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TRANSACTIONS

26th National Safety Congress

NATIONAL SAFETY COUNCIL, Inc.

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oreword

THE Transactions of the Twenty-sixth National Safety Congress, 1937, are published by the National Safety Council in two volumes. This, the first, contains the general, the special subject, and the Industrial Section sessions. The second volume contains the sessions of the Child Education, Home Safety, Street and Highway Traffic, Commercial Vehicle and Transit Sections.

All industrial members of the Council automatically receive Volume I. Volume II is sent to members believed to be interested chiefly in the sessions it covers. Other Council members, however, may obtain it upon request.

Many members have found it worth while to distribute copies of the Transactions to supervisors, foremen, and others in an administrative or supervisory position who may make practical use of them for reference purposes. The following quantity prices are quoted on extra copies: 1 to 10 copies of the large volume (Volume I), $2 each; 11 copies or more, $1.75 each; copies of the smaller volume (Volume II), 75 cents each.

THE Transactions are published as a condensed record of the proceedings at the National Congress. The papers of each session or division of the Congress have been edited carefully to eliminate extraneous matter and to abbreviate the less essential portions because of space limitations. Thus the material herein presented is not a verbatim report of all the speeches presented at the Congress, but rather an abridged version made as compact as possible, yet without injury to the technical aspects of any address. The original manuscripts are on file in the Council's Bureau of Information, where they are available for additional reference. Where illustrations were sent by the speakers to the Council, these also are on file.

The National Safety Council at its Congresses seeks to eliminate from discussion matters which are not pertinent to the aim of the Congress or which are contrary to Council policies. It cannot accept responsibility for the views expressed either in the papers presented or in the discussions based upon the papers.

NATIONAL SAFETY COUNCIL, INC.
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Industrial Dusts

WEDNESDAY MORNING SESSION

October 13, 1937

The meeting was called to order by Chairman A. S. Regula, Executive Secretary, Industrial Relations Counselors, Inc., New York City, and Vice-President for Engineering, National Safety Council, who introduced the speakers.

What Industrial Dusts Are Harmful? Why?

By SENIOR SURGEON R. R. SAYERS

Chief, Division of Industrial Hygiene, U. S. Public Health Service

While dusts exist everywhere in the atmosphere, it has been recognized for centuries that workers in certain dusty occupations are less healthy than those not so exposed. The number of persons exposed in dusty occupations comprises one of the largest industrial groups. The occupational diseases of workers in dusty atmospheres have been found to be due to entrance of dust into the system by inhalation, by ingestion, by direct absorption through the skin, by irritation of the skin, or by a combination of the foregoing.

The suspensions of particulate matter in air have been broadly termed dusts, fumes, and smokes. Such a classification is necessarily arbitrary, since the line of demarcation between them is not very sharp, and the chief differentiation is based on the size of the particles. Investigations by the Public Health Service in dusty industries[1] revealed that about 70 per cent of the dust particles examined were between 1 and 3 microns in size, only about 20 per cent were less than 1 micron, and the median size was 1.3 microns. Industrial dusts are mainly less than 10 microns in size. However, fibrous dusts in the air, such as asbestos, have been found to contain particles as large as 200-400 mircons in the greatest diameter.

While, generally speaking, according to Collis, dusts are more injurious as their chemical composition differs from that of the human body, or from the elements of which the body is normally composed,[2] it is difficult to establish a comprehensive definition for *toxic* dusts. Sollmann,[3] after analysis of various definitions for poison, felt that it is very difficult to give a definition which will not be ambiguous in some cases, but believed that the following covers most of the points which must be considered in classing a substance as such:

> "A poison is any substance which, acting directly through its inherent chemic properties, and by its ordinary action, is capable of destroying life, or of seriously endangering health, when it is applied to the body, externally, or in moderate doses (to 50 Gm.) internally."

Some dusts are known to be poisonous, while others, in the concentrations usually encountered, are comparatively harmless. However, it may be stated that *breathing* dust in high concentration is not desirable.

According to Fairhall, the damage arising from the inhalation of toxic dust may be either local or remote, and depends upon whether the material is a protoplasmic poison, whether it is caustic in reaction, or whether it is absorbed into the blood stream and carried to other centers which are in turn affected.[4]

It is now well established that exposure to certain kinds of dusts, such as those containing considerable quantities of free silica, has increased the morbidity and mortality rate from respiratory diseases; while metallic dusts, such as lead and its compounds,

below . illion particles. They seem willing to graduate upward to 20 million for medium silica and 50 million for low silica percentages. Five million particles is virtually dust free, and is very difficult and expensive to achieve and maintain. The declaration of safety of the installations must remain in the hands of the medical and hygiene groups in whose hands now lies the responsibility for determining the hazard.

We now enter the chapter of our discussion intended to demonstrate that dust control is an engineering job, that it must be given scentific treatment, not guess work, applying engineering methods which are based upon a knowledge of physical law, the behavior of dust, the performance of air-moving machinery, etc.

Prerequisite Knowledge

Let me recite briefly, a few of the things which, in my opinion, the engineer should know to do this job correctly. He must know how to make a survey. Surveys depend upon sampling, and sampling is not a catch-as-catch-can proposition. It involves the place, the time, the frequency, the amount in a sample, and the number of samples so that maximum, minimum and average data mean something, so that credibility can be given them.

For the type of sample involved he must know how to weigh or count respirable dust, as distinguished from large masses of non-respirable dust which complicate the picture. He must know how to observe the sources of dust floods as distinguished from conditions of normal dustiness. He must know the sources of dust and the principles involved in the dispersion of dust. He must determine how much dust enters the problem because it is part of the material, and what dust is created in the process by the fracturing of the material.

Any less survey cannot tell the engineer what his task of dust control is. To visualize that task intelligently he should know the physics of Brownian motion, laws of resistance to the motion of particles moving in air, both when the air is in turbulence and for stream-line motion. He should know terminal velocities, movements due to centrifugal motion; flocculation and the effects of air motion and the effects of humidification on it. He must know all about the difficulties of wetting and what is known about overcoming these difficulties. He should know the several electrical phenomena which bear upon dust behavior.

Those are all principles of physics which explain the behavior of dust and upon which engineering practice must be based. They must be understood and be taken into account. Dust control is not a matter only of general ventilation; the engineer must study the production as well as the dispersion. The problem should be analyzed to determine the applicability of segregation, enclosure, wetting, local exhaust and general ventilation.

In some instances, substitution of non-hazardous material, or non-dust-producing operations may have specific application, and they should be explored first. This implies plant engineering. I am convinced that many bad installations are bad because plant engineering was not used. In the designing of exhaust systems installed to capture the dust at the points of generation, the physical behavior of air moving toward hoods and in ducts must be known, and that knowledge used. Each system must consist of collection hoods, piping, air-cleaning plant and a source of suction. Before selecting a hood for a job the engineer must know dust dispersion by dynamic projection as well as dust dispersion by air currents, and design the hood accordingly.

Knowledge Needed

The aero-dynamic characteristics of suction hoods appear to be little known because little thought was given to them in designing thousands of hoods which can be found everywhere in industry. All the possibility for entrapping dust and much of the efficiency of the system lies in this factor. Air velocity, static suction, and rate of air flow are all related, and they must be known. It is essential to use high velocity of air in certain types of exhaust systems to entrap dust projected at high velocities as in the case of a granite surfacing machine, and low velocities must be used in others, as in the case of cleaning asbestos fibre of dust to prevent wasting material.

Quantity of air and its velocity must be determined, then the piping should be designed to take into account the behavior of air-flow through pipes at low and high velocities. Where the problem is complicated by the large sized particles which go along with the fine dust, how these behave must be taken into account. Pressure losses are very important elements in the design of an exhaust system. Loss at the hoods, loss at the bends, and loss in the ducts must not be guessed at. Pipe design must take into account the gage of the metal and reinforcing to withstand pressures and erosion.

The selection of a fan and its motive power is a matter of calculation, not guess work. Power consumption in the system is calculable, fans follow certain laws, so the engineer must know the behavior of axial flow, propeller type, radial flow, paddle wheel and other fan performance.

More physics and engineering calculation goes into the air-cleaning apparatus. The selection of gravitation, inertial or filtration method depends upon what the dust is, the calculation for any methods requires knowledge of discharge through stacks, the determination of sizes of settling chambers; the behavior of cyclones. The use or non-use of a filter, and if so, what type, how it should perform, how big it should be, what kind of resistance and how much each kind offers, to say nothing of their proper location with relation to cleaning, accessibility, etc., are all items for accurate engineering determination.

Apparatus to check the behavior of installations must be . . and used. Periodi cannot be left to guess work. Supplying s cient air to be exhausted is part of the p lem. The same may be said of heating

Do I give the problem too severe a b up? I think not. Remember these two thi

1. You are dealing with hazardous m rial so small in size and so little of it weight that it is as invisible as the air bears it.

2. Physical laws involved in the beha of dust and air do not permit inexpen methods of control. I am acquainted budgets set up for this purpose which amo to more than a quarter of a million doll and I know of many where 60 to 80 thou dollars is involved.

The need for this much engineering is ognized by men who know. Already m has been done toward getting the knowle into handbook shape. Perhaps the best of this sort to date is "Fundamentals Rela to the Design and Operation of Exh Systems" developed under American Sta ards Association procedure.

The Doctor's Part in Controlling Dust Hazards

By A. D. LAZENBY, M.D., F.A.C.S.

Chief Surgeon, Maryland Casualty Co., Baltimore, Maryland

Considerable confusion has existed in the past as to just what is the physician's function in the prevention of dust diseases, and just what is the engineer's. It is very obvious upon even casual thought that the two sciences must work hand in hand in their efforts to solve the problem.

The physician through his special training must be able to tell the engineer what dusts are dangerous and what are not. He must know how those dusts enter the body and the manner in which they do their harm. He must be trained in the examination of persons who are to be employed to work in dust, and to discover those who are already diseased, or are peculiarly susceptible to dust disease. He must be able to detect the first signs of disease in workers who are exposed to dust, and must be prepared to recognize the disease when it is fully veloped.

It is not necessarily the physician's fu tion to analyze dust. That is a task for t chemist and the petrographer. It is not t physician's function to count the particles dust in a given industrial atmosphere. Th in reality, is the function of the engineer. is not the physician's function to dev ventilating equipment for the removal dust, nor even to be more than an adv as to the means that must be adopted render the atmosphere safe.

The physician nevertheless must corre with his medical knowledge and with studies of the industrial worker the findi of the engineer. A diagnosis of silicosis, f example, requires not merely characteris occupational history and characteristic phy ca... ...gs, but the knowledge as well that the pa...ent has been exposed to hazardous dusts in dangerous concentrations.

All dusts when inhaled in excessive quantities may be considered as harmful, but only a few can be regarded as dangerous. From the standpoint of their dangerous properties, they may be divided into three general groups.

1. Those which are dangerous because of their poisonous action, such as lead, arsenic, mercury, and similar substances.

2. Those which cause only irritation in the respiratory tract, resulting in such conditions as bronchitis or local inflammation; such substances as vegetable fibre, cork dust, flour, starch, and other relatively innocuous organic or inorganic materials.

3. Those which tend to produce fibrosis of the lungs, thereby predisposing to respiratory infections, especially tuberculosis, such dusts as asbestos, silica dioxide or magnesium silicate.

I shall confine my remarks chiefly to dusts occurring in the latter category.

It has been generally believed that the harmful effects of dusts inhaled into the lungs depended more upon their physical structure than upon their chemical. It was believed, for example, that silica dioxide, or quartz, was particularly harmful because of its crystalline structure, and the hardness and sharpness of its particles. This conception is now known to be faulty. The dusts which cause their damage by mechanical interference with function are the dusts which are relatively innocuous, whose symptoms are transitory, and which subside upon removal from exposure to the dust.

Chemical Effect Is Harmful

The disease of particular interest to us today, silicosis, owes its harmful effects very largely to a harmful chemical reaction occurring between silica dioxide and the body tissues. It so happens that silica dioxide is decidedly a tissue irritant to the body, regardless of the part of the body it invades. it causes local irritation, local destruction of tissue, and the replacement of that tissue by scars.

Thus, given a dust containing silica dioxide in sufficient concentration, in sizes small enough to permit its entrance to the ultimate air spaces in the lungs, we have a situation which offers danger to the worker.

We have no real knowledge as to ... figures, but as a simple rule, we can adopt for practical purposes the thought that the human body can withstand successfully a concentration of dust containing 100 per cent silica dioxide in a particulate size less than 10 microns, in a concentration not in excess of 5,000,000 particles per cubic foot. If we decrease the percentage of silica dioxide present in the dust, we can correspondingly increase the concentration with comparative safety. We must, of course, take into account the portion of the worker's time spent in the dusty atmosphere.

To arrive at a rough conception of a safe atmosphere, we multiply the percentage of free silica in a given dust by the total number of particles per cubic foot. If the result is under 5,000,000 the condition may be considered relatively safe. If the result is over 5,000,000 the condition must be regarded as unsafe.

Bear in mind too that silicosis is essentially a disease of great chronicity. Except in a few exceptional instances it will require from seven to thirty years for a worker to develop advanced silicosis. It is evident too that coincident dusts may either retard the development of silicosis or hasten it. Recent research seems to indicate that the admixture of aluminum dust to a silicious dust will greatly inhibit the reaction of the latter; whereas a silicious dust combined with some alkaline coincident dusts may hasten the development of silicosis.

Much research is now under way in problems such as this. We have never learned how to cure silicosis, but we are learning rapidly how to prevent it. Our knowledge in this respect seems to be limited to the removal of dust from the breathing zone of the worker. Later discoveries may show us how to modify existing dusts with contaminant dusts that will render silica dioxide innocuous.

Owing to its very great chronicity, it is only the rare case who actually develops disabling silicosis during his industrial lifetime. It is realized, of course, that exceptional instances take place, but the coincident ravages of age usually keep pace with the effects of dust, so that much of the disability usually attributed to silicosis is often, in fact, actually attributable to other diseases or incapacities which advancing years bring in their wake. To me the great peril of silicosis, the peril not only to the industrial worker himself, but his family, co-workers and the public generally, is the accompanying susceptibility to tuberculosis.

Complicated by Tuberculosis

Silicosis per se does not kill. Tuberculosis as a complicating factor of silicosis rarely recovers despite treatment, and the individual so afflicted is not only totally disabled himself, but a definite menace to all with whom he comes in contact, particularly the fellow worker who may have silicosis. So perhaps the most important places in which the services of the physician in a dusty trade are necessary are—first, along lines of discovering and barring from exposure to a silicious dust those persons who may already have arrested tuberculosis; and secondly, discovering those persons already exposed to dust, possibly already silicotic, in whom tuberculous infections may have developed.

It is well recognized that no individual should be exposed to dust containing silica dioxide until he has undergone a thorough physical, examination, including carefully made and interpreted x-ray films of his chest. It is likewise obvious to anyone familiar with silicosis that no person who is exposed to silicious dust should be denied the privilege of frequent physical examinations and x-rays of the chest, not entirely to discover the existence of possible silicosis, but to discover a coincident tuberculosis if such exists.

A man so diseased should, in protection to himself and to all with whom he comes in contact, be removed from industry. Let me emphasize the uselessness of a physical examination, unless it be accompanied by properly taken x-ray films, except in cases of gross tuberculosis.

It is the function of the physician, therefore, to conduct in a thorough and an intelligent manner the pre-employment examination of all persons who are to be engaged in a dusty trade. The purpose of this examination should be threefold. First, to discover and bar from employment in dust, any person who is suffering from tuberculosis in an active, a quiescent or an arrested state.

A possible exception might be made in individuals suffering from a so called healed primary complex, or a healed childhood infection. It is well known that exposure to silica dioxi... ...ery likely to excit... activity a tub...culous lesion which ... quiescent or arrested, and ...ce such a ... is reactivated, the chances of recove... remote.

The second problem which confron... physician at the pre-employment phy... amination is whether a given individ... by reason of secondary physical d... more susceptible to the development o... cosis than a normal. Is he suffering ... diseases of the nose or upper respi... tract, such as chronic sinusitis, disease... lungs or air passages, or obstructions ... produce mouth breathing?

We must remember that silica dio... not dangerous until it reaches the lun... that the normal individual retains ... nose and the upper air passages a... quantity of the dust inhaled from the ... phere. In instances where this nasal ... tion is disturbed, exposure to silica d... dust may be dangerous to that indi... where it would not be to another.

It is believed that certain diseases ... heart and circulation, of the kidneys, ... bly syphilis, chronic coincident disea... the lungs, all may render a man mor... ceptible to silicosis than normal. The ... cian at his pre-employment examinatio... follow certain established criteria i... respect, and bar from exposure to dan... dusts those persons who through es... disease may be more ready prey to si... or tuberculosis.

Re-Examination Needed

After the applicant for employmen... successfully passed his physical exami... and is engaged in a dusty trade, th... of the physician is not yet ended. This ... man must be periodically re-examined ... to discover the early appearances o... monary fibrosis, but what is even mor... portant, to detect the early eviden... complicating tuberculous infection.

A man should not be dismissed fro... ployment in a dusty trade merely beca... has evidences of non-disabling sil... Workers in dusty trades, especially ... cutters, moulders, pottery workers ... similar craftsmen, are usually highly s... and it seems unfortunate from a soci... economic point of view to deny the... ployment so long as they are physicall... to carry on, especially since the actu... abling qualities of silicosis are in doub...

They should be denied employment in a dusty trade if that condition is found at pre-employment examination, but they should not be barred from continuing an employment in which they are already engaged. Of course, in such instances you, as engineers, must realize that you have failed, because if you had kept the breathing zone of the worker free from dangerous dusts, silicosis would not be present on physical examination.

In this work of preventing dust diseases in industry, it should be evident that the closest and most intelligent cooperation between the physician and the engineer is necessary. The physician must, through his knowledge and research, tell the engineer what dusts, or, for that matter, what other substances used in industry are harmful. He must tell the engineer how such dusts or other materials enter the body, how they leave the body and what they do in their passages through or their residence in the body.

Must Make Analyses

The engineer must in turn tell the physician of the harmful dusts and other substances surrounding his workers. He must make chemical and petrographic analyses of the dusts, and other indicated analyses of the atmosphere in the workshop. He must make dust counts and check his counts at regular intervals, conferring with the physician in an effort to discover whether, in the light of their joint knowledge, working conditions are dangerous. He must develop and install carefully designed ventilating equipment. He must arrange for modification of chemical and other industrial processes, where such modification is possible, and must bend his efforts toward removing from the danger zone of the worker the offending substance, whatever it may be.

Too many engineers construe this function loosely. They pass on to the physician as his responsibility certain functions which essentially are theirs; such functions as dust analyses, dust counts, and similar technical duties. All too often it is considered adequate merely to install a fan.

Ventilating devices in dusty work rooms must be constructed only after careful engineering study has given a knowledge of the physical properties of the air and of substances polluting it. It is possible to calculate to a very fine point the volume of air that must be removed from a given spot to remove the dust originating at that place, and the engineer must approach his task from just as scientific an angle as the physician approaches his.

There is no room in industry for haphazard methods on the part of either the physician or the engineer.

ADJOURNMENT

course, some similarity of procedure in directing the work of any man on any job; but different industries employ such different types of people, under such a wide variety of circumstances, and place such a divergence of requirements upon them that the problem of supervisory training in its more comprehensive aspects is peculiar to each type of industry.

The general treatises on leadership give the groundwork, but the subject matter for any supervisory training course for any particular industry lies within that industry. We must go out and see how our job is being supervised now; analyze the procedure of every foreman and supervisor; compare them and select the best; look upon supervision as a process in itself, and see how best to direct the work of the people. It is a long, tedious, and costly process, but one which, carried through to completion, will pay dividends in the end.

WEDNESDAY LUNCHEON SESSION

October 13, 1937

The Wednesday Luncheon session of the Cement and Quarry Sections was addressed by Isaiah Hale, Superintendent of Safety, Atchison, Topeka and Santa Fe Railroad, who spoke on "The Common Sense of Safety." The address was substantially the same as another address by Mr. Hale before the Steam Railroad Meeting. The complete paper will be found in the Steam Railroad section of this volume.

WEDNESDAY AFTERNOON SESSION

October 13, 1937

Work of the National Silicosis Conference

By R. CAMPBELL STARR

Assistant Safety Engineer, U. S. Department of Labor, Division of Labor Standards, Washington, D. C.

Silicosis is strictly an occupational disease. Medical science has not reported silica dust as affecting any individuals except those who, over relatively long periods of time, have worked in an atmosphere where the air which they breathe contained excessive concentrations of free silica.

The interest of the U. S. Department of Labor in a broad social and economic problem such as this has its origin in the Organic Act, effective March 4, 1913, which created the Department. This act, among other things, gives the Department of Labor the duty "to foster, promote, and develop the welfare of the wage earners of the United States, to improve their working conditions, and to advance their opportunities for profitable employment."

With this in mind, and believing that through joint effort of all concerned, much could be done to eliminate the hazard, the Secretary of Labor called together in Wash-

of the hazard, the fact must be recognized that until silicosis has been wiped out, workers who now have the disease, as well as those who may contract it, must receive workmen's compensation just as do those workers who are injured in accidents.

Accordingly, the committees of the silicosis conference were unanimous in presenting the following recommendations:

Coverage for silicosis in the compensation acts of all States.

This coverage should be compulsory.

Because of competition between the same or similar industries in various States, the laws, rules, and regulations of the several States should be as uniform as practicable.

Should Be Insured

The employer should insure his obligation for compensation either through self-insurance subject to the posting of adequate funds, or with an authorized insurance institution.

Insurance should not be denied any employer, provided the State authorities certify that he complies with the State requirements as to proper safe working conditions, and pays the premiums involved.

Workers having active pulmonary tuberculosis and silicosis should be removed from employment. Such workers should be granted suitable compensation payments and medical care.

Workers disabled from silicosis (but with no tuberculosis) should ultimately be granted the same amount of compensation as those disabled by accidental injury.

Two years is a reasonable minimum limitation period for filing claims subsequent to the date of the last exposure.

Further Activities of the Department of Labor

In carrying out its duty as stated in the basic law, the U. S. Department of Labor has conceived that there is immediate need for the conversion of known facts in the medical and engineering fields working toward prevention, and in the legal, insurance and regulatory phases looking toward adequate workmen's compensation, into a practical, readily understood program which will adequately take care of the silicosis problem.

In its program of cooperation with the 48 States, the Department of Labor has included a section covering silicosis and similar dust diseases. This breaks down into three main sub-headings: (1) Assistance in the preparation of reasonable and adequate codes, rules, and regulations prescribing methods of prevention; (2) assistance in the establishment of equitable standards of workmen's compensation for those employees disabled as a result of the disease; (3) a general educational program among State officials, factory inspectors, etc. so that they will be equipped with adequate knowledge concerning the disease, its method of prevention, and its proper treatment under the workmen's compensation law.

Follows Two Lines

This application program, which is just now getting under way has been commenced along two principal lines: (1) The compiling of practical information concerning actual dust control installations in typical silica hazardous plants, together with approximations as to cost, not only of installation, but also of maintenance of dust control equipment in such plants; (2) a program of visual education supplementing the summary and full committee reports of the National Silicosis Conference. It is contemplated that in this field such media as film strips, lantern slides, posters, illustrated bulletins, etc. will be utilized. Further, in connection with the various exhibits of the department, shown at various large expositions, trade association meetings, labor and technical organization meetings, etc., it is contemplated that much factual information will be used, pointing toward ways and means of correcting the hazard and of establishing adequate standards of workmen's compensation.

Following the address by Mr. Starr a round table discussion of outstanding hazards in quarry operation took place. This concluded the Wednesday program.

Steam Railroad Meeting

WEDNESDAY AFTERNOON SESSION

October 13, 1937

The session was called to order by W. W. Wood, Baltimore and Ohio Railroad, Baltimore, Md., who presided, introducing the speakers and directing the discussion.

The Past, Present and Future of Railroad Safety

By J. M. SYMES

Vice President, Operations and Maintenance Department, Association of American Railroads, Washington, D. C.

No industry in the world requires more diversified study and more exacting application of safety principles than the steam railroad industry. Picture a quarter of a million miles of railroad line covering in a virtual network the vast expanse of the United States. Over this network are operated a billion train miles annually. Vast yard and terminal operations are necessary to make up the beginning of the journey of passengers and goods, and to break up at the end of that journey the 12 million trains that accumulate that billion miles. These trains carry 500 million passengers and one billion tons of freight annually. It requires more than one million railroad employees to run the trains, make them ready for road movement, supervise and safeguard their movement and maintain the equipment and roadbed, as well as perform the many other duties incidental to the production of railroad transportation.

Safety has in the past, is today, and always will be the first principle in railroad operations. But it is within the past fifteen years that greatest advances have been made in railroad safety. During that period we have seen a complete remodeling and modernization of railroad physical properties. Roadbeds have been strengthened; bridges, trestles and culverts rebuilt; tracks have been laid with heavier rail and with treated ties of greater service life and dependability; grades and curves have been eliminated or reduced; signal systems have been modernized and extended; other safety devices have been installed; new and more powerful locomotives, embracing all modern safety devices, have been purchased; new cars, both freight and passenger, have been installed. This capital improvement program has cost the railroads about eight billion dollars since 1923, and a large part, if not all, of that huge sum had a beneficial effect, directly or indirectly, on the safety of operations.

But the engineer's job is never done. As soon as new equipment, new rail, or other devices are installed the engineers go to work to develop more efficient and safer units. The railroads spend millions of dollars annually in research and laboratory work experimenting with engineering improvements. In all this work safety is of primary importance. An invention which might mean great economies to the railroads would not find its way to a single locomotive or car if its use in any way lessened the opportunity for safe operation. Conversely, any improvement, mechanical or otherwise, promoting safety of operation immediately commends itself to railroad officers and employees. The search for greater safety will continue so long as railroad transportation is used.

About a quarter of a century ago, the

THURSDAY AFTERNOON SESSION

October 14, 1937

Safety, An Executive Operating Problem

By R. C. WHITE

Assistant General Manager, Missouri Pacific R. R., St. Louis, Mo.

Safety is an obligation of management. Without the constructive leadership and day-to-day urge from the executive and operating heads, the movement would lapse into a perfuntory activity.

The safety movement is recognized by executive and operating officers as a medium for building up and maintaining that relationship, that fellowship, which broadens our views, enriches character, and brings the Golden Rule into practical application.

Management recognizes that our economic system must enable men to live on an increasingly high plane. It must enable them to fulfill their desires and satisfy their reasonable wants, and give them that feeling of security which is essential to happiness and efficiency.

Having made the decision that safety is an executive problem and responsibility—that accidents must stop—it is then essential that management promulgate, and follow through, a plan that will definitely fix this decision in the minds of all the individuals who collectively comprise the industry. The follow through must be such that department heads, superintendents, and every member of the supervisory force will appreciate the need for a constant, active interest in safety; will understand that passive interest will no more produce results than would the same interest in production. Supervisors must be made to feel that the prevention of accidents demands the same type of heads-up supervision that is given to the other problems affecting cost and service.

The executive must find a way to indicate directly that it is the responsibility of the department heads to carry out management's program, that authority is placed in each superintendent's hands to put accident prevention on the same basis as production.

A complete, factual and descriptive report of each accident must be made. This must be followed by a thorough analysis to find the direct and underlying causes and the procedure necessary to prevent a recurrence.

Proof of its sincerity will depend primarily on whether management will make the first essential move in the program—that is, authorize the expenditure of money necessary to make the maintenance and operating plant a safe place to work.

Safety and Efficiency

Analysis of the underlying causes of industrial accidents and preventive measures to be applied has made it increasingly apparent that those factors which are producing accidents are very largely the same factors which tend to lower the quantity and quality of production. Expressed in another way, safety and efficiency are as inseparable as though one word.

In coupling safety with efficiency I have not minimized it as an executive problem, but have endeavored to indicate that its solution is an executive responsibility, both to his individual industry and to the employees that make it a going concern.

Rail transportation is a scientific business in which laboratory research, expert engineering, trained builders, and skilled workers share a part.

One of the main factors is a group of employees who are loyal—who appreciate that their railroad must give the kind of service that will stimulate and accelerate the development of the territory traversed.

The successful solution of our problem demands the type of aggressive individualism in executive leadership that will attract and command loyal, collective, cooperative effort on the part of all who produce rail transportation.

Our major concern is leadership—leader-