | 559,476 | 19.08 |
| Total..... | 142 | 20,461 | 20,603 | 1,124,566 | 18.31 |
| Group VI a: | | | | | |
| 1924..... | 19 | 1,553 | 1,572 | 69,416 | 23.64 |
| 1925..... | 20 | 1,432 | 1,452 | 67,535 | 21.50 |
| Total..... | 39 | 2,985 | 3,024 | 136,951 | 22.08 |
| Group VI b: | | | | | |
| 1924..... | 630 | 29,338 | 29,968 | 829,533 | 36.13 |
| 1925..... | 692 | 29,089 | 29,781 | 831,682 | 35.81 |
| Total..... | 1,322 | 58,427 | 59,749 | 1,661,215 | 35.97 |
| All groups: | | | | | |
| 1924..... | 1,403 | 120,912 | 122,315 | 4,473,186 | 27.34 |
| 1925..... | 1,460 | 114,639 | 116,099 | 4,448,377 | 26.10 |
| Total..... | 2,863 | 235,551 | 238,414 | 8,921,563 | 26.72 |

The table following indicates the varying number of train accidents, year 1924 compared with the year 1920, charged against four major causes, namely: Negligence of employees; defects in or failure of equipment; defects in or improper maintenance of way and struc-

tures; miscellaneous causes. An analysis of these figures reveals the fact that of a total of approximately 60,000 train accidents involving over 13,000 casualties more than 50 per cent are chargeable to the negligence of employees. Comparing the detailed percentages as shown in the table, we note again that the human factor promises the most fertile field for our preventive efforts.

COMPARISON OF TRAIN ACCIDENTS IN 1920 AND 1924, BY CLASS OF ACCIDENT

| Class of accident | Number of train accidents | Killed | Injured | Total casualties | Per cent of total casualties |
|--|---------------------------|-----------------|---------|------------------|------------------------------|
| Negligence of employees: | | | | | |
| 1920..... | 10,757 | 330 | 4,176 | 4,506 | 51.98 |
| 1924..... | 6,150 | 158 | 1,981 | 2,139 | 49.14 |
| Reduction..... | 4,607 | 172 | 2,195 | 2,367 | 5.46 |
| Defects in or failure of equipment: | | | | | |
| 1920..... | 14,854 | 52 | 1,055 | 1,107 | 12.77 |
| 1924..... | 9,295 | 29 | 323 | 357 | 8.20 |
| Reduction..... | 5,559 | 23 | 727 | 750 | 35.79 |
| Defects in or improper maintenance of way and structures: | | | | | |
| 1920..... | 5,549 | 39 | 1,403 | 1,442 | 16.64 |
| 1924..... | 3,662 | 27 | 794 | 821 | 18.86 |
| Reduction..... | 1,887 | 12 | 609 | 621 | ¹ 13.34 |
| Miscellaneous causes: | | | | | |
| 1920..... | 5,153 | 115 | 1,498 | 1,613 | 18.61 |
| 1924..... | 3,261 | 153 | 883 | 1,036 | 23.80 |
| Reduction..... | 1,892 | ¹ 38 | 615 | 577 | ¹ 27.89 |
| Total: | | | | | |
| 1920..... | 36,313 | 536 | 8,132 | 8,668 | 100.00 |
| 1924..... | 22,368 | 367 | 3,986 | 4,353 | 100.00 |
| Reduction..... | 13,945 | 169 | 4,146 | 4,315 | ----- |

¹ Increase.

Table 100, year 1924, includes a record, by roads, of casualties to passengers per million passenger miles in train and train-service accidents.

These are but a few examples of the detailed information compiled and distributed by the Bureau of Statistics of the Interstate Commerce Commission. An analysis of these statistics year by year reveals facts that would seem to indicate that this information is being utilized effectively by the various roads in their organized safety work. Comparing Interstate Commerce Commission records for 1917 (when the Interstate Commerce Commission records were definitely placed on a calendar-year basis) with the records for subsequent years, including 1924, we find during that period a cumulative saving of 20,640 lives among persons under the direct control and protection of our American railways (Bulletin No. 93, Statements 1 and 3, p. 111), excluding grade crossing and trespasser fatalities. A corresponding reduction in reportable injuries of 296,573 was effected during the same period.

Comparing the number of employees on duty killed in train, train-service, and nontrain accidents, for the years 1920 and 1924 we find: Year 1920, 2,439; year 1924, 1,403; lives saved, 1,036.

One of the most remarkable achievements in accident prevention is contained in our Interstate Commerce Commission records indi-

ating the reduction in casualties resulting from collisions, depicted by the following chart, which covers the years 1907 to 1924, inclusive:

TOTAL CASUALTIES RESULTING FROM COLLISIONS ON STEAM RAILROADS, FOR YEARS 1907 TO 1924, INCLUSIVE

| Year | Total number of casualties |
|---------|----------------------------|
| 1907 | 10,317 |
| 1908 | 8,126 |
| 1909 | 5,737 |
| 1910 | 8,198 |
| 1911 | 7,430 |
| 1912 | 6,327 |
| 1913 | 8,488 |
| 1914 | 6,163 |
| 1915 | 5,937 |
| 1916 | 4,211 |
| 1917 | 5,465 |
| 1918 | 4,930 |
| 1919 | 4,169 |
| 1920 | 4,093 |
| 1921 | 1,969 |
| 1922 | 2,708 |
| 1923 | 2,509 |
| 1924 | 1,924 |
| TOTAL.. | 100,701 |



This record indicates a reduction of 81 per cent in 17 years, or, comparing 1907 with each subsequent year, a cumulative saving of 87,005 casualties for the period.

From the "wastage" account for each of the years 1921, 1922, 1923, and 1924, as compared with the year 1920, we obtain the following cumulative amount saved:

| | |
|-----------------------|--------------------|
| Collisions | \$13,495,711 |
| Derailments..... | 23,528,543 |
| Personal injury | 79,527,936 |
| Total | 116,552,190 |

In a previous paper we took the liberty of removing the impersonal, alphabetical "bushel" from the "light" of Interstate Commerce Commission railroad accident statistics by presenting them on a numerical basis, the purpose being to establish among the railroads the same spirit of contest and friendly competition which had proven so effective an agency for accident prevention in other industries. Recognizing the fact that with large railroads, as with other large industrial organizations, it is more difficult to control accident frequency than within smaller organizations, several group contests were outlined among Class I railroads in order to overcome this handicap, the Interstate Commerce Commission records of 1923 being utilized. These were grouped more or less arbitrarily according to size of road—that is, their respective man-hour (train, train-service, and nontrain) exposure—as follows:

- Group A.—100,000,000 or more man-hours.
- Group B.—50,000,000 to 100,000,000 man-hours.
- Group C.—20,000,000 to 50,000,000 man-hours.
- Group D.—10,000,000 to 20,000,000 man-hours.
- Group E.—5,000,000 to 10,000,000 man-hours.
- Group F.—2,000,000 to 5,000,000 man-hours.
- Group G.—Less than 2,000,000 man-hours.

Had all roads in each of these respective groups attained the rate recorded by the "rank 1" road in each group, there would have been a total reduction of approximately 122,339 reportable injuries for all seven groups.

ESTIMATED POSSIBLE REDUCTION OF INJURIES ON CLASS I RAILROADS, BY GROUPS

| Group | Number of roads | Total man-hours | Estimated possible reduction of injuries |
|--------------------|-----------------|----------------------|--|
| Group A..... | 13 | 2,672,900,000 | 63,797 |
| Group B..... | 18 | 1,338,897,000 | 31,322 |
| Group C..... | 22 | 647,394,000 | 12,271 |
| Group D..... | 18 | 269,511,000 | 6,223 |
| Group E..... | 27 | 185,538,000 | 4,437 |
| Group F..... | 35 | 116,763,000 | 2,961 |
| Group G..... | 38 | 47,713,000 | 1,306 |
| Total | 171 | 5,268,706,000 | 122,339 |

As evidence of the fact that our Class I railroads are alive to the value of the contest spirit, there was adopted at the Salt Lake City meeting of the safety section, American Railway Association, the following resolution:

Whereas, the records of the Interstate Commerce Commission as given in the report of the committee on statistics indicate that casualties to persons on the railroads of the United States can be reduced 35 per cent by the end of the year 1930 and that such a reduction should be adopted as a definite goal of the safety section; be it, therefore,

Resolved, That the American Railway Association, safety section, in annual convention assembled at Salt Lake City, Utah, June 24, 1924, hereby accept the report of the committee on statistics and adopt for the safety section a goal calling for a reduction in casualties to persons by the end of 1930 which will be equivalent to 35 per cent.

For the past two years the game has been keenly contested by the various Class I railroads, and in order to determine how the safety score stands to date we again turn to the Interstate Commerce Commission accident statistics for our official record.

Comparing the 1925 accident frequency rates we find that 101 roads out of a total of 176 included within the seven contest groups have attained their two-year quota; that is, a 14 per cent reduction. The record by groups stands as follows:

| Group | Total roads | Roads attaining quota | Group | Total roads | Roads attaining quota |
|--------------|-------------|-----------------------|--------------|-------------|-----------------------|
| Group A..... | 14 | 9 | Group F..... | 34 | 16 |
| Group B..... | 20 | 13 | Group G..... | 43 | 17 |
| Group C..... | 18 | 13 | | | |
| Group D..... | 23 | 14 | Total..... | 176 | 101 |
| Group E..... | 24 | 19 | | | |

Of these 176 roads, the following 30 roads have in two years attained their full 35 per cent five-year quota reduction according to their 1925 Interstate Commerce Commission frequency records:

RAILROADS REDUCING ACCIDENTS 35 PER CENT OR MORE IN TWO YEARS

| Group and railroad | 1925 casualty rate | Per cent of reduction in 2 years |
|--|--------------------|----------------------------------|
| Group A: Union Pacific System..... | 5.10 | 35.20 |
| Group B: | | |
| Union Pacific R. R. Co..... | 2.87 | 42.60 |
| Southern Pacific Lines in Texas and Louisiana..... | 11.32 | 48.69 |
| Great Northern..... | 20.04 | 36.02 |
| Group C: | | |
| Oregon Short Line..... | 7.45 | 48.90 |
| Wabash..... | 12.08 | 61.82 |
| Delaware & Hudson..... | 19.48 | 38.99 |
| Group D: | | |
| Chicago Great Western..... | 8.25 | 39.25 |
| Kansas City Southern..... | 16.53 | 44.46 |
| Missouri, Kansas & Texas..... | 22.80 | 38.26 |
| Kazoo & Mississippi Valley..... | 22.89 | 45.63 |
| Chicago & Eastern Illinois..... | 36.62 | 68.59 |
| Group E: | | |
| Bessemer & Lake Erie..... | 17.84 | 44.44 |
| Chicago River & Indiana..... | 18.45 | 63.94 |
| Detroit, Toledo & Ironton..... | 19.96 | 38.13 |
| Fort Worth & Denver City..... | 24.88 | 45.09 |
| Indiana Harbor Belt..... | 26.69 | 48.98 |

RAILROADS REDUCING ACCIDENTS 35 PER CENT OR MORE IN TWO YEARS—Con.

| Group and railroad | 1925 casualty rate | Per cent of reduction in 2 years |
|--|--------------------|----------------------------------|
| Group F: | | |
| Baltimore, Chesapeake & Atlantic..... | 1.34 | 38.81 |
| Duluth & Iron Range..... | 5.99 | 44.12 |
| Grand Trunk Lines in New England..... | 11.87 | 42.78 |
| Gulf, Mobile & Northern..... | 19.42 | 37.13 |
| Louisville, Henderson & St. Louis..... | 22.60 | 45.42 |
| Group G: | | |
| Green Bay & Western..... | 1.44 | 90.15 |
| Pittsburg & Shawmut..... | 9.54 | 57.26 |
| Wichita Valley..... | 12.53 | 67.63 |
| Lake Superior & Ishpeming..... | 14.68 | 52.32 |
| Fort Worth & Rio Grande..... | 18.06 | 36.82 |
| Mississippi Central..... | 18.30 | 61.22 |
| St. Louis, San Francisco & Texas..... | 37.31 | 59.32 |
| Bingham & Garfield..... | 48.32 | 41.32 |

At the St. Louis conference of the safety section, American Railway Association, held in April of this year, we presented a paper analyzing casualties to employees on duty in train, train-service, and nontrain accidents, Class I steam railroads, years 1923, 1924, and 1925, and following is a table summarizing the performance of the various Class I railroads by groups and by districts:

CASUALTIES AND CASUALTY RATES (PER MILLION MAN-HOURS), CLASS I RAILROADS, 1923 AND 1925, BY GROUPS AND DISTRICTS, AND ACCIDENT REDUCTION, 1924 AND 1925

SUMMARY BY GROUPS

| Rank ¹ | Group ² | Number of roads | 1923 | | | 1925 | | | Reduction in casualty rate, 1923 to 1925 | Balance of quota reduction ³ |
|-------------------|--------------------|-----------------|------------------|---------------|---------------|------------------|---------------|-----------------|--|---|
| | | | Total casualties | Man-hours | Casualty rate | Total casualties | Man-hours | Casualty rate | | |
| | | | | | | | | <i>Per cent</i> | <i>Per cent</i> | |
| 1 | Group C..... | 18 | 15,710 | 533,092,000 | 29.47 | 11,147 | 503,022,000 | 22.16 | 24.80 | 10.20 |
| 2 | Group B..... | 20 | 41,176 | 1,457,676,000 | 28.25 | 33,285 | 1,390,950,000 | 23.93 | 15.29 | 19.71 |
| 3 | Group E..... | 24 | 5,456 | 170,769,000 | 31.95 | 4,014 | 162,567,000 | 24.08 | 24.63 | 10.37 |
| 4 | Group D..... | 23 | 12,377 | 368,432,000 | 33.59 | 8,657 | 341,774,000 | 25.33 | 24.59 | 10.41 |
| 5 | Group F..... | 34 | 3,685 | 126,761,000 | 29.07 | 3,284 | 120,867,000 | 27.17 | 6.54 | 28.46 |
| 6 | Group A..... | 14 | 92,450 | 2,986,241,000 | 30.96 | 72,883 | 2,667,267,000 | 27.32 | 11.76 | 23.24 |
| 7 | Group G..... | 43 | 1,642 | 55,225,000 | 29.73 | 1,459 | 52,875,000 | 27.59 | 7.20 | 27.80 |

SUMMARY BY DISTRICTS

| Rank ¹ | District | 1923 | | | 1925 | | | Reduction in casualty rate, 1923 to 1925 | Balance of quota reduction ³ |
|-------------------|----------------------------|------------------|---------------|---------------|------------------|---------------|---------------|--|---|
| | | Total casualties | Man-hours | Casualty rate | Total casualties | Man-hours | Casualty rate | | |
| | | | | | | | | <i>Per cent</i> | <i>Per cent</i> |
| 1 | Southern..... | 23,616 | 863,959,000 | 27.33 | 19,337 | 860,751,000 | 22.47 | 17.78 | 17.22 |
| 2 | Western..... | 50,659 | 1,813,460,000 | 27.93 | 36,979 | 1,632,665,000 | 22.65 | 18.90 | 16.10 |
| 3 | Eastern..... | 75,737 | 2,179,545,000 | 34.75 | 59,783 | 1,954,961,000 | 30.58 | 12.00 | 23.00 |
| | All Class I railroads..... | 150,012 | 4,856,964,000 | 30.88 | 116,099 | 4,448,377,000 | 26.10 | 15.48 | 19.52 |

¹ Rank based on casualty rate for 1925.

² Groups consist of roads having specified man-hour exposure (see p. —) during 1925.

³ Quota = 35 per cent reduction by end of 1930 (based on 1923 casualty rate).

CASUALTIES AND CASUALTY RATES (PER MILLION MAN-HOURS), CLASS I RAILROADS, 1923 AND 1925, BY GROUPS AND DISTRICTS, AND ACCIDENT REDUCTION, 1924 AND 1925—Continued

ACCIDENT REDUCTION

| Item | Killed | Injured | Total casualties |
|---|--------|---------|------------------|
| ALL CLASS I RAILROADS | | | |
| Estimated accidents for— | | | |
| 1924 at 1923 rates..... | 1,000 | 136,369 | 138,068 |
| 1925 at 1923 rates..... | 1,000 | 135,475 | 137,165 |
| Total estimated accidents, 1924 and 1925..... | 3,389 | 371,844 | 375,233 |
| Reported accidents, 1924 and 1925..... | 2,864 | 235,549 | 238,413 |
| Reduction from 2-year estimate..... | 525 | 36,295 | 36,820 |

As announced by the American Museum of Safety, the E. H. Hariman Memorial Safety Award for the year 1925 will be very largely determined on the basis of rating of the respective roads as indicated by official Interstate Commerce Commission statistical records.

In order to check up on the effectiveness of statistics let us analyze the records of a railroad which has led all major railroads of this country in the lowest accident frequency for the past five years according to Interstate Commerce Commission records. The accompanying chart covers Interstate Commerce Commission reportable casualties on this railroad for the years 1914 to 1924, inclusive, indicating that on a frequency basis there has been effected a reduction of 90 per cent in 10 years, and on a cumulative basis, comparing 1914 with each subsequent year, a reduction in reportable casualties of 10,346 for this period.

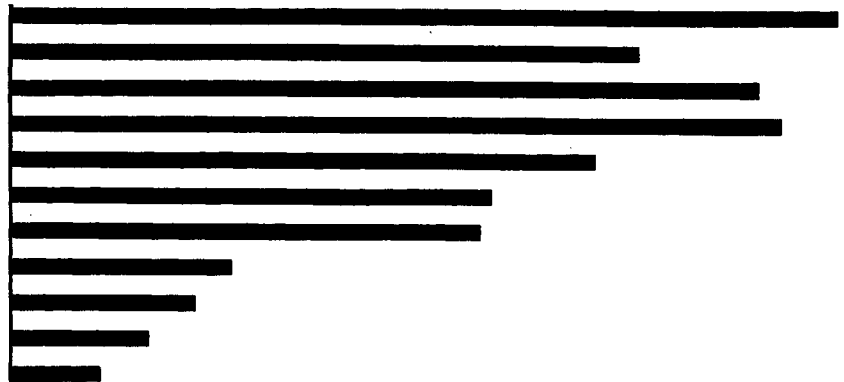
According to Interstate Commerce Commission statistics, the railroad referred to has shown a 77 per cent reduction in fatalities, 1924 as compared with 1920, and for the same period has effected a reduction in personal-injury expense of more than \$3,000,000. Furthermore, the system has shown a reduction in personal-injury expense, 1925, as against 1923, of \$404,560—a 49 per cent reduction in expense as compared with its accredited 35.20 per cent reduction in casualty rate for the same period.

In the five years since 1920 this system has saved 192 lives among employees on duty in train, train-service and nontrain accidents. This railroad organization is known to utilize statistics as an aid in its accident-prevention work. Contests have been developed among units and major shops of the system and divisions within the various units. As accident records are prepared month by month for the Interstate Commerce Commission they are utilized in the current monthly contest.

It has been stated that statistics are to a well-organized safety department what the thermometer and temperature chart are to a well-equipped hospital, and, while it is impossible definitely to allocate the relative importance of statistics as regards other phases of organized safety work, it has come to be generally recognized that, like the batting average, they are absolutely essential to the game.

**INTERSTATE COMMERCE COMMISSION REPORTABLE CASUALTIES PER 100 EMPLOYEES ON ONE OF OUR LARGEST RAILROADS,
1914 TO 1924**

| Year | Average number of employees | Total casualties ¹ | Total casualties per 100 employees |
|------|-----------------------------|-------------------------------|------------------------------------|
| 1914 | 18,803 | 1,529 | 8.13 |
| 1915 | 20,982 | 1,332 | 6.35 |
| 1916 | 23,847 | 1,772 | 7.43 |
| 1917 | 27,438 | 2,101 | 7.65 |
| 1918 | 28,659 | 1,689 | 5.89 |
| 1919 | 31,095 | 1,437 | 4.78 |
| 1920 | 34,336 | 1,592 | 4.64 |
| 1921 | 24,104 | 533 | 2.21 |
| 1922 | 24,789 | 444 | 1.79 |
| 1923 | 27,365 | 371 | 1.36 |
| 1924 | 26,665 | 225 | .84 |



¹Fatalities and injuries resulting in three or more days' loss of time.

| | |
|--|---------|
| NOTE.—Total employees, 1915 to 1924, inclusive | 269,276 |
| Estimated casualties per 100 employees, 1915 to 1924, inclusive, at 1914 rate (8.13) | 21,892 |
| Actual casualties, 1915 to 1924, inclusive | 11,546 |
| Reduction in casualties, 1915 to 1924, inclusive | 10,346 |
| 90 per cent reduction in ten years. | |

The Interstate Commerce Commission is a very important and influential agency of our National Government. Its service, widely extended, includes a multitude of departments, bureaus, and divisions, but we need not hesitate to say that of all its sundry activities none is more commendable than the splendid work of its division of accident statistics, for, as has been stated, "The purpose to save life is the noblest of all purposes. It embodies the highest ideal of humanity." Those who have been associated with this worthy work are known to but a few. However, in the words of Oliver Wendell Holmes,

The noblest service comes from nameless hands;
And the best servant does his work unseen.

DISCUSSION

The CHAIRMAN. We are certainly very much interested in the paper read by Mr. Palmer. The discussion of that paper will now be led by Mr. W. N. Doak of the Brotherhood of Railroad Trainmen.

Mr. DOAK. Secretary of Labor Davis and Commissioner Stewart are both contributing very largely to the advancement of humanity, and I wish to add my appreciation to those who have already expressed themselves of their splendid efforts and to urge upon everyone their hearty support.

The railroad trainmen are probably in a class by themselves when it comes to making progress in changes of conditions in their employment. This is due in a large measure to the useful manner in which statistics showing the real facts surrounding their employment have been handled. We therefore come to you with our unqualified indorsement of this movement, and sincerely hope it will be the means of securing real accident statistics in industrial pursuits.

It is scarcely necessary for me to attempt to add anything to the contribution made by Mr. Palmer or even to comment thereon because he has so thoroughly covered the field of railway accidents that there is little if anything left to say on the subject.

The effect of accident statistics of American railways upon accident prevention in that industry is the most interesting and illuminating study in the realm of statistical data. One can not study these effects without conceding at once that statistics play a most important part in our economic and social affairs.

On February 13, 1871, during the third session of the Forty-first Congress; Senator Charles Sumner, of Massachusetts, introduced a resolution providing for the investigation of accidents by the Senate Commerce Committee, and for consideration by the committee of the expediency of providing by law for regulation of the railroads to prevent the loss of human life and to promote safety of passengers. This resolution was adopted on the day it was presented, but no report was ever made by the Commerce Committee to which it was referred. No further steps were taken in this direction until two years afterwards, when Representative Andrew King, of Missouri, in an effort to get some action, introduced a safety appliance bill. Nothing resulted from this attempt to get

congressional action. For a period of 16 years thereafter numerous bills and resolutions were introduced in Congress, but never received any consideration by that body. Numerous resolutions and memorials were adopted by legislatures and other bodies and societies petitioning Congress to act on safety legislation but without avail.

On December 3, 1889, in his message to the Fifty-first Congress, President Benjamin Harrison presented to Congress some statistics, which, crude as they were, had telling effect. Railway safety became an issue in Congress, and the people back home who are always the best political barometers began activities in behalf of the railway employees. The relative value of certain safety devices had been the subject of bitter controversies, many people actually believing that such devices were only money making schemes of the inventors and manufacturers, and of course the railways were reluctant to adopt safety devices to any extent at that time because no standards had been fixed by law or by order of the commission.

But when President Harrison told Congress and the American people that during the year ending June 30, 1888, over 2,000 railway employees had been killed and more than 20,000 had been injured, the people understood that statement more than they had understood anything that had been said before on the entire railroad question. Bills to carry out the President's suggestion for action to relieve this terrible situation disclosed by him were loaded into the legislative hopper at a rapid rate. Of course it took a little while for the safety leaven to permeate the Nation and thoroughly to arouse the political leaders, so during this session of Congress no bills dealing with railway safety were passed. The President was not content to let the matter rest, so he went back to Congress and in his message of December 1, 1890, again quoted statistics he had gathered and urged action to prevent the enormous loss of life and injuries. Many bills were introduced but none passed during this session of Congress, and President Harrison again went to Congress, in his message on December 9, 1891, stating that for the year ending June 30, 1890, 369 brakemen had been killed and 7,841 maimed while engaged in coupling cars. He also stated that during that year 2,451 railway employees had been killed and 22,390 had been injured. As a result of the determined stand taken by the President of the United States, fortified as he was by statistics and aided by public sentiment, which was aroused through the presentation of the facts disclosed by such statistics, the safety appliance laws were passed in 1893, less than four years after President Harrison had taken the safety question before Congress, whereas nothing had been accomplished in the nearly 20 years which had elapsed from the time Senator Sumner started the safety movement but did not have the statistics to back him in his fight in the education of the public.

The figures presented in the President's message in 1891 showing that 369 brakemen had been killed and 7,841 maimed while engaged in coupling cars suggest a subject which has come up here during this conference with regards to accidents in which the machinery used by the employees was in good shape, particular attention being called to railway accidents of this character. I presume the links

and pins used by the 8,210 brakemen who were either killed or maimed in 1890 were perfectly conditioned; just the same these devices killed 369 and injured 7,841. As to "falling-off" accident casualties among our men, I am willing to concede that in a great many instances men fall from the tops of cars when, no doubt, the equipment is in good shape, but do we ever consider that these men are required to walk along the tops of swiftly moving box cars when the sleet or ice covers them, or that they are often on the top of the rear of a 100-car train when the air hose parts. It is not a question of the condition of machinery or equipment which counts the most in all instances, but the kind of tools and equipment or machinery with which men must work. I therefore say to you that with all of our modern equipment on the railways further steps must be taken to accomplish the desired results—by keeping men from the tops of trains as well as by providing other safety devices.

In 1892, the year before the first safety-appliance law was passed, there was one railway employee killed out of each 322 employed and in 1925 one out of each 1,118 employed was killed—a record for the safety laws and safety-first movements to be proud of.

Following the passage of the safety-appliance law and its enlargements the boiler inspection law was passed, and other laws and regulations followed, until to-day we have fairly covered the field. Yet accidents occurred, many in fact, and these safety-first men came on the scene and began their campaign of education by getting facts and telling the employees these facts in plain everyday language. Safety committees were organized, and men and management not only talk safety but are living it in their everyday lives. In these movements statistics have done the largest part of the work.

My own organization was possibly the hardest hit by accidents—we were paying millions of dollars out for insurance annually though only in small sums per man. In fact we have paid \$65,000,000 out for death and disability claims. We had to insure our men—no insurance company wanted to do it—but to-day we have the cheapest insurance in America for our men. We sell insurance that pays for death and total and permanent disability at \$12.85 per thousand and will permit one of our members to carry as much as \$5,000. The safety laws and safety-first campaigns are helping us out very materially.

I shall not attempt to go into the figures to show what has been accomplished by recent safety laws and safety-first movements on the American railways because Mr. Palmer has fully covered that subject, but I do want to pay my respects to the men who have been responsible for making both of these movements a success.

Our old friends, Edward A. Mosley, late secretary of the Interstate Commerce Commission, and Father Coffin, who contributed the best years of their lives to safety on the railways always will live in the memories of grateful railway employees. Hiram W. Belnap, that tireless worker for the enforcement of our safety laws and a great booster for the safety-first movement, was an honored officer and a highly respected member of my brotherhood and we all love and cherish his memory. Our late brother in the safety-first movement, Harry A. Adams, who startled the railroad world with his accom-

plishments on his own line of railway and in the general movement, was also a member of the brotherhood of which I am an officer and member, and I pause to pay reverence to his memory.

To those men who have in the past and are now carrying on the work of our safety bureaus and handling the safety-first work I pay my highest tribute; they all deserve the highest praise for the most splendid service performed. Each of these would quickly say that accident statistics have been the greatest factor in getting safety over to the employees and the public.

The brotherhood which I represent, together with the associated labor organizations, are boosters for the safety laws and safety-first movements, and we can cheerfully testify that these movements have been the greatest benefactors to the men who handle the commerce of this country. Our own experience has taught us that reliable statistics are of inestimable value in the accomplishment of desired results and we are behind this movement. We therefore hope that the leaders of men and management engaged in industrial pursuits will accomplish even more and in a larger measure than we have been able to do in the railway business in the collection and dissemination of statistics of accidents for the different plants and shops.

We long ago stopped quibbling over mere details and went out to find the number of deaths and injuries, and when we found this information we then set about to eliminate these casualties in a systematic manner. If machinery was at fault, we remedied it; if improper maintenance was the cause of accidents, we made proper repairs; if it was the lack of interest or carelessness on the part of employees, we sought to educate them along safety lines. As a result of these efforts we are handling the largest trains, getting the greatest amount of efficiency out of the men, and working under the safest conditions of any class of men employed in a similar occupation in the world, considering the duties and responsibilities of each man.

We invite the men in industry to compete with us in our safety campaigns and let us hope that all will cooperate with the State bureaus and with the Department of Labor in an effort to give the most accurate and valuable accident statistics.

The CHAIRMAN. We are very much interested in the discussion of this question by Mr. Doak, of the Brotherhood of Railroad Trainmen. Is there any further discussion?

Mr. CARROW. Mr. Doak's paper was certainly illuminating. Mr. Doak has appeared at many of our conventions, and he has the faculty of touching the high spots in a most impressive manner.

There are two or three suggestions that I would like to make. In the first place, the statistics of the Interstate Commerce Commission, as they are at present presented, represent the cooperative effort of the commission and the American Railway Association, and by common consent are the best treatise on accident extant. As Mr. Doak and the other railroad men know, the railroad men of the country, the management, wanted to have the facts. They wanted to get the information that would direct them to remedial measures. The steam railroad section of the National Safety Council has had a committee on statistics ever since its inception, and at every meeting

we have had graphic charts illustrating the progress and possibilities in safety. We have had committees on bulletins, and in every other direction we have had men working, analyzing, and trying to determine ways and means for accident prevention. In 1921 the safety section of the American Railway Association was organized, and this association is enthusiastically working to make the railroads as safe as possible.

Mr. Palmer said the fund of information in the Interstate Commerce Commission is without parallel, and we agree to that. Every individual railroad is apprised of the fact, fully aware of the fact, that accidents are not only costly but a very unsatisfactory thing to have to confront in your business management. I want to show you, Secretary Davis, that not only are we tabulating these statistics, putting them in volumes, and broadcasting them all over the country, but we are actually taking remedial measures. There is nothing in accident-prevention history that corresponds to the results accomplished by the safety section of the American Railway Association in the last four years. The first thing we determined by analysis was that 5 per cent of all accidents are attributable to physical conditions, that 10 per cent are attributable to violations of rules and regulations, and that 85 per cent are attributable to carelessness, thoughtlessness, indifference, ignorance, and misadventure. We determined that the remedial measures for the first class was improved design, better maintenance, the removal of litter, and better housekeeping; for the second class, better training and enforcement of discipline and the selection of men; and for the third class, persuasion, cooperation, and working together to get us in the habit of doing things in a safe way. We determined after a most careful analysis at the Salt Lake meeting in 1924 that we had reason to expect a 35 per cent reduction in accidents. We figured that it could not be done overnight, so we spread it over a period of seven years; we made a chart showing that if we made a gradual progress, 5 per cent each year, we would get 35 per cent by the end of 1930. That was the first step, and at the next meeting in Chicago in 1925 we developed the skeleton outline of the most comprehensive monthly program of accident prevention that was ever conceived by any body of men. Since that date every month, as regularly as clockwork, we have selected a set of causes and distributed the list to the officers and the employees of the American railroads, without any exception. These programs, bulletins, and analyses have gone into the statistical committees, they have gone into the safety committees, and the officers of the railroads have analyzed them. So much for the program.

The next step in our orderly process was to hook the responsibility upon the supervisory forces. It has been the opinion of safety men since the movement was started that men in supervisory capacities were responsible for introducing constructive measures along accident-prevention lines. With that fact in mind, we introduced four resolutions, directed to each of the heads of the respective departments of every division of every railroad in the country—the division engineer, the master mechanic, the train master, and the road foreman. We enumerated the number of men injured in those respective departments. We told them the causes; we told them

the remedies; and we appealed to them to cooperate with us in carrying on this campaign, to the end that we might make the 35 per cent reduction. Now that has been broadcast. The latest report of the Interstate Commerce Commission has been analyzed. We have pointed out the occupations that are showing the increases; we have pointed out the occupations and the causes that show the decreases. We are still appealing to the men on the railroad along that line; and we already have in mind the next step in this matter for presentation at the coming annual meeting of the safety section. In the evenings, after these sessions here, representatives of the safety section have been meeting together, talking, and trying to work on these things. So I want to assure you, Mr. Secretary, that the railroad managements, first, last, and all the time, recognize that accidents on the American railroads are absolutely undesirable, that they constitute a liability; and that out of sheer intelligence, if not for humanitarian reasons, we would do our level best to make the railroads as safe to work and travel upon as it is humanly possible; and I want you to remember that the development, the evolution, and the application of the statistical information in the railroad business is a product of the railroad brain cooperating with the Interstate Commerce Commission.

The CHAIRMAN. We will pass on to the next subject on this morning's program, and consider the question of "Statistics for accident prevention in American mines," by Mr. W. W. Adams, of the United States Bureau of Mines.

STATISTICS FOR ACCIDENT PREVENTION IN AMERICAN MINES

BY W. W. ADAMS, STATISTICIAN, BUREAU OF MINES, UNITED STATES DEPARTMENT OF COMMERCE

The chief object in the compilation of accident statistics is to aid in the prevention of accidents. In and of themselves statistics have no reason for being; and unless the use to be made of them is important the cost of compiling figures is likely to be unjustifiable. On the other hand, when confronted by a problem that can not be solved without the aid of statistics, it would in ordinary cases be ridiculous not to obtain the information needed, and in situations where human life is at stake it would be criminally negligent. It may be said to the credit of the mining industry that it was among the first, if not the very first, to compile accident records on an extensive scale and to use such records as an aid in the prevention of accidents.

As early as 1870—more than half a century ago—the State of Pennsylvania began to keep records of accidents that occurred in the anthracite mines of that State. Four years later Ohio began the keeping of similar records. The next year accident records became available for Maryland. In 1877 the Legislature of Pennsylvania broadened the mine-inspection law to include the bituminous mines in the central and western portions of the State. Iowa undertook the work in 1880, Indiana in 1881, Illinois in 1882, Colorado and West Virginia in 1883, and Kansas and Kentucky in 1884. Thus for more than 40 years the production of the major portion of the Nation's annual coal supply has been accompanied by the keeping of accident

records and by the use of the information revealed by such records in the task of lessening the danger under which mining operations are conducted. In spite of all that has been done, accidents in mines continue to occur in large numbers. Increasing production and development of underground operations over larger areas to meet the Nation's need for coal create new hazards in the mines. Wider areas of roof are exposed, haulage operations have increased in volume and speed, mining machines for undercutting the coal have been rapidly installed, and more explosives are being used. Hence the conditions prevailing in the industry to-day are radically different from those under which coal was mined in earlier years. To keep pace with the development of the industry with its increasing hazards, more detailed information regarding accidents has been found essential.

The Federal Bureau of Mines was organized in 1910. Shortly after its organization preparations were made to obtain statistics of accidents for all branches of the mining industry. The first inquiries were for 1910 and related exclusively to coal mines, not only because the coal industry could more readily furnish the information but mainly because coal mining employs about three-fourths of all mine workers in the country and suffers at least that proportion of the accidents that occur each year. Schedules requesting accident data for 1910 were mailed early in 1911 to all coal operators in the United States. In the following year similar schedules were mailed to coal mines, metal mines, and quarries. The bureau therefore now possesses accident statistics of national scope for all mines and quarries in the United States for a period extending over 15 years. The data for metal mines and quarries relate to injuries as well as deaths. The figures for coal mines relate to fatal accidents only. It was deemed necessary in the early stages of the work to obtain statistics of coal-mine accidents at more frequent intervals than once a year. Therefore an arrangement was made with the coal-mine department of each State to furnish the bureau with monthly reports of accidents in coal mines. The monthly reports were restricted to fatal cases only, because it was impracticable to obtain at such frequent intervals satisfactory figures on injuries which in many cases involved disability over long periods of time. This arrangement brought the bureau in close touch with the State mine inspectors but it had the effect of sacrificing the work of collecting annual reports from operating companies. Within the past two or three years the bureau has had the cooperation of several hundred typical coal mining companies in an intensive study of accidents, and the information from these companies covers all lost-time accidents as well as fatalities. These special returns are extremely valuable in the bureau's statistical work as they supplement in many ways the less complete reports that relate to fatalities only.

From the bureau's statistical studies we have found that the death rates in coal mines vary considerably from State to State. To know this bare fact would avail little if the statistics did not enable us to go further and learn the particular classes of accidents in which the differences in the rates existed. For example, during 1921 to 1924, the latest four-year period for which complete figures are available, the average death rate from all accidents in coal mines in the United

States was 1.88 per million man-hours of exposure. The rates ranged from such low levels as 0.47 and 1.16 for Texas and Missouri, respectively, to as high as 7.24 for New Mexico and 10.37 for Utah. A further examination shows that the higher rates were mainly due to large explosions in New Mexico and Utah during the period covered by the figures; also, to a less extent, haulage accidents and falls of roof and coal.

Again, the bureau's statistical studies show that the average temporary injury occasions a loss of between 14 and 15 days by the injured employee, a period of time during which nearly 60 tons of coal might have been produced, since the production of coal in the United States is around 4 tons per day for each man employed. From other statistical studies the bureau has found that the amount of time lost by injured employees, or rather the length of their disability measured in calendar days, is equivalent to between 8 and 10 per cent of the total man-days worked in coal mines and metal mines, and between 5 and 6 per cent in the stone-quarrying industry. This is a rather severe economic waste when it is remembered that many of the accidents are preventable.

In the keeping of accident records it is quite essential that the records cover all of the accidents that occur. The importance of complete reports is indicated by a statistical analysis of records furnished to the bureau by several hundred metal mines and coal mines. These statistics indicate that, unless accident studies are based upon complete records, conclusions drawn from the records are apt to be misleading. Moreover it is difficult, if not impossible, to compare the accident experience of one mine or State with that of another mine or State unless the same classes of accidents are covered in both cases. It has been found, for example, that 40 per cent of men injured in coal mines are disabled for one week or less. In other words, if only accidents disabling an employee for more than one week are included in our studies, we are ignoring about 40 per cent of the accidents which actually occur. Hence the accident rate of one company may falsely appear to be better than that of another company for no other reason than that the first company bases its rate on something less than the whole number of injuries to its men. In like manner it has been found that States or companies keeping no records of accidents unless the injured employee loses more than two weeks' time are thus maintaining records that are only 35 per cent complete. The lessons that might be learned from the other 65 out of every 100 accidents are entirely lost. It is as if an insurance company should ignore 65 per cent of the cases of sickness among its policyholders and base all of its research work on reports covering only 35 per cent of the cases.

As previously stated, accidents cause a loss to the coal industry which is equivalent to 8 or 10 per cent of the entire amount of time which the industry works. This means that the accident severity rate for the industry is around 10, representing 10 days lost per 1,000 man-hours of exposure. This loss represents the average for the industry. It emphatically does not indicate the best that can be done by individual companies. Again we are indebted to statistics for our knowledge that in 1925 certain coal mines had severity rates considerably

below 10. The bureau's records show that one anthracite mine in Pennsylvania, for example, had a severity rate of only 0.27. A bituminous mine in West Virginia had a rate of only 0.32. A zinc mine in Oklahoma had a severity rate of 0.23, as compared with an average rate of 9.07 for the group of metal mines under consideration. The average rate for the quarry group was 7.60, yet several quarry plants went through the entire year without any employee losing a single day from personal injury. The group of mines producing nonmetallic minerals by underground mining methods had an average rate of 7.34, yet one company in the group had a rate of only 0.004.

These are typical cases of what can be done by accident-prevention effort and what can be revealed by statistical studies. Each mine referred to by these records employed a minimum of 50 men underground; one mine employed as many as 400 men. Each quarry employed at least 25 men inside the pit. The accident rates quoted have reference to strictly mining and quarrying operations and include only such surface operations as are directly connected with mining and quarrying. The figures do not cover milling and smelting nor do they cover the manufacture of lime or cement.

The element of competition is one of much importance in accident-prevention work. Since the causes of accidents are about 25 per cent mechanical and 75 per cent human, it is manifest that the greatest progress in reducing the accident rate is dependent on the success met with in dealing with the human factor. The desire for leadership in accident-prevention work by miners and mining companies is quite as natural as in other lines of effort, as in sports, studies, science, and finance. Statistical records make it possible to utilize a natural sporting and competitive spirit in the laudable effort to prevent industrial accidents. A safety contest to establish the lowest individual accident rate can be conducted only by placing the data for all industries on a correct and uniform basis. Thus the competitive spirit in such a contest may be utilized in bringing about uniformity in accident reporting. Under present conditions, hardly any two States compile their accident statistics in the same way. Not only do the States differ in their methods of compiling statistics, but they also differ widely as to the classes of accidents that must be reported to State officials and as to the classes of accidents covered by their statistical reports. It is conceded that individual States may find it necessary to make special compilations for local needs, but a wide field exists where uniformity is desirable in the interest of safety work in all industries in all States.

The humanitarian point of view in the prevention of personal injury in the American industry should in itself prompt everyone to action. In addition, however, there is also the financial appeal. It may be assumed that industry at large is paying sufficient money in the form of insurance premiums to meet the cost of compensation for the accidents that occur. Yet there is not the same assurance that any specific industry is being charged insurance premiums in keeping with its hazard as compared with the hazards of other industries. It is quite probable that certain industries are paying higher premiums than their relative hazards would justify, and that uniform statistics in all industries would reveal the fact and bring

about more equitable insurance rates. The fact that compensation for accidents is based on pay-roll exposure, a very unstable factor, instead of being based primarily on man-hour exposure, is likely to obscure the relative hazards of different industries. It is here that statistics offer a means for correctly comparing the hazards of one industry with those of another. Unless the element of comparability is present, compilations of figures do not constitute statistics of the kind needed in accident-prevention work. Some present compilations having to do with accidents and compensation for accidents in various States, for example, may be considered to be statistics only within State boundaries. As soon as the figures cross the boundary of the State to which they relate, they cease to be statistics and become merely compilations of figures which can not be compared with figures for adjoining States. A different language spoken in the 48 States would perhaps cause but little more confusion in matters in general than we now have in statistical matters when we try to reconcile or compare the accident records of one State with those of another State. I refer to statistics needed to compare the frequency and severity rates in different States and in different industries. One of the greatest contributions that could be made to industrial safety would be the adoption of a universal statistical language in all States.

It is to be hoped that this conference called by the Secretary of Labor will result in an early agreement as to what shall be considered a reportable accident and what shall be the basis for calculating frequency and severity rates. A further development to be hoped for is the determination by every agency represented here, as well as industrial concerns throughout the country, to place their accident records on a uniform basis so that the lessons to be learned therefrom may be available to all. It is strongly urged that the mining industry take the lead in this improvement in accident statistical records as it took the lead more than 50 years ago in inaugurating this important work.

DISCUSSION

The CHAIRMAN. I am sure we are all indebted to Mr. Adams for this very excellent paper he has read and the lessons to be learned from it I am sure will be of benefit to all of us. Seeking to do what he points out is so important, and that is to do everything we can toward cooperating with the Federal department in trying to facilitate the compilation of the statistics that will be comparable one with the other, we will thereby aid in accomplishing the work of accident prevention in an effective manner.

I acknowledge the compliment given to one of the industries in our State, and say that we deeply appreciate the compliment. I do not know whether we deserve it or not, but at least we hope to give the fullest measure of cooperation, to the end that we may bring about uniform statistics and that we may keep up with the progress being made in the other States in accident prevention. The further discussion of this subject is to be led by Joseph J. Walsh, secretary of mines of the State of Pennsylvania.

Mr. WALSH. I have been asked to prepare a brief statement dealing with the value of statistics in the coal industry. I therefore propose to enumerate just a few of the advantages.

In a general way statistics show the number and kind of accidents, where they occur, and under what conditions. With this information at hand intelligent and practical rules of safety can be formulated.

A more detailed analysis of the causes of accidents makes clearer the remedy that should be applied. For instance, an analysis of mine-car accidents shows that quite a number of accidents result from pushing mine cars by an electric motor instead of pulling them. Cars are more likely to leave the track when pushed than when pulled. They should always be pulled on main roads at least.

Again, when robbing pillars several methods are practiced and in analyzing the reports of fatalities resulting from roof falls in robbing sections it is found that where the back of the pillar is shot off the fatality rate is higher than where the pillar is cut through and removed advancing.

Mine cars sometimes become charged with electricity. Statistics show that this happens when electric haulage is employed and the rails are heavily sanded. Under such conditions blasting powder has at times been ignited with fatal results.

Insulated cars should be used for transporting powder.

Statistics show that out of 94 fatalities from explosions of gas during the years 1924 and 1925 open lights caused 20 per cent; striking matches, 16 per cent; electricity, 12 per cent. The remedy is clear—safety lamps or closed lights.

Statistics indicate that 45 per cent of the accidents in the anthracite and bituminous regions occur between 8 a. m. and 12 o'clock noon, and that the most dangerous period during the day is between 10 and 11 o'clock in the morning. This clearly indicates when supervision is most required.

During the night shift 21 per cent of the fatalities take place when far less than 21 per cent of the employees are at work.

It is also learned from statistics that 21 per cent of those killed in the anthracite mines and 17 per cent of those killed in the bituminous mines had less than a year's experience in the occupation they were engaged in when injured.

After a workman has finished his first year his chances of escaping accident during the next four years at the same job are considerably improved.

This seems to indicate that a new worker should be more fully instructed in his duties.

Many dangerous practices have been revealed by statistics. Some of them are the use of storage batteries for blasting purposes, the use of electric lamps in gaseous mines without the accompaniment of testing lamps, unguarded machinery, and the ventilation of gaseous chambers by the use of compressed air.

If we continue to do the same thing in the same way year after year, we can not hope to reduce the number of accidents.

Statistics show very clearly the mistakes that are being made, and it should be the purpose of all persons interested in mining to seek and apply the proper remedy.

The **CHAIRMAN**. The next subject we have for discussion is "Accident prevention in steel, iron, and nonferrous foundries," by T. F. Jennings, of the Utah Copper Co.

ACCIDENT PREVENTION IN STEEL, IRON, AND NONFERROUS METAL FOUNDRIES

BY T. F. JENNINGS, SUPERINTENDENT OF FOUNDRIES, UTAH COPPER CO.

It is indeed a privilege to be permitted to address this conference of crusaders consecrated to the conquest of the preventable. There is, there can be, no greater, grander, nobler aim than that of alleviating, and so far as humanly possible preventing, the pain, sorrow, and misery of life incident to industrial activity. In the short space of 20 years the movement to prevent industrial accidents has become almost universal in its influence, and is a recognized integral part of every modern up-to-date industrial organization. This is true of the Utah Copper Co., with which I am connected, and which company operates at Bingham Canyon, the largest open-cut copper mine in the United States, and operates at Magna and Garfield reduction and concentrating mills, having a capacity of 40,000 tons a day. In order not to trespass unduly upon your time and patience, I shall limit my discussion to my experience as superintendent of the foundry of that company, and endeavor to point out how and why accidents in that department of that company have been reduced to a commendable minimum.

The safety work begins at the time the man is employed. He is required to take a physical examination. The purpose of that examination is not to reject applicants who are physically imperfect, but rather to prevent their employment in particular kinds of work for which they are physically disqualified. Specific impairments may render the applicant unfit for specific work and yet permit of his being properly employed at other work. In this way an applicant having a defect which would subject him and his fellow employees to undue risk in a given line of the work is kept away from that risk and placed where his defect will not so obviously jeopardize him. Thus an effort is made to put the right kind of men at the right kind of work.

The next step in accident prevention is education. Recognizing that mechanical appliances play but a comparatively small part in accident prevention, and that the greater proportion of accidents is attributable to the human factor, an effort is made to arouse the interest of the worker in the safety of himself and his coemployees. The individual worker is taught that his safety depends largely upon himself, and that the safety of others depends upon himself, and that the safety of the men comparatively is but a massing of the units of the individual. He has impressed upon him the necessity for constant vigilance and every effort is made to teach him the catechism of carefulness. This is done through the distribution of safety articles, posters, calendars, etc., which describe and depict the causes and consequences of accidents, and carry messages of caution.

There is a general safety council, consisting of the management and the superintendents of the mine and plants. Immediately under

that general council is the safety council of the individual mine or plant, composed of the heads of all departments in the respective plants. This committee meets monthly and discusses the accidents occurring during the month, and a means of avoiding those accidents. The next link in the chain is the departmental safety committee, consisting of all foremen in the given department, and one workman for each gang or group in that department. The departmental safety committee meets twice monthly to discuss current accidents and methods of avoiding them. Each departmental safety committee appoints a safety man, whose primary duty, at all times, is to be watchful for unsafe or dangerous practices, appliances, places, or conditions, and to receive reports concerning the same from the workmen. This safety man wears a large button to identify him.

The minutes of the meetings of all the committees are taken down in writing and distributed to the members of all other committees engaged in the safety work. This enables each department to keep in touch with every other department in this activity. The work of these committees is supplemented and facilitated by the plant employment director, who gives every man, at the time of his initial employment, a short talk on safety and the aims and practices of the company in its endeavor to prevent accidents, and instructs him how to report anything which he observes and considers might be unsafe. Similar instructions are given the employee by his foreman on being first put to work. All accidents are carefully investigated and reported by the employment director, and analyzed with the view to preventing a recurrence of a similar accident.

As a part of the so-called educational feature of the program, I, as superintendent of that foundry, personally talk to each man as he is put to work there, and impress upon him the necessity of his being careful and cautious. Furthermore, I emphasize the rule of the company, requiring each man immediately to report to the plant doctor every injury however trivial it may appear to be; pointing out that experience has demonstrated that many injuries of apparently inconsequential nature, unless promptly and properly cared for, may result in serious and extended disability, thus the results of accidents are minimized. I also require every man meeting with a minor accident in that foundry personally to appear before the department safety committee of the foundry and explain how, why, and under what circumstances that accident occurred, to the end that the same thing should not happen again if avoidable.

Whenever the departmental safety committee finds that an accident has been caused by any mechanical defect, or danger incident to any place of employment in the foundry, that committee forthwith so reports to me, as superintendent of the foundry, and I immediately take steps to have the situation rectified. The work of the departmental safety committee is augmented by that of a special foundry equipment inspection committee, composed of experienced foundry men, appointed by me on that committee in recognition of their qualification and competency to pass upon the safety of the various machines, appliances, and tools involved in the foundry operation.

Whenever in that foundry a heavy object has to be elevated above the floor level, and men work under such elevated object, they are

specifically required to place beneath each end of the object blocks up to such height that if the object should drop it would strike and rest on the blocks rather than crush or injure the men under it.

When large flasks are lifted by cranes, with a view to turning the flask over, the use of square-headed trunnions is dangerous, because the crane sling is liable to slip off the neck of the trunnion onto the head, and when the employee goes to turn the flask, the sling, being insecure, may slip off the trunnion entirely and drop the flask on the employee. We avoid that danger by having our trunnion heads tapered to an edge. When such a tapered trunnion is used, if the crane sling slips it must either remain on the neck of the trunnion or slip entirely off and thus drop the flask before the employee has occasion to pass under it or around it. In other words, with a tapered trunnion the sling must automatically not operate at all or else operate safely. This practice in itself removes the hazard of some of the most serious accidents incident to foundry work.

The departmental inspection committee pays special attention to ladles, cradles, casts, and other receptacles wherein are handled the molten metal, and by care in this respect the danger from this source is almost practically eliminated.

The danger of flying particles from the grinding machines is decreased by the position of a thick glass screen between the operator and the machine. It may be thought by some that the existence of that glass screen increases the danger where the wheel itself breaks when the machine gets choked. This contingent danger is minimized by the use of an adjustable platform, which platform can be adjusted so that the edge thereof will be in proper relation to the wheel and thus prevent the occurrence of spaces into which the metal might otherwise drop and choke the wheel. At the same time the use of this platform relieves the lifting or holding strain on the operator and thereby lessens fatigue.

All hand tools are regularly and frequently inspected, and care is exercised to avoid the use of weak, cross-grained, or splintered handles. When a head becomes mushroomed, chipped, or cracked, it is promptly laid aside and not used again until it has been ground down or forged into proper shape. Similarly, chisels and other small tools are sharpened frequently and the burrs kept ground off. All steel hand tools that are liable to be struck by hammers or sledges have the upper part of their shanks tapered from the top downward before they are used at all. Experience has proven that a tapered head, smaller than the body of the tool itself, will not mushroom as quickly as a flat head equal in surface to that of the body of the tool.

Safety shoes are required to be worn in the foundry work. These shoes have smooth uppers, without any objectionable lacing or button opening to admit molten metal. The shoes fit snugly around the ankle. They are what are commonly known as standard foundry shoes. These shoes can be jerked off quickly when emergency demands. In many foundries the use of such shoes is limited to the men who handle molten metal. We make it a practice for the core-makers, grinders, helpers, and all others who are at all liable to receive foot burns in passing through the foundry, or working in it, to wear such shoes.

No employee is allowed to pour molten metal without wearing standard safety goggles. All chippers and furnace men likewise use them. The rules requiring the employment of such goggles are strictly enforced.

A specially assigned crane expert inspects the limit switches on the cranes every morning, and the departmental inspection committee also devotes special attention to the chains and other equipment on the cranes. Each craneman is furnished with, and is required to comply with, a code of rules governing the operation of the crane, which code has been worked out by myself and associates from long experience.

In that foundry is the largest chill machine in any foundry of which I know. It is 122 feet long, and we cast 72,000 pounds of metal every day. It can readily be appreciated that if that machine is cold, or damp, the danger in its use would be immeasurable. That machine is carefully inspected daily, and is preheated and dried, and by the use of these precautions that machine has been operated for two years without a single lost-time accident.

The real efficiency of all these safety precautions revolves around the point of promptness in remedying conditions as they arise, instead of deferring action until some accident forces relief.

In conclusion it is gratifying for me to be able to state (and I trust you will absolve me from immodesty) that in that foundry we employ from 120 to 250 men, and cast from 40 to 50 tons of molten metal per day, and yet for a period of eight months past have operated without a single lost-time accident.

DISCUSSION

Mr. BYNUM. I do not know but there was something mentioned by the speaker with reference to the ages of men. I want to be set right if I am wrong, but it seems to me the tendency of to-day is to employ young men, what I would call boys. Personally, I think that men, mature men, are the persons who are most capable. I might refer to Judge Anderson, Mr. Secretary, who said that in effect a man had no sense until he was 50 years old. I want to know the sense of this meeting in regard to the ages of men. In the year and a half I have been on the Industrial Board of Indiana, most of the men who have come before me are young men. We make no distinction as to men in Indiana. I understand that the railroads are fixing a limit of employment at 45 years, and I want this meeting to understand that I do not approve of that for the State of Indiana. I wish that someone who has been engaged in gainful employment and who has had supervision over men would tell me as to whether accidents happen to men over 50 or whether they happen to young men. That is what I came here for.

Mr. WOLLNER. I am a railroad man, and I would like to explain to the questioner why the railroads of the country fix the maximum age of employment at 45. There are a great many reasons. First, railroading is rapidly becoming a profession. Men must start as boys, learn the business, and reach their full value to themselves and their employers in their maturity. The age of employment has no reference to the frequency of accidents nor—well, I was going to

say severity, but that is not entirely true because a recent survey that I had made shows that men past the age of 40 suffer more severely from injury than do younger men. Their recovery is slower.

Some of the reasons other than the one I mentioned why railroads fix the maximum age of employment for inexperienced workers at 35 and for experienced workers at 45 are: First, the railroads maintain pension systems to which the employees do not contribute, and under most of these pension systems men in the train and engine service are pensioned at 65 years of age and employees in other services at 70. The roads must secure a certain amount of service from a man in order to justify paying him an old-age pension. You can see that from 45 to 65 represents 20 years' service, and it would possibly be unwise for an employer to grant an employee with less than 20 years' service an old-age pension.

A second reason is that an undesirable condition in the railroad business, and one which management and employees' organizations are rapidly overcoming, is the floater. Due to train and engine service, and a good many occupations that go with it, being seasonal, men have been forced into seeking and leaving employment with individual companies. The roads and the men's organizations are attempting to do away with this by fostering all-year-round employment. Now if you did not have a maximum age limit you would have—I might preface that by saying that the men who move around most are the men in the train and engine service. The so-called boomers are largely switchmen and men of that type. As these men become older, they become less agile and less adaptable to the work upon which they are called to perform.

I might say that in addition to being a safety officer I have been an employment officer of railroads for 24 years plus. I have passed upon the qualifications of a good many thousand railroad workers. I agree with the last speaker that—take as an instance the maintenance-of-way work. The man who has reached the age of 40 and past is a more desirable worker. He has gotten into the grind. He is beginning to look into the possibility of the future and stays with his job better and is less troublesome on the job.

As to the more professional classifications of railroading, such as trainmen, enginemen, telegraphers, station agents, etc., they must learn the business. It is not an easy business to learn. Those who can not learn it professionally must learn it by absorption, and they must start in as young men, becoming more mature as they grow older, but by the time they have reached the age of 45 they must have found their place in the railroad world and must depend upon their efficiency in that place for future advancement, rather than moving around from company to company.

THE CHAIRMAN. The paper read by Mr. Jennings was rather surprising in its conclusion. While he was discussing his subject and telling us of the methods and practices—

MR. JENNINGS. I would like to say a word, as this discussion has brought it up, about the age limit of men. There is nobody within the sound of my voice but needs to make an apology for any industry not wishing to employ men over 35 or 45 years of age. There are a great number, and it is a deplorable thing to know—not thinking

it, but knowing it; there is a great deal of difference between knowing and thinking. A man looks forward to the time beyond Doctor Osler's limit of 45, Doctor Osler being accused of stating that every man when he becomes 45 ought to be chloroformed. The industries of this Nation would be in a bad shape if that was to occur. I have had that particular thing to contend with in many sections of this country. I know of many in the West that make that limit, but did you ever notice that a railroad, we will say—I am not aiming at that particularly—when a peak season was coming, or any other time when there was an emergency, and it wanted to speed up freight or traffic, adhered strictly to the rule of 35 or 45 years? Not by a long shot. If a man who was 65 said he was 35, that was all right at that special time.

The Utah company that I have been employed with for the last 14 years has had no age limit. There are perhaps 4,000 men on the pay roll, and I feel confident in stating here that, comparing efficiency in the operation of its mines and plants, it would compare favorably with any in the West, and it makes no age limit; 70 years is not a limit.

Mr. BURNUM. In making my inquiry I cast no reflection upon the railroads or the institutions of Utah, but I want to say this: Possibly I am a reactionary, but I want men who look backward rather than forward. I want men who look back upon the institutions of this country and its traditions; I want men of proper ages who can do that, not half-baked boys. That is the position I take.

The CHAIRMAN. I was just about to remark when the chair recognized Mr. Jennings again, that no doubt after going over the various methods and practices in force in the Utah Copper Co.'s mines, he would tell us at the conclusion what he had to say with reference to the value of statistics for accident prevention. He reached his climax at the conclusion of his remarks, when he practically states that he has a perfect record. It seems to me that that statement carries with it a strong and convincing argument why statistics properly kept according to a uniform method would be most valuable for comparison in the other similar industries.

Our next subject for discussion is "Improved lighting as a factor in accident prevention," by W. H. Rademacher, of the Edison Lamp Works.

IMPROVED LIGHTING AS A FACTOR IN ACCIDENT PREVENTION

BY W. H. RADEMACHER, ILLUMINATING ENGINEER, EDISON LAMP WORKS OF GENERAL ELECTRIC CO.

That lighting is a vital factor in the promotion of industrial safety is not by any means a new idea. A very great number of highly commendable treatments of the relationship of light and safety have appeared and continue to appear in various technical journals and no doubt have come to the attention of practically everyone interested in accident prevention. A survey of past writings and an analysis of present thought indicate that the early ideas on this subject are still sustained, the recognized hazards are unchanged, and remedial suggestions are basically as heretofore. I therefore feel it in order to point out that this presentation can not perforce represent entirely new or original thought.

I believe that the treatment of this subject which will best serve the interests of this conference will be a review of past progress, a brief analysis of prevalent lighting faults which constitute accident hazards, a statement of the remedies which can be applied, and, where practical, physical demonstrations.

Some years ago—about 1913, I believe—R. E. Simpson, of the Travelers Insurance Co., presented before the Illuminating Engineering Society a paper which summarized the results of a study of 91,000 industrial accidents. His investigations indicated that 23.8 per cent of these accidents could be traced either directly or indirectly to improper lighting. Since that time various interested organizations, such as the Illuminating Engineering Society, the Eyesight Conservation Council of America, the departments of labor of a number of States, and a number of insurance companies and manufacturers of lighting products, have carried on extensive educational activities with a view toward acquainting industry with the value of light as a means of accident prevention. The splendid work of these bodies has resulted in greatly improved industrial lighting conditions, but an alarming number of accidents which may be attributed to faulty lighting continue to occur.

In a comparatively recent address Mr. Simpson stated that "improper illumination is to-day a major factor in one out of every eight accidents." This, to be sure, represents a very substantial reduction from the 1913 figure, but there is absolutely no doubt that it can be very greatly reduced by the universal adoption of proper lighting practice.

Of interest in this connection is a recent report prepared by the industrial lighting committee of the National Electric Light Association, summarizing the results of a survey of the prevalent artificial lighting conditions in 390 typical American industrial establishments. This indicated that only 15 per cent of the plants investigated were well lighted, only 29 per cent were fairly lighted, and the surprising number of 56 per cent were poorly lighted. Other statisticians have presented figures showing that substantially more accidents occur in industry during the winter or few-daylight-hour months than during the summer, or months of greater daylight hours, and that there are a far greater number of accidents during the hours of darkness than during the hours of daylight.

For a recent example we may refer to figures presented by Maj. John S. Spicer, chief of the accident investigation section of the Department of Labor and Industry of the Commonwealth of Pennsylvania, in the Annals of the American Academy of Political and Social Science. These indicate that of over 650,000 industrial accidents reported to the Pennsylvania Department of Labor and Industry for the years 1921 to 1924, inclusive, 24,000 more occurred during the winter months than during the summer months. Four hundred more fatal accidents occurred during the former period. From such evidence we can not but conclude that industry as a whole has not been made to appreciate, or has not fully understood, the important relationship which exists between improved lighting and accident prevention.

No one would think much of an unguided blind man's chances of avoiding accident in the average factory, yet we find that the order of prevailing illumination in many plants is such that operators

have but little better chance for safety. Sight is the first essential to safety. Danger must be seen before it can be avoided. Light, however, is indispensable to sight. In darkness we see nothing—with increasing quantities of properly applied light, vision is accelerated and clarified. Authorities state that approximately 70 per cent of our muscular activities are a result of stimulation received through the sensation of sight. In the last analysis, then, the safety of the worker is dependent almost entirely upon the ability of his eye to see quickly and clearly at all times, so that warning messages will be sent to his brain rapidly enough to insure prompt physical response to danger. Therefore, the provision of adequate and proper illumination, natural or artificial, is in reality the first step toward the prevention of accidents in industry.

Illumination in industry may be unsatisfactory from the safety viewpoint because of inadequate quantity or unsatisfactory quality. As to inadequate quantity, it is not unusual to find plants in which many areas and active working positions are dark and gloomy or in harsh shadow due to the use of light sources which are too small or improperly applied. Under such conditions objects can not be clearly or quickly seen and workmen are likely to stumble and fall over unseen obstacles, run into projecting equipment or stock, and misjudge the location of dangerous moving machine parts. These are not hypothetical possibilities, but are situations which have been found to be the cause of numerous accidents.

An inadequate quantity of light is never justifiable, particularly in view of the fact that a low intensity, as it is called, is not only dangerous, but is also economically intolerable because of the sluggish vision, slow physical response, and holding back of production which it causes. Extended studies have proven conclusively that there are certain minimum quantities of light which are essential to safety and efficient production. These figures are available from numerous sources, and in the case of those States having lighting codes are published in the code.

The following table is extracted from the Code of Lighting for Factories, Mills, and Other Work Places published by the Department of Labor of the State of New Jersey:

Intensity Required.—The desirable illumination to be provided and the minimum to be maintained are given in the following table:

| | Foot-candles ¹ at the work | |
|--|---------------------------------------|---------|
| | Ordinary practice | Minimum |
| (a) Roadways and yard thoroughfares..... | 0.05-0.25 | 0.02 |
| (b) Storage spaces..... | .50-1.00 | .25 |
| (c) Stairways, passageways, aisles..... | .75-2.00 | .25 |
| (d) Rough manufacturing, such as rough machining, rough assembling, rough bench work..... | 2.00-4.00 | 1.25 |
| (e) Rough manufacturing involving closer discrimination of detail..... | 3.00-6.00 | 2.00 |
| (f) Fine manufacturing, such as fine lathe work, pattern and tool making, light colored textiles..... | 4.00-8.00 | 3.00 |
| (g) Special cases of fine work, such as fine watch making, engraving, drafting, dark colored textiles..... | 10.00-15.00 | 5.00 |
| (h) Office work, such as accounting, typewriting, etc..... | 4.00- 8.00 | 3.00 |

¹ The foot-candle, the common unit of illumination, is the lighting effect produced upon an object by a standard candle at a distance of 1 foot; at 2 feet the effect would be not one-half foot-candle but one-fourth foot-candle, etc. A lamp which would give off 16 candlepower uniformly in all directions would produce a uniform illumination of 1 foot-candle at a distance of 4 feet in any direction.

A demonstration of these code values presents an interesting study. [Demonstration of code values.] The quantity of light existing at any point may be readily checked by a light-measuring instrument known as a foot-candle meter. [Demonstration of meter.]

It is interesting to note that the quantities of illumination found necessary for safety are far less than those which are necessary for clear sustained vision and efficient production. In other words, the plant manager who does not provide at least the quantity of light required for safety, in addition to the accident hazard, is faced by a serious economic loss in the productive efficiency of his employees. Certainly no one can justly claim that requiring compliance with the prevailing lighting code inflicts a hardship on the user of the light.

Analysis of such accidents as are sometimes classified under the heads: Fall of persons, fall of material, running or striking against objects, stepping on sharp objects, handling tools or objects, etc., can very frequently be traced to inadequate illumination.

Unsatisfactory quality of illumination is the second great cause of industrial accidents and is usually manifested by what is known as glare. If one looks at an exposed lamp the sensation of glare, which is temporary blindness, is experienced. Everyone has no doubt demonstrated this while driving along the highways at night upon meeting a car with improperly adjusted headlights. A sustained condition of this kind is likely to result in permanently impaired vision.

Bare, improperly placed, or improperly shaded lamps used in industrial plants may and do create this same effect. It is not difficult for anyone to realize the accident hazard such lighting constitutes. Picture a workman at a machine with a bare, glaring lamp hanging in front of him. His eye attempts to accommodate itself to this glaring brilliancy by contracting the iris and excluding the excess light. Perhaps he must turn away for another piece of work, and in so doing must look to an area which is not lighted to anywhere near the brilliancy he has just left. The iris of his eye is greatly contracted and can not immediately readapt or open up to admit enough light for clear vision. As a consequence the worker is temporarily blinded. While in this condition he is a ready victim to accident. He may run into projecting material, fall on a sharp tool, place his fingers in moving gears or belting. These and many other serious accidents have been known to occur under such lighting.

There are five recognized causes of glare, all of which may be found in varying degrees in many industrial plants. These are:

1. Excessive brightness of light source or reflected image.
2. Excessive volume of light directed toward the eye.
3. Position of light source.
4. Too great a contrast between light source and background.
5. Excessive time of exposure of eye to light source in field of vision.

These may be best explained by simple demonstration. [Demonstration.]

The provision of correct illumination, i. e., an adequate intensity without objectionable shadows and an absence of glare, is a simple and relatively inexpensive matter. Guesswork in placing a light-

ing installation is unnecessary for the science of illuminating engineering has progressed to a point where the results which will be obtained from a given system of illumination may be readily predetermined with a fair degree of accuracy.

Briefly, proper lighting may be obtained by adhering to the following:

1. *The proper size and type of lamp.*—This insures having sufficient light (raw material) to cover adequately the areas where vision is necessary. When lamps at low mounting heights are likely to be visible, they should be of the diffusing bulb type. Experience indicates that the following foot-candle intensities are desirable both from a safety and economic standpoint for best results for the classes of work listed. The size of lamp which should be used under average conditions may be readily determined by multiplying the floor area to be lighted from each lamp by the watts per square foot corresponding to the desired intensity.

| Class of work | Suggested foot-candle intensity | Required watts per square foot of floor area |
|---------------|---------------------------------|--|
| Rough..... | 4-6 | 0.7-1.0 |
| Average..... | 6-10 | 1.0-1.6 |
| Fine..... | 10-16 | 1.6-2.5 |

2. *An efficient reflector of proper design.*—The bare lamp gives off light in all directions. To obtain illumination where it will be most useful, the light rays must be controlled. The bare lamp, as previously demonstrated, is glaring and a properly designed reflector shields the eye.

3. *A proper placement of light sources.*—Too wide a spacing of lighting units may result in nonuniform or spotty light distribution and harsh shadows. Too low a mounting position may result in glare. Best results may be obtained by using a spacing between units which does not exceed their mounting height above the floor. It is usually desirable to mount the lighting units as high as possible without interfering with belting, etc.

4. *The proper color of walls and ceilings.*—Excessive contrast between surrounding areas and light sources may cause glare. Also dark surroundings absorb light, causing inefficient illumination.

5. *A regular system of cleaning and maintenance.*—If lighting units are allowed to become excessively dirty, or are not promptly replaced when burned out, inadequate lighting results. A schedule of cleaning every four to six weeks and the immediate replacement of burned-out or badly blackened lamps is advisable in the average factory.

Time does not permit of a thorough discussion of the economic advantages which accrue from proper lighting. It is well to recall, however, that compensation insurance premiums are usually based on pay roll, accident experience in a given industry, and experience of the plant under consideration. The reduction in premiums which would result from accident prevention by virtue of the installation

of correct lighting would in itself in many plants more than pay for the finest illumination. Furthermore, the costs of lighting equipment are relatively nominal, particularly when viewed in the light of the production increases which modern illumination has been found to make possible. Production increases ranging from 6 to 30 per cent, at costs for operating and maintaining lighting ranging from 1 to 5 per cent of wages over the same period, are not uncommon.

In concluding this discussion, the remarks of Andrew F. McBride, M. D., commissioner of the Department of Labor of the State of New Jersey, appearing in a paper presented before the Illuminating Engineering Society in 1926, are worthy of mention. He stated that a number of large manufacturers in New Jersey have presented testimony to the effect that accidents have been reduced from 50 to 75 per cent as the result of lighting their premises in accordance with modern practice. Certainly this is proof positive of the vital importance of carefully considering modern lighting in any program of accident prevention.

DISCUSSION

The CHAIRMAN. We are certainly indebted to Mr. Rademacher, of the Edison Lamp Works, for this very interesting illustration of one of the means of accident prevention. The discussion on that paper will be led by R. E. Simpson, of the Travelers Insurance Co.

Mr. SIMPSON. We are not likely to make as much progress as we would desire in the prevention of industrial accidents through good illumination unless we give some attention to another phase of the subject. It will be helpful in this connection if we consider light—that is, adequate and proper illumination—as raw material and the eye, optic nerve, and a certain part of the brain as the mechanism by which the raw material is translated into the finished product—our sense of sight. We can no more expect to have perfect vision without good eyes and proper illumination than we can expect a perfect article of commerce lacking first-class raw material and proper tools and workmanship to fashion it. Eyes free of visual defects comprise a vital factor in the problem.

Mr. Rademacher has presented to you a clear picture of illumination conditions in our industries, including the evils, the remedies, and the means of applying the remedies. But what of the human element? Assuming that all the lighting ills of industry were cured, are the workers in a condition to reap the full benefit?

Go back with me to the babyhood of one of these workers. For the first few months he wakes up every night crying with hunger. His parents turn on a light while they provide him with nourishment. His eyes, however, invariably seek out and remain fixed on the light source. As he grows older he is subjected to the two principal faults of illumination, inadequate light and glaring light, for it is the rule rather than the exception to find these two faults in workmen's homes. Thus at a tender age a strain is placed on his eyes considerably beyond that which nature intended. It is, therefore, not at all surprising that a certain percentage of the children entering our kindergarten grade have defective vision.

Our elementary educational system is predicated on the use of the eye. The printed word, the illustration, and the drawing all require the sense of sight. Lectures and other forms of oral instruction comprise a minor part of the system. In many of our schools one pupil will have more than 2,000 per cent more natural light than another pupil in the same room, while in practically all our schools there will be a variation of 10 to 1. There is still room for great improvement in the artificial lighting, particularly in the older school buildings. These conditions, coupled with the improper illumination in the home and lack of supervision of the manner in which our children use their eyes, place a constant strain on the visual apparatus during their school years. The result is that one out of every three pupils has defective vision at the end of his elementary education. Not only does the number of pupils having defective vision increase but the degree or seriousness of the defect also increases as they go up from grade to grade.

What of the future of these pupils? A small proportion enter institutions of higher education, but the majority of them take up some form of gainful occupation. They are the rookies of industry, subject to all its vicissitudes and hazards. They take the place of those who have passed on and of those who have become incapacitated through old age and infirmities. They are inexperienced in the ways of industry and its dangers, and this in itself is serious enough. But when some of them are further handicapped by defective vision their difficulties are measurably increased. They are, in effect, human seconds turned out to make their own way in the struggle for a livelihood, lacking a perfect equipment in the most important factor affecting their success and safety.

You have had shown to you the value of increased illumination as an aid in speed of vision or quickness of perception. The application in the field of accident prevention lies in the fact that a workman having normal eyes and proper illumination can get a snapshot view of a dangerous situation and act immediately. Another worker lacking either one or both of these essentials must take a longer time to grasp the situation, will be a little slower in responding, and thus may just fail to escape the danger zone. Power-actuated machines have no volition of their own. They can not change their cycle of operation or accommodate their schedule to that of a workman who because of poor light or poor eyes must take a time exposure of an emergency. In this manner and other similar ways is the stage set for many industrial accidents.

You have been told of the faults of industrial illumination and the cure. Light sources, reflectors, shades, and modifying devices are all available. There are hundreds of illuminating engineers who can produce artificial light in form, color, quantity, quality, direction, diffusion, and distribution to meet any conceivable human need. Neither the illuminating engineers nor anyone else can alter the human eye. Once the eye becomes defective in operation there is little or no chance that treatment will restore it to normal condition. The best that can be done is to provide correcting devices in the form of glasses.

It would seem, then, unnecessary to cite individual cases or to quote statistics to enlist your support of the statement that the con-

dition of the eyes of the workers has a direct and important bearing on the subject. There is no need to labor with further argument the contention that the vision of our workers is largely influenced by improper lighting conditions in the home and the school. There is a crying need of greater appreciation and recognition of the situation, and with that recognition an application of the known and proven remedial measures to the end that we may shortly stop supplying industry with young workers 30 per cent of whom have impaired vision. We will not show much progress along this line until our educational authorities permit science and technique to influence their decisions on the lighting equipment of our schools; and until the parents and guardians of our school children will spend much more time and study on the selection of the home lighting units and their accessories than they now spend upon the selection of the fabric and the form of window and door draperies. The latter appeal only to our sense of the esthetic, while the former assist us to enjoy the comforts of a home and at the same time act as a conservator of our most precious natural gift—our sense of sight.

(Meeting adjourned.)

FRIDAY, JULY 16—AFTERNOON SESSION

CHAIRMAN, A. L. URICK, COMMISSIONER OF LABOR OF IOWA

Commissioner STEWART. I want to introduce to you the chairman of the afternoon, Mr. Urick, of Iowa. Iowa has done for us the very best it could; that is all we can ask of anybody.

The CHAIRMAN. As said by the commissioner, Iowa has done the best it could. We are a State new in lines of industry, and naturally the same interest is not paid to these things that there is by the large producing States, although we are carrying on safety work. By way of illustration I might say that we have one railroad shop in Iowa that employs slightly over 1,400 employees, which got through 74 days without a reportable accident, meaning by that an accident that lasted more than 48 hours. Accidents are required to be reported within 48 hours. We have another plant, a gypsum plant, employing slightly over 600 people, that got through the month of May without any lost-time accidents. So you can see that we are interested.

The program thus far has been taken up largely with what is being done and what can be done by the various industries in accident prevention. The program this afternoon is on the perfecting of those statistics, on what the States may do to cooperate with the United States Bureau of Labor Statistics, which is generally accredited as being the proper body for the compilation and analysis of the accident statistics. So the program this afternoon varies a little from the former programs in that it will relate mostly to State cooperation. I have the pleasure at this time to introduce the first speaker: "What State departments can contribute to national accident-prevention statistics," by R. H. Lansburgh, secretary of labor and industry of Pennsylvania.

WHAT STATE DEPARTMENTS CAN CONTRIBUTE TO NATIONAL ACCIDENT PREVENTION STATISTICS

BY RICHARD H. LANSBURGH, SECRETARY OF LABOR AND INDUSTRY OF PENNSYLVANIA

Accident statistics form the groundwork of safety measures. This is incontrovertible. The history of the organized safety movement has proved it. Given accurate and detailed statistics of the causes of accidents, safety measures which can be directed toward the outstanding accident causes can follow. Statistics both arouse interest in and give direction to efforts toward accident reduction.

Statistics of accidents have in some industries and in some jurisdictions been fairly adequate for some time. In others they are totally inadequate. The great progress in accident reduction which has been accomplished in the steel industry during the last 15 years in large measure can be traced to the collection and analysis of acci-

dent records in that industry by the industry itself, as well as to the special attention which has been given to the accident experience of that industry by the United States Bureau of Labor Statistics. Particular groups collect railroad statistics; other groups collect mining accident statistics; still other groups collect statistics with reference to a certain cross-section of industry, as, for instance, the insurance companies which collect the records of their insured, though the records of the insurance companies in Pennsylvania, for example, do not cover the largest corporations in that State because most of them are self-insured.

But in many States and in many industries adequate records of accidents are not available. By adequate records must be meant necessarily records which are sufficiently specific as to causes to permit safety engineers in industry and in State inspection forces to use them as the basis of intelligent safety measures.

State labor departments are in the ideal position to collect, analyze, and distribute accident statistics. Compensation laws everywhere require the reporting of industrial accidents. These accident reports contain the only complete data of accidents and their causes to be found anywhere. Employers everywhere should recognize this and give full information on the accident reports required in order that resultant statistics be accurate and complete.

In that connection may I call your attention to the proportion of the accidents which occur in the various branches of industry in a great industrial State. In Pennsylvania, for instance, we find that 40 per cent of the nonfatal accidents and only 23 per cent of the fatal accidents come from the manufacturing industry—and much that has been said here in the last few days has related to the safety work which has been carried on in the manufacturing industry. It is interesting to find that in a great manufacturing State, such as Pennsylvania, the figures of the total number of accidents in manufacturing are so small.

The mining industry of Pennsylvania which of course still produces more coal than any other State, gives us 25 per cent of our nonfatal accidents and 39 per cent of our fatal accidents. The building and contracting industry gives us about 12 per cent of both our fatal and nonfatal accidents. The transportation industry gives us 12 per cent of our nonfatal accidents and 15 per cent of our fatal accidents, that leaves about 10 per cent of both our fatal and nonfatal accidents occurring in groups which represent neither manufacturing, mining, building, nor transportation, but miscellaneous groups, such as trading, and, in the municipal service, policemen and firemen killed while on duty. We do not ordinarily think of casualties of policemen and firemen as coming under the heading of industrial accidents, but all of the industrial accident statistics of practically all of the States include them, and they help to build up the tremendous total which has been referred to frequently in these gatherings.

It is the job of a State labor department, or similar department which deals with accident-prevention work, to be thinking in terms of all of these various groups, and if there is something being done in the mining group which could be of benefit to the manufacturing group in the same State, or vice versa, it is the task and the duty of

the State department to endeavor to bring that matter to the attention of the other group.

If statistically analyzed on approximately a uniform basis, State by State, these accident reports will give to the industries of each State the information needed by them in developing their safety efforts. The steel industry and other industries organized for safety have some of this information available. But other great and hazardous industries, such as the construction industry, have taken no steps within the industry to collect the necessary data, and, I wish to emphasize what has been said several times in this conference, that the great problem in accident prevention in the United States to-day is in the building and construction industry, for the reason that that is the one industry where accidents are still running wild with very little attempt within the industry to control them. It is through the collection of detailed data that very real service can be rendered to the industries of a State by a State labor department. Even those industries organized for accident prevention and with their own developed statistics profit by this. For instance, some 40 representatives of the steel industry of Pennsylvania met with us at Harrisburg last January, exchanged experience, compared accident records, checked their own record by specific accident cause against that of other companies within the State, and formulated an accident-prevention program for 1926 based on comparative accident records by cause that we had assembled for them in 1925.

The State inspection forces, guided by detailed statistics of accident cause in particular industries, will come as nearly completely fulfilling their mission in prevention work as is possible. Intelligently directed inspection, with detailed cause of accident, by industry, carefully arranged and drilled into the individual inspector by his superior will stop misdirected effort. It will result in a utilization of the inspector's time more nearly in proportion to the predominating causes of accidents in his territory. It will equip him with information which will cause him to be welcomed in the plant which is organized for safety and will give him the necessary data to interest the plant which has not as yet seriously considered the accident problem. He will be able to look at the accident records of the individual companies that he visits, check these, by cause, against the accident for that industry and be in a real position not only intelligently to direct his own efforts but to be of maximum assistance to the plant.

Educational work is recognized as the hope of safety. Educational safety work based on accurate statistics will succeed, be it carried on by a State inspection service or by industry. Educational work based on mere inspirational appeal will fail, however it be carried on, because it has no bull's-eye at which to shoot. Furthermore, educational work that is carried on without a statistical base is likely to strike at the cause of the spectacular single accident. It should rather be directed toward the accidents caused by everyday conditions that have existed so long as to be considered inherent in the business.

If statistics in the various States are developed on detailed and approximately uniform plans, it will be seen at once that through the United States Bureau of Labor Statistics these may be consolidated and codified so that the experience of one State may be com-

pared at once with another. Those in charge of accident-prevention work in the States thus may have an opportunity of comparing the current accident record of their State, in any particular, with similar records elsewhere. Though it will be some years before a man-hour or other accurate base can be worked out for exact comparison between jurisdictions, nevertheless approximate trend comparisons of one State with another will give valuable direction to effort.

It seems obvious, therefore, that State collection of accident statistics and detailed presentation of them is the keystone in the arch of safety effort. There are, however, certain necessary features of any such statistical compilations without which they are almost valueless in accomplishing their end. These are:

1. The presentation by industries must be so subdivided as to group only similar hazards. Thus, though machine shops and blast furnaces are both metal industries, statistics for the two must be separated because the hazards are different. The same is true of building construction and of general contracting. They can not be lumped under the general head of construction. If you use these statistics in actual accident-prevention work on a state-wide basis, you have to get them down to some kind of a common denominator that the individual can apply to his own particular problems.

2. The accident cause classifications must be so developed as to permit specific prevention work to be applied after the determination of exact causes. Thus in building construction, "fall of persons" is not a sufficiently definite record of accident cause to permit the statistics to be used for prevention work. But "falls from scaffolds," "falls through floor openings," "falls from tripping," are definite and give usable statistics.

3. Some method of determining the exposure to which the accident statistics apply must be found. Although it is at present a hopeless task to determine accurately man-hours worked throughout a whole State, this does not preclude the finding of a usable percentage figure. Fairly accurate indexes of employment are available or can be developed, and if these are carefully related to the accident record by industry, usable data will result.

I want to give you three illustrations that have come to my attention in the last two weeks, which are typical, as the reason why I think we are not going to get in the next few years anything that approaches accuracy in man-hour exposure on which you can base your accident rate. At the Sesquicentennial Exposition grounds in Philadelphia week before last a man was killed from falling from what was termed a scaffold about 20 feet up in the air. That accident will appear on our records as a fatal accident in that industry for the year 1926. That man had come from the State of New York, and was employed by a contractor who had one particular job to do at the Sesqui. His total work while he was in the State of Pennsylvania was to be of only three hours' duration, and it was while he was engaged in that job that he was killed. If he had not been killed we would never have heard of that three-hour exposure, regardless of what the law is on the books or how accurately we had endeavored to get exposure in that industry. There are thousands of such cases every day in a State the size of Pennsylvania,

and a percentage of them are likely to be just the cases where accidents occur. They are just the type of cases, for instance, where we have the greatest trouble in getting compensation insurance coverage, because either the man is hurt or the job is completed before we hear that there is such a job, and meanwhile there is no compensation coverage.

A circus train was coming into Pennsylvania from Maryland over the line from Baltimore to York. The circus was to show in York on a certain afternoon, and as the train pulled into the station one of the employees of the circus, in his hurry to start unloading, jumped out of one of the cars and fell under the wheels and was killed. Carnivals, and circuses, and attractions of that kind have given State compensation commissions trouble for years in the matter of insurance coverage, and in trying to get man-hour exposure from them you just multiply your troubles. In fact, it is difficult, if not impossible, to get it, and yet the accidents which they have when reported contribute to the total. We try to get such accidents reported, but we know there are many accidents which are not reported.

In the city of Harrisburg within the last several weeks a man who had never before been a contractor, having always been a carpenter, decided to go into the contracting game. He got a subcontract from a general contractor for certain construction work on a certain church. He went out into the streets and recruited, among others, a certain man as a laborer on the job. That man, within two days of the time that he was on the job, was killed by tripping over a board and falling into a five-foot ditch, breaking his neck, and our attention, of course, was centered on that accident.

It is my opinion that in the case of that particular contractor, and in thousands of other cases just like his in Pennsylvania, the matter of getting man-hour exposure would be very difficult until a sentiment was built up throughout the State that that was one of the things necessary in order to do business in Pennsylvania. We have been 10 years developing the sentiment about carrying compensation insurance. Every year we find thousands of people not carrying compensation insurance and we have to go out and hunt them and prosecute them, and everything else, in order to get them to take compensation insurance and the situation as to man-hour exposure would be worse. The illustrations I have given are, of course, not typical of the great steel plant nor of the great cement plant, nor of the large mine, but they are typical of the smaller type of business which exists everywhere and from which you do get accidents reported but from which it would be very difficult to get man-hours reported. So let us not be discouraged if we find it is impossible to get accurate man-hour exposure in the first few years, but let us start building up an index which we can use until such time as accurate man-hour exposure does become available.

4. Basically all accident statistics must be developed first with the thought of how they are to be used in accident prevention. To collect and publish statistics for their own sake is a waste of money and the acid test of usability should be applied to every column and every item.

With these features applied and used, the statistics compiled by State departments properly become the basis of much of the industrial accident-prevention work of the Nation.

DISCUSSION

The CHAIRMAN. The paper is now open for discussion. The discussion was to be led by Thomas P. Kearns of the division of safety and hygiene, department of industrial relations of Ohio. Mr. Kearns could not come himself, but he sent his discussion, which will be read by his representative, A. L. Rose of his department.

MR. KEARNS. I am in general accord with the viewpoint and conclusions outlined in Mr. Lansburgh's very valuable paper. The belief of the responsible officials of the State of Ohio in the value and importance of statistics as the prime essential in intelligently directing accident-prevention work is fully attested by the ample provision made for a thoroughly adequate accident-analysis laboratory in connection with the division of safety and hygiene, which was recently created by statute and placed under the supervision of the industrial commission, for the purpose of making a scientific study into the causes of industrial accidents and diseases, and to carry on measures for their prevention. With this bureau in operation, the State of Ohio will not only be in a position to, but will gladly co-operate with the Federal Government in its efforts to secure adequate national accident figures.

To-day is an age of specialization. Therefore, in order to secure the maximum results we must specialize in safety. To attempt to carry on accident-prevention work without statistics is like a doctor attempting to treat a sick person without a diagnosis, using the so-called shotgun prescription, loaded with several remedies, in the hope that one will reach the vital spot—certainly an unscientific method of procedure; yet often the remedies suggested for the cure of accident-sick industries are of this sort.

If we concede, as we must, that State statistics are valuable in accident-prevention work, then I believe it can be clearly shown that statistics based on nation-wide experience are also valuable to those engaged in accident-prevention efforts. Assuming that accident statistics based on nation-wide exposure are valuable, it may not be amiss to call attention to some difficulties in the way of securing State records from which reliable and comparable figures can be drawn. As I view the problem, there are several serious difficulties in the way.

In the first place, different States have different requirements as to which accidents shall be reported and to whom they shall be reported; second, cause classifications in different States differ widely; third, man-hour exposure is generally lacking; fourth, type of labor, plant equipment, and methods of operation vary greatly from State to State.

The above factors are mentioned, not to discourage efforts being made to assemble national statistics, but to bring into clear relief some of the obstacles which must be overcome in order that steps may be taken to eliminate them in so far as it is possible.

Obviously, differences in type of labor, equipments, and operating procedure will always exist as between various States. In the course

of time these differences may prove to be negligible, but should, I believe, be borne in mind when the State records of industries are compared.

Whether a law requiring simply the reporting of all accidents would have the desired effect of securing reports on all accidents is open to question. Experience along this line prior to the advent of the compensation laws indicates that it would not. I believe that under a noncompetitive compensation law such as we have in Ohio, a more nearly complete record of accidents is secured than where optional insurance is permitted and therefore our accident frequency rate would be liable to appear at a disadvantage in comparison with some other States. This, of course, would only affect the use of the statistics for comparative purposes. Their use to gain insight into accident causes would not be seriously impaired thereby. It would appear, therefore, that the more nearly uniform compensation laws are, the more nearly will accident reporting also be uniform.

Inasmuch as the cause classifications adopted by the International Association of Industrial Accident Boards and Commissions is more nearly followed by the States at present than any other, it would seem that efforts might properly be directed to securing their general adoption; or, as there is evidently some objection thereto, a revision of the classifications might be undertaken by those concerned so that the classification of accident causes would be uniform.

Mr. Lansburgh has spoken of the need of a measure of determining exposure to which accident statistics apply. I realize, as he does, the difficulty of securing man-hour exposure at the present time and feel that, as this is a very important factor in accident statistics, this conference might properly take steps to suggest ways and means by which these figures may be procured.

It is my opinion based on the experience of our field men, who in making their surveys always attempt to secure these figures, that it will be quite a long while before we shall be able to secure exact man-hours worked from all establishments and for all branches of industry. Therefore, I fully agree with the suggestion to use available material and from this develop man-hour exposure figures that will probably be adequate for practical purposes. We shall, and I think all of us should, continue our efforts to secure exact man-hours and we may find that they can be obtained with less difficulty than now appears.

I am also in accord with Mr. Lansburgh's position relative to the necessity of more elaborate subdivisions of industries and cause groups in any classification adopted; and I feel that too much stress can not be laid on the importance of developing cause classifications to the point where they will be truly indicative of the exact cause of accidents in order to enable the States, or individual plants, to make effective use of these statistics in their prevention work. As stated by Mr. Lansburgh falls of persons is not a sufficiently definite cause. Falls from scaffolds, falls through floor openings, falls from tripping give a much clearer conception of the cause of the accident; but I think we must go even further. For example, I think that falls from scaffolds should be subdivided to show whether the fall was due to failure of a structural member, breaking of ropes or cables, or due to the absence of guard rails. I realize, of course, that

there is a limit at which causes can be broken down and that there is some danger, as Doctor Chaney has pointed out, of pushing analysis to a point where the items lose their coherence. This must, of course, be guarded against; but in order to get the full benefit of statistics they must be in sufficient detail to point out the real cause of the accident.

While the basic value of accident statistics lies in their usability by the States, I think the dissemination of statistics is in itself of value in selling employers, employees, and the public generally, the need for greater safety effort, particularly if the fact that they are preventable is constantly reiterated and stressed when new casualty lists are published. This has been our experience at least. While our statistical department has been in operation only since the first of the present year and only six monthly reports have been issued, we have found quite a lively interest being manifested in these reports, not only by the industrial plants and safety engineers, but by labor and civic organizations, including the chambers of commerce and last, but not least, by many of the newspapers of the State. In other words, it is a means of awakening the public mind.

In this connection I might say that in my opinion, in so far as individual plants or plant safety engineers are concerned, they should not rely on either State or national statistics for primary direction of their safety efforts, but should develop their own figures and simply seek supplementary information as to accident sources from State and national statistics.

There can be no disputing the fact that statistics and educational effort are all very necessary as a means to the end in accident-prevention work. Yet these will be of little avail without a background of legal requirements, safety codes, adequate penalties, and determined and systematic enforcement. Therefore, while I am in complete agreement as to the necessity of more nearly complete and more accurate accident statistics and feel that this work ought to be pushed with the utmost vigor, I think the outstanding need to-day is an effort to apply well-known preventive measures to equally well-known hazards with a far greater measure of energy than is being done. To do this a way must be found to stir employers to a full realization of the enormous preventable loss of life, limb, and dollars which is occurring in American industry; for then, and only then will known safety measures be adequately applied, the interest of workers be enlisted, and our accidents be reduced to a level that an enlightened moral sense can justify.

The CHAIRMAN. Is there anyone else who desires to discuss the paper for a few minutes?

Mr. LEWIS. In the paper by Mr. Lansburgh and also the reply by Mr. Kearns, it seems that there is a misunderstanding as to how far the cause classification in industry codes has been advanced. Mr. Hatch, to my knowledge, has been connected with the details of coding for years. I first met Mr. Hatch in Columbus in 1915 when he was working on the cause code. Bulletin No. 276 of the United States Bureau of Labor Statistics contains the result of that work. On page 36 of that bulletin you will find all about falls of persons, slipping, power machinery, and everything. All of those groups are analyzed in sufficient detail for anyone.

I have waited for two days to say a few things, because I thought my remarks might be understood better after you had heard these papers. In order to acquaint you with my interest in the matter, I might state that I have been doing cause and industry coding for 11 years, and have trained quite a number of people to do this work. I know the details of the work of a statistician and what he has to contend with in trying to teach girls, who are not naturally interested in machinery, etc., intelligently to classify accidents. It takes, to my best knowledge, one year to train a girl to do efficient cause and industry coding when the chief statistician is within calling distance; I do not know how long it would take to train her so that the statistician could go away and stay for a week. In Columbus I had boys for coders in classifying accidents and they got along very well; in New York they were almost all girls and they had great difficulty. The classification of accidents requires an intimate working knowledge of factory operations, and I can not imagine how a statistician's office can be operated successfully unless the workers are familiar with the machines, nor how they can do accurate work from which we can prepare the kind of information the commissioner wants unless they can visualize the operation.

For several years I have been in correspondence with a great number of State commissioners and with statisticians, finding out how they do their work, and I am afraid that in some cases it is very, very poor.

I want to pay due credit to Ohio for being, I think, to-day in the most fortunate position of any State in the United States for gathering statistics.

In Ohio every insuree is numbered and you can classify your accidents by insurees. To show how this works, the malleable iron industry was going to have its premium rate raised, and one of the largest malleable iron plants in the State objected seriously. It said, "We are not causing these accidents. It is not our fault; we have a safety department. We are not causing these accidents at all; it is the little fellows who are doing it." I was working in Ohio then and was privileged to make a survey of the conditions, and because the cards carried the numbers of the insurees by which you could separate the experience of each company carrying insurance, I could place the accidents exactly where they belonged. The result showed that this large company was responsible for about 60 per cent of the outgo of money on accidents, and in consequence the little fellows were paying for some of the accidents in the large plants.

That was found inside of 24 hours, and in another 24 hours the rest of the study had been worked out, the plant had been inspected, and for about \$4.75 correction of the hazard was made, which reduced the accidents tremendously. We found that a great many of the accidents of the big companies were tabulated under our cause code classification "Hot metals—tapping out furnaces," and on inspection found that where the men were tapping the iron out of the furnace and going out on the floor and pouring it, the gangway was too narrow, and the men who stepped up on one side would catch the line of men coming along the other side; they were constantly bumping their arms, and if any of them happened to get a little patch of metal the size of a dime on his foot it disrupted the whole operation. There

was not a step between the two gangs. Before the afternoon was over we moved back a wooden partition 3 feet and put a pipe rail across. As a result the company's record was reduced to 30 per cent, and just because of that one little thing.

The CHAIRMAN. Mr. Patton is listed to discuss the paper by Doctor Lansburgh. We will hear from Mr. Patton for a few moments.

Mr. PATTON. From Mr. Lansburgh's paper it is evident that he appreciates and brought out the manner and the extent to which a State department of labor could help towards the formation of national accident statistics. All of us, of course, appreciate that a proper statistical groundwork is absolutely essential for an intelligent direction of safety and prevention work, and in furtherance of the contention that a State is in the proper position to render that service, I merely want to add, by way of emphasis, that the State occupies a strategic position for securing the information indispensable for providing such a groundwork. Any State which provides accident information that is comprehensive, detailed as to essentials, and reasonably prompt in appearance, wins for itself credit which can be obtained in no other way, and conversely any State which fails to provide such information places a stigma on itself which nothing but the performance of that task can remove.

This is so utterly obvious that it certainly needs no argument here to prove it, but as I say, by way of emphasis, I think we ought to keep in mind that a State department of labor, State industrial accident board, or whatever name it is called, is in the position, and it alone is in the position, to provide the base of operations from which intelligently directed attacks against the enemy common to all industry, namely, accidents, may be directed.

To me it is equally obvious that since the State is logically, as well as by compulsion of law, the only organization to secure this information continuously from all industries and in comparable form, it becomes the bounden duty of the State to perform that service, and, more than that, I would say that it is the duty of such a State organization to bring every legitimate form of pressure available to put itself in a position to render that service.

In saying this I do not mean that the State should annually make an appeal to the legislative body for more appropriations—not that merely. In most cases such appeal falls on deaf ears, and rightly does it fall on deaf ears unless the State organization can demonstrate beyond any question that it has intelligently used such resources as are already open to it.

One of the ways by which the State can better bring about this desirable condition is—and I want to emphasize the point—to cooperate with other agencies. The accident report, by whatever name it is called, is the basic document on which we have to work. I think it is true in most States that it is the insurance carrier and not the employer who files the accident report, but whoever it may be that furnishes the accident report whether employer, carrier, or other person, we ought to do our utmost to secure his cooperation, so that the information presented on that accident report shall be given in such a clear, definite, precise fashion that the results which we desire from it may be secured.

Some one may say, "Very well, since the law itself specifies the form of the accident report, or at least gives to the State department the power to prescribe that form, what more do you need?" Just this: Anybody who has had any experience in the actual tabulation of compensation reports knows that there is a very great difference between an accident report which is sufficient to settle a compensation claim and an accident report which is satisfactory for statistical purposes. The compensation bureau, or the division of the State department that is engaged in the settlement of claims, is constantly overborne by the rush and burden of the work. Its prime object is to dispose of claims; to get this man's case settled; to pay him his money and make way for the next man. The statistical element is necessarily, in most cases, obscured from its view; it is not thinking primarily of what the statistics will produce. I would like to make this earnest appeal that all of us try to impress upon and instill into the minds of the makers of accident reports, whether insurance carriers or employers, the importance of giving clear information as to the causes of the accident, the precise manner of occurrence, and the results of the injury.

Obviously it is a very much easier matter to win the cooperation of a relatively small group of insurance carriers in that respect than it is of the multitude of employers. Still I think that an educational campaign should be pressed in season and out of season to convince the employer that the State department of labor, which tabulates those reports, will be able to give him information which he can intelligently use in accident prevention only to the extent that the reports made to it are complete.

I feel I must say a word, too, by way of indorsement of the movement which Commissioner Stewart is so zealous in, and others as well, that of educating all of us—employers, insurance carriers, and State departments—as to the importance of providing some satisfactory uniform base for tabulating accident rates, whether frequency or severity. It seems to me beyond all question that it has been demonstrated that wherever possible and to whatever extent possible we can actually get the man-hour exposure, that is far superior to any other single bit of data. While I am not optimistic enough to believe that we can secure that in anything like 100 per cent fashion within six months or a year, I am optimistic enough to believe that if we set ourselves wholeheartedly to the task, we can start in with what has already been achieved and build up perhaps more rapidly than we now think possible the belief that it is worth while to go to the extra trouble to furnish that precise information. To whatever extent it is possible for me to aid in that direction I shall certainly be glad to do it.

The CHAIRMAN. I am sure we have all been interested in the expression of the needs for coordination of the States with the Federal department.

We are now about to be entertained with another subject, "Dust explosion hazards in industrial plants, with special reference to the need of proper reporting methods," by David J. Price, Bureau of Chemistry, United States Department of Agriculture.

DUST EXPLOSION HAZARDS IN INDUSTRIAL PLANTS, WITH SPECIAL REFERENCE TO THE NEED OF PROPER REPORTING METHODS

BY DAVID J. PRICE, ENGINEER IN CHARGE OF DEVELOPMENT WORK, BUREAU OF CHEMISTRY, U. S. DEPARTMENT OF AGRICULTURE

IMPORTANCE OF DUST-EXPLOSION PREVENTION

When it is realized that at least 28,000 industrial establishments in the United States are subject to the hazard of dust explosions and dust fires, the importance of prevention can be more fully appreciated. These plants employ approximately 1,324,300 persons and manufacture products of an annual value in excess of \$10,000,000,000. At least 281 explosions of this character have been reported to the Department of Agriculture. In 70 of these explosions 459 persons have been killed (an average of 8) and in 92 of them 760 have been injured (an average of over 8). The property loss in 144 cases amounted to more than \$33,529,350, an average of nearly \$240,000 for each explosion. These statistics of losses do not, of course, take into consideration the interruption to production, loss of time, and general disturbance of manufacturing operations as a result of explosions and fires of this character.

INDUSTRIES AFFECTED

It is now generally recognized that practically all types of dusts created during manufacturing operations are explosive and when mixed with air in proper proportions can be readily ignited by various external sources. The only exceptions would seem to be the inert dusts, such as shale, limestone, gypsum, and the like.

Attention has been directed to this problem in recent years and considerable experimental work has been done to determine the circumstances under which these dust explosions and fires can originate and to develop effective control and prevention measures. As a result of this special research work we have been enabled to understand a little more clearly what takes place when a large manufacturing plant is destroyed by an explosion, resulting in extensive loss of life and property and destruction of large quantities of food products.

Although the early explosions occurred in grain handling and mill-planting, costly experience has shown that these dust explosions are not confined entirely to what might be termed the grain industry. In addition to grain plants, dust explosions have occurred in starch factories, chocolate manufacturing plants, oilcloth factories, cork plants, cotton mills, fertilizer plants, powdered-milk factories, paper mills, woodworking plants, phonograph factories, sulphur-grinding plants, tanneries, and spice mills. Explosions of aluminum dust, magnesium dust, zinc dust, and similar types of metallic dusts have also been reported.

VALUE OF PROPER REPORTING METHODS

In order to determine definitely what measures can be adopted to control and prevent dust explosions in our manufacturing establishments, it is necessary to devise proper reporting methods. A uni-

form system of reporting accidents of this character would accomplish at least three important and necessary results:

1. It would make possible, thorough investigation of the explosion, the circumstances under which it originated and the need of prevention measures.

2. The extent of life losses and injuries could be more definitely determined.

3. The classification of losses by industries could be ascertained, indicating in a more definite manner the type of industry in which the dust-explosion hazard exists.

In referring to the need of proper reporting methods, it is not the intention to call attention to the need of a system of this kind only for the compilation of statistics to indicate the losses as a result of these explosions in certain types of industries. It is important of course that some provision of this nature be made, but it is equally important that the matter of time of reporting and method pursued also be given attention.

In dealing with what might be termed a relatively new industrial problem of this character, it is very essential that accidents of this type be promptly reported or at least brought to the attention of the investigating agencies as soon as possible after the explosion takes place. This makes possible the assignment of trained investigators, which results in a more definite procedure in so far as securing information regarding the circumstances under which the explosion occurred is concerned.

Although the Department of Agriculture promptly receives reports of dust explosions in industrial plants in which there are extensive losses of life and property and as a rule personally investigates these cases, it is quite evident that many occurrences of this character, on account of the minor losses, are not properly reported. In some instances delayed reports reach the department through indirect sources and after contacts have been made with State officials, insurance organizations, operating companies, and other agencies directly concerned, investigation has indicated that the accident was the result of a dust explosion and fire which had not been considered as such by the reporting agency.

PROPOSED PLAN

The success that accompanies the development of methods of prevention of industrial plant dust explosions is to a large extent dependent on the development of a plan for properly reporting this type of industrial accident. The following plan is proposed for consideration:

1. Special attention to be given by State officials, insurance commissions, safety organizations, and other interested agencies to dust explosions and dust fires in manufacturing plants, with a view to providing for prompt direct investigation to determine cause and circumstances under which the explosion occurred.

2. Prompt reporting to Department of Agriculture (by wire if necessary) of accident, if preliminary investigation indicates that explosive dust was the contributing factor, in order to provide for any assistance necessary in the determination of the probable cause of the explosion.

3. Classification of dust explosion and dust fire losses by respective industries to determine existence of any particularly hazardous types.

4. Application of control measures already developed together with essential precautionary measures for dust control and removal.

SUMMARY

This has been the first opportunity for the consideration of this subject in a conference called primarily for the purpose of considering industrial-accident prevention. No effort has been made to discuss the technical aspects of the problem, assuming that the hazard of dust explosions is now generally recognized. It is hoped that as a result of this conference some constructive steps can be taken that will result in the development of a method for uniformly reporting dust-explosion accidents in the manufacturing establishments in this country. It is believed a uniform system of this nature will eventually result in the reduction of the extensive losses of life and property as a result of this type of industrial accident.

DISCUSSION

(Gèorge E. Lynch, consulting engineer, Los Angeles, Calif., was not able to be present at the conference, but sent the following discussion of Mr. Price's paper:)

Mr. LYNCH. Of all classes of industrial hazards, that of dust is perhaps the most common and the least excusable. Proper statistics, covering all forms of injury suffered from dust, are impossible. Of course, injuries due to explosions, to foreign matter in the eyes, and even to infection of wounds in dirty conditions, can readily be classified and reported. But the slow, cumulative effect of continual breathing of a dusty atmosphere, with the gradual reduction of efficiency and the increased susceptibility to other diseases, not directly due to dust, can not readily be reported, nor can any definite statistics be kept up which would have any value in indicating the extent of the trouble.

Our difficulties in this respect are complicated by the reluctance of the men to believe in the danger present in dust, their refusal to wear respirators except under compulsion, and their usual indifference to keeping up any dust system, unless it is designed especially to avoid every possible need of adjustment and even the slightest interference with their work on the various machines. Fortunately, employers are now awaking to their responsibilities in this regard, and they no longer feel that the health of their men is of no importance, so long as an adequate supply of new labor is always available.

Dust conditions in the large crushing plants of the mines of the Southwest have always been bad, even when these operations were much smaller than at present. With the immense quantities of ore now handled, the dust became intolerable, especially in those mills which crush from 3,000 to 6,000 tons of dry rock per shift. Labor turnover was high, and efficiency of men and machines greatly impaired. However, in justice to the larger copper companies, it must

be stated that the primary idea in eliminating the dust was to obtain better working conditions for the men and to reduce the hazard of tuberculosis and other lung troubles as much as possible, rather than to increase the profits of the mills.

The Phelps-Dodge Corporation was the first large company to undertake control of the dust in an adequate and effective manner. This was due, principally, to the influence of P. G. Beckett, the general manager. All of its plants are now either equipped with proper dust-control systems or have such systems under construction, to be completed this summer. The following list of their plants, with approximate costs and capacities, shows the extent to which they have gone into the dust problem:

Montezuma Copper Co., Nacozari, Sonora, Mexico: 3,000 tons ore daily; cost, dust plant, \$6,000; installed March, 1923; operating cost, \$3.50 per day; dust collected daily, 8 to 10 tons, 6.8 per cent average copper content.

Copper Queen Mill, Warren, Ariz. (double-unit plant): 4,000 tons ore per shift (500 tons per hour); cost, double-unit dust plant, \$12,500; operating cost, \$4 per day; dust collected daily, 18 to 24 tons, 2.8 per cent copper content.

Old Dominion Co., Globe, Ariz.: 3,000 tons daily; dust plant under construction, estimated cost \$7,500.

Morenci Branch, Morenci, Ariz.: Dust plant installed in 1918 being rebuilt and brought up to date.

Copper Queen Smelter, Douglas, Ariz.: Dust and fume plant over reverberatory furnaces; cost \$3,000.

The following plants have been installed by the other large copper companies:

Ray Consolidated Copper Co., Ray, Ariz.: 6,000 tons per shift; cost, dust plant, \$6,000; operating cost, \$3.50 per day; dust collected, 16 to 20 tons daily, 1.8 per cent copper content.

United Verde Copper Co., Clarkdale, Ariz.: 4,000 to 6,000 tons daily, smelter ore; dust plant under construction.

Allenby Copper Co., Allenby, British Columbia: 2,500 tons daily; cost, dust plant, \$7,000; operating cost, \$3 daily; dust collected, 8 to 12 tons daily, 2.7 per cent copper.

New Cornelia Copper Co., Calumet & Arizona, Ajo, Ariz.: 4,000 tons daily; no data available as to cost or collection.

In addition to these a plant was recently completed at the Superior Portland Cement (Inc.) at Concrete, Wash. This plant not only handles the dust, but also cools the clinker to a point suitable for grinding.

At the Granite Rock Co., Watsonville, Calif., a double plant is now being installed to eliminate the fine dust produced in crushing some 3,000 yards of granite per shift.

A dust and fume plant was installed at the large plant of the California Cyanide Co., near Los Angeles, two years ago. This plant eliminates certain fumes evolved in the Metzger process of fixation of atmospheric nitrogen. These escaped into the air and caused some damage to vegetation, as well as imperiling the health of the workmen.

An interesting feature of all these plants so far installed is that they pay, not only all costs of operation, but also a very good profit on the investment from the direct savings in valuable material salvaged. The indirect profits in increased comfort and health of the men and reduction of wear on machinery are difficult to estimate, but one can readily believe them to be considerable.

Prices of plants and operating costs are given here purposely to make it clear that dust control is not very expensive. Of course, it must be understood that all these plants have been designed as separate engineering problems, the usual forms of exhausters and light steel piping being used, but in such arrangement and proportion as experience has proved to be best adapted to each special condition. It is very clear from this work that the manufacture of a complete standard design of dust system, which can be made up at the factory and sent out on any job, is entirely out of the question. Also, it is essential to note that all these plants are designed not to collect, but to control the dust, retaining it in the chutes and conveyors intended for carrying solids, and merely preventing it from escaping into the air of the mill. This is all that is necessary in the great majority of problems, and the same methods may be applied by any engineer and to any form of dust met with in industry. With explosive dusts it is necessary, of course, to avoid mixtures which can be exploded, keeping them either too rich or too attenuated for explosion at all times when a spark might be possible.

Since it has been made clear by actual experience in very difficult conditions that dust is unnecessary, and that its elimination is neither expensive nor inconvenient, one is forced to conclude that a dusty condition in any industry means either ignorance or indifference on the part of those responsible, and it would appear that restrictions and regulations can be made much more severe than at present without entailing unnecessary hardship upon the manufacturer or employer.

The CHAIRMAN. The next paper of the afternoon will be "The United States Bureau of Labor Statistics and the accident-prevention program," by Ethelbert Stewart, United States Commissioner of Labor Statistics. I am sure we will all be glad to hear from Commissioner Stewart.

THE UNITED STATES BUREAU OF LABOR STATISTICS AND THE ACCIDENT PREVENTION PROGRAM

BY ETHELBERT STEWART, UNITED STATES COMMISSIONER OF LABOR STATISTICS

I had prepared a paper, or at least I had outlined a paper, but just what I imagined would happen has happened, that practically everything that we had in mind has been touched upon to such an extent that it is only necessary, in a few words, to recall them.

What the Bureau of Labor Statistics wants to do is to be a clearing house for the statistics that the States are gathering. We do not want to do anything that the States will do. We do want to bring together the statistics of the iron and steel corporations with the State bureaus, and if possible gather the outside information that is not being gathered by anybody.

Mr. Stokes, of the Constructors' Association of the District of Columbia, sent me word that a man was killed in the building trades here yesterday and another one killed to-day. Nobody is required to report any accidents to anybody in the District of Columbia. Nobody is required to report any accidents to anybody in the State of Florida, and there are a number of other States in which this is true. There is no use to go into details. There are some places that none of you reach. We want to gather together all the data

we can get from all possible sources, augment that as much as possible, and give you a national accident rate in industry, and we want you to help us to do it. We want you to accept a uniform system of reporting by causes, by severity rates, and so on. It has just been called to my attention that there is nothing about dust being an element in the cause. It need not be the whole cause, but it might be an element in the cause. Our code does not show whether or not the place was well lighted. I see clearly that our Bulletin 276 needs revision, and I have asked a committee of all of the interests here to join with us in bringing that code down to date, if necessary. Fundamentally it is the code of the International Association of Industrial Accident Boards and Commissions—I call it the alphabetical association down at the bureau—printed by the Bureau of Labor Statistics, and which the bureau is trying to get everybody to adopt as a uniform method of reporting so that when it gets these reports they will all mean the same thing.

Now, basically we must have exposure in some form. What the bureau is trying to do now and has been trying to do for two years past is this: In our volume of employment index we have something like 10,000 establishments reporting to us the number of people on their pay rolls on the 15th day of each month. We have divided them by industries, and then have gone to the States which have compensation insurance and said, "Give us the accident record for these firms" for which we have the days of exposure. That is as far as we have been able so far to get, and what we want now is for the States to do a little bit more toward combining the actual accidents and to get a few more concerns to report the number of their employees, so that we can get a man-day or a man-hour rate. I do not believe that accident statistics will ever be as useful and as helpful as they ought to be until you get on a man-hour basis. I do not expect you to do it to-morrow; I do not expect you to do it in a year; but I would like to have you start doing it. We have had such an arrangement with about eight States—I am not sure of that number—for two years. We have not gotten that data satisfactorily from all of them yet; we have gotten it very well from a number, but we want to expand the number of States with which we work.

The National Safety Council is composed of a lot of industries, some of which are doing safety work and making excellent safety reports. For instance, the National Cement Co. has just issued a bulletin in which it reports on 120 companies; last year it reported on 110. It gives the million man-hours in each plant, the accidents, and all of the necessary details, so far as the industry as a whole is concerned, and I was told by Mr. Cameron that it has them by departments. That is what we want; we want to know exactly where the accident is happening. The only purpose of statistics, the only good that statistics can do, is to point the finger to the place where the accidents are occurring. It is up to the industry then to see whether they are going to continue to occur. Statistics are not going to prevent accidents, but they are to be the textbook for you who are in the safety work to study, to concentrate on, to focalize your effort, so as not to spill your money over the whole plant.

The associations are furnishing us those figures so far as they are getting them along our line, and we are asking only that more do it. For instance, the cement people, who last year had data for 110 plants, this year have data for 120 plants, while the census shows 133 plants making cement. That is pretty good. On the other hand, some of your associations have data for less than 5 per cent of the concerns engaged in the industry. I grant you that your 5 per cent employ probably 60 or 65 per cent of the number of workers in the industry. I grant you that there is no real relation between your membership and the total number of establishments, and the employees of your membership and the total employees, but if 92 per cent of the establishments in the United States employ less than 100 people and you have a mere skimming of the plants that employ 100 employees, or less, then it is up to somebody to reach these nonassociation manufacturers, to get the accident-prevention statistics into the hands of the nonassociation members, and I submit to you that it is up to the State bureaus to do that. Then it is up to the United States Bureau of Labor Statistics or the Department of Labor to pool those statistics and give you a national picture, but we can not do it without your assistance.

We are not going into the field, into the factories. We have not got the men nor the money. It is simply unthinkable. We want to do it as far as we can, but the States must realize what the statistical side of accident prevention means.

The Secretary sent a letter to the governors to send the State officials here; then we went to the associations, as far as we could get a line on them, to send representatives here. Then we sent to the insurance companies to send representatives here, and then to the larger labor organizations that were interested in safety in manufacturing. So far as I know, this is the first effort to bring all of the elements together at once. You have your own associations and your own conventions, and you stand off and look at yourself and pat yourself on the shoulder or condemn yourself, as the case may be, but what we want to do is to bring the whole thing into the picture. I feared that July was a bad time to call people together in Washington, but I believe this conference has done much to emphasize the importance of statistics as a guide in accident prevention. It has brought us together, and I think we have convinced ourselves that there must be cooperation to pour the final material into one hopper where it can be thoroughly analyzed, made comparable, and then spread.

For instance, take the American Engineering Standards Committee. The only connection which the Department of Labor has with that is that it is one of the members. I am on the correlating committee, on the main committee, and on the executive committee. That is all the interest the Bureau of Labor Statistics has in that committee, but we are working to get safety codes for each and every industry, as far as we can. When those codes are worked out inside of the industry and accepted by the association as standards, all the Bureau of Labor Statistics does is to print them and send them out to the States and ask them either if they will not adopt them if they

have the power, or try to get the legislatures to make these codes standard for the State.

I received a letter from the commissioner of labor of Wyoming the other day, saying "The law of Wyoming permits the commissioner of labor to tell what the factory inspection standard shall be and how the establishments shall guard and safeguard their work." He said, "Send on your bulletins, I can make them law." All the States are not in that category, but we have printed and distributed some 15 or 20 of these codes and 24 out of 48 States have signified their intention of putting these codes into effect or of getting the legislature to enact them into law.

We send these codes to all the labor organizations in the State; we send them to all the representatives in the State; we furnish the National Safety Council with enough copies to put them in the hands of every manufacturer in the States, if it wants to; we simply broadcast and urge the acceptance of what the American Engineering Standards Committee says is a good code.

What we want to do is to have a chance to unify the accident statistics of this country to the point where we can broadcast to an industry what the industry total is; what the subdivision is—for instance, iron and steel does not mean anything unless you separate the blast furnaces and the open hearths and show where the accidents are really occurring. The finer you get the classification the better it is.

Take the cement people; they have just issued a bulletin, and I want to call your attention to one little paragraph in that. They say that there were 61 deaths in the cement industry in the last year. Then they go on to say, "If we said this and nothing more there would be 61 deaths in the industry next year and the next year and the next year. The mere statement of this fact wouldn't make any difference in the number of deaths in the cement industry." Then they say, and I think it is one of the cleverest pieces of work that I have seen: "Industry as well as the Nation owes something to its dead." It owes it to its dead to analyze the causes of their deaths; it owes it to the crippled worker as much as the Nation owes it to the wounded soldier to analyze the causes of the deaths, so that the number of fatalities in the cement industry shall not remain 61. It owes it to the injured to know why he was injured and to see to it that the next fellow under the same circumstances shall not, if possible, be injured.

The cement people have 120 out of 133 plants reporting; I want to find out where the other 13 are, send these facts to them, and do what I can, using all the sources of information possible. I do not want to enter into any of your fields: all I ask is that the statistics be gathered along uniform lines. If they are not, they are of no use. We can not compare the State that has a 2-day waiting period with a State that has a 7-day or a 14-day waiting period. We have got to have all the data on the same basis.

I want to thank you for coming here; I want to thank the governors for sending you here and I want to ask Secretary Davis to thank you for coming here.

DISCUSSION

The CHAIRMAN. Secretary Davis.

Secretary DAVIS. I do not know that I can add anything to what the Commissioner of Labor Statistics has said, other than to say to you that I am sure we have accomplished much good here during the last three days.

I am very much interested in statistics. One could not spend his life in an industrial community with the workers and working among them without becoming interested. One could not help but become interested in statistics after one has seen the hundreds of injured men and women who have been carried to their homes, and has seen the resulting neglect of their dependents. One could not be at the head of a great organization that has cared for something like 2,500 children in the last 10 years without becoming interested in statistics. I want to indorse what the commissioner has already said, that the Department of Labor does not want to supersede the State. It does not want to supersede anyone; it only wants to be the central agency for combining what you give us and sending it out, because I am sure that if you just point out the situation to the American people, to the American business men, they will correct it. I have great faith in American business men. I have come much in contact with them during the past five or six years, and if you asked me to point out to you one American business man who is not interested in making his factory and his place of business an interesting place for his men and a safe place for them to work, I could not do it. I believe at heart we are all trying to do what is right.

I want to thank you for coming here and, as the commissioner said, thank the governors for sending you here. I am going to write to the governors and tell them what an interesting program we have had and what I think we have accomplished, and I am sure they will be glad of the part you have played in this work.

I can go out now and talk statistics. I have absorbed enough information here in the two days I have been with you to make a real genuine, red-hot speech on accident prevention. I shall write the President and tell him of the conclusions we have reached and the good I think we have done in this conference.

If at any time the Department of Labor can serve you in any way I am sure it will be glad to do it. I want to thank you also on behalf of the President of the United States for coming here.

The CHAIRMAN. I desire at this time to call upon the publicity committee, the chairman of which is A. C. Carruthers, for its report.

Commissioner STEWART. The chairman of the publicity committee informs me, naturally, that he has no report to make. He has been making his report for the last three days.

The CHAIRMAN. We will then proceed to the report of the committee on resolutions. The chairman, J. H. Crawford, has been called away, so Commissioner John Hopkins Hall will make the report.

REPORT OF COMMITTEE ON RESOLUTIONS

No. 1. Whereas the conference on industrial accident prevention called by the Hon. James J. Davis, Secretary of Labor, has been most beneficial and will undoubtedly result in great improvements in industrial wastage of men and money to the ultimate good of all: Therefore be it

Resolved, That the high appreciation and thanks of the delegates here assembled be extended the Hon. James J. Davis, Secretary of Labor, and his most able assistant, the Hon. Ethelbert Stewart, Commissioner of Labor Statistics, for their constructive and humane contribution to the welfare, progress, and prosperity of America's greatest assets, her productive units both human and material; be it further

Resolved, That a copy of these resolutions be presented the Hon. James J. Davis, the Hon. Ethelbert Stewart, and a copy be furnished the press.

(Adopted.)

No. 2. Whereas statistics are an indispensable aid to most effective accident prevention, and national accident statistics are of fundamental importance for most dependable comparisons of experience; and

Whereas it is necessary for State governments to collect accident statistics in the several States in connection with their own accident-prevention work and administration of compensation laws, and duplicate reporting of data by employers to State and Federal authorities should be avoided so far as possible; and

Whereas it is entirely feasible for State departments of labor to collect the original data from employers and furnish copies to the Federal Department of Labor as needed for statistics on a national scale: Therefore be it

Resolved, That this conference recommends that a system of national accident statistics should be developed as rapidly as possible by the following plan:

1. Standard and uniform data to be prepared in each State by the department of State government dealing with such matters and copies thereof to be furnished to the Federal Bureau of Labor Statistics, which bureau shall promptly transmit such records and information to the other governmental agencies interested.

2. The data in general to be standardized and made uniform in the several States by compilation so far as possible in accordance with the definition, classification, and table forms adapted by the International Association of Industrial Accident Boards and Commissions.

(Adopted.)

No. 3. Whereas dependable accident rates showing accident occurrence in relation to amount of employment or exposure are indispensable as a guide to accident prevention; and

Whereas such accident rates on a national scale are dependent upon development in the first instance of the necessary data in the several States; and

Whereas the States generally recognize by laws requiring accident recording and reporting the necessity of securing one part of the data for accident rates, namely, the occurrence of accidents; and

Whereas the recording and reporting of exposure in terms of amount of employment is equally necessary for accident rates: Therefore be it

Resolved, That this conference recommends that the States should put this entire matter where it belongs as a matter of necessary information for the guidance of safety work, both public and private, by supplementing present accident reporting laws so as to provide specifically, in case such laws do not already provide for it, that employers shall furnish such information concerning number of employees and amount of employment as may be necessary for the purpose of compiling accident frequency and severity rates by industries.

(Adopted.)

(The following was reported to the conference for such action as it might desire but without the recommendation of the committee:)

Whereas the importance of the subjects which have come before this conference and their bearing upon the securing of more complete statistics, and also the prevention of industrial accidents in many cases, calls for information and experience not available now, but which could be developed at future conferences of this nature; and

Whereas to accomplish the results which this conference aims to achieve can only be secured through further educational efforts and experience, this committee believes it is desirable that the Secretary of Labor call an annual conference at Washington for the continuance of the constructive work in connection with industrial accident statistics and industrial accident prevention which has originated in this conference.

(Referred to the Secretary of Labor.)

(The following discussion was had on resolution No. 2 in its original form, which contained a clause relative to transmitting the statistics gathered to the Bureau of Mines:)

Commissioner STEWART. I agree with all that resolution except where the inference is made that we should gather mining statistics and report them to the Bureau of Mines. Now it is just the other way. The Bureau of Mines is more closely in touch with the coal interests than we are or ever could be. The Bureau of Mines should collect the statistics on the same scope, along the same lines, as all other industries, and when they get them they will give them to us.

Mr. HALL. That matter was discussed and it was not the idea of the committee that the Bureau of Mines should discontinue its present statistical information or the gathering or collecting thereof. The idea was that additional information might come to the Bureau of Labor Statistics in which the Bureau of Mines might be interested, and which could be transmitted to it. In other words, to continue the present practice, but if additional data came in that might interest the Bureau of Mines or the Census Bureau, or any other bureau, it should be transmitted promptly to the interested bureau. I think perhaps Mr. Adams, a member of the committee, can explain it.

Mr. ADAMS. That is the idea the committee had, I think, in framing this resolution. It has been suggested that this information coming from the States to the Federal Government at Washington will come in the form of a very brief compilation, and such part of that brief statement as relates to mines which we in the Bureau of Mines do not already have we would like to receive. It would be very much more convenient for the State office to prepare its statistics on one statement, one type of list, and send it to one place in Washington, and that place the Bureau of Labor Statistics, which could then promptly transmit a portion of it to the Bureau of Mines.

Mr. HALL. I think your objection could be obviated by striking out the reference to the Bureau of Mines and saying "other governmental agencies interested." If there is no objection from the rest of the committee we will so report it.

(The following discussion was had as to the resolution calling for an annual conference:)

Mr. HALL. There were several other resolutions presented to the committee which the committee did not deem germane to the subject of this conference. One was relative to calling an annual meeting of this conference. It was presented rather late in the meetings of the committee, but the committee did not feel that it was up to this conference to suggest calling an annual conference. We all have conferences of various kinds. However, the author of this resolution is present, and the committee thought that it would report that to this body and you could take such action as you desire but it did not desire that the resolution be reported out.

The CHAIRMAN. What is the pleasure of the conference?

Mr. BYNUM. I move that a national meeting be held at Washington, D. C., during the period between July 1 and September 1.

The CHAIRMAN. That it is the sense of this meeting that there be a request for such a conference; is that the—

Mr. BYNUM. That is the sense.

CHAIRMAN. Is there a second to the motion?

Commissioner STEWART. I appreciate the thought behind the resolution. I think it is a compliment to ourselves and to the success of the conference. It is a subject that I have not had time to take up with the Secretary, in fact it never occurred to me that this might be a continuing affair. In my judgment all of the purposes of the resolution would be served if the resolution were referred to the Secretary of Labor for his consideration, without committing him without his consent, since the matter would have to be left to his judgment anyhow. I think the reference of the resolution by this conference to him would serve all purposes. That is the way I feel about it.

The CHAIRMAN. I would suggest that the chairman of the committee read the resolution and then we can—

Mr. HALL. I want to say in defense of the committee that the committee was in thorough accord as to the value of this conference and as to the possible value of future conferences. However, there are many agencies, State and National, that are serving the same purposes as this conference. Unfortunately, Indiana has not been represented at those meetings—the Association of Governmental Labor Officials, the National Safety Council, the International Association of Industrial Accident Boards and Commissions, and various other conventions. This is not a convention, but it involves an expense to the various States. It would not be expensive to those of us who are in States adjoining Washington to come to an annual conference, and probably would not be objectionable from that viewpoint, but it would be for people to come across the continent annually. In any event, we considered that it was within the province of the Secretary to call a meeting when he deemed it advisable to do so, and that was the only reason the committee felt it inadvisable to recommend the adoption of this resolution. However, I have no objection to reading it if the chairman desires it read.

The CHAIRMAN. Let me suggest that the feasibility of the calling of a convention be left to the option of the Secretary.

Mr. KAUFMANN. I believe we should record ourselves in favor of a gathering of this description from year to year, even though Mr. Hall indicates that there are many conventions calling together some of the folks in this gathering. I do not think other gatherings have the same complexion as this one has. There are labor men here who may not appear at the different conferences that Mr. Hall indicates, and I believe that all the big interests—labor is one of the big interests—in this country ought to be in joint session with the different industrial organizations and get into closer cooperation. I believe the Secretary has done a magnificent work in just the

gathering together of the folks, although labor has not taken very much part in the conference this time.

Mr. BYNUM. I am willing to accept the amendment of Mr. Hall, of Virginia, as to the calling of the convention, or conference rather, by the Secretary of Labor.

The CHAIRMAN. The next committee report is that of the committee on classification of industries, L. W. Hatch, New York Department of Labor, chairman.

Mr. HATCH. The committee on classification of industries has done a little less and a little more than you apparently referred to it for consideration. We assumed that the committee on classification of industries had as its task, as originally conceived, to take the standard classification of industries of the International Association of Industrial Accident Boards and Commissions, and examine it to see whether it ought to be revised as a part of the basic plan for uniform State statistics and combined State statistics in national accident statistics.

Now the classification of industries in that standard plan is a fairly long classification. We sat down and spent a couple of hours to see if we could arrive at anything in the way of a revision in that one classification in the time available in this convention. When I tell you that that classification and the other classifications took about three to five years' work by a committee on statistics that met once or twice and sometimes three times a year and did a lot of other work in between before it arrived at those classifications, you can understand that it was utterly out of the question to undertake any revision of a classification in the time available here. So the committee set out to consider two questions: Assuming from what has already been indorsed here by the passing of two of the resolutions from the resolutions committee that we are to proceed to build up national statistics by the use of the standard plan in the various States, does not that plan now require some revision? While we are building up national statistics we ought to take thought of whether we are building on the best possible foundation.

It is some 10 years ago that that plan was adopted. After consideration the committee felt that there was a pretty general opinion that some revision, not only of the industry classification but quite possibly of some of the other classifications or codes, ought to be made.

Having gone that far the question was, What is the best way to bring about such a revision? A suggestion was made to the committee—which it very carefully considered and which it finally decided indicated the best course to pursue—that there is in existence to-day exceptionally efficient machinery for just this kind of standardization work, and that is the American Engineering Standards Committee. That committee, as you know, is working very successfully. Commissioner Stewart referred to the fact that it has been very successful in working out standard industrial safety code rules for the prevention of accidents.

Accident statistics, as we have been told a great many times in the last three days, are simply a tool of the accident-prevention man. When we want that tool standardized, why not utilize the same ma-

chinery that has worked so well in connection with the practical application of some of the information we get by statistics in the form of code rules?

The present standard plan for uniform statistics was developed under the auspices of the International Association of Industrial Accident Boards and Commissions. The American Engineering Standards Committee is a technical agency, as I understand it, which takes up the working out of standards on any matter it is willing to take up, doing the technical work, when the project itself is sponsored by some responsible organization; so if this idea of revision, or study of whether we should revise and how and in what way we may revise, be taken up by that committee, the proposition should be taken up with that committee through the industrial accident boards and commissions organization. That would seem to be the appropriate and logical agency to take the matter up.

However, everything has to be started by some one, and we are here attempting to start something. That is exactly the word, as I see it. This conference wants to start something, or at least make something go faster that has been started heretofore, toward national statistics. The committee wanted to put in its report, as a part of its recommendation, that we should proceed to push and extend the use of the present standard accident plan. That, however, you have already considered and passed on. That section of our report, then, is adopted.

Coming to our part of the report, we propose that this committee on classification of industries should be continued temporarily to take up the question of revision with the International Association of Industrial Accident Boards and Commissions, asking it to act as sponsor for such revision, and with the American Engineering Standards Committee.

That is the way we discussed the matter and the conclusions at which we arrived.

In order to give you something a little more definite and specific we offer the following report:

REPORT OF COMMITTEE ON CLASSIFICATION OF INDUSTRIES

The committee finds—

(1) That some revision of the existing plan for standard and uniform accident statistics of the International Association of Industrial Accident Boards and Commissions seems desirable;

(2) That such a revision is a matter requiring study and time;

(3) That pending such a revision the use of the existing plan is urged;

(4) That the most promising means of revision would be utilization of the machinery of the American Engineering Standards Committee, as it is being employed for development of standard industrial safety code rules;

(5) That the logical and appropriate agency to sponsor revision by this means would be the International Association of Industrial Accident Boards and Commissions under whose auspices the existing plan was developed.

The committee therefore recommends—

That this committee be temporarily continued and authorized to take up negotiations with the International Association of Industrial Accidents Boards and Commissions and the American Engineering Standards Committee looking to revision of the standard plan by this means.

[It was moved and seconded that the report of the committee on classification of industries be approved.]

Mr. BYNUM. I wish to speak on the resolution. The International Association of Industrial Accident Boards and Commissions will meet at Hartford, Conn., about the middle of September. I do not know a chairman of any of the accident boards who is here except myself. I am against that resolution for the reason that it should be submitted to the boards or the delegates of the boards. Therefore I oppose the resolution as proposed.

Mr. LANSBURGH. Representing the Department of Labor and Industry of Pennsylvania, which is a member of the International Association of Industrial Accident Boards and Commissions, I feel that I have a right to speak for that membership of that association. I would direct attention to the fact that it has a standing committee on statistics, of which Mr. Hatch is the chairman, and therefore it seems to me that Mr. Hatch is in a sense already authorized to speak for that association, at least to the extent of saying that he will bring to the attention of the association in its next meeting in Hartford in September the fact that it is the sense of this meeting that what is in this resolution be carried out. I see no reason, from the standpoint of the association in question, why this meeting should not adopt Mr. Hatch's resolution.

Mr. HATCH. I would like to say just a word. Far be it from me to assume any authority, although I am chairman of one of its standing committees, to speak for the International Association of Industrial Accident Boards and Commissions. I have no such authority. I can say this, however, that the committee on classification of industries of this conference, which considered this matter had four members who happen also to be members of the standing committee on statistics of the International Association of Industrial Accident Boards and Commissions, so that we have looked at this thing from the point of view of the interests of the International Association of Industrial Accident Boards and Commissions, as well as of this conference here.

Just let me emphasize the wording of this resolution. We are not proposing to start any revision whatever. Some one, as I said a moment ago, will have to start something. This conference has been devoting its attention for three days to standard accident statistics, and all the discussion that I have heard about whether the standard plan is still as good as it might be is to the effect that some very useful revisions could be made. The question is how to start those revisions. All this resolution proposes is that as long as you have this committee, which is purely a temporary affair, you just continue this committee long enough so that we can put the matter as it looks to this conference before the International Association of Industrial Accident Boards and Commissions. Then it will be entirely up to that association to decide whether or not it cares to sponsor any revision by the American Engineering Standards Committee. Frankly, I do not mind telling you that if you decide that this is a good thing to do, it was my purpose, as chairman of the committee on statistics of the International Association of Industrial Accident Boards and Commissions to report the action here to the Hartford convention on the 14th of September. A tentative program is already out, and the chairman of the committee on statistics has to make a report to the convention anyway on other matters.

It did not seem to be at all out of the way to inquire, at least before we put this proposal up to that association, whether that association could get the Engineering Standards Committee to do anything of the kind. It is a little bit different from the things it has done so far, a little new in some of its aspects. So the whole proposition is purely informal, purely in the nature of getting something under way for consideration by the International Association of Industrial Accident Boards and Commissions, and in order to get something under way we are proposing this specific method of doing the business. The effectiveness of the method and the way it is worked out with industrial safety code rules proves well enough that it is a very reasonable method to suggest to that association. In other words, we are not starting anything that the international association can not turn down or refuse even to consider. We are simply proposing to report to it the sense of this meeting in this way.

Commissioner STEWART. I am a little bit befuddled about this thing. I do not quite see the point of view. I am secretary-treasurer of that association, and I want to say that a great many of its members are compensation commissioners purely. Some States have nothing to do with accident reporting at all; that belongs to another division of the State which is not a member of that association. Its members do not always listen to accident stuff with the kind of enthusiasm that we sometimes wish they would, and it seems to me that it would be very helpful to me in approaching the executive committee to know whether we want to revise the classifications—in other words, Bulletin 276—and if so, whether we want to do it ourselves or to bring in the American Engineering Standards Committee to help in the matter. I do not quite see what harm this report is going to do, and I do see where it would help a good deal in the Hartford convention to have something done, one way or the other.

I think we all agree that those standards, 10 years old, need revision. There are 150,000 men employed in the radio business. There was no radio business in those days. There are now something like 260,000 engaged in making victrolas and that sort of thing. There were not enough employed 10 years ago for us to pay any attention to that industry. The question of lighting has come up, and there are dozens of place where the classification is weak because it does not mention these things. I do not think it is vitally wrong as it stands but it does not cover enough ground, and it seems to me that this report will be exceedingly helpful. It will enable me to say, "Well, the conference in Washington appointed a committee of five and continued it and they are after me to get this thing done." If there is any real objection, why, that is something else again, but I do not see it—it seems to me to be helpful.

The CHAIRMAN. I would like to ask Mr. Hatch a question as to whether the proposed changes are confined solely to the matter of classification, or whether they happen to be other features of that work?

Mr. HATCH. We are not recommending any changes in the plan at all. It would take too long to do that. We can not revise that

standard plan in three days. I was a member of the committee that worked five years to evolve that plan. It is a matter that takes a lot of technical study and work, if you are going to make any revision of it at all, and the whole idea of the committee was that it is a common opinion—Commissioner Stewart just voiced it—that after 10 years there ought to be a revision. What is the best way to get the best revision? This is a suggestion which we think offers the most promise, and all we want to do is to get the proposal considered where it should be considered.

Mr. MARSHALL. I would like to add one word, if I may. I am not opposed to this resolution at all. I believe there ought to be a revision, as is necessary in all such laws or codes, or anything that has such detail, but I want to point out one thing. I hope the matter of revision will not be entirely given to some other different organization, which did not have the work and care of getting it out originally, with the possible result of a general revision and destruction of whatever material we have already prepared.

Mr. BYNUM. I want to say this for the industrial accident boards, we have various duties to perform. I have free employment, factory inspection, boiler inspection, etc. I can not grasp all of this work; I do not attempt to. I have the utmost faith in Mr. Hatch and in Mr. Lansburgh, of Pennsylvania. I do not think that this meeting should attempt to tell the boards or to suggest to the boards what they should do except by presentation to the boards themselves, or to that meeting of their organization. I know Mr. Hatch will be there, and probably I will support his motion when there, but I do not want it presented here where there are no industrial boards represented, except, possibly, myself.

Mr. DAVIE. I rise to have Mr. Hatch read again the recommendation of his committee. It appears to me that it is perfectly clear that it is a tentative plan that will be presented before the very board that the gentleman from Indiana seems to object to having it presented to, and if Mr. Hatch would be kind enough to read it again I think it will clear the atmosphere sufficiently so that we can adopt the recommendation of this committee. That is what I am going to support.

(Mr. Hatch read the recommendation of the committee.)

Mr. HATCH. I think the committee on classification of industries would be willing to reword that so as to make it entirely safe, but what we have in mind is simply that something ought to be done; a revision should be inaugurated and sponsored, and it will have to be by some organization. The International Association of Industrial Accident Boards and Commissions is the logical and appropriate body to propose any revision of its own standard plan. We simply suggest that this conference might continue this committee to negotiate with it to consider the matter, and, if it so desires, to approach the Engineering Standards Committee with some practical proposal. We can not go to the Engineering Standards Committee and say, "Here now, we want a revision"—nothing of that kind. All we can do is simply to inquire, "If the International Association

of Industrial Accident Boards and Commissions wanted it, would you undertake it?" If it said, "No," that would end it.

(The recommendation of the committee was adopted.)

The CHAIRMAN. We now have the report of the committee on determination of exposure, chairman, L. W. Chaney, United States Bureau of Labor Statistics.

Doctor CHANEY. The ground covered by this committee seemed to be also covered fully by the committee on resolutions, and therefore our report was turned over to the committee on resolutions and is embodied in that report, which has already been acted upon.

The CHAIRMAN. That concludes, then, the program of the conference. What is your pleasure?

Mr. GRAM. Before we adjourn I want to say that I have appreciated this meeting very much. I have learned a whole lot from the various papers that have been read, and I want to thank Secretary of Labor Davis for calling this conference. I notice, however, that Oregon is about the only far Western State represented here.

Mr. WOLLNER. No, California is represented.

Mr. GRAM. The thought occurred to me that if the Secretary contemplates calling some future meeting similar to this, would it not be advisable to call two meetings—one for the West and one for the East. If we go to the manufacturers with a certain thing they say, "Why should I be required to do this? I am operating also in Idaho, Montana, and California, and I am not required to do it there." That may be all an excuse; nevertheless, it is closely allied out there. It seems to me that it might be profitable, if a conference is held, to hold one for the Coast States and one here. I want to leave that suggestion with the Secretary to take under consideration.

(Meeting adjourned.)

APPENDIX.—LIST OF PERSONS WHO ATTENDED THE INDUSTRIAL ACCIDENT PREVENTION CONFERENCE HELD AT WASHINGTON, D. C., JULY 14, 15, AND 16, 1926

ARGENTINA

Owen L. Thomas, Argentine manager Munson Steamship Line, Buenos Aires.

CANADA

Quebec

W. A. Booth, director safety and first aid, Canadian National Railways, Montreal.

W. H. Jones, assistant director safety and first aid, Canadian National Railways, Montreal.

Ontario

R. B. Morley, general manager Industrial Accident Prevention Associations, Toronto.

UNITED STATES

California

J. B. Monahan, general supervisor of safety Southern Pacific Lines, San Francisco.

William S. Wollner, general safety agent Northwestern Pacific R. R. Co., also Society of Safety Engineers, San Francisco.

Connecticut

Edward R. Dejon, chairman industrial committee, Chamber of Commerce, New Haven.

James W. Hook, president and treasurer Geometric Tool Co., New Haven.

Frederick J. Kingsbury, chairman and treasurer Bridgeport Brass Co., Bridgeport.

F. W. Mitchell, director of personnel New York, New Haven & Hartford R. R., New Haven.

Henry J. Potter, superintendent Engineering and Inspection department, Hartford Accident & Indemnity Co., Hartford.

R. E. Simpson, engineer Travelers Insurance Co., Hartford.

John L. Thompson, superintendent Travelers Insurance Co., Hartford.

David Van Schaack, director bureau of inspection and accident prevention, Aetna Life Insurance Co., Hartford.

Harry Walsh, industrial engineer New York, New Haven & Hartford R. R. Co., New Haven.

Delaware

J. Hay Barnholt, safety engineer E. I. du Pont de Nemours & Co., Wilmington.

R. T. Doherty, supervisor of safety The Pullman Co., Wilmington.

Charles H. Grantland, secretary Industrial Accident Board, Dover.

N. S. Greensfelder, editor The Explosives Engineer, Wilmington.

John B. Grier, employment and safety manager American Car & Foundry Co., Wilmington.

Joseph M. McVey, safety engineer Hercules Powder Co., Wilmington.

Theodore Marvin, managing editor The Explosives Engineer, Wilmington (also Hercules Powder Co.).

Donald R. Morton, Delaware Safety Council, Wilmington.

Walter Dent Smith, manager Delaware Safety Council, Wilmington.

Winthrop B. Wood, chief engineer Joseph Bancroft & Sons Co., Wilmington.

District of Columbia

- W. W. Adams, statistician United States Bureau of Mines; also representative of American Statistical Association.
- C. P. Alford, American Engineering Council.
- George H. Bailey, counsel American Mining Congress.
- Charles E. Baldwin, assistant commissioner United States Bureau of Labor Statistics.
- J. D. Battle, traffic manager National Coal Association.
- D. H. Beatty, superintendent safety and sanitation, Southern Railway System.
- E. B. Berry, superintendent of insurance Southern Railway System; also Railway Fire Protection Association, Richmond, Va.
- Robert S. Billups, United States Bureau of Labor Statistics.
- J. Chester Bowen, United States Bureau of Labor Statistics.
- Frank P. Cartwright, technical representative National Lumber Manufacturers Association.
- Lucian W. Chaney, United States Bureau of Labor Statistics.
- Ward P. Christie, engineer Associated General Contractors of America.
- Lindley D. Clark, United States Bureau of Labor Statistics.
- Miss E. R. Coombes, American Mining Congress.
- Edward Crane, Bureau of Statistics, Interstate Commerce Commission.
- James J. Davis, United States Secretary of Labor.
- W. N. Doak, vice president Brotherhood of Railroad Trainmen.
- Fayette B. Dow, counsel American Petroleum Institute; also representative of National Petroleum Association.
- James P. Dowd, superintendent Postal Telegraph Co.
- Fred A. Emery, United States Daily.
- Paul B. Fenlon, Washington sales manager Worthington Pump & Machinery Corporation.
- Harry L. Gandy, executive secretary National Coal Association.
- Hugh S. Hanna, United States Bureau of Labor Statistics.
- J. E. Hannum, director of safety and production study American Engineering Council.
- M. H. Hedges, research director International Brotherhood of Electrical Workers.
- Horace H. Herr, representative American Contractor.
- George Herring, interpreter.
- R. J. Hoage, chief statistician United States Employees Compensation Commission.
- Paul E. Holden, American Engineering Council.
- B. F. Linz, manager Technical News Service.
- M. G. Lloyd, chief section of safety engineering, Bureau of Standards.
- R. A. McGowan, assistant director social action department, National Catholic Welfare Conference.
- Leifur Magnusson, American representative International Labor Office.
- M. M. Mahoney, Department of External Affairs of Canada, British Embassy.
- E. N. Matthews, United States Children's Bureau.
- Paul L. Messersmith, inspector Travelers Insurance Co.
- Frank Morrison, secretary American Federation of Labor.
- W. P. Neville, secretary-treasurer Labor.
- William A. Noel, dust explosion engineer United States Bureau of Chemistry.
- A. C. Oliphant, assistant secretary American Engineering Council.
- Stewart J. Owen, jr., engineer United States Bureau of Standards.
- David J. Price, engineer in charge United States Bureau of Chemistry.
- Ruth Sanders, United States Bureau of Labor Statistics.
- Dr. R. R. Sayers, chief surgeon United States Bureau of Mines.
- L. W. Searles, chairman Highway Safety Association.
- Joseph Stansfield, Interstate Commerce Commission.
- Ethelbert Stewart, United States Commissioner of Labor Statistics.
- Earl F. Stokes, executive secretary National Association of Builders' Exchanges.
- E. N. Suarles, Western Electric Co.
- Laura A. Thompson, librarian United States Department of Labor.
- J. L. Vandergrift, Chesapeake & Potomac Telephone Co.
- Anice L. Whitney, United States Bureau of Labor Statistics.
- Nathan B. Williams, National Association of Manufacturers.
- Dr. Robert M. Woodbury, Institute of Economics.
- F. B. Wright, manager Western Electric Co.

Georgia

- W. E. Christie, assistant commissioner Department of Commerce and Labor, Atlanta.
L. J. Kilburn, Industrial Commissioner, Atlanta.

Illinois

- W. H. Cameron, managing director National Safety Council, Chicago.
H. C. Evans, manager Alton Box Board & Paper Co., Alton; also representative of La Fayette Box Board & Paper Co., La Fayette.
J. F. Green, safety and protection engineer Western Cartridge Co., East Alton.
George H. Hawes, assistant director of safety the Pullman Co., Chicago.
Arthur M. Huddell, president International Union of Steam and Operating Engineers, Chicago.
Frank A. Lauerman, safety engineer Interstate Iron & Steel Co., Chicago.
L. F. Shedd, superintendent of safety Chicago, Rock Island & Pacific Railway and Chicago, Rock Island & Gulf Railway, Chicago.
W. A. Titus, assistant superintendent Western Electric Co., Chicago.
J. H. Walker, president Illinois Federation of Labor, Springfield.
J. D. White, superintendent of safety Illinois Central Railroad Co., Chicago.

Indiana

- Dixson H. Bynum, chairman industrial board, Indianapolis.
Thomas K. Lewis, statistician International Typographical Union, Indianapolis.

Iowa

- A. L. Urick, commissioner of labor, Des Moines.

Kansas

- John H. Crawford, director of labor of Kansas, Topeka.
Isaiah Hale, safety superintendent system, Santa Fe Railway, Topeka.
L. T. Hussey, chairman public service commission, Topeka.

Kentucky

- O. H. Wilcox, executive secretary Employees' Mutual Benefit Association of West Kentucky Coal Co., Sturgis.

Louisiana

- W. H. Jennings, safety engineer Great Southern Lumber Co.; also representative Bogalusa Paper Co., Bogalusa.

Moine

- Charles O. Beals, commissioner of labor, Augusta.

Maryland

- Rollin S. Bailey, National Safety Appliance Corporation, Baltimore.
A. E. Brown, secretary State industrial accident commission, Baltimore.
Robert H. Carr, chairman State industrial accident commission, Baltimore.
George Louis Eppler, State industrial accident commission, Baltimore.
James E. Green, jr., superintendent State accident fund, Baltimore.
Walter A. Hearn, president National Safety Appliance Corporation, Baltimore.
George W. Knapp, jr., chairman safety division, Baltimore Safety Council, Baltimore.
Holger Jensen, manager Maryland Casualty Co., Baltimore.
Bertha C. Joseph, statistician State industrial accident commission, Baltimore.
C. J. Raider, superintendent United States Fidelity & Guaranty Co., Baltimore.
J. H. Rixse, safety engineer Hartford Accident & Indemnity Co., Baltimore.
John P. Rostmeyer, assistant director Baltimore Safety Council, Baltimore.
O. A. Shipley, safety engineer United States Fidelity & Guaranty Co., Baltimore.
John H. Truett, director Baltimore Safety Council, Baltimore.

Massachusetts

- W. A. Dearborn, chief engineer Federal Mutual Liability Insurance Co., Boston.
 Frank E. Morris, assistant chief engineer Liberty Mutual Insurance Co., Boston.
 C. E. Pettibone, American Mutual Liability Insurance Co., Boston.
 J. E. Walters, General Electric Co., West Lynn, Mass.

Michigan

- L. E. Averill, safety engineer Packard Motor Car Co.; also representative of operating board, Industrial Safety Council, Detroit.

Minnesota

- Henry McColl, commissioner industrial commission, St. Paul.

Missouri

- C. F. Larson, superintendent, safety, Missouri Pacific Railroad Co., St. Louis.
 D. G. Phillips, superintendent, safety, Wabash Railway Co., St. Louis.

New Hampshire

- John S. B. Davie, commissioner of labor, Concord.

New Jersey

- H. U. Dambmann, safety engineer, New Jersey Zinc Co., Franklin.
 Dudley Farrand, president, Newark Safety Council, Newark.
 Thomas E. Hicks, director first-aid department, Johnson & Johnson, New Brunswick.
 Andrew F. McBride, M. D., commissioner of labor, Trenton.
 W. H. Rademacher, illuminating engineer Edison Lamp Works, Harrison; also representing Illuminating Engineering Society.
 Fred M. Rosseland, secretary-manager Newark Safety Council, Newark.
 A. J. Van Brunt, director safety education Public Service Corporation, Newark; also representing American Gas Association.
 Charles H. Weeks, deputy commissioner of labor, Trenton.

New Mexico

- James J. Heaney, yardmaster Atchison, Topeka & Santa Fe Railroad, Albuquerque.

New York

- P. G. Agnew, secretary American Engineering Standards Committee, New York.
 J. A. Allen, Fominte-Childs Co., Utica.
 Thomas P. Brennan, supervisor of safety Long Island Railroad Co., New York.
 Stuart H. Brown, assistant secretary Union Bag & Paper Corporation, New York.
 Thomas J. Cahill, president New York State Bricklayers, New York.
 Arthur C. Carruthers, president and editor Safety Engineering, New York.
 J. C. Caviston, secretary safety section, American Railway Association, New York.
 C. L. Close, manager bureau of safety, United States Steel Corporation, New York; also representative of American Iron and Steel Institute.
 W. Graham Cole, safety engineer Metropolitan Life Insurance Co., New York.
 A. E. Davidson, Patent Scaffolding Co., New York.
 Lewis A. DeBlois, National Bureau of Casualty and Surety Underwriters, New York; also representing National Safety Council.
 Martin Dodge, manager industrial bureau, Merchants Association of New York, N. Y.
 Seymour W. Doran, personnel superintendent, Pratt & Letchworth Co., Buffalo.
 James P. Eaton, chairman safety committee, General Electric Co., Schenectady.

- J. B. Gibson, safety and health director, Western Electric Co., New York.
 L. L. Hall, National Council on Compensation Insurance, New York.
 James A. Hamilton, industrial commissioner, New York.
 L. W. Hatch, director bureau of statistics and information, department of labor, New York.
 Charles E. Hill, general safety agent New York Central Lines, New York; also representing Michigan Central Railroad Co.
 J. C. Hubbard, general supervisor of lines Western Union Telegraph Co., New York.
 John Price Jackson, manager of personnel New York Edison Co.; also representing American Society of Mechanical Engineers, New York.
 E. Kaufmann, general organizer United Garment Workers, New York.
 J. E. Long, superintendent of safety Delaware & Hudson Co., Albany.
 Daniel T. Meany, traveling safety supervisor International Paper Co., New York.
 H. W. Mowery, American Abrasive Metals Co., New York.
 A. J. Mundt, engineer Western Union Telegraph Co., New York.
 Otto Nicols, general organizer United Garment Workers, New York.
 W. H. Olschewsky, supervisor Western Union Telegraph Co., New York.
 G. A. Orth, chief safety and claim departments American Car & Foundry Co., New York.
 Lew R. Palmer, conservation engineer Equitable Life Assurance Society, New York.
 Eugene B. Patton, chief statistician department of labor, Albany.
 C. L. Peake, director industrial relations American Radiator Co., Buffalo.
 R. J. Peterson, supervisor of safety the Pullman Co., New York.
 Louis Resnick, assistant to the president American Museum of Safety; also representing New York Edison Co., New York.
 H. A. Rowe, claims attorney Delaware, Lackawanna & Western Railroad Co., New York.
 E. S. Shartzler, manager bureau of safety, Utica Mutual Insurance Co., Utica.
 Isidor Silverman, secretary Brotherhood of Painters, New York.
 Clarence E. Spayd, safety engineer Brooklyn Edison Co., also representing Brooklyn Safety Council, Brooklyn.
 Edward R. Stettinius, jr., industrial relations staff General Motors Corporation, New York.
 Arthur M. Tode, superintendent technical division the Texas Co., New York; also representing National Safety Council.
 Charlotte Todes, organizer Workers' Health Bureau of America, New York.
 R. S. Turner, safety supervisor West Virginia Pulp & Paper Co., Mechanicsville.
 R. M. Urquhart, president Amdyco Corporation, New York.
 Frederick Wahlert, president Pulmosan Safety Equipment Corporation, Brooklyn.
 T. A. Walsh, safety engineer American Optical Co., New York; also representing National Safety Council.
 Charles A. Whitney, engineer Amdyco Corporation, New York.

North Carolina

- Frank D. Grist, commissioner of labor, Raleigh.
 L. M. Grist, Raleigh.
 M. O. Howle, safety engineer Carolina Power & Light Co., Raleigh.
 E. A. Muse, Hamlet.
 W. L. Pate, Raleigh.
 Stewart Robertson, North Carolina State College, Raleigh.
 V. M. Townsend, Raleigh.

Ohio

- Ernest Augustus, safety director and editor Employes Magazine, Mead Pulp and Paper Co., Chillicothe.
 F. E. Barr, medical director National Cash Register Co., Dayton.
 Carl C. Beasor, chief statistician industrial commission, Columbus.
 F. G. Bennett, director of safety Buckeye Steel Castings Co., Columbus.
 Harry H. Graef, manager service department Goodyear Tire and Rubber Co., Akron.
 D. C. Hunter, safety director National Cash Register Co., Dayton.
 George L. Markland, Jr., Philadelphia Gear Works, and American Gear Manufacturers Association, Cleveland.

W. B. Pettibone, works manager Willard Storage Battery Co., Cleveland.
 K. E. Roff, personnel director Willard Storage Battery Co., Cleveland.
 A. L. Rose, assistant superintendent division of safety and hygiene, industrial commission, Columbus.
 James M. Woltz, safety director Youngstown Sheet & Tube Co., Youngstown.

Oklahoma

Richard V. Ageton, safety engineer Tri-State Zinc & Lead Ore Products Association, Miami.

Oregon

D. A. Elkins, commissioner State industrial accident commission, Salem.
 C. H. Gram, commissioner of labor, Salem.
 William A. Marshall, commissioner State industrial accident commission, Salem.

Pennsylvania

C. B. Auel, manager employees service department, Westinghouse Electric & Manufacturing Co., East Pittsburgh; also representing American Gas Association.
 George R. Beehler, engineer Glen Alden Coal Co., Scranton; also Anthracite Operators Conference.
 Thomas J. Bell, W. T. W. of A., Philadelphia.
 Fred C. Benfield, investigator Lehigh Valley Coal Co., Wilkes-Barre; also Anthracite Operators Conference.
 E. F. Blank, safety director Jones & Laughlin Steel Corporation, Pittsburgh.
 Charles H. Bowditch, park engineer National Association of Amusement Parks, Philadelphia.
 L. J. Bowker, district representative Mine Safety Appliance Co., Philadelphia.
 F. C. Caldwell, general superintendent Philadelphia & Reading Coal & Iron Co., Shamokin.
 Thomas H. Carrow, chairman safety section American Railway Association, and superintendent safety Pennsylvania R. R., Philadelphia.
 John T. Cartwright, general superintendent Scranton Coal Co., Scranton.
 G. E. Clarkson, secretary-manager Western Pennsylvania Safety Council, Pittsburgh.
 J. E. Culliney, safety engineer Bethlehem Steel Corporation, Bethlehem.
 James B. Douglas, manager insurance department United Gas Improvement Co., Philadelphia.
 Francis Feehan, mine safety commissioner, United States Bureau of Mines, Pittsburgh.
 Phillip G. Fenlon, superintendent safety and welfare, Carnegie Steel Co., Duquesne.
 J. J. Forbes, mining engineer, United States Bureau of Mines, Pittsburgh.
 Willard H. Fray, compensation agent Scranton Coal Co., Scranton.
 Walter A. Gleason, safety engineer Hammermill Paper Co.; also representative of Erie Safety Council, Erie.
 A. R. Gray, general superintendent The Peoples Natural Gas Co., Pittsburgh.
 Edward Griffith, assistant general manager, Lehigh & Wilkes-Barre Coal Co., Wilkes-Barre; also representative of Anthracite Operators Conference.
 W. E. Hannah, chief engineer The Peoples Natural Gas Co., Pittsburgh.
 Morris Harrison, director of personnel Hammermill Paper Co., Erie.
 E. I. Humphrey, general superintendent, Hazle Brook Coal Co., Philadelphia; also representative of Anthracite Operators Conference.
 Harry Jenkins, secretary Glass Bottle Blowers Association, Philadelphia.
 Richard H. Lansburgh, secretary of labor and industry, Harrisburg.
 J. M. Larkin, assistant to president, Bethlehem Steel Co., Bethlehem.
 F. Lauterwasser, international union of Textile Workers of America, Philadelphia.
 J. M. Lewis, manager industrial department Mine Safety Appliances Co., Pittsburgh.
 William J. Maguire, director bureau of statistics, department of labor and industry, Harrisburg.
 W. E. Megraw, safety engineer H. H. Robertson Co., Pittsburgh.
 John A. Oartel, safety director Carnegie Steel Co., Pittsburgh; also president of Western Pennsylvania Safety Council.
 Mahlon D. Scott, branch manager Consolidated Expanded Metal Companies, Philadelphia.

H. M. Smyth, superintendent St. Clair Coal Co., St. Clair; also representative of Anthracite Operators Conference.
 Thomas S. Strobhar, vice president Wagner-Taylor Co., Philadelphia.
 W. J. Thompson, secretary Anthracite Coal Operators Association, Philadelphia.
 Fred J. Upton, safety director Pittsburgh Steel Co., Monessen.
 Joseph J. Walsh, secretary department of mines, Harrisburg.

Rhode Island

Christopher M. Dunn, deputy commissioner of labor, Providence.

Tennessee

M. F. Nicholson, chief inspector department of labor, Nashville.
 Howard I. Young, American Mining Congress, Mascot.

Texas

J. L. Walsh, superintendent safety Missouri-Kansas-Texas Railroad., Dallas.

Utah

T. F. Jennings, superintendent of foundries Utah Copper Co., Garfield; also representative of American Foundrymen's Association.

Vermont

John S. Buttles, commissioner of industries, Montpelier.

Virginia

N. B. Atkins, Virginia Bridge & Iron Co., Roanoke.
 D. M. Blankenship, supervisor industrial rehabilitation, Richmond.
 William Boncer, mine inspector bureau of labor and industry, Richmond.
 E. D. Booth, machinist, Richmond.
 E. R. Cole, district wire chief Chesapeake & Potomac Telephone Co., Richmond.
 W. C. Creekmore, chairman legislative committee, Virginia Federation of Labor, Norfolk.
 John Gribben, chief factory inspector bureau of labor and industry, Newport News.
 A. I. Griffin, F. S. Royster Guard Co., Norfolk.
 John Hopkins Hall, jr., commissioner of labor and industry, Richmond; also representative of Association of Governmental Labor Officials of the United States and Canada.
 F. E. Harr, industrial claim agent Clinchfield Coal Corporation, Dante.
 J. W. Hatch, president Virginia Federation of Labor, Clifton Forge.
 C. G. Kizer, industrial commissioner, Richmond.
 Louis J. Lynn, secretary safety committee Newport News Ship & Dry Dock Co., Newport News.
 O. G. Pippin, mine inspector, Clinchfield Coal Corporation, Dante.
 W. F. Robinson, business agent International Association of Machinists, Richmond.
 D. E. Satterfield, safety inspector Chesapeake & Ohio Ry., Richmond.
 E. J. Shave, secretary-treasurer Virginia Federation of Labor, Hampton.
 L. Gordon Shean, vice president Safety Council, Richmond.

West Virginia

Mrs. Mary D. Emory, inspector women and children bureau of labor, Charleston.
 A. W. Matlack, manager compensation department Wheeling Steel Corporation, Wheeling.
 John T. Moore, chief clerk State compensation department, Charleston.
 Lee Ott, State compensation commissioner, Charleston.
 Earl E. Sang, safety engineer American Car & Foundry Co., Huntington.

Wisconsin

F. W. Braun, chief engineer Employers Mutual Liability Insurance Co., Wausau.

LIST OF BULLETINS OF THE BUREAU OF LABOR STATISTICS

The following is a list of all bulletins of the Bureau of Labor Statistics published since July, 1912, except that in the case of bulletins giving the results of routine surveys of the bureau, only the latest bulletin on any one subject is here listed.

A complete list of the reports and bulletins issued prior to July, 1912, as well as the bulletins published since that date, will be furnished on application. Bulletins marked thus () are out of print.*

Wholesale Prices.

- No. 284. Index numbers of wholesale prices in the United States and foreign countries. [1921.]
- No. 415. Wholesale prices, 1890 to 1925. (In press.)

Retail Prices and Cost of Living.

- *No. 121. Sugar prices, from refiner to consumer. [1913.]
- *No. 130. Wheat and flour prices, from farmer to consumer. [1913.]
- *No. 164. Butter prices, from producer to consumer. [1914.]
- No. 170. Foreign food prices as affected by the war. [1915.]
- No. 357. Cost of living in the United States. [1924.]
- No. 369. The use of cost-of-living figures in wage adjustments. [1925.]
- No. 418. Retail prices, 1890 to 1925. (In press.)

Wages and Hours of Labor.

- *No. 146. Wages and regularity of employment and standardization of piece rates in the dress and waist industry of New York City. [1914.]
- *No. 147. Wages and regularity of employment in the cloak, suit, and skirt industry. [1914.]
- No. 161. Wages and hours of labor in the clothing and cigar industries, 1911 to 1913.
- No. 163. Wages and hours of labor in the building and repairing of steam railroad cars, 1907 to 1913.
- *No. 190. Wages and hours of labor in the cotton, woolen, and silk industries, 1907 to 1914.
- No. 204. Street railway employment in the United States. [1917.]
- No. 225. Wages and hours of labor in the lumber, millwork, and furniture industries, 1915.
- No. 265. Industrial survey in selected industries in the United States, 1919.
- No. 297. Wages and hours of labor in the petroleum industry, 1920.
- No. 348. Wages and hours of labor in the automobile industry, 1922.
- No. 356. Productivity costs in the common-brick industry. [1924.]
- No. 358. Wages and hours of labor in the automobile-tire industry, 1923.
- No. 360. Time and labor costs in manufacturing 100 pairs of shoes. [1924.]
- No. 365. Wages and hours of labor in the paper and pulp industry, 1923.
- No. 371. Wages and hours of labor in cotton-goods manufacturing, 1924.
- No. 374. Wages and hours of labor in the boot and shoe industry, 1907 to 1924.
- No. 376. Wages and hours of labor in the hosiery and underwear industry, 1907 to 1924.
- No. 377. Wages and hours of labor in woolen and worsted goods manufacturing, 1924.
- No. 381. Wages and hours of labor in the iron and steel industry, 1907 to 1924.
- No. 387. Wages and hours of labor in the men's clothing industry, 1911 to 1924.
- No. 394. Wages and hours of labor in metalliferous mines, 1924.
- No. 404. Union scale of wages and hours of labor, May 15, 1925.
- No. 407. Wages and hours, and labor cost of production, in the paper box-board industry, 1925. (In press.)
- No. 412. Wages, hours, and productivity in the pottery industry, 1925. (In press.)
- No. 413. Wages and hours of labor in the lumber industry in the United States, 1925.