

This magazine is published to promote sound thought upon and concerning industrial medicine and traumatic surgery. To that end it will contain articles, news items, reports, digests and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

Reg. U. S. Pat. Off.

The editors will exercise care in checking on the accuracy of data presented but in all other respects articles and opinions of which expression is allowed are the opinions of their authors—the editors reserving in all cases the right to comment on the same, in the current or any subsequent issues, as they may be inclined.

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Physical Examinations of Employees

—An Echo from the Pre-Depression Era; Written
by One Executive to Another, in 1930—

A SERIES of surveys covering in all more than 500 shops, showed that 30% require a medical examination of all new employees at the time of hiring; while an additional 3% require a partial examination of all new employees or a complete examination of certain classes.

Six plants were found which at one time operated medical departments and required physical examinations of new employees, but for various reasons, generally sharp reductions in working forces, discontinued the practice. Of this number, two have since re-established their medical service, two have medical examinations made by outside physicians, and two have given up the idea entirely. These last two are operating with forces of 85 and 26 people respectively.

According to statements made by executives, the purpose of the medical examination at the time of hiring is to determine the applicant's physical fitness to do the work required. This does not mean that the applicant for a job as blacksmith, for instance, must measure up to a certain physical specification such as "must be more than 30 years old, weigh between 200 and 230 pounds, be 70 to 74 inches tall, have a 40-inch reach, and be able to strike a 500-lb. sledge with a 6-pound sledge". On the contrary, the examination is to determine whether or not the applicant can do work of this character without endangering himself or his fellow workmen.

It is obvious that an individual with a hernia should not be employed as a blacksmith, or on work requiring severe physical strain. He would be too apt to injure himself seriously. The individual with defective eyesight, high blood pressure, chronic heart trouble, or epilepsy, be employed as an overhead crane operator—he is liable to cause an accident involving injury or even death to his fellow workmen.

Generally speaking, the medical sorts applicants into three classes: "unfit", or "rejected". Those found fit to do the work for which they were hired are marked "acceptable" and put to work. Those found to be not qualified to do the work

they were hired are marked "unfit" and returned to the employment manager, not to be put to work until their condition has been remedied or work is found that they are well qualified to do. Those found to be unfit to perform any class of work in the plant, because of personal uncleanness or communicable diseases, etc., are marked "rejected" and are not to be put on the payroll. Reports received indicate that the total number of unfit and rejected applicants varies from 3% to 10%, (averaging 8.5%) dependent, of course, upon individual plant requirements.

Many of the larger plants have Mutual Aid societies or group insurance, paying sick and accident benefits; and in these plants the applicant must be acceptable from an insurance standpoint before he can be put to work. In some of these plants, the age of the applicant might bar him from employment, while others recognize what they call a social responsibility for the "unemployable", the sick, the lame, and the blind, and make efforts to locate work where such men are able to perform useful duties and earn their living.

One of the objections to the examination, on the part of certain state authorities and organized labor representatives, is based on the assumption that the primary objective of the examination is to weed out undesirable employees. This idea is erroneous. Only those individuals reach the physician's office who are acceptable from every standpoint except that of physical condition. The employment manager does not hesitate to inform the undesirable applicant that he cannot be placed. Usually this is done before the physical examination is made. As one executive puts it: "There are too many ways of getting rid of undesirable applicants to justify asking the doctor to lie about the man's condition. Besides, the doctor won't do it."

The examination need not be more detailed than is actually necessary. It accomplishes no good purpose to make an elaborate examination and then file the findings without using them. Of 41 concerns requiring physical examination of new employees:

PLAINTIFF'S
EXHIBIT
TPI-685

- 28 include complete optical examination;
- 6 include partial optical examination or vision test;
- 7 do not include optical examination.

The examination of females need not be as strict as the examination of males. This is true because females as a rule are not required to perform the class of work done by the male. For instance, hernia in the female is rare, and the chance of injury so small as to be negligible. Of 41 concerns requiring physical examination of new employees:

- 17 do not employ females;
- 13 require examination of females also;
- 4 require only partial examination of females;
- 7 do not require examination of females.

In the dispensary the choice of male or female nurse or physician is not important, but in the pre-employment examination, the "examination of females should be conducted by a female physician or nurse. If this is impossible, a nurse or matron should be present during the examination. At all times, unnecessary exposure of the body is avoided".

Of 41 concerns requiring examination of new employees, 17 have periodical examinations as follows:

- 2, all employees annually;
- 1, all employees biennially;
- 1, all employees semi-annually;
- 3, executives and foremen annually;
- 2, voluntary annually.

One employer requires a medical examination of all employees at the time of hiring, at which time a record of the individual examination is made and the workman informed of the findings. Six months later, the employee is again subject to a medical examination. If his condition has continued good or his ailment improved, and his work has been satisfactory, he is then considered a permanent employee and is eligible to join the Mutual Aid society.

According to the returns of 370 concerns:

- 36 employ physicians on a full time basis (Yearly or monthly salary, all work done in plant hospital);
- 39 employ physicians on a part time basis (Monthly retainer fee, physician spending one or more hours daily at plant, work being done either at plant dispensary or elsewhere);
- 9 employ physicians on a cooperative basis (Yearly or monthly salary, paid pro-rata by several neighborhood employers, work done in local dispensary. Expenses paid by physician out of his own pocket);
- 286 employ physicians on a straight time basis. (Employer billed monthly for all work done on his order. Sometimes employer is billed for each case as it is closed. Cases generally sent to one selected physician, although a few leave choice of physician up to the employee).

The cost of physical examinations varies considerably, very few concerns reporting this item, and those being employers who use outside physicians with fees varying from \$1.00 to \$3.00 per examination.

General medical service, including all examinations, treatments, supplies, salaries, etc. accord-

ing to the National Industrial Conference Board, costs on an average of \$5.14 per employee per year. The American Management Association, in a similar study, found an average cost of \$6.89 per employee per year. In this study, an average of \$6.02 was found.

Only estimates may be found as to the savings effected by medical service and examinations. These vary from \$10 to nearly \$500 per employee per year to the company, and similar amounts to the employee. Concrete evidence of value is to be found in reduced accidents and absenteeism. One concern reports a 50% reduction in absenteeism, another a 30% reduction, and several between 20% and 30%. The National Industrial Conference Board reported an accident rate for 98 plants, requiring physical examination, of 1.56 per employee per year, as against 1.92 for 105 plants without examination. Five years later the Board made a similar study and found an accident rate for 217 plants, requiring physical examination, of 1.66 per employee per year, as against 1.72 for 225 plants without the examination.

Twenty-three plants have maintained records of compensation insurance costs over a long period of years, and from time to time have made studies of the effect of medical examinations upon their insurance costs. The average reduction in compensation insurance costs reported by these concerns amounts to 20.12% of the annual premium, the maximum reduction reported being 60%, the minimum being .35 of 1%. This average reduction in compensation costs of 20% covers only those items that may be directly measured and does not take into account intangibles; such as, earlier recovery from accidents due to good physical conditions, and less severity due to absence of complications, etc.

In answering the question: "What effect does medical examination have on your industrial relations?" 40 concerns report as follows:

- 8, no effect;
- 6, good effect, satisfactory effect, etc.;
- 5, helps to place employees in right position;
- 4, prevents a spread of disease;
- 4, eliminates maligners and other undesirables;
- 3, welcomed by employees;
- 3, provides personal touch and boosts goodwill;
- 3, reduces compensation cost;
- 2, saves time and man-power;
- 2, selects better class of employees.

Prevention of Disability in the Management of Street Injuries

By GEORGE L. APFELBACH, M.D.*
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THE old timers' idea of street accidents consisted of horse and buggy accidents, stab and gunshot wounds. Although we now have quite a few window jumpers, most of our street injuries are due to the automobile.

Injuries occur more commonly to pedestrians than to the occupants of the auto. In the former we commonly find bumper fractures of the leg whereas in the latter we encounter more commonly trauma to the head, chest, and spine. Fracture of the pelvis formerly uncommon in females

* From a Radio Talk by Dr. APFELBACH, Station WAAF, September 27,

is frequently seen in one of the three ladies on the back seat. The automobile has made multiple fractures common.

Disabilities following accidents are due not only to broken bones with resulting deformity, but also to joint, ligament, muscle, blood vessel and nerve injuries. The more fatal injuries are those of the head, spine and spinal cord, and of the organs of the chest and abdomen, known as internal injuries. Even if death does not occur immediately it may result later from infection, gangrene and blood clots or embolism.

The ratio of casualties to death in automobile accidents is, no doubt, greater than that of warfare. Battle gunshots produce great shattering of bones, with frequent severe infections such as tetanus and gas gangrene. Street accidents, however, have the same hazard in a lesser degree, but are more often disabling because of multiple fractures. The medical profession saves many lives annually by giving tetanus antitoxin and serum against gas gangrene in street injuries.

A compound fracture is a broken bone with an open wound exposing the bones to street dirt. Fifty years ago they always became infected, and ended most frequently in amputation or death. Medical science has reduced this danger, so that we seldom see such a result. The public must learn that a compound fracture is even a greater emergency than appendicitis, and that the wound must be cared for and the fracture reduced as well as possible within four hours of the accident. Every well-trained surgeon realizes this, and that any manipulation of the broken bone after this period usually brings on infection.

I wish to correct a fallacy in the public mind that wound infection can be prevented by the use of iodine or other chemicals. The only and best antiseptic known in wound surgery is the surgeon's scalpel. Sharply incised wounds are seldom infected, contused ragged wounds usually are. No surgeon depends on iodine; he relies entirely on removing coarse dirt with sterile forceps, and on turning the wound into one with clean cut edges by excising all contused and damaged tissue.

Before all this is done the injured must have been treated for shock by prompt relief measures.

To prevent infection the injured part must be kept at complete rest, for further trauma invites infection.

The weak link in handling street accidents is the removal of the injured from the site of the accident to the hospital. Sir Percival Pott, in 1757, long before any knowledge of wound infection, refused to be carried to a hospital until his compound fracture of the leg had been splinted. He then was carried to the hospital on a door, showing far greater judgment than is shown today by our police ambulances.

Eleven per cent of our population die of accident, a greater percentage are maimed. You worry about your blood pressure and are eating large quantities of vitamins. Have you ever worried how you will fare if injured on the street? Will your leg be properly splinted? Will you be treated for shock? Will you be transported to the hospital without making your injury still worse? A great cause for future disability is the manner in which street injuries are mauled and hauled about.

provided with first aid equipment, including blankets, Thomas splints and bandages. Every person should carry an identification card requesting that he be taken to certain hospitals in case of injury.

The second weak link in the treatment of street accidents is the lack of equipment. We do not blame the hospital, for equipment and the care of the injured cost money. Some institutions give this service for tax exemption, others cannot. A street accident ends in a liability argument; no one pays, and if there is a settlement the samaritan services of the doctor and hospital are forgotten.

The medical profession and hospital associations have for years advised our legislative solons that we cannot carry the financial burden of street accidents; that a lien law would make this possible. Lawyers and undertakers have this protection. A lien law which guarantees payment to the doctor and the hospital is only fair. It is, however, more important to your interest since it determines the welfare of your life and limb.

Even with the best of medical care street injuries are followed by disabilities. It is our object to minimize these. The surgeon thinks first of his patient's life, then he considers in importance, saving the limb, bringing about a good functional result, and, lastly and not so important, an exact anatomical apposition of the broken bones. Don't become alarmed if you see an x-ray of your fracture and find the bones not perfectly lined up. Your result may be very satisfactory.

The important things to remember in case of accidents are:

1. Do not allow yourself to be moved in case of injury without splinting the injured part.
2. Do not place your faith in iodine, but rather in a competent physician when wounded.
3. A compound fracture is an emergency which may end in loss of life or limb, and should be taken care of within four hours.
4. Demand of your city government more efficient transportation of the injured.
5. Do not lose patience with hospitals in not giving you all the service you need. They have been imposed upon for a long time, and they need your help in obtaining a state lien law to secure just compensation in handling street accidents.

The Traumatic Fakir

Cases from Personal Experience

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ONE of our rules in detecting a fakir, as stated in a former article,¹ may be worth repeating: When the history does not ring true, when the complaints do not tally with the superficial findings, we doubt the claims. Once the surgeon has reasons to doubt the claims he will use all the ammunition at his command to determine the facts. A sincere, thorough and painstaking physical examination, including necessary laboratory tests, culminates in a final diagnosis. Efficiency plus honesty places that

diagnosis above any and all complaints and claims that do not coordinate with the findings reached in making that diagnosis.

Is it too arbitrary to state further that, when the complaints do not coincide with the ultimate findings, the claims should be considered false and exaggerated?

The fakir in making false and exaggerated claims, though appearing sincere has, as a general rule, an ulterior purpose in view. That ulterior purpose is *money*. The hysterical patient may only want sympathy, but the fakir wants something more substantial. It is human to sympathize with suffering individuals. Medical men are human. But the doctor should not allow sympathy to run away with his good judgment. His judgment should be based upon history, symptoms and findings, all of which have a background of knowledge of physiology, anatomy and pathology of human tissues and their reactions. This total knowledge gives the surgeon a definite opinion as to reactions of trauma and approximately the amount of pain resulting. Again, when the complaints of pain do not tally with the surgeon's knowledge of trauma reactions he should doubt the claim.

The traumatic surgeon doing any reasonable volume of work meets some of these unreasonable claims every day of his life. By this experience he is best able to cope with them.

To avoid criticism that we are prejudiced against the injured in favor of others concerned we must state again, as in a former article,² that we always give the injured the *first* consideration in treatment, interpreting symptoms, listening to complaints, and in the final diagnosis and reporting end results.

Innumerable examples may be cited. Let me start with a recent one, though minor. Last night a young man, aged 24, while inebriated became rowdy and refractory in a hotel lobby. In order to stop him it appeared necessary for the hotel clerk to "punch him in the face". The result was two "black" eyes, and we were called by the hotel management to attend him.

The symptoms: Alcoholism; pain of face, region of both eyes.

The findings: Inebriation; contusion and ecchymosis, region both orbits; sub-ocular conjunctival hemorrhage left eye; cornea and eyeballs intact and uninjured.

The treatment: Argyrol and boric compresses.

Today (the morning after the altercation): Eyes ecchymotic, left subconjunctival hemorrhage lessened, eye sight not involved; general physical condition good.

The complaints: "Cannot see like I did; headache, chest pains, abdomen sore and painful; must stay in bed".

Examination of head, arms, chest and abdomen revealed nothing more than a probable "sick" stomach, due to acknowledged drinking.

When told he could be up and about he remonstrated that he was unable. When told he would be able to be out and around in a day or two he made it plain that he intended to stay in bed, at least in his room. Before we left he said his lawyer would get in touch with us soon if he had not already done so.

our findings to his attorney. Are attorneys practicing medicine? Is the lawyer or is the doctor the one to say when an injured man may be up and about? Which one of the three (lawyer, patient, doctor) should be the one to decide the length of disability and when incapacitation ends? It suffices to state that our records will reveal the facts and record the end results, regardless of "pressure" from other or outside sources.

Another recent illustrative case is that of W. M. T., age 35, in apparent good general health. Bending forward and limping, he came to our office complaining of severe "back" injury.

HISTORY: Carrying his own tray in a cafeteria, he slipped on wet food on the floor and fell, striking buttocks.

INSPECTION: While disrobing, his actions and body movements, including expressions of pain, appeared unnatural even for a patient with fractured coccyx.

EXAMINATION: This was difficult, because cooperation was lacking, and it appeared to cause him excruciating pain even to lie on the table or turn on his belly. He finched and objected at the slightest palpation of the lumbar and buttocks regions. With a gloved and lubricated finger it was next to impossible to make a rectal examination.

TREATMENT: When it was determined that the coccyx was intact, and recorded mentally that there were no external objective signs of contusion, he was given radiant heat and massage.

SUBSEQUENT EVENTS: When he called next day, according to appointment, a casualty adjuster was at the office with a photographer concealed. Within 20 minutes his confession of purposely faking the fall was obtained. The photographer's "flash" was the "shot" that inspired him to leave the city rather than the prospect of boarding at the bridewell.

One of the most outstanding cases in recent years of false and exaggerated claims for the sole purpose of obtaining money (insurance) was a colored youngster between five and six years of age. This was outstanding in our experience, because a boy of that age is naturally frank, honest and dependable with reference to symptoms of physical ailments, even though parents attempt to create in him the elements of exaggeration.

We will only "sentence outline" the high points in depicting the case: He was struck by an automobile, injuring his right ankle, and was transported to the hospital in an auto. "Brush burn", external malleolus. Two-view x-ray showed no bony involvement. Ankle dressed and bandaged. He was taken home. On residence call, next day, there was no noticeable swelling; and there was no infection at the second residence call four days later. We asked the mother to bring the boy to our office a week later. Four days subsequently the mother telephoned: "Boy can't walk; won't you come and treat him?" Forced to respond with another residence call, in our opinion the boy had almost completely recovered. The parents were told to bring the boy to our office in a week for a final check-up. When the week was up the father telephoned: "Boy can't get about; he can't walk; he cries with pain," etc. We told the father to bring the boy to the office and if needed he could be treated.

Examination revealed complete recovery. During encouraging conversation, we put the boy's shoes on and aided him from the couch to a standing position on the floor. The boy shrieked with "pain", and crumpled toward the right to the floor! During the examination the father now and again injected words into the conversation such as: "pain"; "cries at night"; "can't walk"; "never be well again", etc.

We must take command! The problem was how? Modus operandi? We spelled these words: "D-a-d, w-a-t-c-h m-e, s-a-y n-o-t-h-i-n-g. U-n-d-e-r-s-t-a-n-d? S-a-y n-o-t-h-i-n-g." We attached the fluoroscope in next room, lights off; asked the father to come in and see the bones in his hand. All interest centered on the fluoroscope and its wonders. We took Jack by the hand and he walked, for a look at his bones. We thought the game was won, but, the excitement of the fluoroscope gone, Jack reverted to pain-cry psychology. Next we asked him if he had a little sister at home. He had. "We want to show you how to have a lot of fun with her". A strip of adhesive tape "shackled" his hands together. Creating interest and emphasizing the fun he was going to have, we had him on his feet. With another strip of adhesive attached to the cross bar between his hands and leading to a finger of the operator, the boy was led out of the office, down the hallway, down the elevator, and on to the sidewalk—without a limp, complaint or expression of discomfort, but on the contrary all the evidences of enjoyment!

There was no subsequent evidence of pushing litigation by the father or other interested persons.

Why do we announce this as an exceptional or outstanding case within the realm of Traumatic Fakirs? Because of the immaturity of the injured and his almost perfect showmanship. The acting in our opinion was vicarious, instigated by the parents or others.

Arsenic Poisoning

ARSENIC poisoning after the drinking of wine was reported in J.A.M.A., July 23, 1932, page 319. A systematic study of this problem, however, seems to have been conducted only recently, even though chronic arsenic poisoning of this origin has been observed for years in the wine-growing regions of Baden. The disorder is surprisingly frequent in the wine-growing region of the Kaiserstuhl. Because some of the cases were considered occupational diseases, the federal ministry of the interior appointed a committee of experts, under the directorship of Prof. Uhlenhuth, to make an investigation.*

The investigation considered the manner in which the arsenical spraying preparations are employed in the vineyards, the familial hypersensitivity and also other factors, among which probably the excessive consumption of the wine, with its damaging effect on the liver, plays the most important part. The patients are usually strong drinkers and many of them have cirrhosis of the liver. According to the lecture by Uhlenhuth before the medical society in Freiburg, it has to be determined whether the arsenical dusting sub-

stances should be entirely prohibited, and whether it would be possible to use other preparations that are free from arsenic (for instance, pyrethrum or nicotine).

Half of the 50 patients were observed by Prof. Ziegler in the polyclinic. The arsenic content of the parasiticides amounts to from 4.3 to 7.3%. The most severe symptoms of poisoning occur almost exclusively in dry, volcanic regions. The disorder attacks men almost exclusively. The "house drink," which is consumed in large quantities, is obtained by hard pressing of the grape husks; it contains arsenic and is a contributory factor but rarely the only cause.

The acute symptoms seem as a rule to disappear within a few days. In some cases, signs of chronic arsenic impairment develop after work is resumed with the parasiticides. These are not simply superficial irritations but a vital, universal damaging of the tissues, resulting from the absorption of arsenic. The respiratory tract apparently is the most important resorption surface. During this stage the most noticeable symptoms are those of the skin, characterized by hyperkeratoses on the inner and outer surfaces of the hands, the soles of the feet and the toes. Later there usually appears a small-flecked melanosis of the skin and other well-known changes. That the nervous system is involved is indicated by abnormal moods, depression, disturbances in the memory and polyneuritis, usually of the sensory type, and particularly a hypersensitivity to cold. There are disturbances in the sympathetic and endocrine systems indicated by loss of tonus, disturbances in the vasomotor regulations, impotence, hyperglycemia and true diabetic glycosurias.

In case of cirrhosis of the liver, it is possible that both alcohol and arsenic impair the hepatic parenchyma and that these two damaging factors promote each other. The same applies to hemochromatosis. The course of the disease differs in the individual cases. Complete cures have been observed after elimination of the causal factors. Generally the disease takes an unfavorable course and may be drawn out over a number of years. The mortality so far has amounted to 16%. Limitation of working capacity is considerable, even in mild cases. The treatment should begin even in acute cases by administering absorptive substances. In chronic cases the intravenous administration of from 10 to 20 cc. of a 5% solution of sodium thio-sulphate is advisable. Later, liver preparations, borax baths and sulphur-salicylic ointment may be applied. The protective measures are of especial importance.

Chemical studies are being made, particularly on the amount of arsenic in the "house drink." As was to be expected, considerable quantities of arsenic were detected in the hair of the patients.

Occupational Disease Report

DR. A. R. LARRAIN presented the following report of the Special Committee on Occupational Disease of the Chicago Medical Society to the Council:*

"An occupational disease as it is defined in the average standard Medical dictionary is one due to one's employment. Such definition of necessity

is very ambiguous, and reveals the chaotic state of this important field of medical practice.

"Wesley M. Graff, Director of Conservation of the National Bureau of Casualty and Surety Underwriters, representing 40 casualty companies, said at the last meeting of the State and Provincial Health Authorities that: 'In the last few years occupational disease claims have grown at an alarming rate. They represent today one of the important problems of industry'.

"For the past few years, a number of national organizations have become aware of the increasing importance of the influence of industrial hazards on the general health of the industrial population and particularly the social, economic and medicolegal aspects of disease inherent or influenced by occupation. It is the opinion of the Committee that these activities of lay organizations if not properly directed, may seriously affect the practice of medicine in the near future. To support this contention we quote the following resolution approved at the last meeting of the American Public Health Association:

"'Unhealthful occupational environment constitutes an important and widespread cause of increased morbidity and mortality among the large group of wage earners and among the general population.

"'RESOLVED, That it is a function of the department of health to include as an integral part of a complete public health program the protection of the population against health hazards resulting from unhealthful working environment . . . and recommends to each state health department of an industrial state the establishment of a bureau or division of occupational diseases or industrial hygiene under the supervision of a physician trained in public health and industrial hygiene, with adequate technical and laboratory facilities and personnel, empowered to make investigations of working environment, for the control of industrial health hazards and the prevention of occupational diseases.'

"The Committee seriously questions the advisability of placing such an important field of medical practice in a Bureau which of necessity will be influenced by the social political activities of the groups in power.

"In 1911 the Legislature of the State of Illinois became cognizant of the industrial hazards within the state, and in order to remedy the situation they passed two separate and unrelated acts. These acts being in all probability drawn without active counsel or participation of organized medicine, are known as the Occupational Disease and the Workmen's Compensation. The former gave the right to employees to seek redress by a lawsuit in a court of common law. The latter made it possible for an employee accidentally injured while at work to receive definitely stipulated amounts of compensation through an industrial commission which was created for the purpose of administering such claims. Under this Act, such claims were automatically recognized and paid, hence the right of lawsuit in a court of common law was not given to these claimants.

"Section I of the Occupational Diseases Act provided in substance that every employer engaged in any work which may produce illness peculiar to that work shall, for the protection of his employees, adopt and provide reasonable and

approved devices, means and methods for prevention of such industrial or occupational diseases

"Section II of the Act specifically named certain kinds of work as being particularly dangerous to the health of employees, such as the manufacture of brass, the melting of lead, processes using white lead or Paris green, etc., and named definite precautions to be taken by employers in designated causes, e. g., the furnishing and use of proper clothing, respirators, ventilators, etc.

"In 1923, an amendment was made to the Occupational Diseases Act which provided that redress for employees diseased by the extra-hazardous occupations specified in Section II would be subject to the same conditions and would receive the same amount of compensation as those mentioned in the Workmen's Compensation Act for accidental injuries, and the Industrial Commission was given jurisdiction over the administration of such claims.

"Thus, the right of redress by lawsuit was taken away from all employees diseased while employed in those occupations specifically designated in Section II.

"The amendment, however, did not affect those cases which were covered by Section I of the Occupational Diseases Act, these retaining their right or redress by lawsuit in a court of common law.

"Between 1929 and 1935 a large number of lawsuits were filed by employees claiming disability from pneumoconiosis due to the inhalation of injurious dusts during employment. These included cases of carborundomosis, anthracosis, bituminosis, siderosis, etc.

"Dust diseases, not having been specifically named in Section II of the Occupational Diseases Act, the attorneys for these plaintiffs based their claims on Section I of the Act, which still gave the right of redress by lawsuit. Most of those suits were for amounts up to \$25,000. In many cases juries awarded damages up to \$24,000, to the point that these claims reached alarming proportions and threatened to bring financial collapse of some of the insurance companies and manufacturers. These companies appealed to the Supreme Court of the State of Illinois, and this body on April 25, 1935, rendered a decision in which it held that Section I of the Occupational Disease Act violated the Constitution of the State and the 14th Amendment to the Federal Constitution. The Court also inferred that Section II of the Act may constitute an unlawful delegation of legislative power to an administrative body or to courts and juries. Thus there is at present no redress for those suffering from any Occupational Disease not as specifically mentioned in Section II of the Act; therefore, the need for proper legislation on this problem is vital and immediate.

"At the last session of the Legislature efforts were made unsuccessfully to pass an Occupational Disease Act. The Committee understands that the present special session of the Legislature will consider a bill which apparently has been drafted by the manufacturers in cooperation with the official labor organizations and which to all intents and purposes covers fairly this problem. Your Committee has not been able to secure a copy of this bill and understands that it has not been finally drafted or released for publication.

"In conclusion, your Committee wishes to make the following recommendations:

"1. That the Society should take a very active interest in the problem of occupational diseases and offer that type of counsel and leadership compatible to the best interest of organized medicine and public welfare and to this extent it should engage through this Committee and in cooperation with other committees, affiliated societies and branch organizations in an educational program to acquaint the medical profession of this State of the various industrial hazards and their proper recognition.

"2. To make an investigation of the attitude of the medical schools located in Chicago to ascertain what their present ideas are concerning the teaching of industrial hygiene. Surely it is patent that the young blood coming up to the front continually should be exposed to the fundamentals of this important field. In no other way can we expect to develop men who will be properly prepared.

"3. The Committee requests authorization to contact the various organizations and agencies dealing with the occupational disease problem and in general with those related to industrial hygiene, that it may be in a better position to enlighten the Council with its findings.

"Respectfully submitted: G. HENRY MUNDT; M. J. HUBENY; W. C. HAMMOND; D. H. LEVINTHAL; A. R. LARRAIN, Chairman.

"Motion was carried that the report be adopted."

Silicosis and Tuberculosis

THE NORTH End Foundry Company had to reinsure its employees. The prospective insurer demanded as a condition precedent to the execution of a policy that all employees be examined by a physician selected by it. Before the examination was made, all employees were discharged. Only those were reemployed who were believed to be physically fit for the duties to be imposed on them. Five employees who were not reemployed, because they were not physically fit, were awarded compensation by the industrial commission, under the Wisconsin workmen's compensation act. Thereupon their employer and its insurance carrier brought actions against the commission and the several claimants to set aside the awards. From a judgment modifying and affirming the award in each case, the industrial commission, the several claimants, the employer and the employer's insurance carrier all appealed to the Supreme Court of Wisconsin.

The Supreme Court based its decision* on the case of one claimant, Pernovich, as the same questions were involved in all cases. Pernovich, before he was discharged, had worked steadily. He was not aware that he was suffering from any disease. The physical examination, however, showed that he had had silicosis for probably five years or more and was in the second stage of that disease and that tuberculosis had already developed. Although at the time of the examination Pernovich was able to perform at his work, his chance of recovery would be diminished if he remained in the dusty employment in which he had been engaged. Reexamination three months later showed that his

ability to do work requiring physical exertion was greatly diminished, if he could be said to be able to do it at all. Nevertheless, Pernovich's employer and the company's insurance carrier contended that he had suffered no compensable injury in the course of his employment with the North End Foundry Company.

Disability within the meaning of the statute, said the Supreme Court, occurs when an employee is disabled from rendering further service; that is, when he no longer has physical ability to perform his work in the usual and customary way. Unless he is so disabled he sustained no compensable injury even though in the course of his employment he is subjected to conditions that contribute to disability as an end result. The right of an employee to compensation depends on whether or not, in the course of his employment and because of it, an occupational disease renders him incapable of performing his customary work.

It has been argued, said the court, that if an employee is entitled to compensation, as he is when he voluntarily ceases work because of physical incapacity to continue, then an employee who is discharged by his employer because of potential physical disability is equally entitled to compensation. For the latter contingency, however, the present law, which was framed to cover injuries resulting from accident, rather than incapacity resulting from occupational disease, affords no relief. An employee who has been exposed to industrial hazards, who has suffered no "physical disability" that prevents his performing his work in his usual and customary way, and who is discharged because an examination discloses that such disability may arise in the future, is not entitled to compensation for "medical disability."

It has been argued that it is against public policy to permit an employer to discharge an employee who has been exposed to industrial hazards, in order to anticipate his employee's future disability. That, however, said the Supreme Court, is a problem for the legislature and not for the courts. The courts can do nothing more than interpret and administer the statute. The remedy lies solely with the legislature.

Finding no evidence to show that the claimants suffered disability within the meaning of the law during the period of their employment with the North End Foundry Company, nor until after the relation of employer and employee had been terminated, the judgments of the courts below in the several cases were reversed and remanded with instructions to enter judgments setting aside the awards of the industrial commission.

"Error!"

A FAITH healer's dog fell down the porch steps, hurting his leg a little, and his feelings a lot. But, as would be expected, he talked himself out of it; all the way down he proclaimed loudly, "Error! Error!" This is apropos of the fact that we had our own feelings considerably hurt, in our December issue—through one of those inadvertences which, with the fear that they will happen sometime, haunt an editor's life. A portion of Dr. James W. Ferguson's article on "Pneumokoniosis and Its Social Effects" was omitted. In justice to

Metatarsal and Phalangeal Fractures

—One Splint for All Fractures of the Metatarsals and Phalanges—

by

GEO. G. DAVIS, M.D., F.A.C.S.*
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Fuel Company

IN AN active industrial dispensary, where a considerable number of cases are cared for as "new cases" and also as "redressings," a planned program of treatment of all fractures is desirable.

When a fracture case arrives at the dispensary or hospital it is not the time for a piece of research work on treatment of fractures, or the time to improvise a splint for any special fracture. Treatment for every fracture should be planned in advance.

THE evolution of this splint, originally designed for fractures of the metatarsals only, is interesting. Dr. F. W.

Merritt, of the Illinois Steel Company, Gary Works Hospital, and the writer, have modeled and remodeled and experimented with the application of, and noted results obtained with, this splint for over a decade. And we believe that the splint still can be improved, and we are having considerable enjoyment striving for that improvement.

Incidentally it is noted that the hospital and



Fig. 1. Evolution of the splint. In shaping the first splints for metatarsal fractures, (left above) no provision was made for traction. A later splint (right) provided traction, but the arch was too far posteriorly and there was no provision for fractures of individual phalanges

Fractures of the metatarsals and their corresponding phalanges are quite common. A malunion of the metatarsals may cause great disability, and result in a rather painful foot. Angulation and displacement of fracture fragments of the phalanges result frequently from lack of a definite plan for caring for such fractures.

In crushing injuries of the foot with compound fractures, the wound will need frequent dressings and re-applications of the splint for care of the fractures.



Fig. 2. Evolution of the metatarsal splint: an early model which lacked the slits for the phalanges and proved too heavy and cumbersome

Fractures of the metatarsals call for a splint that will conform to the concave arc of the plantar surface of the bones, and also exert extension on the distal fragments, for any or all metatarsals of the foot. Fractures of the foot phalanges require a splint that will allow splinting, and holding in place by adhesive, of any or all fractures of one or five toes of the foot.



Fig. 3. Dorsal view of the application of the splint, bound to the toes and foot with adhesive, for multiple fractures of toes or metatarsals or both toes and metatarsals combined. (See Fig. 4)

dispensary staff are taking a greater interest in these small but important fractures, that better results are being obtained, and that the amount of permanent disability is accordingly decreased, which from an industrial point of view is important in these days.



Fig. 4. Lateral view of the application of the splint, bound to the toes and foot with adhesive, for multiple fractures of the toes or metatarsals or both toes and metatarsals combined

The first metatarsal splint Fig 1 was modeled

This splint helped to correct the position of the fragments and held them in place if there was no great deformity. However, where angulation and especially over-riding of fragments occurred it was evident that traction was necessary to correct that pathology. Accordingly a new model was designed to retain the convex surface and also to provide for traction, Fig. 1, right, (Fig. 2).

At about this stage of the development of the



Fig. 5. Evolution of the metatarsal splint: four slits and five projections for binding the phalanges to splint with adhesive: two lateral slits on either side for adhesive: two slits posteriorly for adhesive to keep the splint tight to the heel that traction may be sustained on the metatarsal fragments

splint the question of application of traction of the distal fragments was presented. Traction was then provided by applying adhesive to the toes, like a Buck's extension of the femur, and bringing the adhesive over the anterior end of the splint.

Then it was noted that the frequent association of fractures of the phalanges with metatarsal fractures demanded attention. A new model, Fig. 3, with four slits and five finger-like splints was designed. This was a decided improvement, in that

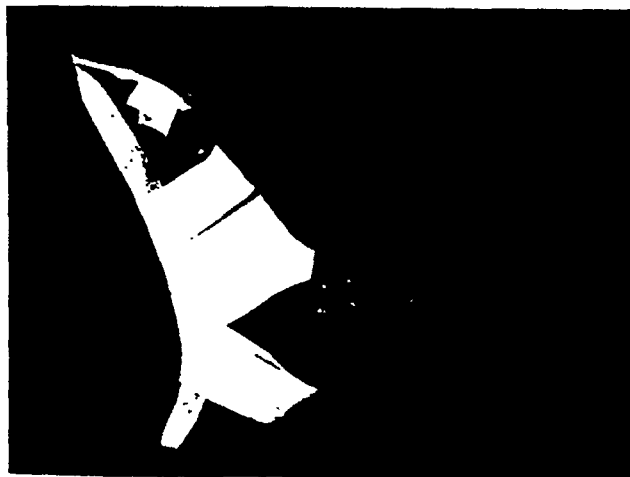


Fig. 7. Splint applied to foot with adhesive, for fracture of 1st metatarsal and proximal phalanx of 1st digit

two new features were provided: first, fractures of the phalanges of the toes could be splinted with adhesive to these projections; second, the toes could be taped to the projections and then the splint pushed forward, thus exerting extension on the distal fragments of the fractured metatarsal bones, Fig. 4. Adhesive about the splint and over the dorsum of the foot and about the heel holds the splint in place and keeps up the trac-

tion of the distal fragment of the fractured metatarsal.

To keep up the traction and to prevent the splint from slipping anteriorly, a new model, Fig. 5, was designed. In this splint six slits for passage of adhesive were made; two on either side, to bind the splint firmly to the foot, and two posteriorly for adhesive to tape the posterior end of the splint over the ankle, like a strap at the back of a roller skate, to keep the heel well back on the splint and the splint well forward on the heel.

With the modeling of the splint with four slits and five projections, a wider projection was made on the median side of the splint for the big toe, Fig. 6. This, however, made it necessary to have



Fig. 6. Hallux valgus accompanying fracture of a phalanx of the great toe or of the 1st metatarsal complicates the method of traction. This is accomplished by using the next lateral digit of the splint to apply the traction in the slanting direction of the toe.

two types of splints, one for the right foot and one for the left foot. To overcome the two-splint problem, a new model was designed with five slits and six projections. Thus two projections could be used for the big toe, and one splint could be used for either the right or the left foot.

This splint as now used is shown in Fig. 10, with two views giving the dimensions. It is noted that there are five slits and six finger-like projections, two of which may be used on either side for a big toe. This makes one splint do for either foot.

FOR metatarsal fractures two points are to be observed in the application of this splint: one, to have the convex surface of the splint pressed well up at the site of the fracture; two, to apply the extension in such a manner that it will be continuous. This may be done by placing adhesive tape about the toes, as in a Buck's extension, and bringing it over the corresponding finger-like pro-



Fig. 8. Case 3064, 1923. Fracture of proximal phalanx, first digit: left, dorso-plantar view and right, lateral view before application of splint. The lateral view shows the common deformity of dorsal displacement of the distal fragment. (See Fig. 9)



Fig. 9. Case 3064, 1923. Fracture of proximal phalanx first digit, (see Fig. 9): left, dorso-plantar view and right, lateral view after application of splint with traction. The deformity of dorsal dislocation of the distal fragment has been corrected

jection of the splint and fastening it. The splint then is pushed forward to obtain traction, and when this extension has been secured the splint is anchored to the foot with broad bands of adhesive over the dorsum of the foot, Figs. 3, 4, 6, 8, and also about the heel to keep the splint from slipping posteriorly.

For phalangeal fractures, the finger-like projections offer an excellent splint for any or all fractures of the toes. Adhesive may be taped over each

of the phalanges and, if extension of the proximal or middle phalanx fragment is desired, the distal phalanx may be taped first to the splint and then by pushing the splint forward, the desired amount of traction may be obtained and the phalanges and foot held in correct position on the splint.

Particular attention might well be directed to the fracture of the distal end of the first phalanx of the great toe, Figs. 9, 10, 11, 12. The rotation dorsal-wards of the articular surface of the distal

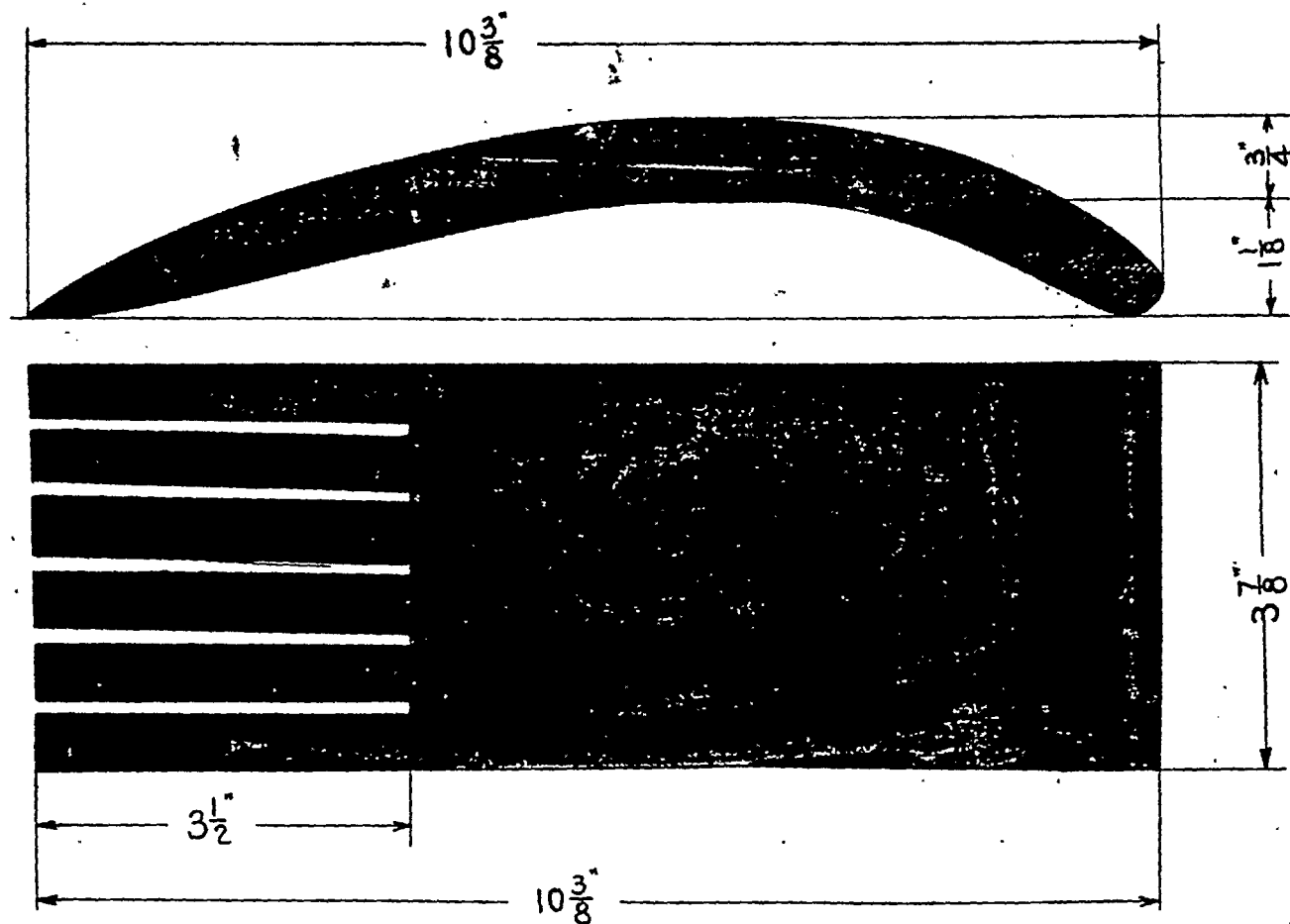


Fig. 10. Two views of the metatarsal splint with its dimensions as now used: below, top surface of splint with five slits and six finger-like projections: two projections can be used for the big toe on either foot, thus using one splint for either foot; above, lateral view of splint with dimensions

fragment is a deformity often overlooked, especially if only a dorso-plantar x-ray view is taken. In the lateral view this displacement is readily picked off. A union of this fracture in malposition causes considerable disability, as the driving pow-



Fig. 11. Case 1614, A. S. T. P. 1932. Fracture of the distal end of the proximal phalanx of the great toe, before the application of the splint: right, the fragments appear in good position; in the lateral view, left, the distal fragment is dislocated dorsalwards, a common deformity in this fracture. (See Fig. 12)



Fig. 12. Case 1614, A. S. T. P. 1932. Fracture of the distal end of the proximal phalanx of the great toe, after application of the splint: left, the fragments in excellent position with slight over extension, and right, lateral view showing the correction of deformity of distal fragment. (See Fig. 11)



Fig. 13. Case 5495, I. S. C. 1929. Right foot, before application of splint. Fracture of proximal phalanx, 2nd digit: left, lateral dislocation of distal fragment and over-riding of fragments; right, plantar dislocation of distal fragment and over-riding of fragments. (See Fig. 14)



Fig. 14. Case 5495, I. S. C. 1929. Fracture of proximal phalanx of 2nd digit, right foot: after application of the splint: left, extension has corrected the over-riding of the fragments and brought them to 80% apposition: right, over-riding of fragments and plantar dislocation corrected. (See Fig. 13)



Fig. 15. Case 1714, I. S. C. 1932. Fractures of the proximal phalanges of the 1st, 4th and 5th digits, and of the 3rd metatarsal, close to the head, before splint and traction were applied (See Figs. 16 and 17)



Fig. 16. Case 1714, I. S. C. 1932. Fracture of the proximal phalanges of the 1st, 3rd and 5th digits, and fracture of the 3rd metatarsal close to the head, after application of splint and traction. (See Figs. 15 and 17).

er of the take-off push of the big toe will be lost. The combination of fractured metatarsals and fractured phalanges may be treated in the manner just described. The splint is light, and the patient may be up and about the room, and when in bed the projecting finger-like end of the splint keeps the covers from pressing over the fractured toes.



Fig. 17. Case 1714, I. S. C. 1932. Fractures of the proximal phalanges of the 1st, 4th and 5th digits and of the 3rd metatarsal bone close to the head, four months after injury. (See Figs. 15 and 16)



Fig. 20. Case 184, I. S. C. 1932. Right foot: fracture of 2nd metatarsal: left, dorso-plantar view, the fragments appear in excellent apposition, however, in the lateral view, right, the fragments are seen to be 25% off center. (See Fig. 21). This is before application of the splint



Fig. 18. Case 397, I. S. C. 1922. Fracture of the shaft of the 1st metatarsal, right foot before application of the splint with extension: left, fracture 1st metatarsal with angulation: right, this appears to be in good position. (See Fig. 19)



Fig. 21. Case 184, I. S. C. 1932. Right foot: fracture of the 2nd metatarsal, after application of the splint: left, dorso-plantar view shows the fragments in excellent position, with slight over extension, and right, lateral view shows the off-center deformity corrected. (See Fig. 20)



Fig. 19. Case 397, I. S. C. 1922. Fracture of the shaft of the 1st metatarsal, right foot, after application of splint with traction: left, correction of angulations: right, alignment good. (See Fig. 18)



Fig. 22. Case 574, I. S. C. 1933. Multiple metatarsal fractures; right foot; 2nd, 3rd, 4th, and 5th metatarsals before application of the splint. (See Fig. 27): left, lateral view: right, dorso-plantar view



Fig. 23. Case 160, I. S. C. 1932. Healed fractures of the distal ends of the 2nd, 3rd and 4th metatarsals and of the proximal phalanges of the 2nd, 3rd and 4th digits, three months after injury. (See Fig. 29)



Fig. 27. Case 574, I. S. C. 1933. Multiple metatarsal fractures: right foot: 2nd, 3rd, 4th, and 5th metatarsals after application of the splint. (See Fig. 22): left, lateral view showing more traction is needed: right, dorso-plantar view



Figs. 24 and 25

Fig. 24. Case 12244, C. C. Hosp. 1928. Right foot: fractures of 3rd, and 4th metatarsal shafts and slight dislocation at epiphysis of 5th metatarsal; epiphysal lines of phalanges and metatarsals simulate fractures.

Fig. 25. Case 7926, C. C. Hosp. 1927. Right foot: fracture of 1st, 2nd, and 3rd metatarsals: the epiphysal lines of the phalanges and metatarsals simulate fractures



Fig. 28. Case 371, I. S. C. R. Fractures of the 2nd and 3rd metatarsal shafts, healed after application of splint with extension. (See Fig. 33)



Fig. 26. Case 184, I. S. C. 1932. Fracture of the shaft of the 2nd metatarsal. (See Figs. 32 and 30). Healing of the fracture two months after the injury.



Fig. 29. Case 160, I. S. C. 1932. Fracture of the distal ends of the 2nd, 3rd and 4th metatarsals and of the proximal phalanges of the 2nd, 3rd and 4th digits with application of the splint and traction. (See Fig. 23)



Fig. 30. Case 184, I. S. C. 1932. Fracture of the shaft of the 2nd metatarsal. (See Fig. 32 and 26) after traction and splint were applied: right, showing slight overextension, and left, displacement corrected



Fig. 33. Case 371, I. S. C., R. Fracture of the shafts of the 2nd and 3rd metatarsals: before application of splint. (See Fig. 28)



Fig. 31. Case 13, I. S. C., R. End result of fracture of shaft of 2nd metatarsal near the head (see Fig. 34) after splint with traction had been applied and corrected the deformity.



Fig. 34. Case 13, I. S. C. R. Fracture of the shaft of the 2nd metatarsal bone, close to the head: before application of the splint with traction; displacement of the distal fragment noted in the dorso-plantar view, right; also in the lateral view, left



Fig. 32. Case 184, I. S. C. 1932. Fracture of the shaft of the 2nd metatarsal before application of the splint: left, dorso-plantar view: right, lateral view, showing displacement of fragments. (See Figs. 30 and 26)



Fig. 35. Case 1531, I. S. Co., 1935. Fracture of the shaft of the 5th metatarsal bone, before splint was applied. (See Fig. 36)



Fig. 36. Case 1531, I. S. Co. 1935. Union of the fracture of the shaft of the 5th metatarsal bone after application of the splint with traction. (See Fig. 35)



Fig. 37. Case 2469, I. S. C. 1929. Fracture of the shafts of the 4th and 5th metatarsal bones with displacement of the distal fragment of the 5th; lateral view, before application of the splint and traction. (See Fig. 38, 39 and 40)



Fig. 38. Case 2469, I. S. C. 1929. Fracture of the shafts of the 4th and 5th metatarsals with application of the splint and traction. (See Figs. 37, 39 and 40)

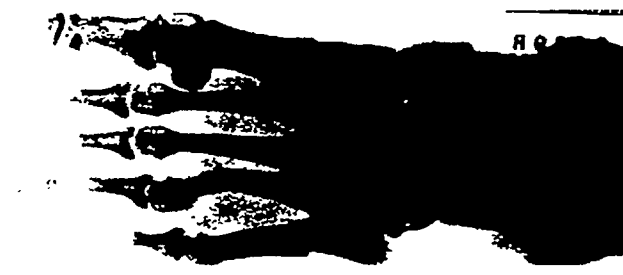


Fig. 39. Case 2469, I. S. C. 1929. Fracture of the shafts of the 4th and 5th metatarsals with angulation of the 4th; before splint and traction were applied (See Figs. 37, 38 and 40)



Fig. 40. Case 2469, I. S. C. 1929. Fracture of the shafts of the 4th and 5th metatarsals with application of the splint and traction. (See Figs. 37, 38 and 39)



Fig. 41. Dislocation of the 2nd, 3rd, 4th and 5th metatarsal bones before application of the splint; and reduction of the dislocated 2nd, 3rd, 4th and 5th metatarsals by application of the splint

The splint is simple in application, cheap in construction, and efficient in caring for the fractures of the metatarsals and fractures of the phalanges and combinations of fractures of metatarsals and phalanges.

A series of illustrations, showing the various types of fractures and their displacements is presented giving rather complete legends, as it is believed that in this manner the subject matter may be presented with the minimum of text. The fractures are shown in x-ray views before and after splinting.

Since this article was handed to the publisher the writer has had occasion to use this splint on a bridge worker on the San Francisco-Oakland bridge.

The patient in this case fell from the "cat walk" of the bridge and among other fractures and grief, he sustained the pathology as shown in Fig. 41: a dislocation of the 2nd, 3rd, 4th and 5th metatarsal bones. The splint was applied and all dislocations of the metatarsals were reduced, as also shown in Fig. 41.

Personality Disorders in Industry

THE regular monthly meeting of the Industrial Relations Association of Chicago, occurring on Monday evening, January 13, 1936, had as its main event an address on the above subject by Dr. Robert N. McMurry, Executive Secretary of the Chicago office of the Psychological Corporation.

It was stated that, as the result of studies made in this country and also in Great Britain, an estimate has been made that 20% to 30% of all employed persons suffer in some degree from mild mental disorders. The peculiarities of so-called problem employees can be roughly classified in two groups: the first group includes those who have once been rapid and accurate in their work but who have become slow and inactive, and although once rated among the best producers, later have become placed at the bottom of the list of producers; the second group would include those who are perennially unsatisfied, those who are chronically ill, those who are perpetually dissatisfied, individuals who tire easily, those who treat their superiors as competitors, those who are given to periodic drinking sprees, insubordination, those who are extremely timid, and those with ungovernable tempers.

Dr. McMurry stated that it was only a consideration of the important principles that was to be given in this outline; that this would include a consideration of psychology and psychiatry; that in the former, psychometric measurements were important and in the latter, abnormalities either organic or functional are fundamental.

The material considered in this talk was concerned mainly with the functional types of abnormalities, and to illustrate this a story was told of an individual who had carried over the so-called "temper tantrums" of childhood into adult behavior.

Another common form of the functional abnormality of mental disorders is what is known as schizophrenia in which day-dreaming is carried to an extreme.

There are of course all combinations of types of mental disorder, and many times there is no clear-cut line of demarcation.

Dr. V. V. Anderson in his psychiatric work among employees has estimated that approximately 30% to 40% of industrial and commercial employees may have mild mental disorders. Of such persons there may be mentioned (1) those who are suspicious and distrustful; (2) the so-called pathological liars; (3) the neurasthenics who are always tired; (4) the introverts; (5) those who have chronic ill-health; (6) the hypersensitive inadequates; and (7) the alcoholics.

Interestingly enough, stated Dr. McMurry, mild mental disorders are not by any means confined to workers or employees, but may exist commonly among executives and be expressed in the following ways: (1) the executive given to pedantry, the employer who is not open to suggestion and who may adopt suggestions made by employees some time before, giving them out as his own; (2) those addicted to stinginess, who quibble with employees on punching the time clocks, or who

make a fetish of promptness; (3) the sadists, who are forever keeping employees on the "anxious seat" even when there is no real or apparent reason to do so.

One way of working out the problems of those who have mild mental disorders is by the use of the so-called "personality inventory," which is a series of questions that may either be answered "yes," "no," or "not known." These personality inventories are then rated according to a rating scale, and the person can be given a rating as to his personality difficulties. Dr. McMurry has not been very much impressed with the use of these personality inventories as a diagnostic tool for the chief reason that the results do not check with practical ratings. For instance it has been found that persons who rate very high in the inventory have not been found to be efficient employees in the practical experience met—and, contrariwise, those who have sometimes shown low ratings on the inventory have been found to be very efficient in their actual work. Then, too, a great many employees cannot or do not tell the truth in answer to the questions asked on the inventories. The rating or grading of the questionnaires is also rather difficult, even if done by the same person on different studies, primarily because the patterns as indicated by the psychological response to the inventories are many times of a mixed character.

It seems, therefore, that the clinical approach is the better method of ferreting out the various bases for mild mental disorders. The clinical approach includes: (1) A thorough physical examination, as the basis for the mental disorder may be physical or physiological; (2) psychological tests, which are done for the purpose of finding out how well adapted the individual is to his work and also of the sociological relationships of the individual; and finally, (4) the so-called psychiatric interview. The first three of these items in the clinical approach provide a rational basis or a background for the psychiatric interview and permit the interviewer to get leads as to where difficulties may be found.

The chief types of remedial procedures are some form of mental therapy or change of work, or adjustment to work.

To bring out certain points relative to diagnostic and remedial measures, Dr. McMurry described five illustrative cases, among them a chemical laboratory assistant, 18 years of age, whose difficulty was that his work was "over his head," intellectually; another a woman of 46 with involutional melancholia which demanded endocrine adjustment; an Austrian truck driver of 42 who went on periodic drunken sprees, because of his dominating consort; a book agent of 24 years who enjoyed so-called "flights into illness," because he had been raised as a "mamma's boy"; and finally a sadistic female supervisor who had charge of a department of 30 women file clerks and who made herself a perfect tyrant because she was known as a "dumbbell" at home.

In summary, the application of the above described methods may well be made to "ironing out" dissension among commercial and industrial employees—because of a falling-off of production—in "labor troubles." It should be thoroughly understood that all of these procedures can be justified on a dollars and cents basis.

The Action of Silica

—As Modified by the Presence of Alkalies*—

by

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with

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THE exact manner in which silica acts to produce silicosis remains undetermined. This statement applies not so much to the physiologic responses to the presence of silica as to the mechanism that inaugurates these responses. Of all dusts that enter the lungs, silica and silica alone, with the exception of the magnesium silicate, asbestos, is up to this time known to possess the peculiar property of provoking the formation of characteristic fibrotic nodules in large numbers. Manifestly this property is not wholly imparted by any condition within the lungs, since typical silicotic structures may be produced experimentally in almost any portion of the body. The mere presence of siliceous substances in substantial amounts within the body is not sufficient to assure an injurious action. At this stage of knowledge it appears that damage may be anticipated only from silica present in some little understood phase, state, or condition. The literature of silicosis is not lacking in ably conceived publications precisely devoted to explanations of the phenomenon of silica action. Chief among these are the theories of Gye and Purdy,¹ Gye and Kettle,² and Heffernan.^{3,4} No one may be accepted as conclusive although all have immensely contributed to the understanding of this vexatious problem. Running through many publications is the concept that silica solubility facilitated by alkalies plays a significant role. This has associated certain occurrences of so-called acute silicosis with exposure to mixed silica and alkali dust, the latter acting as an accelerator. The present publication is related to the action of alkalies in silicosis and is based upon clinical and experimental observations.

Clinical Observations

THE colloidal theory of silica action attaches importance to the presence of the weak alkalies of the lung fluids as the agents responsible for, or at least participating in, the shift of the silica (SiO_2) from the solid to the hydrosol ($\text{Si}(\text{OH})_4$) state, with silicates possibly representing a transitory stage. Quite naturally, when a rapidly progressing silicosis appeared in certain industries, such as silica soap plants, unusual significance was attached to the presence of alkalies employed in the soaps. Heffernan's⁴ appraisal of the situation is here condensed:

"The existence of an acute form of silicosis in workers handling siliceous soap powders can scarcely be regarded as longer in doubt . . . Sections of pathological material of lungs in fatal cases show under the microscope typical whorled silicotic islets . . . If we regard freshly formed silica hydrosol as the active agent in the causation of silicosis—a belief which, as I shall attempt to show later, now would appear to require some

qualification—there is a *prima facie* case for attributing the acuteness of these cases to the coating of alkaline soap surrounding the silica particle. A colloidal alkaline silicate would appear to be slowly formed, and in time to become a 'system' of silica hydrosol, sodium silicate,

and water. Eventually some silica is deposited as a gel."

The details of several occurrences of acute silicosis associated with mixed exposure, including alkalies, have been reported by Chapman,⁵ Kilgore,⁶ Spilsbury and McDonald,⁷ McDonald, Piggot and Gilder,⁸ Kettle,⁹ and Lennane.¹⁰ Such publications have caused a number of workers to regard exposure to mixtures of silica and alkali dust as unduly hazardous. This is exemplified in a statement attributed to Willis:¹¹

"There have recently been a number of contributions in the literature which point out the fact that if there is an alkali in association with silica dust, the results are likely to be very devastating; that an alkali inhaled with silica will stimulate the formation of fibrosis to a remarkable degree."

Since much more of so-called acute silicosis may be shown to have arisen without concurrent exposure to alkalies, the belief is growing that an accelerating action of alkalies is not established. The rapidly developing cases in both the West Virginia and New Jersey outbreaks probably may be attributed to the presence of gross concentrations of silica dust in minute particle size.

Beginning early in 1933 opportunity has been provided one of the present authors to investigate six industrial plants in which certain departments provided exposure to silica and alkalies in high dust concentrations. Other departments and other plants provided exposures to silica and alkalies alone, as well as exposures to the dusts of clays, flints, cullet, carbon, iron oxides, tripoli, gypsum, limestone, emery, carborundum, etc. These last items are mentioned only as the source of materials for comparative purposes.

In the silica-alkali exposure, substances appreciably present and giving rise to dusts were quartz silica, sodium carbonate, limestone, sodium sulphate, sodium chloride, carbon, and in some instances small quantities of arsenic, antimony, and iron oxide. The investigations included occupational and medical histories, x-ray examinations, physical examinations, dust counts, chemical analyses, and in some instances petrographic analyses and geologic appraisals. At the outset of the work, it was necessary to group the workers into two lots: those who had no other industrial dusty exposure, and those who had been employed in other dusty departments of the same plants and in other dusty occupations. Due consideration was given to the duration of exposure.

In no single instance was silicosis found in any worker whose exposure had been limited to the

* From the Industrial Health Conservancy Laboratories, Cincinnati, Ohio.

silica-alkali-plus mixture. Silicosis was detected in three instances of workers previously and extensively exposed respectively in mining, pot making and pottery work. No previous medical records yielded any evidence of suspected silicosis or tuberculosis in workers no longer employed, provided their exposure was limited to the one occupation under inquiry. In all instances long exposed workmen revealed more fibrosis than average for their ages, healed tuberculosis was at times demonstrable, and the possibility of arsenic poisoning was accepted in a few instances. Characteristic silicosis was signally absent.

It is quite impossible to deduct from the foregoing that the alkalis present in the dust along with silica served as any deterrent to the action of silica through facilitating the solution of silica or otherwise. The situation is much more complex than first appears. The alkalis present so rapidly dissolved the silica that a grossly dusty atmosphere in terms of visibility yielded no dust particles in the ordinary dust count procedures. Using absolute alcohol as the entraining medium, no known solution took place, but it was impossible to distinguish between silica and other dusty materials. Petrographic analyses were not effectual. The chief evidence of a silica exposure resides in the fact that visible clouds of silica dust were created in the operations of the silica shutes. The absence of silicosis may in fact result from lack of sufficient exposure.

Recognition must be extended to other chemicals leading to dust utilized along with the silica, soda ash, and limestone. These, however, have been relegated to minor consideration in view of the relatively small quantities employed and to the fact that their physical state was such as to minimize dust formation.

A further item to be recognized as conceivably standing in relation to the absence of silicosis is to be found in the possibility that the electrostatic charges of various types of dusts may have been such as to agglomerate all of the dust into masses of such size as to hamper entry of the silica into the lungs. This action has been observed by the authors in connection with tripoli exposure, and lately has been mentioned by Gardner¹² in the course of experimental work with gypsum and silica. However, in the case of the six plants under discussion, this electrostatic action is regarded as most unlikely.

The fact remains that among the workers of six plants employed in dusty operation and regularly furnishing exposure to mixed silica and alkalis, no silicosis was detectable, whereas prior to the institution of the inquiry, a high incidence of "acute silicosis" was anticipated as possible in view of previous publications dealing with the action of alkalis entering the body along with silica dust.

Experimental Observations

THE number of experimental approaches, either in man or through the use of animals, for the purposes of determining the influence of alkali associated with silica, is limited. With a group of men King and Dolan¹³ sought to accelerate the output of silica in the urine through the administration of sodium bicarbonate by mouth. Such a process did not change the pH concentration of the blood, but through increasing the alkali re-

serve it was conceived that the rate of solution might be increased and that the quantity of silica in the urine might be augmented. The results obtained were not conclusive. Kettle⁹ in discussing acute silicosis states:

"In the affected persons the disease progressed with extraordinary rapidity due, it was claimed, to the presence of the alkali which rendered the silica more readily soluble in the lungs. On the face of it this seems unlikely, for sufficient alkali to alter significantly the reaction of the tissues would most probably cause a severe catarrhal inflammation of the air passages. This, at any rate, is what happened to my animals when I tried to reproduce the condition experimentally—I could not convince myself that the action of the silica had been affected in any way by the associated dust. We still lack proof that anything of the kind can occur."

In our own experiments the technique of Miller and Sayers¹⁴ was employed. This same technique, only slightly modified by us, elsewhere has been described.¹⁵ The essential feature of the technique is the introduction into the abdominal cavities of guinea pigs of a predetermined amount of the test material, usually 0.1 or 0.2 gram in fine particle size, all passing through a 325-mesh screen or finer, the particulate material being suspended in distilled water or normal saline. After an interval of 30 days or more the animals were killed and the type of response determined. Although in many instances the period prior to killing has been extended well beyond 30 days, Sayers,⁹ in his remarks on Kettle's paper, has indicated that 30 days is sufficient to provide distinctive responses. In the case of quartz silica, tripoli, amorphous silica, flint, chalcedony and other substances with a high content of free silica, the reaction is proliferative, typical silicotic tissues being produced. In the case of emery, carborundum, iron oxides, and carbon (among others) the reaction is one of inertness. A third response is that of absorption, and is characteristic of the presence of gypsum, limestone, silica gel, and cement (among others).

In our series, utilizing 300 animals, 29 substances have been tested. Among these were combinations of quartz silica, of varied particle size, silica gel, tripoli, mixed either with equal quantities or quantities in chemical combining weights of alkali substances, including sodium bicarbonate, sodium carbonate, limestone, and magnesium carbonate. In other instances the combination of silica and these alkalis was further admixed with kaolin. In some instances the mixture of silica and alkali material was injected once only, but in other series additional quantities of alkali were injected at three or four day intervals. For control purposes silica in its various forms alone was injected, and likewise the several alkalis alone were injected.

Very early it was established that sodium carbonate either alone or admixed with silica was so highly irritating as to preclude use. Promptly it was established that limestone administered along with silica produced no new reactions, for which reason limestone likewise early was dropped from the series of investigations.

Such quantities of the chemical combining weights of the alkalis were admixed with 0.2 gram of siliceous material at the outset of the experiments. In such instances, and in those others

when equal quantities of the materials, that is 0.2 gram each, were employed, the immediate toxicity, chiefly in the case of sodium bicarbonate in silica mixtures, rather than the mixture of silica and magnesium carbonate, was such that most of the animals did not survive longer than four days. No primary toxicity beyond immediate reaction to injection was noticed either from the siliceous material or the alkalies when alone injected. The high mortality encountered was out of proportion to any expectable consequence solely resulting from the doubled mass of material introduced. This high mortality caused the quantity of material injected to be reduced to 0.1 gram of each, or 0.1 gram of the siliceous material together with the chemical combining weight of the alkaline substances. It is noteworthy that silica gel, which led to no proliferative response, was highly toxic when admixed with alkali materials.

At the end of 30 days, autopsies revealed a much greater extent of involvement than from silica alone. In addition to the usual nodulation on the anterior abdominal wall—the most pendant portion of the animal's abdomen—large numbers of nodules were detectable on almost all organs, including the diaphragm, liver, gall bladder, omentum, intestines, mesentery, epididymides, testes, urinary bladder, seminal vesicles and cremasteric muscles. Although some nodules may be produced on some of these organs from the presence of silica alone, the number encountered is customarily far more in the case of silica admixed with alkalies. This extensive involvement was regularly observable in the case of all forms of silica, such as quartz, tripoli, chalcedony, etc., but not silica gel, the reaction from the last named substance being one of absorption with or without the presence of alkalies. The nodules encountered were typically silicotic as described by Miller and Sayers,¹⁴ and as established by us after the examination of microscopic tissue preparations. This excessive number of silicotic nodules resulting from the admixture of alkalies with the silica in the intraperitoneal injections has given rise to the use of the term "miliary proliferation" in another publication,¹⁵ describing the entire series of three hundred animals.

TWO summarizing protocols are here introduced as representative of the entire lot of animals devoted to this phase of our investigation:

COMPOSITE RECORD:

Sodium bicarbonate and quartz silica, through 325 mesh.

Injected five male guinea pigs with 0.2 gram sodium bicarbonate alone.

Re-injected 21 days later with 0.1 gram of quartz silica and 0.26 gram of sodium bicarbonate.

Two animals killed for examination 51 days after first injection, 30 days after second injection. Three animals killed for examination 74 days after first injection and 53 days after second injection.

AUTOPSY NOTES: (Two groups combined):

1. Site of injection: No markings.
2. Anterior peritoneal wall: Dense fibrous ad-

hesions extend from proliferative nodules on the anterior abdominal wall and from other portions of the anterior abdominal wall to the liver, gall bladder, testes, intestines and seminal vesicles. More adhesions in second group of animals.

3. Diaphragm: A few nodules in one instance. Many nodules in one other instance. Adhesions in others hamper examination.
4. Suspensory ligament: Many nodules in animals in second group.
5. Liver: Extensive nodulation. Silica nodules appearing in lines or streaks rather than discrete, as is usual.
6. Gall Bladder: Not extensively involved, except for adhesions to anterior peritoneal wall in one instance.
7. Omentum: Isolated nodules, but not the same extent of involvement as observed in some other series.
8. Spleen: A few pinhead nodules in two instances.
9. Mesentery: A few widely scattered nodular deposits.
10. Intestines: Large numbers of nodules on intestinal wall and in second group nodules averaged about one per inch throughout tract.
11. Peritoneum over kidneys: Essentially uninvolved.
12. Seminal vesicles: Nodules with many adhesions to anterior peritoneal wall.
13. Urinary bladder: Nodulation of posterior surfaces.
14. Testes: Nodulation in two instances. Nodules also found in cremasteric muscles.
15. Posterior peritoneal wall: Extensively nodulated in second group.

APPRAISAL: Wide distribution of typical silicotic nodulation. The nodules are smaller than usual for silica, but distribution is greater.

COMPOSITE RECORD:

Magnesium carbonate and quartz silica, air separated sample, particle size below 10 microns. Injected five male guinea pigs with 0.2 gram quartz silica and 0.28 gram magnesium carbonate.

One pig died within 24 hours. Four pigs killed after 30 days.

AUTOPSY NOTES:

1. Site of injection: One instance of an intramuscular silicotic nodule.
2. Anterior peritoneal wall: Characterized by extensive adhesions between nodules and intestines, seminal vesicles, and liver. Extensive confluent nodulation chiefly near midline, and many small discrete nodules. Nodules are characteristic cream color, but hemorrhagic in one instance.
3. Diaphragm: A few nodular deposits in two pigs. In one pig, adhesions to liver.
4. Suspensory ligament: Two small nodules in one instance.
5. Liver: Heavy nodulation on all surfaces. No nodules except those superficially located. In three instances, liver is enlarged, hemorrhagic, and friable. Nodules encoun-

- tered not uniform in size, the largest being several times the diameter of the smallest.
6. Gall bladder: In two instances, uniform nodulation.
 7. Omentum: Rolled up, massive proliferation. Some discrete nodulation. Adhesions.
 8. Spleen: Uninvolved.
 9. Mesentery: Nodules in three or four animals. Adhesions.
 10. Intestines: Grossly nodulated and many adhesions between coils of intestines and to other tissues.
 11. Peritoneum over kidneys: In one instance, adhesion to intestine.
 12. Seminal vesicles: Many nodules and adhesions in all cases. In one instance, seminal vesicles are involved in caseous mass size of hazelnut.
 13. Urinary bladder: Uninvolved.
 14. Testes: In two instances testes contain a few nodules.
 15. Posterior peritoneal wall: In one instance, a small number of minute nodules.

APPRAISAL: The involvement encountered is constant, but with minor variations. The general picture is characterized by extensive adhesions and miliary nodulation. The chief point of nodulation, apart from the anterior abdominal wall, is the intestinal tract.

AUTOPSY findings from the entire lot of animals in this work might prompt the belief that here is definite proof of an accelerating action of alkalis in the production of silicosis. Such appears not to be the case. The irritant action of the alkali seemingly provokes much increased movement on the part of the omentum, intestines and seminal vesicles, to the end that the silica which otherwise might chiefly lie in the pendant portion of the abdomen against the anterior peritoneal wall is widely disseminated. Animals killed within a few hours or days after injection were found to present a much wider distribution of the siliceous material throughout the abdominal cavity. Wherever deposits of silica were thus mechanically made, silicotic nodules appeared.

In pulmonary tissues it is not known that any comparable mechanical distribution may result from the irritant action of the alkali, so that the miliary nodulation regularly found in the abdominal cavity may stand in no relation to the effect of alkalis on silica dust entering the lungs.

Comment

AT THIS time it appears that the determination of the influence of alkalis as accelerators or inhibitors of the action of silica in pulmonary tissues, through animal experiments, will require prolonged exposure by inhalation over a period of many months, under conditions establishing the actual entry both of the silica and the alkali into alveoli. None of the shortcuts thus far attempted offers any prospect of providing fundamental underlying facts.

No justification is now known to exist for the use of alkalis in the treatment of silicosis. At least there is no warrant for any belief that alkalis may reduce the fibrosis already created, although there may be some reason for believing that the dusting of lungs with harmless alkali

dusts may increase the drainage from the lungs and increase the amount of silica detectable in the urine. But this is more speculative than established.

Likewise, no warrant is known to exist at this time for the use of alkalis in the prevention of silicosis. It is a provocative concept that silicosis might be prevented by the daily dusting of the lungs by harmless alkalis, during, or before and after exposure to silica dusts. Conceivably these coexisting alkali dusts along with the silica dusts in the alveoli might so accelerate the solution of the silica as to prevent or delay the inception of silicosis. No substantial fact permits adherence to this conception.

Summary

THE often encountered assertion that coexistence of silica and alkali dust in industry constitutes extra hazardous work conditions, is unproved, but not necessarily unfounded. Extensive investigation of the workers in six plants simultaneously exposed to silica and alkali dusts provided no evidence of an accelerator action by alkalis. The entire absence of silicosis suggests the possibility of an inhibitor action.

Animal experiments with guinea pigs in which the peritoneal cavities were injected one or more times with 0.1 or 0.2 grams each of silica and alkali (sodium carbonate, sodium bicarbonate, magnesium carbonate, or limestone), yielded no results proving either an accelerator or inhibitor action of alkalis in the production of silica nodules. The presence of alkalis markedly increased the distribution of silicotic nodules throughout the abdominal cavity, which action is apparently solely due to the mechanical distribution of the silica by increased motions of abdominal organs, induced by alkali irritation.

The primary toxicity of silica and silica gel mixed with alkalis is much greater than is true for silica, silica gel or alkalis alone.

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Central States Society Clinic

—All Day Clinical Session of Central States Society of Industrial Medicine and Surgery, Cook County Hospital, Chicago, January 15, 1936—

UNDER the chairmanship of Dr. Frederick W. Slobe, the following program was given in an all-day clinical session of the Central States Society of Industrial Medicine and Surgery, at Cook County Hospital, Chicago, Wednesday, January 15, 1936:

1. "An Important Industrial Injury," by Dr. J. DANIEL WILLEMS.
2. "Vertebral Injuries," by Dr. FREDERICK NELSON, of Ottumwa, Iowa.
3. "Injuries of the Female Genitalia," by Dr. CHANNING W. BARRETT.
4. "Injuries to the Male Genitalia," by Dr. HARRY C. ROLNICK.
5. "Use of Kirschner Wire in Femur Neck Fractures," by Dr. FREDERICK DYAS.
6. "Chest Injuries," by Dr. RALPH BETTMAN.
7. "Elbow Fractures and Closed Reduction," by Dr. FRANK P. HAMMOND.
8. "Flange in the Femoral Neck," by Dr. JAMES CALLAHAN.
9. "Physio-Therapy in Traumas," by Dr. ISRAELI KOBAK.

In the afternoon session, the following demonstrations and discussions were given:

1. "Fractures," by Dr. CARLO S. SCUDERI.
2. "Interesting Scapula Case," by Dr. J. BEVERLY MOORE, of Benton, Illinois.
3. "Trivial Eye Injuries Resulting in Impaired Vision," by Dr. SIDNEY WALKER.
4. "Peripheral Nerve Lesions," by Dr. HAROLD VORIS.
5. "Bone Tumors and Allied Lesions," by Dr. CHESTER WARFIELD.
6. "Interesting Vertebra Case," by Dr. B. V. McCLANAHAN, Galesburg, Illinois.
7. "Fractures Around the Shoulder Joint," by Dr. WILLIAM CUBBINS.

Dr. WILLEMS demonstrated a case of a boy who had had a series of repeated minor injuries to the knee over a period of five years' time. There had been no physical evidence of any injury until a modern amount of swelling became evident in the knee a few weeks ago. All of the x-ray films taken on the patient were somewhat confusing, although showing no very definite type of pathology. An x-ray film of the chest was negative for any evidence of metastasis. An artefact was suspected in one of the films, but was not proved. The case was interesting from the standpoint of difficulty of diagnosis, and suggestions were sought from the physicians attending the clinic.

In replying, Dr. LEROY P. KUHN mentioned that possibly osteitis resulting from an old abscess or inflammatory process might be the condition with which we were confronted. The probability is that the condition was not malignant. It might be advisable to do an exploratory operation and secure material for biopsy, which might really give the solution to the problem.

Dr. NELSON gave a review of the surgical neurology of spinal cord injuries. The principle involved is to diagnose the injury from the neurological findings regardless of what the x-ray findings may suggest. Comments were made on the nerve supply of the various cord segments and consideration was given to anatomical landmarks. X-ray demonstrations were then given of several different cases, including a forward dislocation of cervical vertebra—an unusual instance of forward dislocation of the fifth lumbar vertebra on the sacrum (the probabilities were that the fifth lumbar was not normal before the injury, since there are many anatomical anomalies of this structure)—a demonstration of a compression fracture of one of the dorsal vertebrae.

Dr. BARRETT, in speaking about injuries to the female genitalia, commented that there is a very significant relationship medicolegally between injury and pregnancy. Absolute aversion to pregnancy may be transformed into intense desires, subsequent to an injury which may or may not affect a suspected pregnant condition adversely. In this connection it is important to secure a sample of urine from the patient, for making the Ascheim-Zondek test. Injuries to the female genitalia may occur rather frequently from falling off a stool or chair, while doing domestic housework, such as hanging pictures and other similar activities; kicks around the vulva, either by human beings or animals, may produce haematomas; not infrequently it has occurred that a bull may rip open the vulva producing extreme lacerations; in fact it has been known that serious infections have been produced in this manner. In medico-legal cases, women often claim displacement of the uterus and not infrequently the displacements have usually existed previous to the associated injury; quite similarly fibroids have produced bleeding but have been overlooked until an injury has taken place. In this connection, the famous case of Marion Sims relative to retrodisplacement was mentioned. A case was also described of an injury that took place on a railroad journey in which displacement of the uterus was claimed, but later on an operation disclosed a tubal pregnancy, the case terminating in a decision favorable to the defendant railroad company.

Dr. ROLNICK, in speaking of injuries to the male genitalia, mentioned the use of suction apparatus by males for the purpose of causing erection and in one such instance tearing off the glans penis. This case was dealt with successfully by an operation. Two other similar cases were remembered in Dr. Rolnick's experience. It was also interesting to point out that in some of the earlier cystotomies, lacerating injuries to the penis occurred, necessitating plastic operations. Another remarkable instance was the lodging of a bullet in the corpora cavernosa. A case of shrapnel particles lodged in the penis has also been a part of Dr.

Rolnick's clinical experience in this work. In another instance, after mutilating injury and partial amputation of the penis, although the operation was successful from a plastic point of view, erection was not experienced beyond the point of injury, on account of penile circulation not being completely established. It should be emphasized that the regeneration of penile and scrotal tissues is comparatively rapid. Haematomas are rather common in this type of injury and are predisposing factors to subsequent infection. It should be stated that traumatic hydrocele is rare if it does occur, the same statement holding good for so-called traumatic epididymitis. Traumatic orchitis does occur, however. Many so-called traumatic herniae are really cases of funiculitis.

DR. DYAS, in discussing the adaptation of Kirschner wire in fractures of the femoral neck, stated that many cases of fracture of the femur occur in old persons; that there is poor bone regeneration; that to find a technique which will permit the patient to be up and about in a chair is one of the problems. This apparently is solved in the use of the Kirschner wires, several of which are put through the femoral neck and into the head, being first inserted through the intertrochanteric crest by the special apparatus which is provided with the Kirschner wire. A case was demonstrated where such wires were used in an elderly woman, with very good clinical results. Motion picture demonstration was also given of the technique of putting in the wires and the results which were secured in such a case. Apparently this method is giving good results and allows of considerably quicker and better function than any that has been discovered heretofore.

DR. BETTMAN, in commenting on chest injuries, arranged his remarks around five different principles: (1) close every open wound of the thorax immediately; for this purpose one may use any of the ordinary kinds of material close at hand and close the wound temporarily because it is important for good aeration of the lungs that air should be kept out of the pleural cavity, and also avoidance of shock may be accomplished; (2) beware of bleeding from intercostal arteries—stop this by ligaturing the ribs involved; (3) beware of internal tension pneumothorax—this will produce the most distressing symptoms and can be immediately relieved; (4) do not aspirate any chest unless this procedure is definitely indicated—there is always the temptation to put a trochar into the chest to see if one gets an effusion or pus—more and more chest explorations are being done and there is relatively little difficulty in doing this operation successfully; (5) be on the lookout for diaphragmatic herniae—these are far more common than has been previously suspected. One is liable to have a paralytic ileus following a rib fracture—this ileus may account for symptoms which sometimes appear quite unusual in such fractures. Pneumothorax can occur somewhat later than an injury but is usually associated with a previous infection causing pleural adhesions, which may be displaced or torn by an injury. Cardiac damage may result from a crushing of the sternum, and this has occurred in instances of deformity of the sternum and produced chronic effects on the heart over a period of time. Ordinarily operations on pericard-

ial sacs or upon blood vessels of the heart have been found to be a great deal easier in technique than abdominal operations in certain types of gangrenous appendicitis.

DR. HAMMOND presented an x-ray demonstration of multiple fractures around the elbow joint, successfully treated by closed reduction. In this case there were multiple fractures around the elbow joint, with forward dislocation. The fragments were properly moulded into position, and the arm was put up in a cast at approximately right angle of the forearm with the arm, the result being very good. Another case was demonstrated by Dr. Hammond in which there was a compound fracture of the elbow and a fracture of the humerus in the lower third, this fracture after being properly manipulated being put up in suspension traction followed by being put into a cast in flexion and supination. The result now shows approximately 75% of extension.

DR. CALLAHAN, in discussing the use of a flange in fractures of the femoral neck, stated that after a lot of experience with fractures of this type it was thought best to put the leg up in traction, and it was found that good union was obtained in a small percentage. Later experience after trying the usual pegs, screws and other implements did not show what were thought to be good results. At the present time on this service, use is made of the bone flange, an incision first being made and the muscles split so that the flange may be inserted with the proper caliper and be driven through the greater trochanter, the neck and into the head. Traction is then exerted for 10 days or two weeks, and then the case is properly operated. After this, traction is again used for seven weeks, and then the patient is put into a walking caliper for a period of approximately four weeks. The latter period may vary considerably according to the case. Demonstration was then made of a patient operated in September, 1935, showing the good result obtained. Dr. Callahan advises early operation in all of these cases, stating that by early operative interference, prevention of late cases will be obtained.

DR. KOBAK, in commenting on the use of physio-therapy in traumatic lesions, stated that such procedures are used principally to obtain the restoration of function. There has been a lot of misuse of physical therapy procedures which are composed mainly of manual operations or procedures—passive electrical stimulation—thermal agencies—and therapeutic exercises. No one of these groups of measures is applicable in any given case, but a combination of methods is usually found best. An important principle regarding the application of physical therapy measures to the proper treatment of traumatic lesions is to teach the patient to help himself. It is for this reason that corrective exercises must be taught in a rather absolute and dogmatic fashion, because the patient will naturally become lazy and careless and will not apply himself properly when doing exercises away from the supervision of the nurse or the physician. Physical therapy has a very definite place in the restitution of function and must not be abused—neither must quackery enter into the practice of physical therapy.

AFTERNOON SESSION

DR. SCUDERI presented a series of x-ray films showing vertebral injuries. In the first case there was a dislocation of the atlas on the axis with no neurological symptoms; treatment with five pounds of traction was given later on, the patient developed a bronchial pneumonia and died. The second case showed no history or trauma, but the patient remembered twisting his head suddenly during a nightmare; the x-ray film showed a forward dislocation of the atlas on the axis; later on the patient developed a paralysis and was also diagnosed as a miliary tuberculosis, which of course was incidental. In the third case there was a fracture and dislocation of the seventh cervical vertebra after an automobile injury, this being treated according to usual routine, with good results. In the fourth case there was a fracture and dislocation of the second cervical vertebra; there was a numbness of hands without other definite neurological symptoms; traction of five to eight pounds was used, a Queen Elizabeth collar applied, and the neurological symptoms completely disappeared. In the fifth and sixth cases, which were similar, there were anterior dislocations of the fourth and fifth cervical vertebrae, both occurring in young boys who had dived, striking the head against the ground underneath the water; in one instance there was a flaccid paralysis of the left arm with no cutaneous disturbances; a Queen Elizabeth collar was applied, neurological symptoms disappeared, and the case was discharged to return again in four months, but was not finally followed up. In the other case of the boy diving there was an extensive paralysis; laminectomy was done. This, however, was followed by an ascending nephritis. In the seventh case, the patient had fainted striking the head against some obstruction; in this instance there was paralysis of the right deltoid, the usual treatment of traction and collar being given with good results. The eighth case showed a fracture and dislocation of the fifth cervical vertebra on the sixth, the patient having fallen off a ladder about 15 feet high, after which he was unable to move the left leg for a period of six months; traction was applied and collar fitted, satisfactory results being obtained, but with some involvement of the grip of the right hand at the time of discharge. In the ninth case, there was a fracture and dislocation of the sixth cervical vertebra with a crack through the lamina; traction was used on this case, but it was not followed up later. Demonstration was then made of two patients, one having history of falling downstairs after partaking too freely of liquor; the man presented himself with some soreness of the neck, the side to side movement being somewhat involved; it was later discovered that there was anterior displacement of the second on the third cervical; reduction is now being attempted with this patient. The second case demonstrated was that of a woman who sustained an automobile injury, the diagnosis being an anterior displacement of the fifth on the sixth cervical; 10 pounds traction has been exerted at intervals and the patient then put up in plaster; this was alternated with traction, it being found that every time the patient was put up in plaster there was a return of the dislocation, although traction reduced the dislocation; the patient still has the

dislocation but no neurological symptoms and is now wearing a head halter.

DR. MOORE, in discussing an interesting scapula case, showed x-ray films of a fracture of the scapula in a coal miner. The history given was that something fell on him while he was on a scaffolding. The film showed a fracture through the lower half of the glenoid process. The nature of this fracture and separation was such that operation was necessary. The operative incision was made over the outer margin of the scapula, the muscles split and the fragments wired into position. The fragments have stayed in this position, as subsequent films have demonstrated. The patient is now confined in bed because of other injuries sustained at the same time, but moves his arm for therapeutic exercises.

DR. SIDNEY WALKER, commenting on trivial eye injuries which may result in impaired vision, stated that what may appear trivial may not be so eventually. Many changes can occur in the results of apparently small injuries and aggravation of other conditions may also intervene. In many superficial lacerations of the conjunctiva, small wounds may not be apparent except by staining with a 1% solution of fluorescein. In some instances these small lacerations should be drilled out to prevent corneal ulcers. When small wounds close suddenly as they frequently do, intra-ocular steel may be present and very easily overlooked. Hence the need for very careful and painstaking examination by one who is accustomed to going through these procedures. Electrical flashes may cause severe retinitis or even cataract, and it is well to make a thorough examination for these conditions, especially with a view to ruling out pre-existing conditions. Infection is a scourge which is all too common in eye injuries, and the tear sac itself may harbor pneumococcic forms. Another point to be remembered is the eradication of the shop oculist and of the plant nurse who oversteps the rights of that group. In the matter of liability, blows on the head or jars from jumping a foot or two may cause severe results in the detachment of the retina, especially in persons of high myopia. Claims for visual losses are continually occurring in the face of very slight injuries. There are also instances of where crossed eye has been ascribed to head injuries. It is always a question of how far the plant physician can go in the removal of foreign bodies; certainly the responsibility for thorough examination and treatment of after-effects is better assumed by the ophthalmologist, although it is always a matter of judgment as to the removal of superficial bodies, by the plant surgeon.

DR. VORIS presented a series of cases and clinical demonstrations relating especially to peripheral nerve lesions after injuries. The first case was that of an individual injured in an automobile accident in which an open reduction of the right arm was done twice; these operations were complicated by radial nerve injury manifested by wrist drop and an anesthetic area over the dorsal surface of the index finger and thumb—there was also some atrophy of the supinator longus and the brachial muscles. Another case

of injury due to an auto accident showed a fracture of the lower third of the humerus, later complicated by wrist drop and an area of anesthesia; at the time of operation the nerve showed a neuroma which was divided by multiple long incisions, and the patient now has the arm in a cast. In a third case there was a compound fracture of the left elbow with subsequent infection; wires were placed in the joint, and traction was exerted and the patient put into a cast; this was an example of a median nerve involvement, there being trophic changes in the first and second fingers and the fingers held constantly in a position of semi-flexion. In the fourth case there had been dislocation of the left shoulder complicated by paralysis of all motions of the upper extremity after reduction; there appeared in this case an anesthetic area involving the axillary nerve distribution and also an atrophy of the deltoid.

In the fifth case, the result of an auto accident, there was a fracture of the lower third of the humerus, complicated by wrist drop; the radial nerve was freed but it was discovered that the brachial plexus was also involved; there was anesthesia of the hand and the volar surface of the forearm with atrophy of the deltoid; there is now a small amount of flexion of the hand possible. Dr. Voris then reviewed the nerve supply of the three principal nerves of the hand and arm—the radial, median and ulnar—and also briefly commented on motor functional tests.

DR. WARFIELD, in an interesting series of x-ray films of typical lesions, presented a review of bone tumors and allied lesions as manifested by x-ray films. There are three guiding principles in making classification of bone tumors: (1) one should decide on one bone or a part of a bone involved; (2) grouping should be made under and over 20 years of age; and (3) classification should include osteolytic and osteoplastic changes. Following these suggestions, Dr. Warfield showed a series of films using principally a classification of the different types of changes in the young and in the old patient:

1. Osteolytic changes in young persons (bone cysts—Brodie's abscess and sarcoma).

2. Osteolytic changes in older people, which are relatively uncommon (giant cell tumors—benign chondromata of fingers and toes—malignant metastases).

3. Osteoplastic changes in young persons (osteoma of the single cauliflower type—sarcoma—chronic sclerosing osteitis—Ewing tumors).

4. Osteoplastic changes in older persons (fibrosarcoma of benign type—myositis ossificans—ossifying periostitis, usually luetic).

5. Multiple osteoplastic changes in young persons (congenital multiple exostoses—osteopetrosis with many fractures—subperiosteal haematoma with calcification, in scurvy).

6. Multiple osteolytic changes in young persons (rickets osteochondritis of lues—osteogenesis imperfecta which progresses into fragilitas ossium after about one year of age).

7. Multiple osteolytic lesions in older persons (metastatic lesions—multiple myelomata usually of the skull—osteomalacia, somewhat rare in the United States).

8. Multiple osteoplastic lesions in older persons

(metastatic lesions from carcinoma of the prostate—Paget's disease).

In concluding, Dr. Warfield stated that deeper specimens should be taken for biopsy, and more biopsy specimens should be taken than is the rule.

Syphilis can produce any kind of bone change in any bone of the body, so that it is well to be wary of the exclusion of syphilitic infection.

DR. McCLANAHAN presented an interesting demonstration of a case of a patient who had been injured in an automobile accident, a woman of 27 who had apparently suffered a sudden jerk of the spine and was brought to the hospital with a kyphosis. Later on it developed by taking x-ray films that there was a crushing injury of the body of the first lumbar vertebra. Operation was done with a local anesthetic and the patient was put up in a hyperextension cast which she wore for a period of 99 days, meanwhile taking special exercises as demonstrated by the motion picture film which was shown. Because of strict adherence to exercise and supervision, the patient was in a great deal better physical condition following this treatment than when she first presented herself with the injury.

DR. WILLIAM R. CUBBINS gave a very brief summary of his experience with fractures around the shoulder joint, stating particularly that there are many difficulties in the solution of the problems presented by this type of injury. The fracture staff is working now on a modification of methods for the treatment of fractures in and around the shoulder joint with the hope that standardization of treatment may be made based on the securing of good functional and anatomic results.

It was felt by members of the society that the all day clinic was productive of a great deal of useful information and that the program chairman, Dr. Frederick Slobe, and the officers of the society were to be congratulated on arranging a very unusual and interesting program. The meeting was adjourned to reconvene at dinner at the Bismarck Hotel, and later at a joint meeting with the Chicago Medical Society to hear the program of that organization and also the paper of the guest speaker, Dr. John J. Moorhead, of New York City, on "Traumatic Surgery Trends," reported elsewhere in this issue.

Trivial Eye Injuries

By SIDNEY WALKER, M.D.,

Chicago

WHAT may appear at first to be a trivial injury is often of a severe character or may result in a serious condition. Moreover there is often an underlying pathology which is in no way related to the injury but for which claim is later made on the basis of direct result, or from the standpoint of aggravation of the pre-existing condition. This problem often arises in industrial ophthalmology. I shall attempt to enumerate and briefly describe the types of eye injuries which are most likely to cause such future trouble.

The industrial surgeon sees during the year

many superficial lacerations of the eyeball caused by flying chips, some of which imbed themselves and are easily diagnosed. However many simply lacerate the cornea slightly and do not imbed themselves. The result is a small, often fine, wound which is only diagnosed by staining with fluorescein.

If cases of this kind are passed on as of little importance, a subsequent severe ulcer may develop at the site of the wound, and before control is established the eye is permanently damaged to a varying degree. The same thing holds true for minute emery burns of the cornea. If these are not properly drilled out, they also break down into ulcer and, depending upon the location, result in a specific loss of vision the amount of which depends, in turn, upon the location on the cornea.

Intra-ocular steel may be present in some cases which appear to be very trivial trauma of the cornea or bulbar conjunctiva. I will not go into the means and methods of making a diagnosis under these conditions, as that is not the scope of this paper. The facts are that a minute wound of the cornea often closes so quickly and so perfectly that, unless great care is used in the examination, the presence of a deep-hidden foreign body is entirely overlooked. Moreover a severe process is given a good start as the result of the lack of proper diagnosis, resulting in the total loss of the eyeball. Infection carried in may result in an all but fatal issue. I submit a case of B. Welchi Panophthalmitis, the result of a supposed trivial injury.

While the majority of electrical flashes cause no more than a possible severe conjunctivitis with irritation for several days, there are cases of apparently trivial nature which result in severe retinitis and at times a gradually developing cataract in one or both eyes. Just what the causative factor is in cataract electra has not been determined, but an examination should be had at once to rule out pre-existing pathology of the lens or the retina.

Such conditions as I have already noted show the need of careful methods, but there also often enters the complicating factor of the physical well-being of the patient. We all recognize focal infection as the source of much aggravation, and often as the cause of protracted healing. Trivial wounds of the cornea when infected may spread rapidly or refuse to heal because of infected teeth or because of other foci. I have seen a badly infected cornea starting from a very slight trauma and carried on to a total loss of vision due to the presence of an infected tear sac harboring the pneumococcus.

It seems hardly necessary to stress the damage caused by the shop oculist—so many eyes have been irrecoverably damaged by this handyman with his penknife. He, however, is not alone, as the plant nurse is sometimes at fault in exceeding her duties or capability. Surprising as it is, the first aid in one shop was given by one of the employees who was also a student of chiropractic. Before much damage was done, however, the State Board of Registration put an end to his endeavors.

To you who examine or come in contact with cases of public liability let me offer a few remarks as to the eye symptoms which may follow

blows on the head of a seemingly trivial character or even such slight jars as jumping down a foot or two. I have in my records at least a dozen cases of detachment of the retina occurring after a trivial blow about the head, or a slight jar. The facts were that a predisposing factor such as a high myopia existed, and it only needed a slight jar to upset the balance of tissue, and detachment of the retina occurred.

Along the same line, but entirely alike, are those cases in which many kinds of pathology had existed prior to the alleged injury. Claims are often filed on the basis that these conditions were directly or indirectly aggravated by some trivial trauma, if not directly caused by it. Where no evident pathology exists in the eye, and we have a condition of amblyopia exanopsia due to uncorrected refractive errors, claims for visual loss as a result of some slight injury are not at all uncommon. I have seen not a few cases of incipient senile cataract, partially dislocated lenses, old atrophic choroiditis, glaucoma, optic atrophy, and, believe it or not, trauchoma, for which claim has been filed. Cross eye is often claimed to be the result of head injury, and certain types may be; but there are many cases of this condition found in persons without head injury, the causative factor being entirely ocular.

It is, therefore, suggested that unless special training has been had in ophthalmology, first aid in eye injuries should not exceed the removal of superficial foreign bodies; also, that the shop oculist be put in his place in every plant.

It is very nearly an axiom that little credit is given to the industrial surgeon for the favorable outcome of an eye injury, and lots of grief if the outcome is not good. Therefore little is to be gained by unnecessarily exposing the injured man and yourself. For the protection of all concerned an early examination by a competent oculist should be had in many of the cases of so-called trivial injuries.

Dust and Tuberculosis

HAWES believes* that exposure to protein dusts, some of which may occasionally cause asthma, hay fever or other anaphylactic phenomena, to the carbohydrate dusts, such as flour, which presumably have no effect, specific, irritating or otherwise, and to the inorganic non-silicon-containing dusts, including lime, marble, carbon and other elements, in normal amounts and under normal conditions will not reactivate an arrested or quiescent tuberculous process. He does believe, however, that dust in excessive amounts under abnormal conditions, such as street dust in winter and fall or germ laden dust from sleeping cars, which might well cause irritation and infection of throat, trachea and bronchi, is a potential source of harm. Dust that may cause allergic phenomena, such as asthma, bronchitis or hay fever, will not reactivate or harm a tuberculous process. As to allowing an arrested or quiescent tuberculous patient to take up a trade in which he would be exposed to a harmless dust, the author would be quite willing to allow his patients to take up such dusty work unless the conditions as to dust were extremely bad.

* *Am. Rev. Tuberc.* June, 1935; *Abstr., J.A.M.A.*, July 27, 1935.

Pneumokoniosis; Traumatic Surgery

—Review of Papers at Joint Meeting of the Central States Society of Industrial Medicine and Surgery and the Chicago Medical Society, held Wednesday Evening, January 15, at the Medical and Dental Arts Auditorium, 185 N. Wabash Ave., Chicago—

AS GUEST of the Central States Society of Industrial Medicine and Surgery, Dr. John J. Moorhead, of New York City, gave a paper on "Traumatic Surgery Trends," which was discussed by Dr. Harry E. Mock and Dr. C. R. G. Forrester, of Chicago.

The Chicago Medical Society had previously arranged a program on the general subject of "The Pneumonokonioses," prepared in the following order: (1) "The Problem of the Pneumonokonioses in Industry," by Dr. George G. Davis; (2) "The Clinical Aspects of Pulmonary Fibrosis produced by Dust Diseases," by Dr. Allan J. Hruba; (3) "The Pathology of the Pneumonokonioses," by Dr. Henry C. Sweany; (4) "Roentgenologic Visualization of Lung Fibrosis Produced by Silicosis and Other Dust Occupations," by Dr. Hollis E. Potter; (5) "The Legal Status of Occupational Diseases in Illinois," by Daniel D. Carmell, Assistant Attorney General, State of Illinois; and (6) "The Role of the Medical Department of the Illinois State Industrial Commission in Connection with Occupational Disease," by Dr. Philip H. Kreuscher.

DR. DAVIS, in discussing the problem of the pneumokonioses in industry, first stated that it was a pleasure to talk on this subject and that he had not solicited the opportunity. It is of course proper that persons having disability should be compensated. The real problem is not in the diagnosis, but in the medicolegal jurisprudence of the actions which have been brought. Other problems which exist are those with reference to: (1) legal representatives; (2) x-ray experts; (3) witnesses on medical problems; and (4) the apathy of the medical profession in general. The Institute of Medicine in Chicago deserves great credit for its work in attempting to minimize the amount of commercialization which has been observed in these problems. This paper was prepared from knowledge obtained from 182 suits beginning with 1932 up to date. Mention was made of the use of so-called "triple plays" in this kind of work, the play being from runner to lawyer to doctor. In a series of lantern slides, Dr. Davis showed that in 30 actions there were five cases of tuberculosis, no cases of silicosis and no cases of disability from dust exposure. Another important aspect of this problem is the large amount of damages against industrial organizations. The ultimate solution of the problem depends on the honesty of representatives of the bar and the medical profession and the immediate elimination of quacks in both professions. The speaker repeated his former statement that the real problem of the pneumokonioses in industry is that of medicolegal jurisprudence.

DR. MOORHEAD, the guest of the evening, speaking on traumatic surgery trends, first said that traumatic surgery was a branch of gen-

eral surgery in which there was involved the history of trauma, and that traumatic surgery had the following important characteristics: (1) no incubation period; (2) no exceptions as to age, sex, color, race, or other personal peculiarities; (3) a definite relationship of trauma to disease at various times; (4) greater complications and sequelae; (5) more frequent contacts with the judiciary; (6) malpractice problems; (7) diverse effects; (8) an important relationship to general surgery; and (9) involvement in the controversy as to proper use or abuse of antiseptics. In general, the medical profession is responsible for the early care of injury, and the results are correspondingly better the sooner such care is given. The sources of injury may be due to transportation facilities, to industrial accidents, to incidental causes, and to sports. The automobile is the most responsible mechanism in the production of injury. We now appear to be in the "gadget" stage of traumatic surgery, and it must be remembered that general surgery passed through a similar stage. Certain of the trends in traumatic surgery at the present time were mentioned by Dr. Moorhead: (1) the universality of compensation laws; (2) early treatment means less deformity and disability—by early is meant within the first six hours; (3) use of soap and water as a reliable method of antiseptics; (4) the realization that primary suture is hazardous—later suture is of distinct advantage; (5) the importance of early drainage—liberal use of hot applications and incision after localization; (6) the development of new ideas relative to the methods of treatment of fractures—a general review of the results of various types of treatment of different fractures—conclusion that fractures of the neck of the femur and the os calcis are at the present time offering the greatest difficulties; (7) increasing interest in the relationship of trauma and disease, with especial reference to pneumokonioses, cancer, tuberculosis and diabetes—emphasis being placed more and more on the medicolegal aspects of these problems; and (8) the importance of realizing the progress made in various types of anesthesia.

DR. C. R. G. FORRESTER, Chicago, in discussing Dr. Moorhead's paper, emphasized that traumatic surgery was a definite specialty, and pointed out the need for a chair in traumatic surgery in the various teaching institutions.

DR. HARRY E. MOCK, of Chicago, also in discussion of Dr. Moorhead's presentation, noted that there was a marked increase in surgical interference on traumatic cases because of the accumulation of industrial experience and the necessity of getting men back on the job. Especial reference was made to the contributions of the World War to the technique of traumatic surgery and at pres-

ent the great increase in public accidents, which is also greatly developing the experience of the traumatic surgeons. The growth of physical therapy, an important adjunct of traumatic surgery, is due in large measure to the war experience and the industrial experience, and is now being, of course, definitely affected by the increasing number of automobile injuries.

DR. HRUBY, in reviewing the clinical aspects of pulmonary fibrosis produced by dust diseases, believed that the word "pneumonokoniosis" was a collective term; that the pathology produced in the majority of instances depended upon the silica content of the dust. Experience with industrial employees who had previously been coal miners was detailed. Mention was made of five cases of silico-tuberculosis coming to autopsy at the Cook County Hospital in a period of approximately three years. There has been a change of ideas from an emphasis put on mechanical effects of dust, the emphasis now being placed on the chemical effects. There seems to be a great variability in the period of industrial exposure relative to the production of fibrotic effects in the lungs. The physical findings in cases of fibrosis are often meager. The diagnosis depends mainly on the history of the exposure to dusty occupations and the x-ray findings.

DR. SWEANY, in discussing the pathology of the pneumonokonioses, believed that although there were many cases of non-occupational fibrosis, there were industrial instances of where real damage was done to the lungs. Specific fibrosis is apparently caused by the solution of silicon dioxide and silicates, and also by the plugging of the lymphatic system by relatively inert dusts. Apparently certain organic dusts sensitize the lungs. One of the present day pathological problems is the effect of silica compounds on tuberculosis, or the effect of silica compounds when diluted or associated with other types of metallic dusts or inorganic minerals of non-siliceous type. A series of lantern slides was shown demonstrating the histogenesis of silicosis.

DR. POTTER, in commenting on the roentgenologic visualization of lung fibrosis produced by silicosis and other dusty occupations, gave a general review of the x-ray manifestations at various stages of fibrosis in the production of silicotic lesions. Especial emphasis was placed on the relationship to tuberculosis, and an excellent demonstration of chest films, with a discussion of diagnostic points, was made.

DR. CARMELL, in speaking about the legal status of occupational diseases in Illinois, commented that the problem of occupational disease in this state was previously rather serious on account of various court decisions. At the present time the serious problem is what occupational diseases are really compensable. A real question now is whether silica is a poison, and the legal profession must look to the medical profession for the solution of this problem. At the present time various representatives of labor and industry are concerned with a law regarding compensation for disability in real occupational diseases. Prevention is the key to the situation, and besides being interested in the diagnosis and treatment of occupa-

tional disease, it is the further duty of the medical profession to prevent such types of disease and disability. Mention was made of the recent developments in West Virginia, which emphasized the need for the development of accurate knowledge and the use of specialists in the avoidance of such situations in the future, in any and all parts of the country. In conclusion, Mr. Carmell stated that it is not laudable to compensate industrial employees for disease which is not directly associated with occupation.

DR. KREUSCHER, in discussing the role of the medical department in the Illinois State Industrial Commission in connection with occupational disease, believed that workmen should be paid for disability due to occupational disease. The Commission has had no experience with disability in relation to silicosis. It is generally recognized that orthopedists or general surgeons do not possess the eligibility and experience to pass on such problems. It is therefore the present plan of those interested persons in the Commission to use three medical men in the working out of problems relative to disability caused by silicosis. This is of course assuming that a compensation law will eventually go into effect. Of these medical men, one should be versed in the proper examinations of persons exposed to dust and should be a person who "has no ax to grind," so that a non-prejudiced opinion may be given; another medical man of this group would necessarily be a pathologist who is thoroughly acquainted with the pathological findings; the third man would quite likely be a roentgenologist whose experience along this line had been sufficient to make him thoroughly conversant with the roentgenological manifestations. No comment was made regarding what might be done with respect to occupational disease other than silicosis. Dr. Kreuscher assured the Medical Society that the Commission would be prepared to deal efficiently with the problems of silicosis.

DR. D. C. STRAUS, in opening the discussion, thought the expert witness was the real problem in the occupational disease situation. The suggestion was made that reports of the roentgen findings by medical witnesses on both sides of these cases should be sent to the Chicago Roentgen Society for review. It was also proposed that greater activity on the part of official medical groups, and the cooperation of these groups, might be instrumental in improving the general situation with regard to medical witnesses.

Tuberculosis Control

THE important point in this study* is that no matter what people enter a hospital for, the chance for a complete examination is too important a matter to be overlooked, and in advising people about themselves all the facts that have entered into their health problems should be known.

Arrested cases of tuberculosis in industry present an important economic problem and only the most intelligent of the arrested cases can be trusted to protect themselves by what they have learned while getting well. The racial differences are shown in the incidence among negroes.

* PHILIP KING BROWN, M.D., F.A.P.H.A., in *A.J.P.H.*, June, 1935.

The problem of tuberculosis in the Pacific Southwest was illustrated by the fact that when the Southern Pacific bought a rival road running through its territory, 11 of the officials who had been transferred to San Francisco had to be provided for in their former environment because of conditions of their lungs which had brought them to the Southwest.

Finally, annual examinations in industry are of the utmost importance from an economic point of view for industry and employees.

Significance of Lead in Body

THE investigation of Myers and his associates in 500 cases not known to be associated with lead exposure has pointed out various syndromes that may be associated with the "subchronic" type of lead poisoning.* Common sources of poisoning, such as foods, drugs and environment, are discussed. One should be on the alert for the possible presence of lead in drinking water, fruits and vegetables. People suffering with obscure gastro-intestinal and cardiovascular disturbances should be examined with the greatest care. Early symptoms that are of importance are loss of appetite, nausea, weariness, constipation, headaches, eye symptoms and circulatory manifestations. For the present, the laboratory investigator and clinician should certainly give attention to all values of more than 50 mm. of lead per liter of urine. About 20 mm. per liter is probably somewhere near the expected limit. In the examination of blood, it is believed that 24 mm. of lead per hundred cubic centimeters covers the patients of the "subchronic" type, and that 6 mm. is probably a value somewhat nearer that which should be expected. In the case of hair, it appears that lead finds its way with a great deal of difficulty into the hair, and when lead is found it may be of diagnostic significance, depending on the habits of the patient. Under the present mode of living, lead undoubtedly plays a part in many other diseases and should always be given consideration when the clinician is unable to place his finger immediately on some definite syndrome.

Activation of Tuberculosis

MORRILL, a granite cutter, while operating a silicon carbide saw for the defendant, August 27, fell and injured his left hip, side and chest. At the time he was apparently in good health and able to work, although he was suffering from silicosis and latent tuberculosis. On the day following the accident he went to bed, where he remained until his death, October 8, from acute pulmonary tuberculosis. His widow brought proceedings under the workmen's compensation act of Vermont to recover compensation for herself and her children. From an award in her favor, but denying the compensation to her children, confirmed by the county court, she appealed to the Supreme Court of Vermont, as did also the employer.

There is no question, said the Supreme Court,* but that Morrill sustained personal injuries by ac-

cident. Compensation is not allowable if death resulted solely from a so-called occupational disease. The question, then, is whether Morrill's disability and death resulted from the accident. The evidence tended to show that the injuries resulting from the accident "lighted up," aggravated or accelerated a preexisting disease and caused death earlier than otherwise would have been the case. It is not apparent that the nature of silicosis from which Morrill was suffering, whether it was an occupational disease or not, is material to the determination of the question of compensability. It cannot be that one who has incipient silicosis is precluded from compensation when injured, because the silicosis from which he is suffering, or ailments consequent on it, might ultimately result in disability or death. The compensation act prescribes no standard of fitness to which an employee must conform, and compensation is not based on any implied warranty of perfect health or immunity from latent and unknown tendencies to disease that may develop into positive ailments if incited into activity by accidental injury. Although Morrill's disability and death were due to the development of a disease that he had in his system when he was injured, if his injuries were a contributing and proximate cause of such development, the disease, in the opinion of the court, "resulted from the injury" within the meaning of the workmen's compensation act and the motion of the defendant for a directed verdict was properly denied by the trial court. The judgment of the trial court in favor of the claimant, but denying compensation to her children because they were not shown to be dependents of the deceased, was affirmed.

Industrial Health

THE ideal concept of industrial relations demands that those conditions and processes that are known to be injurious to the health of workmen must be eliminated*. No industry that prides itself on its industrial relations program can fail to recognize the importance and the urgency of setting up an organization of employees led by engineering and medical groups that will attack and eliminate every industrial disease hazard.

Briefly, control of occupational health hazards depends upon:

1. A complete knowledge by doctors of the physical effects of all types of occupational exposure in the industrial unit.
2. A thorough understanding by doctors and engineers of the industrial factors which produce harmful conditions or substances.
3. The development by engineering methods of effective means of protection for every exposed workman.
4. Complete organization of the entire personnel of each industrial group for the purpose of educating every one in the avoidance of occupational disease.

This problem is difficult and complicated, but it can be solved. Long years of practical experience make me absolutely certain that the doing of this job will pay for the expense and effort by increased efficiency of the working force, improved

* *New York State J. Med.*, 35:579; *Abstr. J.A.M.A.*, August 3, 1935.

* *Morrill v. Charles Bianchi & Sons, Inc. (Vt.)* 176 A. 416. *J.A.M.A.*, Medicolegal (October 29, 1935).

* JAMES A. BRITTON, M.D., in *National Safety News*, July, 1935.

quality of product, and (that which is the most important of all) more cordial relations between men and management.

Infectious Diseases

As Vulnerating Forces Under Workmen's Compensation Acts

By KURT GARVE, M. D.,*
Member of California Bar

AN EMPLOYEE was sent upon a business trip in the course of which he was to visit a number of eastern cities. In pursuance thereof he left San Francisco, the place of business, and called on dealers in different localities. Finally he landed in New York. A month later while homebound he found himself sick, and continued to be so when he arrived at San Francisco. He was suffering from typhoid fever. Proceedings ensued before the Industrial Accident Commission on the ground that the claimant had contracted his ailment by reason of his employment while in New York.

The Commission found that there had been an epidemic of typhoid fever in New York at the time of the claimant's stay there; that he had eaten oysters, but that they did not cause, or aggravate, the epidemic. And, since all other people in New York had been subjected to the contact with the disease in the same manner and degree as the claimant had been, no connection between his stay and his disorder was proved. His duties had not been so peculiar or hazardous in regard to the contagiousness of the epidemic as to intensify the risk which was common to all. Compensation was denied. Appeal was taken.

Infectious diseases are often contracted outside of the employment as well as by reason thereof. Their relation to the workman's job may be difficult to trace. Intensification of danger of infection by reason of industry marks compensability.

In some situations the infection can clearly be tracked down to the employment. An industrial tool, laden with virulent germs, pierces the intact skin. Stepping on a tack, receiving a scratch from box cars while unloading bags, a fall on a dirty floor with resulting fatal erysipelas or blood poisoning are, therefore, compensable accidents.

Employment may also furnish contact by germs with a pre-accidental open wound due to employment or otherwise. There is an aggravation of a pre-existing infirmity. A cold sore, infected by rubbing while handling carbon paper, wading with an old open wound through infested water, or cleaning urinals after having received a cut, warrant compensation whenever complications result.

Blisters, callosities, felons are often considered occupational rather than accidental, unless employment causes an additional infection. On similar principles rest vaccination wounds: they are not regarded as incidental to the employment, though the employer may have required vaccination as a condition precedent to giving, or permitting to continue, work. Since vaccination wounds may easily become infected from sources other than industry, proof of connection between

infection and job would have to be rather clear and convincing in order to hold the employer liable.

Certain occupations, however, suggest at first blush causal connection between infection and work. The place of employment, or materials or tools handled, are veritable breeding places of microorganisms often of the highest virulence. In "embalmers' cases", for instance, the inference of compensability becomes strong when the species of germs, found in the body of the employee and identified as to strain, dovetails with that in the corpse. Awards have also been upheld in litigations involving anthrax, actinomycosis, blastomycosis, and similar ailments, though in some decisions compensability could not be sustained because of strong possibility of extra-industrial inoculation.

No visibly open wounds need be proved. It is, however, important that the manifestation of the disorder be not postponed too long so as to indicate recuperation or illness from sources not connected with industry. Yet it cannot be denied that a period of incubation may be comparatively protracted in industrial infections.

Contagious diseases are more difficult to trace to the job. The genesis and source of the disease, such as sleeping sickness, may be obscure. In North Dakota compensation was denied. In typhoid fever, on the other hand, the etiology is well-established. Where the employer supplies the workman with polluted water at the place of work and while he is in the line of duties, many courts have held that his contracting the disorder constitutes a compensable accident. In other jurisdictions non-compensability, however, was upheld upon the ground that there was no injury to the physical structure at the time the water was consumed, or that there was nothing fortuitous, as the interpretation of the word "accident" requires.

Where the disorder is considered to be accidental, compensation would also be granted when the employer is aware of a source of infection within the reasonably immediate neighborhood of the place of work so as to be able to warn the workman, and when the employer fails to do so. Vice versa, the source of infection being some distance from the place of work, causal connection between employment and disease must be denied.

In another type of cases, germs are already in or on the body. But, they were of weak virulence prior to the accident. Lowered vitality, local or general, caused by industry, contributes to the infection. A severed spinal cord and loss of sensation below the seat of infection, followed by a bed sore and resulting in blood poisoning, warrant compensation. Similarly, the complete rupture of the skin making the employee, who is suffering from arteriosclerosis, more susceptible to blood poisoning and gangrene than normal persons would be, does not exempt the employer from liability when industry contributes to the septicemia. But a kidney infection, due probably to a dropped kidney, a tipped womb, and the wearing of a pessary, is too remote in connection with an industrial accident.

Suffering from a disease in the stage of incubation and at that time sustaining an industrial trauma, also makes out a case of compensability,

* Condensed from *Dickinson Law Review*, vol. XXXVIII, January, 1934.

since the disorder is aggravated by reason of lowered vitality.

Finally, "carriers" may be reduced in their vitality by an industrial injury. Pulmonary tuberculosis, pneumonia, pleurisy, when originated by accident, are compensable. Diphtheria has been held to be non-compensable. As to typhoid fever, judicial doubt exists.

To come back to the "traveler's case". The reviewing court in its majority-opinion sustained the commission. Yet, a dissenting opinion pointed out that "it is axiomatic that to go from a place of safety to one of danger is to incur a special risk. If one's employment requires him to incur such risk, any injury resulting therefrom certainly arises out of the employment."

There is another reason why compensation ought to have been awarded. There was a change of climate, of diet, of air, and so on, incidental to traveling from the West coast to the East. When such a trip is made, a temporary revolution in the metabolism, and consequently some sort of lowered vitality, exists. Amenorrhea follows immigration from Europe into the United States. Why not apply corresponding reasoning to the male? Natives do not undergo this stage of adjustment to the new surroundings and to the new living conditions. It is submitted, therefore, that there was an intensification of hazard in regard to the epidemic of typhoid fever in New York by reason of employment. This is also somewhat substantiated by another decision of the same reviewing court holding that typhoid fever was compensable under similar circumstances, the only difference being that the business trip extended into a foreign country. There the court thought that the natives were less affected by the epidemic than newly arrived people. The majority of the justices do not seem to have grasped the import of the essential facts in the "traveler's case".

Vertebral Fractures

Reduction of Dislocations

STOOKEY presents a method for the reduction of incomplete fracture dislocation that may be employed immediately after the injury, can be maintained as long as may be desired, and is available in any hospital having an air mattress. Reduction of the dislocation is accomplished without manipulation and usually no special skill is required. With slight modifications the principle of the method may be used for transporting patients with acute spinal cord injuries by substituting a stretcher for the bed and using an air mattress.

The technique used is as follows:

A fracture board is placed on the springs in the usual manner. The foot end of the bed is placed on low blocks elevated slightly in order to raise the relative position of the patient's head to his trunk. In order to have the head easily accessible, the foot end of the bed is made the head of the bed. Two ordinary mattresses are placed over the fracture board. A blanket is then rolled and placed on the ordinary mattresses at the level of the shoulders for fracture dislocations of the cer-

vical vertebrae or at whatever level may be indicated for fractures of other regions of the spine. An air mattress, preferably eight inches thick, is then placed on the bed over the blanket roll and a strip of adhesive tape, eight inches wide if the fracture is in the cervical region or from 12 to 14 inches wide if the fracture is in the thoracic or the lumbar region, is applied to the mattress beginning at the line of the blanket roll. The mattress is covered with a soft woollen blanket or a sheet and the patient is placed on the bed. The adhesive strip is then drawn as tight as possible, as much force being used as is necessary to obtain the proper degree of angulation of the air mattress. It is then fastened to the bottom of the foot piece of the bed either directly or to a movable bar attached to the foot end, a ratchet being used to tighten as needed. The air mattress must not leak and must be kept pumped up, and the adhesive strip must be tight at all times. A pillow is then rolled and placed beneath the patient's knees so as to flex the lower extremities slightly. A small folded blanket is placed beneath the calf muscles, reaching to within four inches of the insertion of the achilles tendon. The heels are thus kept off the bed by resting the calves on a wide surface and pressure sores of the heels are thus avoided. Any abnormal position of this sort is naturally uncomfortable and the author has found it advisable to relieve the patient's discomfort during the first few days by medication. If each of the details is carefully observed, he believes that the foregoing method will be found satisfactory for the reduction of incomplete vertebral fracture dislocations, especially in the cervical region, and for the reduction of compression fractures of the whole spine.

Death from Tuberculosis

Activated by Silica Dust as Accidental Injury

BEAVER entered the employ of the Morrison-Knudsen Company in 1928. At that time he had tuberculosis in an arrested stage but otherwise seemed to be in good physical condition. He was able to carry on regular manual labor. In the course of employment he was subjected to clouds of dust, containing from 80 to 85% silica, and was more or less bothered by coughing, which became more frequent as time passed. In 1931 he became ill with active tuberculosis and filed a claim under the Workmen's Compensation Act of Idaho. After the hearing before the industrial accident board Beaver died, and his administratrix was substituted as claimant. From a judgment of the district court affirming a decision of the board disallowing compensation, the claimant appealed to the Supreme Court of Idaho.*

It seems clear from the evidence, said the Supreme Court, that the inhalation of silica dust activated a latent tuberculous condition in the employee's lungs, which in 1931 suddenly lighted up and resulted in death. No one was able to testify as to the specific time when the injury was received, or when the fatal draft of dust was inhaled. Who can in truth and fairness say that there was not a compensable "accident?" All accidents are preceded by a cause; in some cases that cause may have operated instantaneously; in others it may

*DR. B. STOOKEY, in *Amer. Jour. of Surgery*, (December 1934). *Abstr. J.A.M.A.* (February 9, 1935).

**Beaver v. Morrison-Knudsen Co. (Idaho)* 41 P. (2d) 605. *J.A.M. Medical*, (October 19, 1935).

have been operating for days, months or years, and ultimately the accident occurs and the "blow up" happens. A workman works for years on a given job in which he regularly has to lift a considerable weight. In the course of time his heart grows weaker. Eventually he lifts a similar load, his heart fails and he dies. He has overstrained himself in lifting the load and it is said to be an "accident" arising out of his employment. *In re Larson*, 48 Idaho 136, 279 P. 1987. Strain may impair or rupture some other part of the body so that the final effort at labor accomplishes the breakdown, and it is held to be an "accident." *Hanson vs. Independent School District 11-J*, 50 Idaho 81, 294 P. 513.

In principle, said the court, the cases cited are not dissimilar from the one here under consideration. In view of the facts and circumstances bearing on the injury in this case, said the court, and of the uniform purpose of the court to give the workmen's compensation law a liberal construction in favor of the injured workman, we are constrained to hold that the workman in this case met with an "accident" in the course of his employment and was entitled to compensation.

The judgment of the lower court was reversed.

Pneumokoniosis and Its Social Effects

By JAMES W. FERGUSON, M.D.,

THE physiological aspects of pneumokoniosis in relation to its effect on the present economical and social status of the employer and employee have become a very important problem.

Many studies have been made of diseases of the lungs caused by dust; and extensive work has been done in an effort to determine the etiology, pathology, and diagnosis of the lung conditions; but very little attention has been given to the effects of the degree of disability on the industry, the employee, the employee's family, and society.

The ill effects of inhaling dust while working at a dusty occupation are not a recent discovery; the earlier medical writers¹ knew something about the harmful effects of dust.

The importance of this subject is emphasized by the number of commissions lately formed to study the conditions dealing with dust and health and by the number of articles on pneumokoniosis¹¹—silicosis, asbestosis, anthracosis, etc.—that have appeared recently in medical literature. It is also interesting to note that in cases concerning dust ills brought before the courts of several states, industry has received a verdict of adverse character. All this reflects the trend of social thought, and, in turn, points out that disease due to the inhalation of dust at one's occupation concerns not only the employee and his dependents, but also the industry and society.

The severity of the diseases varies somewhat with the different kinds of dust, fumes, gases, and mist in the atmosphere, and, on account of the wide distribution of the industries which subject one to these hazards, the diseases vary in different localities and in different industries.

Investigators now agree that various kinds of dust, fumes, gases, and mist are capable of causing pathological conditions of the respiratory apparatus but that an inhalant that contains silica pro-

duces a severe form of pneumokoniosis, called silicosis, which is characterized by fibrosis within the lungs, and which disease can completely incapacitate or render the victim susceptible to other respiratory diseases.

Silica in its different forms comprises better than half of our earth's composition. It is found in all animal and vegetable life; it gives form to the hulls and husks of different grains, and to the leaves and stocks of the various grasses, weeds, and vegetable plants. It occurs as almost pure silica in opal and amethyst. Quartz and flint contain a very large amount of it, and it is found in all sandstone, gravel, and granite.

Since it is found so abundantly in its various forms and combinations and is so widely distributed over the surface of the earth and throughout our constructive and destructive enterprises, it is obvious that people who work with the different products of nature are more or less exposed to dust which contains silica; and this explains the reason for so many industries being concerned with it.

Throughout the various stages of industrial development, dust has been somewhat of a hazard and a hygienic problem for the industries. The use of modern machinery for rapid cutting, pulverizing, and polishing has produced dust in enormous quantities and this, along with the present trend of economical and social conditions, has so widely introduced the subject of pneumokoniosis that it has become the outstanding hygienic problem of the day.

THE length of time an employee works at a dusty occupation before pneumokoniosis develops to a dangerous stage, or before it is severe enough to warrant a change in occupation, depends upon the amount of dust inhaled, the chemical composition of the dust, the fineness of the dust, the susceptibility of the person, the anatomical condition of the upper respiratory tract, and the working conditions. Formerly it was thought that 15 to 20 years were required to produce a serious condition, but recently, by investigations and the study of cases by the roentgen rays, it has been found that under certain conditions some cases may take several years and under others, where the dust is very fine and in large amounts, and the employee has little resistance, the time may be reduced to a few years.

For a long time physicians have been advising certain patients to work in less dust. In recent years some industries have shown a willingness to cooperate with them by installing, from time to time, modern preventive measures. But, on the other hand, it is impossible entirely to eliminate the dust, fumes, gases and mists from all industries and still carry on the business of the enterprises. This means that many industries contain more or less hazardous occupations and, therefore, it remains for society, the industry, and the employees to cooperate for the best interests of all.

When society considers the preventive and compensative measures it should also consider the fact that the more the protection and the greater the compensation offered, the greater the burden on the industry. Since the states, instead of the federal government, make the compensation laws, occupational diseases are not similarly recognized by the various states. Some do not recognize occupational diseases at all. Others award compen-

sation or benefits according to the degree of disability and the amount of suffering of both the worker and his dependents. Those states that do not recognize occupational diseases teach little or no protective health measures and employ little or no preventive and protective measures. This creates an unequal cost of production in some industries and in different states. The incentive to protection and preventive measures is, and always will be, in direct proportion to the difference between the first cost of the preventive measures and the consequences — the costs and culpability — which are determined by the amount of the verdict as a measure of damage awarded by juries under common law suits, the workman's compensation law, or by society attempting to legalize preventive measures.

In some states industry recognizes the importance of healthy employees in its plants because it means more efficiency and fewer accidents. Many have been teaching first aid and accident-preventive measures. Through this teaching, the average worker, though he himself might not be injured or get sick as a result of his working conditions, regards the accident and preventive measures as his own immediate concern and often places the culpability of the whole scheme of hygiene upon his employer, the industry. These acts are often evidenced by the demands upon industry for protective measures or compensation for injury received by the employee or one of his fellow workers in the course of employment.

In the past, fatal accidents, because of their inevitable publicity, have been given more thought and attention than occupational diseases, especially those which develop insidiously like pneumokoniosis, which as a rule occurs little by little, day by day, out of sight and mind of the public. Therefore, society has been slow to adjudge industry and make demands for preventive measures in this particular condition. But, recently, on account of the present social and economical trend, society is strongly asserting itself by awarding court verdicts against industries in cases of pneumokoniosis from occupational dust exposure.

An important condition from an economical and social standpoint is the fact that the present economic depression has caused considerable reduction in employment, especially in the constructive industries that are always attended with dusty occupations. A large number of the unemployed have been exposed to dust. Since some states do not recognize occupational diseases they have not employed very many protective and preventive measures and, therefore, in these states exposure has sometimes been very extensive.

With the return of prosperity, the labor influx in the various factories, mills, and mines will carry more or less hardship for the industry, the operators, and society. It is questionable how many of these unemployed will return to their former occupations and how many will be compelled to seek employment in other industries of their own state or of other states. The moving from one state to another expecting to find employment will add to the social problems. Many will not be accepted because of their physical conditions. Because of the present social and economic unrest, with society demanding more protective measures for its workers, some states that do not now recognize occupational diseases as a compensative condition

will do so in the future. This will prevent many of the exposed unemployed from obtaining employment in the states where occupational diseases are compensable, leaving them to seek employment elsewhere, which will add to the perplexity of the problem, with many of them on the verge of poverty and dependency. Some will find their way into similar industries, some into dissimilar industries—factories, mills, and mines. This unfortunate situation will result in disaster to the self-insuring industries if they do not protect themselves by carefully examining the applicant before hiring. They will be very likely to receive in their employment some very dangerously-exposed persons with pneumokoniosis, possibly tuberculosis, or both, for which they may be required to assume responsibility for all of the exposure whether or not the worker received it while in their employ.

For this reason it is strongly recommended that a roentgen examination be given at the time the applicant is being considered.

The industries that depend upon outside compensation coverage may find it very expensive, if not impossible, to obtain proper coverage for certain occupations. At the present time some insurance companies are unwilling to cover certain occupations. There seems to be an increasing confusion concerning the unstable condition of the subject of pneumokoniosis. Recently a company² found it necessary to reinsure all of its employees. All were discharged and re-employment took place after a health survey was made. Some affected were not re-employed. Legal proceedings were commenced against the company. The Supreme Court ruled that it was a matter for legislation and not for the courts, and further ruled that no disability was suffered by the employees within the meaning of the law during the period of their employment nor until after the relations of the employer and employee had been terminated and, therefore, the employees were not compensable.

THE last occupation is not always the one actually responsible for all of the trouble. The person may have had pneumokoniosis when he was hired. He may have contracted it during some occupation of short duration, and on account of frequent changes in occupation the one that caused the exposure was forgotten. But if the industry does not know the condition that existed when it hired him, it may be required to assume responsibility for all the existing conditions.

A radiogram, made when the applicant is being considered and kept as a record, appears to me to be a decisive way to show the condition that existed when the worker was hired and the progress of the condition during employment.

Subsequent roentgen examinations will show when the danger point has been reached. Roentgenograms will also aid in detecting tuberculosis, and, by eliminating the tuberculars, the other workers within the plant will be protected. Roentgenograms may be the means of detecting tuberculosis at a time when the applicant does not know that he has the disease, and may give him a chance for recovery by receiving early treatment. Furthermore, he may be enabled to protect his family by affording them information so that they can use preventive means against infection. Roentgenograms can be used in the future as a deciding evidence to aid in the establishment of the

degree of disability compared to the amount of pneumokoniosis that the applicant had at the time he entered employment.

The day of specialization is here. The companies wish experienced operatives. In gaining experience the worker, while learning, may have been subjected to exposure to dust which resulted in his contracting a corresponding amount of pneumokoniosis. Hence, one of my reasons for recommending an examination of all applicants who expect to work in dust or who give a history of working in dust, or when tuberculosis is suspected and when a history is given which reveals contact with tubercular patients.

Tubercular applicants who expect to work in dust should be ruled out. The inhalation of silica dust can activate tuberculosis,³ and those suffering from this disease have fewer chances of recovery if silicosis is present along with the tuberculosis. Some courts have ruled that tuberculosis activated by silica dust is compensable.⁴

As a rule, a person with silicosis continues at his occupation without knowing that he has the disease until he ultimately contracts tuberculosis or pneumonia which causes the condition to become progressively worse and probably incapacitates him for further work.⁵ Frequently an acute respiratory condition such as bronchitis or influenza aggravates a silicosis condition that has been lying dormant for several years, and the worker does not recover as quickly as he should, with the result that silicosis is for the first time discovered and usually is accredited to the last occupation of the patient. Society should not adjudge an industry for wrongdoing until it has been shown that the industry is at fault. If damage to the worker's lungs has occurred, the source of exposure should be definitely established, because, as has been previously explained, an employee may have worked in a dangerously dusty industry for only a few years, and have developed silicosis and, because of his frequent change of occupation or its short duration, the occupation is forgotten or is not considered important by those in charge of employment, and the applicant is hired. The new occupation may be silica-free and in no way responsible for silicosis, but still, if there is dust present, the industry may be adjudged responsible for all damage. Again, a worker who has been exposed to silica dust at a certain occupation, either knowingly or unknowingly, applies for similar employment in another industry which has the necessary preventive measures, or possibly on account of its location may have a silica-free atmosphere, and again an innocent industry may be adjudged and held responsible for all of the damage.

BEFORE an industry, an insurance carrier, or the courts can render compensation measures, certain facts necessarily must be established. They must be furnished with decisive information, so they can award the compensation as prescribed by the compensation laws. They must be shown that actual damage to the lungs has occurred, and what damage has been done. Also, the degree of disability that is present and the amount that is likely to continue permanently must be determined. The condition of the claimant's chest at the time he began the alleged responsible occupation should be offered as a deciding influence to those administering compensation measures. To show that the oc-

cupation really did cause the condition, or to show that an occupation made an existing condition worse, should also aid the compensation administrators.

Roentgenograms of the claimant's chest made at the time he began the occupation and at the time he left the occupation, or at the time the exposure was stopped, should, along with other information, aid in settling the dispute.

But it must be remembered that stopping the exposure by removing the worker to a dustless occupation does not always stop the progress of the disease. As a rule it does, but it has been proved that sometimes it does not.⁶ The disease may keep on progressing, especially if the person is subject to frequent attacks of bronchitis or if he falls ill of pneumonia or influenza. This has been proved in the writer's experience.

Whether or not certain occupations aggravated a previously-existing condition is difficult to determine unless there is some record of the condition which existed when the worker began the occupation. Whether or not a condition developed while at a certain occupation is also difficult to determine unless a record of the condition that existed at the time the worker began the occupation can be shown.

WHEN we consider that silica is capable of producing a severe form of pneumokoniosis, and that other dusts and mixtures of dust cause somewhat different pathological conditions, and that silica and mixtures of silica and other dusts vary in amounts throughout our various industries which are widely scattered throughout the country, it becomes obvious why one authority said: "Even clinicians experienced in examining cases from one industry may not be qualified to express opinions upon cases in other dusty industries,"⁷ and explains a reason for differing testimonies being offered in these cases. Those interested in testimony may be interested in knowing that many who have had special training and experience in roentgenology have a certificate from the American Board of Radiology which was formed in 1933. The board is made up of 15 members, all recognized authorities on radiology who were appointed by the various radiological societies. The board conducts examinations for those who wish to qualify as to their ability and competency to practice radiology or one of its branches. A diploma from the board indicates that the holder thereof has had certain training and experience and has satisfactorily passed the examinations of the board and satisfied them as to experience, training, competency, and other qualifications which they deem necessary in order to practice radiology or one of its branches.

The physical suffering of one afflicted with the disease, and his inability to work, with the resulting reduction in his wages, and, perhaps, the possible destitution of his dependents, plus the fact that the afflicted worked at a dusty occupation, usually furnishes grounds or reasons for claims for compensation; but, frequently, lack of evidence by those in charge of the case, including the industry, the physician, and the employee or his dependents is the cause of compensation disputes. Sometimes claims are filed against an innocent industry by some unscrupulous person, and there-

fore it behooves the insurance carrier to seek all the information possible so as to aid in awarding the compensation as provided for by the compensation laws. Sometimes, when the insurance carrier, the industry, or the courts request sufficient information to justify them in settling a claim, or to aid them in awarding a fair and adequate compensation, a just claim is insufficiently presented and the claimant suffers, the blame being shifted onto those attempting to administer the compensation. Hence, another reason for keeping records, histories, and roentgenograms as outlined herein, and considering them along with the clinical aspects of the dispute between the claimant and the defendant.

MOST of the records of physicians, hospitals, and industries pertaining to pneumokoniosis do not usually give the information necessary to settle a compensation dispute. The value of good records is evidenced by the inconvenience often experienced when an attempt is made to obtain records after the claim has been entered for trial. Physicians' records are generally kept for their own therapy requirements and not for tracing the cause or origin of the disease. The same thing may be said of hospital records. They give general information, but not enough detail as to the amount of dust inhaled or the kind of dust encountered in the occupation, the hours of exposure, and the various occupations that the patient had, with the exact duties of each one.

Often pneumokoniosis is obscured by tuberculosis or pneumonia for which the patient was admitted to the hospital, and these often appear on death certificates because they are considered the active causes of death. For these reasons it is possible that there may be considerably more cases of pneumokoniosis in our country than our records indicate.

I believe that records made when an applicant is being considered can be made to be of considerably more value both to the employer and the employee.

Records should be made of the various previous occupations, not just what company the applicant worked for; the exact duties of each occupation, not the name of a general occupation; the number of working hours per day in the dust, and the exact number of days—not just how many years of work and whether or not the occupation was a dusty one; the kind of dust, if possible, and the location of the plant; not just the name of the company; the hygienic conditions of the occupation and, if possible, whether respirators were used and what kind of respirators. All this will, when the time comes, help to arrive at a fair settlement of compensation disputes, and will be useful when considered along with the roentgenological examination and clinical findings.

SILICOSIS is characterized by irritation, congestion, and fibrosis within the chest; as the fibrosis develops it encroaches on the air cells, air passages, and lymph and blood vessels, with a corresponding decrease of or interference with lung ventilation and a reduction in constitutional capability for muscular activity — “exercise and work.” Uncomplicated silicosis rarely kills the person unless the exposure has been extensive, but it usually leaves him susceptible to other dis-

eases which may cause him to die earlier in life than his fellow workers who do not develop silicosis. It can also, by causing a partial disability, result in a reduction in earning power with a corresponding amount of suffering to himself and his family. Silicotics are subject to frequent attacks of upper respiratory colds, bronchitis, and other diseases, but the most common danger is an extraordinary susceptibility to tuberculosis which completely incapacitates the worker and usually progresses rapidly towards death. Seventy-five percent of those afflicted with silicosis ultimately develop tuberculosis.⁸

In the year 1916, when the Pennsylvania Compensation Law went into effect, this writer made a health survey of several hundred employees for a large self-insuring corporation. The chests of the employees were examined both clinically and roentgenologically. Many of these people were stricken with influenza in the epidemic which occurred in the fall of 1918. A number of them were again examined in 1921, and just recently some were further examined, and others will be as they are located. The results of these examinations are of value, but out of the scope of this paper. I expect to report them later. However, evidence was sufficient to indicate that influenza caused some of the cases of pneumokoniosis, “which were not interfering with their health and ability to work,” to flare up and become progressively worse and cause a few to become incapacitated. Other physicians have reported similar conditions.

EVEN though it is impossible to remove all the dust from some industries it appears that it is up to the industry to meet the increasing demands that are being made upon it in this respect by society or to accept the consequences. While it is impossible to eliminate entirely the dust from certain occupations, industries can do much towards preventing pneumokoniosis from developing among their employees to a dangerous stage. They can make a health survey of their workers to determine the condition of their chests, determine how many have pneumokoniosis, how many have tuberculosis, and how many have both diseases. A roentgen examination will show the amount of fibrosis, and its anatomical location. It will show the design or pattern of the fibrosis. Roentgenograms will aid in the segregation of the tubercular from the non-tubercular, so that those who have silicosis may not be subjected to the dangers of contagion. A health survey will aid in determining whether or not more exposure will be harmful, and if the worker should be transferred to some other work. It will show the exact state of affairs, so that more serious trouble may be guarded against. Subsequent examinations will show the progress or development of the condition after the survey was made.

After the general health survey of the employees the question arises of what to do with those having silicosis or pulmonary tuberculosis, or silicosis and tuberculosis. Discretion must be used in handling these cases. To discharge all of them would invite litigation², but, on the other hand, those having pulmonary tuberculosis become a hazard to their fellow workers. It would not be wise to allow a tubercular person to continue working among other employees, especially if some of them have silicosis, because it has been

irrefutably proved that silicotics are susceptible to tuberculosis, and tuberculosis contracted by a silicotic usually means the beginning of a rapidly-progressing disability and a premature death.

To tell tuberculars of their condition may invite some criticism, but not to tell them would deprive them of necessary treatment and the chances of recovery. It would also deprive their families of precautionary preventive measures. If tuberculars continue at employment for the industry, medical treatment should be started at once. Periodic examinations are advised. Roentgenograms offer reliable aid in determining the progress of the disease. Follow-up roentgenograms ought to be of similar density, detail, and distance technique for comparative purposes.

Those having only silicosis in the early stages, without pulmonary tuberculosis, present a different problem. They will not infect their fellow workers, but they have a strong tendency towards the contraction of pulmonary tuberculosis, pneumonia, and acute respiratory colds.

As a rule, silicotics who have not as yet contracted pulmonary tuberculosis are healthy looking and able to carry on the duties of their occupation. More exposure to dust may or may not be harmful, but here it should be remembered that removal of the exposure does not always stop the progress of the disease.⁶ A transfer to a less dusty occupation may be indicated.

A careful study of the roentgenograms as to the amount of fibrosis, the anatomical location of it, and its structural design may aid in determining whether or not the patient should be transferred to a non-dusty occupation or be allowed to remain at his regular one.

Those having tuberculosis and silicosis present a still somewhat different condition. They are not so infective as persons with primary pulmonary tuberculosis, probably because tubercular germs are not so frequently found in their sputum as they are in tuberculars where silicosis is not present, but these people require treatment and it is imperative that a dusty occupation be eliminated. Such cases usually progress rapidly towards incomplete incapacitation, and finally a fatal termination is reached. Frequently some acute condition, such as pneumonia or a cardiac complication fatally terminates the condition⁹.

A person with a well-defined case of advanced silicosis presents a serious problem. He may at any time develop tuberculosis or become ill with pneumonia or bronchitis, and from that time on he may be totally incapacitated, with a resulting more or less depressing effect on his family, and with the possibility of his family and himself becoming a burden on society. If he is permitted to continue at his work he probably will develop tuberculosis, with its resulting incapacitation, and the industry will be left to assume the responsibility for all ensuing trouble, whether he developed the disease in the course of his last employment or while at some other occupation. Those who develop tuberculosis on a well-advanced case of silicosis usually do not continue to work long after the tuberculosis is established; their condition invariably becomes rapidly worse.⁹

ROENTGENOGRAMS made of the applicant's chest will give valuable information which will be helpful both to the employer and the em-

ployee. They will aid in detecting early tuberculosis and pneumokoniosis; they will aid in determining whether the applicant has suffered exposure or whether he should be allowed to work in more dust; and they will aid the employer in placing the applicant according to his physical condition. Roentgenograms will also show the condition of the applicant's chest at the time he became an employee, and when kept as a record, along with other data, as previously outlined, they can be used for comparative study purposes at future examinations, and in this way control the development of pneumokoniosis and tuberculosis and other conditions within the industry which are not considered in this paper.

A fluoroscopic examination does not make a permanent record, and it usually does not reveal the minute structural design or pattern of the fibrosis and air cells as clearly as when they are depicted on a film, but it often becomes useful in determining the excursion of the diaphragm and the gross aeration of the lung and gives information as to the size, shape, and position of the cardio-vascular structures. It is also useful in indicating the technique needed or the quality of the exposure necessary. Thick masses of fibrosis require more penetration to depict their structural features than does air-filled lung tissue. Frequently several roentgenograms of a chest are necessary to depict the areas of fibrosis, or the small patches of emphysema, or the small areas of atelectasis which often occur in silicosis. One image may show an air-filled lung, but the same image usually does not show the structure of a denser shadow. The structural pattern of the shadows or design of the fibrosis offers means towards establishing the diagnosis and the origin of the kind of dust that caused the fibrosis. Sometimes stereoscopic roentgenograms are indicated to show space and distance around and between the various shadows to determine their design or contour and location, with reference to other structures within the chest.

The similarities of the symptoms of pneumokoniosis and those of pulmonary tuberculosis, and other conditions not due to the inhalation of dust, and the differing opinions of physicians and roentgenologists, plus the fact that the claimant worked at a dusty occupation, and the inability to determine the condition of the chest at the time the claimant entered the employ of the industry—together with the possibility that some, or all, of the exposure may have occurred outside the industry, and the further possibility of it not being due to dust at all—make it very difficult for the compensation administrators to administer compensation according to the laws of the statute.

Matters would be somewhat simplified if the various states were to pass laws containing uniform, fair, and adequate compensation coverage of occupational diseases, establish uniform and specific preventive and protective measures, and formulate a health standard for dusty occupations. However, at the present time, such a step appears to be remote.

In the meantime each state should create a board of control.⁷ It is here suggested that this board, under an already-existing department, be appointed, or that a new medical board be created, with representatives in districts for the greatest convenience of all concerned. This board

should have the authority and power to investigate occupational hazards, to determine the degree of disability, and to decide upon the allocation of work according to physical conditions. The power of the board may be broadened so as to provide for study of dust hazards and dust diseases, to point out defects, and recommend corrections of the system in order to accomplish efficiency with the least possible cost. It may include occupational injuries, whether they be due to accidents or hazardous conditions — "occupational accidents and occupational diseases." The board should pass on the physical condition of the applicant or appraise the applicant for certain dusty occupations and have the power to pass final judgment on all cases applying for compensation.

At the present time, since each industry must answer to its own state, I therefore recommend that *each industry*:

1. Make a clinical and roentgen examination of its applicants who expect to work in dust;
2. Make a physical and chemical examination of the dusts in the industry;
3. Formulate a health standard for applicants to dusty occupations;
4. Make periodic health surveys of the operatives;
5. Allot the work according to the physical condition of the employees;
6. Keep records as outlined herein;
7. Insist on efficient respirators where needed. (See standards for tests)¹⁰; and
8. Obtain more exact information as to previous occupations as suggested herein.

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Industrial Poisons

ISENSCHMID and Kunz¹ report the history of a man, aged 56, whose occupation caused him to inhale trichlorethylene. He developed a severe retrobulbar neuritis with pupillary disturbances, paralysis of the hypoglossal nerve of the left side and polyneuritis of the nerves of all the extremities, with abolishment of the reflexes and reduction of the cutaneous sensitivity in the region of several peripheral nerves. The symptoms proved to be rather persistent and the vision seems to be permanently impaired. The authors call attention to the wide use of neurotoxic trichlorethylene, pointing out that it is employed as a fat solvent in industry as well as in cleaning fluids and other preparations that are marketed for home use.

Hypertension

ENOUGH has been said to emphasize the complexity of the problem presented by hypertension and, therefore, the difficulty in setting any definite standards for the employment of those showing the condition.² Certainly no arbitrary standard can be set up, based simply on a blood pressure determination. Wychgel's classification furnishes probably as satisfactory a basis as any suggested. Our own experience has been chiefly in connection with the examination of older employees, and the question chiefly involved is determination of suitable work. Generally speaking, the basis is as follows: In hypertension with early myocardial changes, lighter physical work is indicated; with arteriosclerosis, not only lighter physical work, but usually work involving less responsibility is indicated. Arteriosclerotics are placed also where any such thing as a cerebral or coronary accident would not be likely to endanger others. Those showing only an unusually high systolic pressure, with freedom from signs of accompanying disease, and with no tendency toward steady increase of pressure, may often continue with apparent safety at their usual work. All cases showing any noticeable increase above the usually accepted standards are urged to consult their own physician. Our great difficulty has been in persuading such patients, who are often symptom free, to give their condition proper attention.

One of the most important practical points in the hypertension case is continuing supervision. Response to treatment must be noted at intervals to insure continued safe relation between work and the patient's capacity. Sometimes suitable work may be available for several years. In other cases leave of absence must be given for a time, and in a few cases not responding to treatment, or showing other serious changes, retirement must be arranged. As far as possible we try to co-operate in the treatment of these cases by providing suitable work and environment.

Hypertension is probably more common in industry than is generally supposed. Care must be taken to avoid error in the detection of cases. Itself only a symptom, associated conditions must receive the greatest consideration. From point of

1. *Schweiz. Med. Wchnschr.*, Basel, 65:530, Abstr. *J.A.M.A.*, July 27, 1935.
2. A. G. CRANCH, M.D., in *Ohio State M. J.*, XXXI:676, September, 1935.

view of capacity for work, myocardial and arteriosclerotic changes are most important. Standards based primarily on blood pressure determinations are not satisfactory. Successful placement of hypertension cases is only possible through continuing supervision.

Eye Hazards

IN THE discussion of health hazards in industry,¹ at the annual meeting of the American Public Health Association. Dr. R. A. Jewett stated: "For years, I have been impressed by the great amount of relief obtained from physical symptoms by proper treatment of the eyes." A survey of the vision of men employed in one oil company showed that 30% had subnormal vision, and 7% had pathological eye conditions. A special eye hazard for filling station attendants is the irritation to the eyes, of acids used in cleansing car springs and lubricating racks.

Refusal of Employee

To Submit to Medical Treatment

IN THE course of his employment, on December 23, Haill ran a file into his hand. A clerk of the employer, who had charge of the employer's first aid station, washed the wound, applied certain preparations, and rendered "medical attention" to the employee daily for the succeeding three days. Until January 2, the workman's wife bathed his hand every morning in hot water in which she put "some sort of antiseptic". The hand seemed to be improving and, according to lay testimony, was healed from the outside. On January 2, however, there was a swelling and the workman went to a physician. On January 4, a fever developed and he was taken to a hospital where he died January 7 from septicemia. His widow was awarded compensation by the workmen's compensation commission. The employer then appealed to the St. Louis circuit court, contending that the workman had unreasonably refused medical attention. To sustain that contention, he relied on the testimony of the clerk in charge of the plant's first aid station and of the plant foreman that they had suggested to the workman on several occasions that he go to a physician, but that on the workman's assuring them that he did not believe the injury was serious enough to warrant that they refrained from insisting that he do so and at no time named any particular physician for him to see. Two medical witnesses, one called by the plaintiff and the other by the defendant, testified, in effect, that even if the workman had been treated by a physician from the inception of his injury, septicemia might still have developed. The court affirmed the award of the commission and the defendant appealed to the St. Louis court of appeals.

It cannot be said as a matter of law, said the court,² that under the facts of this case the workman unreasonably refused to submit to medical treatment. It does not conclusively appear that he refused at all. While the defendant's witness-

es testified that the workman refused to go to a physician, though repeatedly told to do so, they further testified that they merely suggested that he go to a physician or advised that he ought to do so. A mere negligent failure on the part of the workman to obtain or accept medical treatment, though advised or urged to do so, does not bar a recovery of compensation. To bar a recovery, an unreasonable refusal to submit to medical treatment must be shown and the burden of proving that refusal is on the employer. The court held that the commission was warranted in holding that the employer had failed to offer the required proof. The award of compensation was accordingly affirmed.

The Arsenic Problem

REUER cites a probable case of arsenical dermatitis caused by wearing a black wool-len suit.¹ Arsenic was found in the urine and hair of the patient, and in the suit. Recovery occurred when the patient discontinued wearing the suit and when local treatment of the skin was instituted. The presence of arsenic in excretions is discussed. There are no definite criteria by which to identify arsenic as a cause of disease in a given case. At present the diagnosis in obscure cases of arsenical poisoning rests on presumptive evidence. A general rule regarding the behavior of arsenic within the body is of little value, because in many persons the biochemical reactions are exceptional. Patients who suffer from symptoms of arsenic poisoning are exceptions in that they manifest a hypersensitivity to arsenic. Legally, it is difficult to state whether or not arsenical poisoning has been the cause of death, even though the amounts of arsenic found in the tissues and excretions are the same or less than those cited as "normal" values. The use of arsenic as a contaminating factor in foods and drugs should not be permitted, since no limit of tolerance for arsenic can be established for all persons.

Total and Permanent

THE NEW YORK Life Insurance Company issues to the plaintiff an insurance policy providing for the payment of certain benefits on receipt of "due proof. . . that the insured. . . has become wholly disabled by bodily injury or disease so that he is and will be presumably thereby permanently and continuously prevented from engaging in any occupation whatsoever for remuneration or profit." The plaintiff, 40 years old, became afflicted with phlebitis and a blood clot formed in the vein in the thigh of his right leg. Contending that he was totally and permanently disabled, he applied for the benefits payable under the policy. The insurance company denied liability. In a suit to collect the benefits, the trial court gave judgment for the plaintiff and the defendant appealed to the Supreme Court of Michigan.

The medical testimony, said the Supreme Court,² established the fact that the plaintiff could not pursue any suggested vocation with a

1. *The Sight-Saving Review*, V:128, June, 1935.

2. *Haill v. Champion Shoe Machinery Co. (Mo.)*, 71 S.W. (2d) 146. *J.A.M.A.* (February 9, 1935).

1. *Arch. Dermat. & Syph.*, 31:811, June, 1935; *Abstr. J.A.M.A.*, 105:313, 1935.

2. *Forman v. New York Life Ins. Co. (Mich.)*, 255 N.W. 222. *J.A.M.A.* (February 23, 1935).

reasonable degree of regularity or length of time and without hazard of relapse. The physicians who attended the insured stated that he was not able to engage in any occupation for gain except under circumstances so favorable and fortuitous as to be outside the range of probabilities; that his disability was probably permanent.

The insurance company contended, however, that "due proof" of total disability had not been submitted to it, as required by the policy.

Of course, said the Supreme Court, the policy cannot fairly be construed to constitute the defendant insurance company the sole judge of disability or to mean that the fact of permanent disability is foreclosed in favor of or against either party by the proof made to the company by the insured. Actionable disability ultimately, said the court, is a question of fact for trial. "Due proof" can mean no more than that reasonable evidence of disability within the terms of the policy shall be submitted to the company. Where such evidence is submitted in a good faith attempt to comply with the provisions of the policy, the company should point out particularly any defects therein if it intends to rely on them. The insured in this case submitted the reports of four attending physicians covering treatments from July 26, 1928, to June, 1930, showing the character of his ailment and that he was totally disabled continuously during that time. The physicians who early treated him made a prognosis that his disability would extend into the future but did not then express an opinion that it would be permanent. However, they became progressively doubtful of his recovery as time passed and the condition did not yield to treatment. The physician who attended him in 1930 stated: It is my opinion that as much collateral circulation has been established in the right leg as is possible and that condition now is one of total and permanent disability as far as pursuing occupation is concerned. Having before it proof of the nature of the disease, concluded the Supreme Court, of the results of treatment for two years, of the fact of past and present total disability, and medical opinion that it would be permanent, the defendant insurance company had such reasonable showing of total disability as constituted "due proof" and required it to pay the benefits or to be prepared to defend on the fact of disability. The judgment in favor of the insured was consequently affirmed.

Protecting the Eyes

THERE are four things to consider when furnishing protective glasses to workmen: ultra-violet, infra-red, glare and color.*

In the past a number of types and kinds of glass have been used to give supposed protection: brown, red, combinations of three or four glasses, and blue—this latter being predominant. Little or no thought was given in the past to harmful rays, the workman simply choosing a pleasing color and a density sufficient to cut down the glare. Workmen in various industries and different localities learned to judge temperatures, heats and flame characteristics with their predecessors' or fellow workmen's glasses. Makeshift standards and density numbers were set up, and a feeling now exists

among these operators that they cannot change from one color to another, or from one type of glass to another, without losing the ability to make the above-mentioned determinations.

Now, glass does not give protection by virtue of its color, but from the chemicals used in its manufacture. Ultraviolet and infra-red have no color, therefore color does not affect them. Two pieces of glass of exactly the same appearance often have entirely different properties. Blue glass, most commonly used, gives little or no protection.

The United States Government, through the Bureau of Standards and the U. S. Navy, has set up a definite standard covering the amount of absorption necessary for protective glass; and has standardized a set of shade numbers based on the density of the glass. Table "A" is from Federal Specification No. GGG-G-541, covering the lighter shade lenses, and No. GGG-H-191, covering the darker shades.

Glasses made to these specifications assure the workmen of complete protection from ultraviolet and infra-red, it being only necessary to pick a shade of glass which cuts down the glare to the point where the eyes will function normally when looking into the flame or arc. All lenses in these specifications transmit the visible rays in the green or yellow-green portion of the spectrum.

Glass meeting these requirements is available from several manufacturers, in a number of types and kinds of goggles, in helmets or hand shields; also in plates of any size required for use in peep-holes, observation windows, etc.

The following table in suggested shades for various industrial operations is recommended by the leading manufacturers of specification glass:

Shade No.	Suggested Use
14	Carbon arc welding and cutting. Electric furnace operation.
12	Metallic electric arc welding 250 amperes or more.
10	Metallic electric arc welding 75 to 250 amperes.
8	Heavy acetylene cutting and welding.
6	Acetylene welding set-up work on electric welding. Fire box observations.
5 }	Acetylene burning, cutting and brazing.
4 }	
3	
Extra Dark "Calobar" or No. 2	Bull ladlemen, spot, flash and seam welding.
Dark "Calobar" or No. 1	Employees in area of electric welding, stray or reflected light, low temperature fire box observations, rivet heaters, ladleman, hand pourers.
Medium "Calobar"	

IN INDUSTRIAL medicine, particularly railroading, the attitude toward hypertension in employees should be one of extreme conservatism. No matter at what age hypertension manifests itself, it should be looked upon as a degenerative process—an expression of senility. Responsibility and senility are incompatible. A policy based on such a conclusion may work a hardship, or even prove unjust in individual instances. And there may be exceptions made, yet in the long run experience and physiology have proved that such an attitude is fair."

* W. T. CAMERON, in *National Safety News*, 31: pp. 17, 18, 62, 1935.

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Opening for a Bank!

WHEN the average individual begins to suffer from interference with the normal body processes of the human temple of his alleged soul, the doctor is the first to be called and the first to respond. Where this occurs in the region outside of compensation cases—employee family matters, for example—there follows, as it were, a transference of suffering; the individual recovers from his physical disability, whatever it may be, and the doctor begins to suffer from the queer quirks of human nature as it is manifested in that same individual. All too often the doctor is never paid in full; much too often he is only partly paid, and that grudgingly; and many more times than is good for the economic integrity of any social equation, he is never paid at all. But even these eventualities are not the end. Wholly or partly unpaid, he isn't called again: "I'll go to Dr. ———. I don't owe him anything." Too familiar to be repeated; almost too painful to be remembered. "Human nature" at its rather ugly average!

A thousand schemes have been devised to correct, or at least reduce, the hardships of this condition from the doctor's standpoint. Most of them, however, have proved unworkable; where persistence in collection is their chief element they are almost inevitably unworkable. Even when the patient's financial condition improves, so that he could keep up at least with current needs, the old resentment lingers.

For any plan of this kind to be really successful, it is necessary to interpose a third party. And the ideal third party is the agency through which the

patient obtains the money to pay the doctor, in full, at the time the services are rendered, so that the obligation of repayment of the amount involved does not remain any concern of the doctor himself. The credit union is useful in this respect. Likewise, such institutions as those which lend to an employed person on a signature and co-signature basis, are equally valuable. Delayed collections, as between a debtor individual on the one hand and a creditor bank or credit union on the other, do not involve the personal relation between doctor and patient with any extraneous exigencies of financial obligations, and do not antagonize where antagonism does too much damage. The employee won't get very mad at the credit union; he can't afford to get too mad at the bank.

There is much in this for the doctor to think about. The tactful suggestion that there are ways and means, organizations, agencies, banks, which may be thus called to assistance, may very often—indeed, more often than is quickly realized—preserve for the doctor both his pay and his patient.

Industrial Medical Trends

IN OBSERVING the development of traumatic surgery, the fact cannot be avoided that the World War experience and industrial injuries have contributed greatly to the material which has been of vital use in developing this specialty.

Industrial injuries, however, have been reduced considerably and according to some authorities to an almost irreducible minimum, during the past 10 years. The fact is that most traumatic surgeons at the present time are depending for their clinical material very largely upon the results of public accidents, especially automobile accidents. That this source has provided an abundance of clinical material is well known among traumatic surgeons; and the types of injuries are somewhat different from those seen in industry, thus affording a different type of experience.

It may be assumed that for some time to come there will be a considerable number of public accidents resulting from the misuse of the automobile—although in some quarters this is vigorously denied. Granting that there have been many improvements in making roadways safe, providing adequate and properly working traffic signals and traffic supervision, and in making the automobile as a mechanical unit as foolproof as it is possible to do, there will still be what is called the "human element." And probably this factor will be the cause of a great number of casualties for many years to come.

Nevertheless, it is quite sensible to believe that there will be a material reduction in the number of public accidents during the next five years, for the public is becoming thoroughly aroused to the necessity of cutting down the enormous number of casualties and deaths from this source. Moreover, it is not impossible that "things may become so bad before they get better," that the amount of automobile travel may be materially reduced, this in itself having a desirable effect upon the decrease of automobile casualties and deaths.

It may be assumed therefore, that the material afforded for traumatic surgery may reasonably suffer a considerable decline and, with the increas-

ing number of traumatic surgeons developed, will accordingly cause a disproportion of material and men.

Granting that such events may occur, the real opportunity for medical service in industry will exist through the avenues which have previously been most neglected, namely, the hygiene of industry and its employees, including preventive measures against injury and disease, and, more constructively, the promotion of health among industrial groups.

With the emphasis upon occupational diseases over the entire country, with the attention given by legislatures to the consideration and final passage of laws compensating for disability from occupational disease, and with the increasing concern manifested by employers and insurance companies, one natural effect will be a general stimulus of the development and application of preventive and control measures. No less important will be the by-products of this stimulus to new activity—investigations as to the causal relationships of abnormal conditions both in industrial environment and in the bodies of employees, which, when associated, tend to bring about occupational disease or to aggravate previously existing conditions which may be associated with disease difficulties.

Such natural developments will further give rise to the critical study of the various problems associated with the subjects of preventive medicine in industry and industrial health.

For many years a small group of specialists in industrial medicine and industrial hygiene have continued to advocate the more extensive use of teaching material relating to the problems of industrial medicine and industrial hygiene. It would now be a wise move on the part of the large universities in the industrially developed areas of this country to establish industrial clinics in connection with the hospital facilities already afforded, for the specific purpose of developing clinical material, both out-patient and hospital types, to be adapted to the teaching of medical students in regular courses, and also the development of postgraduate courses especially designed for those physicians who are already in industrial practice.

Physical Examinations

SO MUCH has been said and written about physical examinations in industry, but so much has been left unsaid and unwritten!

Aside from the more or less obvious personal reasons, the chief objection to physical examinations on the part of prospective employees has been the fear that the procedure may be used as a discriminatory measure. That physical examinations have been so used in a small number of instances probably is true; but those who are conversant with the facts are aware that their wide and general use is as an instrument of selection, placement and supervision. It must be recognized that if a man has a physical defect or abnormal condition which is dangerous for him or for his fellow employees, or which may become a liability to the company, the condition should certainly be recognized and proper steps taken to alleviate it or to place the person having it in an environment where the effects are most likely to be least hazardous. This principle is the rationale of the proper use of physical examinations in in-

dustry from the sociological viewpoint, but, needless to say, it has not been observed as a part of the reactions of the great number of persons who object or have objected to this measure.

Although these remarks are only a brief review of the past and present situation, the physical examination at the present time is not in need of justification; it is and will continue to be in the future an accepted method of classifying individual employees according to physical status, and upon such classification so selecting, placing and supervising, that the best possible use may be made of the physical capacity of each individual concerned—and further, and more important, so that the possibility of the occurrence of injury and disease may be minimized.

It is with this last application of the physical examination in industry that many an opportunity has been overlooked.

Ordinarily in the use of the physical examination only the gross defects and abnormal conditions are actually recorded (or made use of), although in a few scattered instances special adaptations have been made to unusual situations.

Since occupational disease has come to be an ever present problem and one of most vital socioeconomic importance, one would naturally reason that the physical examination in industry would be important in working toward the prevention of occupational disease. Such, however, has not been the case so far as the general experience of industry is concerned. It would seem that few people have heretofore realized that the industrial physical examination can well be a preventive procedure. For example, Sappington has previously mentioned in this magazine that when an industrial physical examination is made on an employee who is going into an occupational disease exposure the physicians might well take into account three things: (1) the nature and severity of the exposure into which the prospective employee is going—meaning as accurate as may be possible to do, a measurement of the kind and severity of exposure and a rating of the occupational disease hazard; (2) with the nature and severity of the exposure in mind, an appraisal of the physical condition of the employee, taking into account especially those defects or abnormal conditions which might be aggravated by the occupational exposure or which might in time produce occupational disease; and (3) a scientific knowledge of the type of protection afforded the employee during his occupational exposure and the efficiency of this protective mechanism.

Aside from detecting gross abnormalities or defects which are due in most instances to non-occupational disturbances, one might well ask the question as to why the physical examination is justifiable unless Sappington's suggestions are followed. Of course it is to be acknowledged that in the general physical examination the recording of vision and the condition of the inguinal rings are either one worth the amount of money it takes to make a physical examination, even if nothing else is done.

In the working out of occupational disease relationships in industry, however, it appears reasonable that, to make the most of the industrial physical examination, physicians should lay much emphasis on securing the type of information indicated above.

Industrial Medicine and Surgery

Compensation for Occupational Diseases*

FROM its beginnings the workmen's compensation law has covered all injuries to health resulting from occupational accidents. Further it has now, in many jurisdictions, in this country and abroad, been extended to cover many specified diseases, not resulting from accidents, classified as "occupational". And in a few states in this country and Latin America it has been inconsiderately extended indefinitely further to cover "all inclusively" all injuries to health "arising out of and in the course of the employment" or all "occupational diseases", undefined, "arising out of the employment".

In this country, peculiarly, there is strong political pressure in favor of this "all inclusive" coverage of injuries by disease based upon the contention that there is no difference in principle between "injuries by accident" and "injuries by disease" and, therefore, that industry ought to be liable for both classes of injuries on the same terms and conditions. This contention is fallacious. The fundamental principles of the compensation law are that industry shall be held responsible and liable to compensate for the losses from those injuries only which are caused by "trade risks", that is, risks resulting from the employment and which the employer can control; and that the liability for such risks shall be "insurable", that is, shall be sufficiently well defined as to be insurable at practicable and equitable rates, fixed in advance. The standard compensation laws have been framed to carry out those principles in application to injuries by accident. But the factual conditions relative to injuries by disease are so different from those relative to injuries by accident as to necessitate different treatment, that is, different terms and conditions in the provisions governing liability, in order to carry out the same principles and effect equally salutary results.

The crucial difference between accidents and diseases is the time factor. An accident is a sudden event, happening at a definite time and place. Generally the causal relation between the employment and accident and between the accident and the resulting injury or injuries can be traced with reasonable certainty. Generally the employer responsible is automatically identified. And there is a clear-cut event from the date of which time-limits on notices, claims, etc., can be measured. In contrast, many diseases attributed to occupational risks are of slow contraction, some very slow; and they may be of equally slow progress to

their harmful results. In silicosis there may be an interval of as much as 20 or 30 years between the first exposure and disability or death.

In the meantime many causes for disablement or death, other than the occupational disease—e.g., bad habits, bad living conditions, contraction of other diseases, old-age, etc.—may have operated. It follows that it is commonly a matter of extreme difficulty to determine whether disability or death really has resulted from an occupational disease or from other causes or from a variety of causes. Medical diagnosis of the mere existence of a particular disease is often uncertain; yet for the proper operation of compensation for occupational diseases it is essential to obtain true medical diagnoses not merely of the existence of the disease, but also of its causes and consequences. This, manifestly, calls for practices and procedure, limitations and conditions, different from those which suffice for the operation of compensation for accidents.

A further difficulty from the time element is that, where the disease is of slow contraction, it may be contracted by a workman under several or many different employers or insurance carriers or both. In such cases it is essential for the protection of the workman that some one existent employer or insurance carrier shall be directly liable for the entire compensation. Manifestly that is a highly vicarious and harsh liability to impose upon an employer or insurer—whether or not accompanied by a right to claim contribution from earlier employers and insurers—and, in all fairness, should be subject to strict limitations.

Moreover there is a further difficulty incidental to the initiation of a novel law or the provision of new insurance for compensation for such progressive diseases of slow contraction as silicosis. Under such conditions, the liability imposed upon the employer or assumed by his insurer includes a liability for disability or death in the future in those cases of disease which may be the result of exposures during long years in the past—in other words, a liability, not merely for future risks but also for the cost of a volume of physical impairments already incurred, though the liability therefore is not yet matured. In insurance parlance these are loosely termed "accrued liabilities". Such accrued liabilities—the impending cost of past exposures—under a law newly imposing a liability to compensate for silicosis, would, it is estimated, in a state such as New York, amount in the aggregate to many millions of dollars. This cost is additional to the cost of losses from current risks; and how to meet it and how to fix reasonable charges for insuring it is a complex financial problem of the first magnitude. Manifestly a law initiating compensation for such diseases as silicosis needs to be so shaped

and tempered as to enable employers and insurance carriers to adjust themselves to such novel burdens.

The situation, then, in my opinion, is this:

The principle of compensation, regardless of fault, may well be extended to cover those disabling diseases that are characteristic of and peculiar to and have their origin in the occupation or process in which a person is engaged. This would exclude, of course, the diseases of ordinary life, and would be applicable only to the specific hazards which arise out of and because of industrial processes and occupations, but upon terms and conditions and with procedures differing quite radically from those applicable to compensation for injuries due to accidents and differing, of course, for different categories of diseases that present peculiar problems. The provisions for such coverage should be separate and distinct from the provisions of law applicable to compensation for accidental injuries, and these distinctions should be kept constantly to the fore and emphasized. The problem of formulating such provisions is relatively simple with reference to those recognized diseases that have been generally included in the schedules set forth in the older occupational disease laws, since such diseases are reliably diagnosable, of quick contraction and non-progressive.

But it is more difficult in respect to such progressive diseases of slow contraction as silicosis and asbestosis—now generally regarded as being truly "occupational". Fortunately, in respect to the coverage of these latter diseases, there are promising models for our guidance in some of the foreign compensation laws, whereas experience under indefinite, "all inclusive" coverage in Connecticut, Massachusetts, Wisconsin and California is helpful with lessons of faults to avoid. In my opinion, a law for the compensation of occupational diseases should contain provision to the following effect:

1. The diseases to be made "compensable" should be distinctly specified—by listing in a "schedule" or otherwise. They should include all those diseases, but only those diseases, to be found in the state, which, according to prevailing medical opinion, can be traced, in individual cases, to origins in "trade-risks"—i. e. risks, not of ordinary life, but created by special practices or processes in industrial occupations.

2. There should be a special regime for expert adjudication of medical questions in occupational disease cases.

3. There should be definite periods of exposure required as a condition to the right to compensation for various occupational diseases; the time within which, in order to be compensable, disability or death must follow exposure should be limited;

* Excerpts from an Address, by F. ROBERTSON JONES, General Manager, Association of Casualty and Surety Executives, delivered at the 24th Annual Safety Congress and Exposition (Industrial Diseases Section), Louisville, Kentucky, October 13, 1935; published in the Bulletin of the Association of Casualty and Surety Executives, November, 1935.

and cases resulting from exposures entirely prior to the effective date of the compensation coverage, or in industries wholly outside the particular state, should be excluded.

4. Prompt notice either of the first manifestation of symptoms of the disease or of disablement—the time of such event to be determined as a medical question—should be strictly required; and every presumption should be against the validity of a claim not made as promptly as practicable.

5. In case an occupational disease merely aggravates, prolongs or accelerates disability or death due primarily or proximately to a non-occupational disease or infirmity or, above all, to old age, the compensation should be reduced to be proportionate to the degree to which the occupational disease contributes to the disability or accelerates death.

6. The employer as of the time of the workman's last substantial exposure to hazards of the disease and the insurance carrier then on the risk should be liable for the entire compensation—with or without right to contribution from earlier employers and insurers. But all such liabilities, whether directly for compensation or for contributions to the compensation payable by others, should be subject to brief time limitations.

7. In respect to incurable diseases, especially silicosis, the obligatory medical benefits should be specially limited in time and kind.

8. In respect to silicosis and other diseases of slow contraction, there should be special provisions for limited compensation to workmen laid off before actual disablement because of manifestations of first symptoms of the disease, with the alternative, under some conditions, of waiver of compensation by such workmen for aggravations resulting from being allowed to continue in the hazardous occupation.

9. A law newly imposing liability to compensate for silicosis and other diseases of slow contraction should leave a substantial interval for preparation between the date of its enactment and the date when it shall take effect; and the compensation for such diseases should be specially reduced and limited substantially below what would otherwise be appropriate until the "accrued liabilities" are worked off.

10. Compensation for occupational diseases should be insurable separately from compensation for accidents; and, in the initial stage, at least, of a regime of compensation for such diseases as silicosis, the rating practices now imposed upon insurance carriers by public regulation need to be radically modified and liberalized.

Compensation for occupational diseases involves dangers, difficulties and uncertainties which call for more careful study in advance of legislation than political impatience is apt to concede.

Political impatience indeed is the chief obstacle to a just and equitable settlement of the occupational disease problem. If those thoroughly informed as to this intricate and

THE BULLETIN

The American Association of Industrial Physicians and Surgeons

THE object of this Association shall be to foster the study and discussion of the problems peculiar to the practice of industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in the industries; to promote a more general understanding of the purposes and results of the medical care of employees, and to unite into one organization members of the medical profession specializing in industrial medicine and surgery for the mutual advancement in the practice of their profession.

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complex subject who have sincerely at heart the welfare of workers actually suffering from or exposed to real occupational diseases could be delegated the authority to devise a solution, some progress might be made. But when political propaganda is injected into the situation and when campaign issues are developed from it, there is little chance for an adjustment which will be satisfactory to all concerned.

This is a highly technical subject. It cannot be solved by political methods, by passing resolutions or by damning employers as a class. On the other hand it requires careful study of all the factors involved and especially the incidence of occupational disease legislation upon employment. That the passage of acts without proper limitations as to benefits may be highly detrimental

to labor apparently has not been considered by the labor leaders who are promoting these measures. The same is true of the politicians who have taken their cue from the labor organizations. The average worker knows nothing whatever of the subject, and consequently his only opinion is that he should be compensated if he gets sick while at work from any cause whatever. He does not comprehend the ultimate effect of such legislation, either upon him or his fellows, and therefore easily is misled by the agitators who claim they are trying to help him.

The greatest need today in this field is the divorcement of occupational disease legislation from politics or political considerations. Until that is done, the many problems confronting us never will be properly solved.

Workmen's Compensation Problems

THE cost of insurance to Massachusetts industries can be largely controlled by the buyers of insurance themselves.* This is true of fire insurance, automobile insurance, workmen's compensation insurance, and practically all other kinds of insurance which business concerns buy. There are important differences in the methods open to insurance buyers in controlling costs and in the extent to which costs can be controlled, but they can be controlled to a very great extent in any kind of insurance.

In the Factory Mutuals, in the decade from 1870 to 1880, the average fire loss was some \$.25 annually for each \$100 of value insured. During the past decade, the loss has been under \$.02, a reduction of over 90%.

The average rates paid for fire insurance generally have likewise been going steadily down for many years, reflecting successful efforts in the reduction of fire losses. Fire insurance costs have been reduced and can be further lowered by decreasing the number of and the seriousness of fires.

There is a very fundamental difference between fire insurance and workmen's compensation and other forms of liability insurance. The number and seriousness of injuries to workmen, the number of accidents caused by automobiles can be controlled, but the cost of the injuries which are not prevented is determined by persons outside your control.

Workmen's compensation statutes, administered by industrial accident boards or commissions, determine the amounts to be paid for injuries. The amount to be paid for automobile and other public liability accidents, as well as for injuries to employees of employers who have rejected the provisions of the Workmen's Compensation Act, is determined by a combination of common and statutory laws interpreted and administered by juries assisted by plaintiff and defendant attorneys.

In Massachusetts, the law, which became effective in 1912, has been liberalized by amendments year after year until the law, as it now stands, pays almost double the benefits of the original law. I have seen statements that compensation losses had increased eight or ten times since 1912. They have increased, but not to any such extent. For 1913, the first full year under the Act, the average losses for all Massachusetts industries were \$.35 for each \$100 of payroll. In 1933, the cost was \$.62, not quite doubled.

Is there a constant upward trend in compensation costs? During the early years of a compensation act there is always likely to be a definite upward trend. People become familiar with its benefits; its maximum limits are determined by numerous legal tests; and almost always such laws are interpreted more broadly than originally expected.

There is, however, little evidence in the Massachusetts experience that there is any continuing upward trend in cost except that resulting from law

changes. Between 1923 and 1933, the average loss cost increased from \$.52 to \$.62 for each \$100 of payroll, an increase fully accounted for by law changes. In 1928, the loss cost was \$.63, in 1933 \$.62.

Since 1912, the losses in relation to payroll have nearly doubled and the statutory benefits have likewise been nearly doubled.

I know that some employers are wondering whether it is not less expensive to reject the compensation law; that is, to substitute the old common and employers' liability laws for the compensation law, and substitute the jury for the industrial accident board.

What would have happened to the cost to employers for industrial accidents if Massachusetts had never had a compensation act? Of course, we can only guess, but we may gain some indication from the experience in those states which have continued up until now without compensation laws. There are only two states now without compensation laws—Mississippi and Arkansas. In South Carolina, a compensation law became effective for the first time on September 1, 1935. It is interesting to note that the standard or manual insurance rate for a cotton mill in South Carolina was \$1.04 under the old common and employers' liability law, and for workmen's compensation under the new law \$.71. The rate for furniture manufacturing was \$2.08 and it is now \$1.59. The rate for boot and shoe manufacturing was \$.75 and it is now \$.59.

These common law rates, that were in effect prior to September 1, were not the rates in effect in 1912, but the cost of settling claims of employees had increased in South Carolina without a compensation act even more than it has in Massachusetts with a compensation act, and the passage of a compensation act has actually reduced insurance rates for South Carolina employers. The experience in states still without compensation laws is similar to that of South Carolina.

It is entirely possible that costs might have increased more rapidly in Massachusetts without a compensation law than with one.

The problem of increasing injury costs is not peculiar to industrial injuries. Juries and plaintiffs' attorneys largely determine what is to be paid for automobile injuries. I do not need to tell you that in the past 20 years the meaning of "negligence" has greatly changed. The percentage of all automobile accidents for which the driver is held responsible has increased tremendously. The amounts juries are awarding has likewise greatly increased. Lest anyone think this is peculiar to Massachusetts, because it has a compulsory insurance law, let me assure you that in many states juries are much more generous in spending your money than they are in Massachusetts.

Pensions in Great Britain

THE years of depression and unemployment following the Great War have accentuated the need for industrial pension schemes because state pensions in Great Britain* are not conditional upon retirement, nor are they

sufficient to ensure voluntary retirement. As a result there are now 2,600 separate schemes in existence, covering some half-million workers of all grades.

Non-Contributory Schemes: Pension funds maintained and administered entirely at the discretion of the firm and invested in the firm's capital or as a special trust.

The inadequacy of such schemes accounts for the preponderating growth of

Contributory Schemes: Fund managed by a special trust or insurance company with uniform and accepted scales of contribution and benefit.

Survey of Main Types of Contributory Schemes: Scope: Salaried and/or wage-earners included—very often confined to male employees only.

Employees' Contributions: (1) Scale based on amount of salary or wage; (2) Flat rate, e.g. 10d. to 1/3; Both may be variable to adjust for age of entry into the scheme.

Benefits: (1) Sliding scale—benefits some percentage of wage or salary; (2) Flat rate—commonly £1 per annum for each year of contributions.

Silicosis

THE question of silicosis* last week caused a wrangle in San Francisco, where doctors, lawyers, miners, mineowners, insurance men, legislators, public health agents and fuss-budgets met to argue the pros and cons of a disease which has lately taken the public spotlight as the subject of bitter industrial controversy.

Silicosis is due to inhalation of fine, sharp particles of sand, sandstone or quartz, all of which contain silica, by miners, sandblasters, quarrymen, tunnel borers. The silica particles erode the delicate lining of the lungs, make them vulnerable to the germs of pneumonia and tuberculosis. If those diseases do not kill, the silica victim usually wastes away to death because his clogged lungs transmit insufficient oxygen to his blood.

Because silicosis may terminate fatally as long as 40 years after silica inhalations, the California Supreme Court last year declared that there is no time limit to bar a silicotic employee from bringing a damage suit against an employer. Industrial insurance companies immediately wanted to increase their rates. Operators of deep California gold mines, which are difficult to ventilate, would be obliged to pay \$22.25 instead of the current \$11 premium for every \$100 they pay their men. Some mines of low-profit margin have already shut down. Others threaten to do so. Mineowners and miners, who face loss of employment, were last week beseeching California's insurance commissioner to forbid any such rate upping on account of silicosis hazards.

Last March the West Virginia Legislature passed a silicosis compensation law as the result of an unholy industrial condition from which the U. S. radical press last week was belatedly trying to distill national bitterness.

In 1929 a water-power tunnel was begun at Gauley Bridge along the forest-fringed New River in southern West Virginia, with cheap transient labor, black and white, from moun-

* S. BRUCE BLACK, President, Liberty Mutual Insurance Co., in *Industry*, December, 1935.

* Abstr. in *Labour Management*, January, 1936, of an article in *Internat. Labour Rev.*

* *Time*, January 6, 1936.

tain districts as far away as Georgia. The tunnel went through white sandstone and quartz which were 99% pure silica. Every blast of dynamite puffed deadly silica dust down the throats of sappers who wore no protective masks over their mouths and noses. Rapidly men began to die of silicosis, pneumonia and tuberculosis. When workmen refused to go into the tunnel heads, foremen, according to subsequent court testimony, often clubbed them on. But the foremen dutifully followed, their gangs into the dust, and many of them died too. According to the People's Press, Rinehart & Dennis, tunnel builders for New-Kanawha Power Co., contracted with a distant undertaker to bury casualties at \$50 per head. When he had buried 169 of them on his mother's farm at Summersville, W. Va. she planted the cemetery to corn.

Digging of the Gauley Bridge tunnel ended in 1932. By that time about 500 silicosis deaths had spread terror throughout the territory. A smart Kentucky lawyer went over the mountains, instigated damage suits against Rinehart & Dennis. Some relicts won. Some derelicts won. Many lost or sued too late to accomplish anything for themselves. But as a result West Virginia passed its silicosis compensation law, which in turn prompted the radical press to dig up the Gauley Bridge skeleton and rattle its bones.

Sickness Among Male Industrial Employees During the Second Quarter of the First Half of 1935*

ONE has to go back to the fourth quarter of 1932 to find an increase in the frequency of sickness and non-industrial accidents as large as that which occurred in the second quarter of 1935 in comparison with the corresponding quarter of the preceding year. Cases causing disability for more than one week occurred 17% oftener than in the second quarter of 1934. After two years of below-average sickness incidence rates, the frequency of disability in the second quarter of 1935 increased to a figure approximately the same as the average rate for this period of the five preceding years.

In the first three months of 1935 only a slight increase in sickness frequency occurred over that recorded for the same months of 1934. The fairly sharp rise in the second three months of 1935 brought the rate for the half year to a level 13% above the corresponding rate for the same period of 1934.

These findings emerged from an analysis of reports from a group of 33 corporations having sick-benefit organizations covering approximately 158,000 male industrial workers in the periods under consideration.

There was very little change in the frequency of non-industrial accidents in the second quarter and in the first half of 1935 as compared with the corresponding periods of the preceding year. The increase was due to a greater frequency of cases of disability

ing sickness as distinguished from injuries of non-industrial origin.

In the second quarter of 1935 the frequency of disability from respiratory diseases exceeded the average rate for such illnesses during the five years 1930 to 1934 inclusive. The average rate was exceeded in each of the respiratory disease categories shown in table 1 with the exception of respiratory tuberculosis which occurred at average frequency in the second quarter of 1935. For the six months as a whole, each numerically important respiratory disease, tuberculosis included, occurred oftener than in the first half of 1934. Influenza which was recorded at less than average frequency in the first three months of 1935 was found at greater than average incidence in the second quarter among the industrial employees cov-

ered by the reporting organizations. The influenza mortality rate likewise increased sharply, but the mortality from this disease in 1935 was considerably below the average for influenza during the winter and spring seasons.¹ This result suggests that the influenza fatality rate (percentage of cases terminating fatally) may have been unusually low during the first half of 1935. The rise in the influenza morbidity rate was accompanied by an increase in the frequency of pneumonia among the industrial workers under consideration. The mortality from pneumonia, however, as reported by the Metropolitan Life Insurance Company, differed little from that in the first half of 1934.²

1. Statistical Bulletin, Metropolitan Life Insurance Company, Vol. 16, No. 7, July, 1935, p. 5.
2. Ibid., p. 7.

Table 1. Frequency of disability lasting 8 calendar days or longer in the second quarter of 1935, compared with the same quarter of preceding years, and in the first half of 1935 as compared with the corresponding period of 1934. (Male morbidity experience of industrial companies which reported their cases of the United States Public Health Service).¹

Diseases and disease groups which caused disability. (Numbers in parentheses are disease title numbers from the International List of the Causes of Death, Fourth Revision, Paris, 1929).	Annual number of disabilities per 1000 men				
	Second quarter of		First half of		
	1935	1934	Five yrs. 1930-34	1935	1934
Sickness and non-industrial injuries ²	85.2	72.8	84.9	92.9	82.4
Non-industrial injuries	9.5	9.6	11.1	9.9	10.6
Sickness ²	75.7	63.2	73.8	83.0	71.8
Respiratory diseases	29.1	20.9	25.4	37.9	28.2
Bronchitis, acute and chronic (106).....	3.8	2.5	3.0	4.2	3.6
Disease of the pharynx and tonsils (115a)	6.5	5.2	5.6	5.8	4.8
Influenza, grippé (11).....	11.1	7.2	9.9	19.0	12.2
Pneumonia, all forms (107-109).....	2.4	1.9	2.0	3.1	2.4
Tuberculosis of the respiratory system (23)	1.1	.8	1.1	1.0	.8
Other respiratory diseases (104, 105, 110-114)	4.2	3.3	3.8	4.8	4.4
Non-respiratory diseases	46.6	42.3	48.4	45.1	43.6
Diseases of the stomach, cancer excepted (117-118)	3.1	3.2	3.9	3.3	3.3
Diarrhea and enteritis (120).....	.8	1.1	1.1	.9	1.0
Appendicitis (121)	4.2	4.1	4.0	3.9	4.0
Hernia (122a)	1.4	1.6	1.6	1.4	1.5
Other digestive diseases (115b, 116, 122b-129).....	3.0	2.7	3.0	3.0	2.8
Rheumatic group, total.....	9.9	8.9	10.9	9.8	9.4
Rheumatism, acute and chronic (56, 57)	4.9	4.3	5.8	4.6	4.6
Diseases of the organs of locomotion (156b)	2.5	2.8	3.1	2.7	2.9
Neuralgia, neuritis, sciatica (87a).....	2.5	1.8	2.0	2.5	1.9
Neurasthenia and the like (part of 87b)	1.4	1.1	1.3	1.1	.8
Other dis. of the nervous system (78-85, part of 87b).....	1.2	1.4	1.3	1.2	1.5
Dis. of the heart and arteries, and nephritis (90-99, 102, 130-132).....	3.7	3.2	4.1	3.8	3.5
Other genito-urinary diseases (133-138)	2.9	2.3	2.4	2.7	2.5
Diseases of the skin (151-153).....	2.3	2.2	2.8	2.3	2.3
Epidemic and endemic diseases except influenza (1-10, 12-18, 33, 37, 38, part of 39 and 44).....	4.0	2.5	2.8	3.3	3.2
Ill-defined and unknown causes (200)	2.1	1.7	1.8	2.0	1.8
All other diseases (19-22, 24-32, part of 39 and 44, 40-43, 45-55, 58-77, 88, 89, 100, 101, 103, 154-156a, 157, 162).....	6.6	6.3	7.4	6.4	6.0
Average number of males covered in the record.....	158,959	158,875	150,777	158,310	152,300
Number of companies included.....	33	33	36	33	33

1. In 1934 and 1935 the same companies are included. The rates for the second quarter of the years 1930-1934 include 19 of these companies which employed an average of 120,666 men during these months or 80 percent of the 150,777 men representing the sample population for the five years.
2. Exclusive of disability from the venereal diseases and a few numerically unimportant causes of disability.

* DEAN K. BRUNDAGE, Statistician, Office of Industrial Hygiene and Sanitation, U. S. Public Health Service. The report for the first quarter of 1935 was published in the Public Health Reports for August 23, 1935, Vol. 50, No. 34 pp. 1125-1127.

For non-respiratory diseases as a whole the rate was 10% higher in the second quarter, and 3% higher in the first half than in the corresponding periods of the preceding year. There was practically no change in the frequency of digestive diseases. The rise in non-respiratory diseases was due to a combination of small increases in the rate for the rheumatic group of diseases, neurasthenia, diseases of the heart and arteries, and diseases of the genito-urinary system and annexa. The rate for diseases of the skin remained virtually unchanged from the low incidence to which this group of diseases has declined during the past few years.

Although the sickness experience of the group of male industrial workers under consideration was not so favorable as in the corresponding periods of 1934, no disease group with the exception of epidemic and endemic diseases occurred at a rate which was appreciably above its five-year average. The down trend in sickness frequency which has been manifested during the past five or six years, however, may have reached its nadir, at least for the time being. Progressive increase in the proportion of workers employed on a full time basis may result in slightly higher sickness rates on account of increased exposure to occupational health hazards. That a relationship exists between the health of industrial workers and the rate of business activity seems apparent from the changes which have occurred in sickness frequency among industrial employees from 1921 to date.

The comparison of rates in 1935 with those in 1934 is based on the reports of identical companies and the five-year averages are based on the experience of almost the same employee groups. The number of companies included may be insufficient to afford an adequate sample of the sickness experience of industrial workers in the country as a whole although the reporting companies employ persons in nearly all parts of the country. A majority of the workers covered in the record are located north of the Ohio and east of the Mississippi river. The illnesses reported are those for which sick-benefits are paid (for cases causing disability lasting longer than one week) from funds to which payments are made either by the employee, by the employer, or by both.

Broken Bones and Wasted Money

DR. E. W. HEY GROVES (Emeritus Professor of Surgery, Bristol University) gave a very arresting paper* on the treatment of fractures and the waste of money and time caused by unorganized methods of dealing with accidents. In the first place he found a great deal of difficulty in arriving at an accurate estimate of the number of fracture cases which occur in this country and of the number of different bones affected, the length of disability, or the percentage of cases of permanent disability. Fractures do not come under any government department, and no statistical evidence is collected as is done in the case of tuberculosis, fev-

*Abstr. in *Labour Management*, London, October, 1935; paper presented at Congress of National Safety First Association.

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ers, maternal and infantile mortality.

Figures have been collected by a Committee of the British Medical Association, and from these we have reason to believe that there are more than 150,000 cases of fracture in a year, and that very wide differences exist in periods of disability experienced for a similar fracture at different centers.

For example, one firm reports an average disability period for Colles' fracture above the wrist of 27 weeks which should recover in seven weeks. Another company was so impressed by similar differences that it arranged for all cases of fracture among its employees to be treated at one clinic, which reduced cost per case from £117 to £19, and the incapacity period from 23 weeks to five weeks.

There is an organized clinic at Crewe for the L.M.&S. Railway which has wonderful results even from patients with old injuries of many kinds who were seemingly incapable of improvement; from this and fracture clinics in Manchester and Liverpool, remarkable figures have been collected for comparison with unorganized treatment. The period of disability has been reduced from 22 weeks to five weeks (clavicle) and from 57 weeks to 26 weeks (patella) with a permanent disability of only 1% as against 37%.

With regard to compensation, to take one special fracture, namely Potts' fracture of the ankle, 100 such cases treated at the organized clinic would involve a payment of £1,650; the same number treated haphazard

would cost £7,050. Another point is the great loss suffered by the patients in wages and the unnecessary pain and loss of morale.

These striking differences between the results of organized and unorganized treatment of fractures are not special or peculiar to this time or this country. It was first demonstrated on a large scale by the experiences of the war. In the early months no less than 80% of gunshot fractures of the femur died, while in the last year of the war this mortality was reduced to 10%. No new discovery was made in treatment, and the improvement was entirely due to the standardization of methods and continuity of treatment.

In Vienna the insurance company, which is a state institution, has proved that it pays to treat cases of accident by an organized system. The maintenance cost of a complete hospital was saved on only 124 cases of fractures of the long bones in 1929, so that the rest of the cases were practically treated for nothing. (Total treated, 1,792 in-patients, and 6,936 out-patients.) The Vienna Hospital is under the control of one man, whose methods are used throughout, whereas in most of our hospitals every surgeon on the staff has a few accidents and different methods may be used even in the same ward.

Many examples may be given of cases that have been sent from one medical man or hospital to another, where no one person takes the responsibility, or where the patient is first seen by a junior house surgeon, and wrong diagnosis and treatment result in total disability.

In an organized clinic three principles must be aimed at: unity of control, continuity of treatment, and an efficient follow-up. The provision of a fracture service consisting of three surgeons, sister, nursing, massage, and x-ray assistants, would not be very expensive, and if all cases of fracture within the radius of the hospital were treated in the same way and gave the same average result, about £4 million a year in compensation could be saved.

In any given city, if the leading insurance companies united to finance such a scheme they would be far more than repaid by the saving of compensation. If such centers could be founded in, say, 10 of the leading cities of this country, a good start would be made towards general reorganization. At the end of a few years accurate figures would be available, showing how much money has been saved at these centers in comparison with that spent on cases still treated in an unorganized way. Such demonstration would soon lead to the spread of the system to all great towns in the country.

Synovial Whitlow

SYNOVIAL whitlow causes the loss of many working days, and is the source of much litigation under the Workmen's Compensation Act.* Thus, it would perhaps be helpful to give an outline of the "percentage disabilities" which can be sustained in this condition. The stiff finger which cannot be flexed, and which so often follows synovial whitlow, approxi-

mates more or less to the condition of ankylosis of all three joints of the fingers, and of the two joints of the thumb. The lumbrical muscles may effect some movement at the metacarpophalangeal joint, but their action is too weak to be of any practical value. Again, so often the inflammatory reaction has involved and immobilized the lumbrical muscles themselves, and has produced peritendinous adhesions. Imbert, Oddo and Chavernac, in their "Guide pour l'Evaluation des Incapacités," give the following useful figures in the assessment of the disabilities sustained.

Complete stiffness of the digits at both the interphalangeal and the metacarpophalangeal joints:—

Thumb—	Right	Left
In extension	30%	25%
Moderation flexion	25%	20%
Index finger	18%	14%
Middle finger	15%	12%
Ring finger	15%	12%
Little finger	10%	8%

Lesser degrees of stiffness can be assessed accordingly from this table.

Should the finger be completely stiff following sloughing or fixation of the tendon, amputation at the metacarpophalangeal joint should be advised. Suppurative arthritis of the proximal interphalangeal joint may be present, and affords an additional indication for amputation. This does not, of course, apply to the thumb, all of which, or as much as possible, should be preserved. Even a completely stiff thumb can be rendered useful by affording something against which the fingers can oppose themselves. Often the patient himself requests that amputation should be done, as he finds the stiff finger a constant hindrance at his work. Amputation at the metacarpophalangeal joint is assessed by the same writers in the following manner:—

	Right	Left
Thumb	30%	25%
Index finger	15%	10%
Middle finger	10%	8%
Ring finger	10%	8%
Little finger	8%	6%

It is interesting to note that apart from the case where a thumb is stiff in moderate flexion, the percentage disability of amputation at the metacarpophalangeal joint is substantially less than complete stiffness of the corresponding finger.

Industrial Hygiene

DR. LEONARD GREENBURG, Executive Director of the Division of Industrial Hygiene, who is conducting a series of studies on the need of the Division, with special emphasis on the problems presented by silicosis and other dust disease hazards in industry, in a partial report on the progress of the studies presents an outline of their purpose.* The dust hazard phase of the studies, Dr. Greenburg reports, is "designed to obtain fundamental data in a representative number of plants."

Using these data as a basis, it will be possible to:

- determine the incidence of silicosis in its various stages.
- present factual evidence of ex-

posure in an effort to make an accurate adjustment of accrued liability and premium rates.

(c) propose recommendations of a merit system to the Compensation Rating Board whereby premium rates will be based upon the degree of prevention in respective plants.

(d) revise present Industrial Code rules on injurious dusts, fumes and gases.

(e) make specific recommendations for control of dust hazards.

(f) plan and inaugurate a vigorous campaign for the prevention of silicosis in collaboration with industry and labor.

"It is obvious that the success of a study such as the one upon which we are now engaged depends in large measure on the cooperation we receive from certain groups outside the Department of Labor," Dr. Greenburg commented. "It is essential that we have the cooperation and backing of industry and labor. Also, it may be desirable to ask the cooperation of certain unofficial as well as official health groups."

Medical Service in Office Management

WHILE the value of an industrial medical service is receiving attention from industrialists of vision, the importance of such a service in office organization has perhaps been less well recognized.* This may be due to the fact that medical service for employees was originally established to minimize the obligations of the employer under the Workmen's Compensation Act. It was later realized that it had a wider sphere of interest, to promote the health of the worker and produce a substantial reduction in sick absenteeism.

The most important duty of an office medical service is the examination of all prospective new employees. It should be as thorough as that for life assurance, though many people with even grave physical handicaps are able to work with profit both to their employers and to themselves. The proportion rejected should be somewhere near 3%.

The Medical Officer must have an intimate knowledge of the nature of the work and of the environment in which this work will be performed. Most employers pay staff salaries during periods of sickness. This is a burden which a medical service can reduce, by the exclusion of those applicants whose sickness absenteeism is likely to be much above normal.

In a large number of applicants there are minor defects which, if left untreated, will result in invalidism. The medical service can confer a double benefit on such applicants by recommending them for employment on condition that they agree to have the necessary medical treatment—examples of such conditions are carious teeth, pyorrhoea, chronically infected tonsils, defective vision.

The Medical Officer should be in attendance at certain specified times each week, so that both management and staff may know when he is available. By referring any member of the staff whose health does not appear to be satisfactory many ail-

* From an article by J. COSSIE ROSS, CH.M. (Liverpool), F.R.C.S., in *Liverpool Medico-Chirurg.* J., Vol. XLIII, Part 3, 1935.

* *Indust. Bull.*, December, 1935, State of New York Department of Labor.

* T. E. A. STOWELL, Chief Medical Officer, I.C.I., in *Labour Management*, December, 1935.

ments are discoverable in the early stages, and not infrequently cases of grave communicable diseases are thus discovered.

The most common cause of absenteeism is that of influenza, the common cold, and their sequelae. The results of a large scale experiment of inoculation with vaccine were disappointing, as also that of using vitamins to increase resistance. Every sufferer from a cold should be regarded as a leper and sent home and kept away from work until such time as the M. O. certifies him free from infection. Spraying offices in the hope that this will keep down infection is a waste of energy; there is, however, an excellent fumigator which has proved itself effective.

Another common cause of lost time among female members of office staffs is painful menstrual periods. This is in a measure due to a combination of superstition and ignorance. The modern girl, in her sane outlook on life, is an improvement on her mother, and a far greater improvement on her grandmother, but the superstition of the taboo still lingers. Medical supervision and the encouragement of a sane outlook on life can almost entirely banish this particular bogey.

In a recent letter to The Times Mr. Hyde, of the I. W. S., wrote: "One wonders how the employer today can afford to do without the services of a medical man, whose main task is the prevention of sickness." I have figures showing a reduction of 50% in sickness absenteeism in a very large group of office workers, due to the institution of a staff medical service.

Such a service need not entail great expense. All the offices in one building can share the cost in proportion to the number of their employees. Waiting accommodation is necessary, and a consulting room with examination couch, sterilizer, cabinet with the essential instruments, a plentiful supply of hot and cold water and the necessary dressings.

A fully-trained nurse is another essential. To place nursing responsibilities on the shoulders of a welfare worker who is not so trained is unfair both to her and to the patients. It is to be remembered that nurses, by qualifying, do not lose their native common sense and intelligence thereby. They may profitably fill in time by filing or doing various other clerical jobs.

The scale of fees for the medical officer should be approximately 60 guineas per year for a half-day session every week. For office staff it is more satisfactory to have part time medical officers than whole time. The cost of such a service, therefore, is not great, and the return will be a substantial reduction in absenteeism, improved health and happiness, and therefore increased efficiency.

Corporate Practice

A BOMBSHELL opinion* was handed down on October 21, by Judge D. F. Wright, of the Thurston County Superior Court of Washington (state) to the effect that the Olympia Lumberman's Clinic was illegal. It was

* Medical Economics.

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soon followed by Judge Wright's statement that he would issue an order to compel the outfit to dissolve. Many lumber mill operators and logging companies have been using the clinic's services to provide medical care for their employees.

The judge's decision followed charges by Prosecutor Smith Troy that the O.L.C. was actually a corporation engaged in the insurance business and therefore could not be licensed to practice.

This action is expected to have a far-reaching effect on similar organizations that flourish throughout the country.

New York Employers Oppose Occupational Disease Compensation

A MASS meeting was held at the Hotel Astor in New York on November 21, 1935,* to crystalize sentiment among employers against the medical practices and occupational disease amendments to the Workmen's Compensation Law of New York, which were enacted by the 1935 legislature. The meeting was called by a joint-committee of the five brokers' organizations in Greater New York, and many of the industrial groups in the state participated. The additional expense imposed by the amendments on industries in

New York state, to their detriment in competing with business from other states, was stressed by several speakers. It was reported that a number already had to lay off many employees because of the additional expenses under the amendments, and that expenses will increase when the full effect of the occupational disease amendment is felt. A resolution was proposed from the floor that all groups agree to amendments to the present law, to be presented to the 1936 legislature. This motion was heartily endorsed.

N. Y. Regimentation

INDUSTRIAL Commissioner Elmer F. Andrews recently promulgated the following set of rules and regulations governing the application of Chapter 258 and 930 of the Workmen's Compensation Law, familiarly known as the "Free Choice of Doctor" amendment:

1—All doctors whose applications have been disapproved by the various county medical societies may continue to treat workmen's compensation cases until a final decision is rendered by the Industrial Council. (Rule No. 1 not effective after November 1st, 1935).

2—All C-4 reports filed by attending physicians should be verified to insure their value as prima facie evidence in a compensation case.

3—In the event of a serious accident requiring immediate emergency

medical aid an ambulance or any physician may be called to give first aid treatment.

4—Homeopathic and osteopathic societies and boards should receive applications from and recommend for authorization to treat workmen's compensation cases only homeopaths and osteopaths.

5—All specialists, consultants, etc., should submit a report of their findings in triplicate to the attending physician who referred the case to them. It is not necessary that these specialists file a 48-hour report. The completion and filing of all reports is the duty of the attending physician.

6—A registered physiotherapist may treat workmen's compensation cases at his own office or bureau when the case is referred to him by an authorized physician. The authorized physician should, however, give a written direction to the physiotherapist as to the kind of treatment to be rendered and the number of treatments to be given. This direction must be given in writing by the physician and shall constitute a part of the record of the case.

7—Removal of physicians from panels. Section 13-D.

(a) The doctor accused of misconduct shall be notified of the charges in writing by the medical society or board as to the date and time of the hearing.

(b) Careful records shall be kept of the minutes of the hearing.

(c) These records, together with the report of the Board of the medical society with its findings, shall be submitted to the Commissioner.

Appeal by physicians to the Industrial Council to be referred to a subcommittee to report findings to council.

(a) The doctor appealing and the medical society or its board shall be notified in writing as to the date of the hearing.

(b) The doctor may be represented by counsel.

(c) Accurate stenographic or stenotype minutes of the hearing shall be kept for the files of the Commissioner and Industrial Council.

(d) Findings of the committee shall be submitted to the Industrial Council for final action.

8—Arbitration Committee on medical bills: A panel of physicians is to be appointed by the president of each county medical society, who shall submit the names of the physicians on the panel to the Industrial Commissioner. The Commissioner shall, when arranging hearings on medical bills, select two members of each arbitration committee from this panel for each arbitration session, the Industrial Commissioner to set the dates for all hearings and notify all interested parties. The arbitration committee shall submit to the Industrial Commissioner its decisions on a form prescribed and provided by the Industrial Commissioner, who will then forward notice of decision to all interested parties. In the event of disagreement as to the value of medical services rendered a hearing shall be held in the county in which the doctor practices or in which his main or principal office is located. Notice of this hearing shall be sent to the doctor or hospital who rendered the services, the employer and the insurance carrier, any of whom may appear or be represented if they so

* Jour. Am. Insurance, December, 1935.



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LORENZ BOHLER has long been internationally famous for his many successful developments in methods for the treatment of all kinds of fractures. The German editions of his book are well known in America, but their use has naturally been restricted by the limitations of language. Even a fair reading knowledge of German is not sufficient for a complete grasp of principles or a reliable understanding of details of technique. Many American surgeons have wished for a complete and reliable English translation of Dr. Bohler's work, and one is now ready. Not only a complete translation of the fourth German edition, but added material, not previously published, from Dr. Bohler's latest experience with Fractures of the Spine and of the Neck of the Femur. Not a dull machine-like translation by an uncomprehending literary hack, but a work of appreciation done by a man who is himself a well known master-surgeon. Ernest Hey Groves, editor of the British Journal of Surgery, an authority on fractures, who deliberately postponed revision of his own excellent book on the treatment of fractures in order to pay tribute to the Viennese master of the art, and make his work better available to all English-speaking surgeons. It has been well said that Dr. Bohler's book reveals he has that quality of genius which consists in the infinite capacity for taking pains. All of his painstakingly acquired knowledge and experience is now available to every American orthopedist and general surgeon.

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"IT SHALL be the duty of the Division to investigate conditions of occupation with reference to hazards to health and to determine the degree of such hazards, to investigate and evaluate methods for the control of such hazards to assist in the preparation of rules and regulations for the preventing of occupational accidents and diseases, and, in cooperation with the department of public health or otherwise, to promote occupational health and safety education."—Sec. 11A of the law creating the Division, effective 1934.

desire. The arbitration Board shall pass upon the matter in dispute in accordance with Section 13-D of the amended law. Careful records of the hearing shall be kept in the office of the county society.

9—In the event of the rejection of a physician by a county medical society the jurisdiction of the County

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Medical Society has terminated and it cannot reconsider its action. Each county medical society must pass upon the application of each physician within thirty days of the receipt of the application and notify the Industrial Commissioner of its action.

10—Bills for x-rays and other consultants should be made out separately and submitted by the doctor in charge of the case and paid directly by the employer to the doctor rendering the service.

11—A hospital may not secure a license to operate a medical bureau to render care to compensation cases.

12—No insurance company or self-insurer may reduce the size of notice to employees (form C-105) which is to be placed in all places of employment covered by the act, unless such permission is granted on application to the Industrial Commissioner.

13—Physicians treating claimants in hospitals may secure signature of claimants for authorization of copies of any necessary hospital records.

14—The physician in attendance in public hospitals must be the judge as to when the "emergency status" of the case has terminated.

15—Methods for identification of medical inspectors of insurance companies wishing to visit claimants in hospitals must remain in the hands of the hospital themselves.

16—No license is necessary to operate a first aid station for emergency treatments, but no subsequent visits are to be made by claimant to the first aid station.

17—The physician in attendance must seek authorization for a specialist first from the employer; if unable to secure it, he may apply to the Industrial Commissioner if necessity for operation or ability of specialist designated is questioned, in accordance with Section 13 A-5.

18—The interpretation of Section 13 A-5 shall be to the effect that the authority of an employer for the services of a specialist in excess of a \$25.00 fee applies only to the necessity for such services but that the choice of such specialist is entirely within the jurisdiction of the injured worker and the doctor in the case.

19—All medical bureaus and laboratories in operation on July 1st, 1935 shall be charged a license fee, effective from July 1st, 1935 to and including June 30th, 1936.

20—When it is in the interest of the injured employee and where an x-ray is required and it is impossible to secure the services of a qualified x-ray specialist the Board of the Local County Medical Society may designate a specially qualified individual to take x-ray pictures under the supervision of the attending physician. The attending physician however, shall render a bill for such service to the employer. This in no way however, deprives the employer or insurance carrier from having other x-ray pictures taken if they so desire.

21—No advertising matter of any nature on compensation work will be allowed by authorized physicians, medical bureaus or laboratories.

22—That all County Medical Societies be instructed first to investigate all complaints submitted to them and if the evidence warrants it, charges should be preferred against the physicians after which the physicians should be notified in writing of

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the charges, as well as given a bill of particulars so that they may be in a position properly to defend themselves at the hearings.

Mental Hygiene as Applied to Industrial-Accident Prevention

OUR present methods of accident prevention* are based on the presumed need of awakening employees to a sense of responsibility for their own safety. To do this, we spend considerable time trying to scare them into looking out for themselves. Posters showing the horrible results of accidents are prominently displayed. Speeches are made in which the suffering at home as a result of loss of income is vividly explained, and articles are written telling large groups of workers to "do this" or "do that" to avoid dreadful consequences. A number of the individuals for whom this propaganda is prepared pay complaisant attention—and then apply the lesson to some one else. Our general educational campaigns are, no doubt, leaving many things undone.

According to the best authorities, at least 85 or 90% of all accidents have as their proximate causes the mental conditions of workers. This estimate relegates the remainder of the accidents to machine or material failures, "acts of God," and various

more or less indefinite causes. The mental conditions that result in error are lack of knowledge, inattention, confusion, and often an unwarranted sense of superiority typified by the "it-cannot-happen-to-me" attitude. These terms, of course, overlap and are dependent for their existence on a number of things, such as experience, training, worry, fear, fatigue, exhilaration, or some mental subnormality, all of which tend to expose the individual worker to hazard.

Accident investigation and analysis usually stop at the first cause, in as much as most plants are not equipped for further analysis and their executives believe it impracticable to go into psychological causes further than to note that the man was inattentive, disobedient, or, perhaps, careless.

New Chrysler Laboratories

THE Industrial Hygiene Laboratories of the Chrysler Corporation began operation on January 1, 1936. These laboratories, located at the Dodge Main Plant of the Chrysler Corporation, in Detroit, are devoted to the study of occupational diseases and their sources, together with other agencies and conditions of work leading to industrial health hazards. The Laboratories are under the direction of Dr. Stewart F. Meek, as industrial hygienist, with Dr. Cordon C. Harold, as chemist; they were planned under the direction of Dr. Carey P. McCord, who remains associated in the capacity of adviser and consultant.

* EDWARD R. GRANNISS, Travelers Insurance Company, Hartford, Conn., in *Mental Hygiene*, July, 1935.

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Occupational Morbidity and Mortality Study

THE U. S. Public Health Service, in cooperation with the Works Progress Administration, has included in its national "health inventory" project a study, the object of which is the attainment of sickness and mortality rates in relation to occupation.*

From Census data it is estimated that the health of approximately 40% of the total population is affected in varying degrees by their working environment. Thus among the 14 million persons employed in manufacturing and mechanical industries in 1930, more than 900 different occupational exposures to hazardous materials and conditions have been found. Many of these exposures undoubtedly affect health adversely. This supposition is substantiated by the finding of life insurance companies that the life expectancy of industrial workers is six to seven years shorter than that of non-industrial workers. It is the purpose of the Occupational Morbidity and Mortality Study to obtain sickness and death rates for each numerically important disease or disease group according to occupation. Sources of this information are the records of sick benefit associations and the records of personnel departments of companies having sick benefit societies. Information also is being obtained as to raw materials handled, the nature of the end product of each process, and the working conditions surrounding each occupation. The schedule is so arranged that sickness and death rates can be computed for groups exposed to such specific potential health hazards as arsenic, lead, quartz dust, mercury, chromium, extreme temperature changes, dampness, etc. Thus, from a statistical analysis of the schedule, the effects of industrial exposures are measured in terms of occupational morbidity and mortality rates. It is expected that several hundred thousand of these schedules will be obtained by May 1, 1936.

* A.J.P.H., December, 1935.

It is anticipated that a number of interesting by-products will arise from this study: as, for example, the measurement of effects of marital status on health and longevity. The relatively high death rate usually recorded for single persons as compared with married persons frequently is ascribed to the factor of selection.

Injuries to Workers in Ohio

CUTS and lacerations furnished the basis for more occupational injury claims last year than any other form of injury, as they have in preceding years.* The claims due to this class of injury numbered 68,271, or 15,228 more than in 1933.

Crushes and bruises, with 29,810 cases, were second in frequency. Sprains and strains gave rise to 21,834 claims, puncture wounds 12,930, fractures 10,168, burns and scalds 10,987, dislocations 651, traumatic amputations 570, concussions 169, asphyxiations 175, drownings 3, and unclassified 3,680. These figures represent increases over 1933, with the exception of concussions, drownings and unclassified cases.

An analysis of the record shows that the fingers of workers in Ohio industries are more susceptible to injury than other parts of the body, 41,749 claims being based on injuries of this nature. Eye injuries were second with 27,195 cases, the trunk had 22,604, legs 15,565, arms 15,841, hands 12,898, head and face 10,192, feet 7,739 and toes 5,465.

Included in the 10,168 fractures reported in claims for compensation were 1,945 of fingers, 1,883 of toes, 1,349 of arms, 1,354 of ribs, 1,063 of legs, 834 of feet, 390 of hands, 294 of the skull, 348 of teeth, 261 of vertebrae, 144 of the nose, 136 of the pelvis and 88 of the jaws. The extent of the incapacity due to this one type of accident alone, is shown in the fact that workers sustaining fractures suffered a time loss of 1,782,790 days, or more than 22 per cent of the total for all injuries.

* 1934 Annual Statistical Report, Industrial Commission of Ohio.

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od: D 56) and suitable for use as an illuminant when burned in a wick lamp.

GAS OIL: A liquid petroleum distillate having a viscosity intermediate between that of kerosene and lubricating oil.

FUEL OIL: Any liquid or liquefiable petroleum product burned for the generation of heat in an industrial or household furnace or firebox, or for the generation of power in a Diesel engine, exclusive of oils with a flash point below 100°F. Tag Closed Tester, and oils burned in a cotton or wool-wick burner. Fuel oils in common use fall into one of four classes (not here specified).

TAR, PITCH: These terms shall not be applied to petroleum products.

PETROLEUM LUBRICATING GREASE: A combination of a petroleum product and a soap or a mixture of soaps, suitable for certain types of lubrication.

OIL-SHALE: A compact rock of sedimentary origin, with an ash content of more than 33% and containing organic matter that yields oil when destructively distilled but not appreciably when extracted with ordinary solvents for petroleum.

ENGINE DISTILLATE: A refined or unrefined petroleum distillate similar to naphtha, but often of higher distillation range.

TOPS: The unrefined distillate obtained in topping a crude petroleum.

Gasoline: Motor, United States Government

MOTOR gasoline shall be of one grade only. Federal specifications for certain of these substances are abstracted as follows:

Gasoline: Motor, U. S. Government⁸—This gasoline shall be of one grade only. It shall be volatile hydrocarbon fuel free from water and suspended matter, and shall be suitable for use as fuel in internal combustion engines. **Distillation range**—When the thermometer reads 75°C. (167°F.) not less than 10% shall be evaporated. When the thermometer reads 200°C. (392°F.) not less than 90% shall be evaporated. When the thermometer reads 140°C. (284°F.) not less than 50% shall be evaporated. The vapor pressure at 37.8°C. (100°F.) shall not exceed 12 pounds per square inch. The vapor pressure shall not exceed eight pounds per square inch in tropical countries; intermediate pressures in warm weather. Used as fuel for automobile, tractor, motor boat, and similar engines.

Motor-Fuel V⁷—Motor-Fuel V shall be of but one grade—a highly volatile hydrocarbon liquid. When the thermometer reads 70°C. (158°F.) not less than 10% shall be evaporated; at 125°C. (257°F.) not less than 50% shall be evaporated; at 180°C. (356°F.) not less than 90% shall be evaporated. The vapor pressure at 37.8°C. (100°F.) shall not exceed 10 pounds per square inch. This specification covers a grade of motor fuel which is suitable for ambulances, fire engines, emergency vehicles, military and naval equipment, and for other equipment under adverse conditions of starting and acceleration.

Ether: Petroleum⁸—Petroleum ether shall be of two grades, A and B, respectively. Grade A should be composed solely of low boiling hydrocarbon distillates. It shall distill completely between 30° and 80°C. (86° and 176°F.). Grade B shall distill completely between 30° and 65°C. (86° and 149°F.). Neither grade to contain benzene hydrocarbons.

Thinner: Paint, Volatile Mineral Spirits⁹—This specification covers that grade of petroleum distillate known as "mineral spirits," or "petroleum spirits" for use in paint. Distillate below 130°C. (266°F.) shall not exceed 5%. Distillate below (230°C. (446°F.)) shall not be less than 97%. It is frequently used in place of turpentine in thinning oil paints.

Thinner: Paint (for) Semipaste Paints¹⁰—This specification covers one grade of composite vehicle which contains, in one liquid, drying oil, drier, and volatile thinner. When mixed in any proportion with pure raw linseed oil (also specified), the resulting mixture shall be clear and shall show no separation of precipitation on standing 18 hours. Non-volatile matter not less than 50% by weight. Such preparations are sometimes called "thinning mixtures for paint," "japan oil," "paint oil," "linseed oil substitute," etc.

Drier: Paint, Liquid¹¹—Type I, for general use, containing lead. Type II, for special lead-free paint, containing no lead. This specification applies both to straight oil drier, that is, material free from resins or "gums," and to "japan drier," that is, material containing resins or "gums." Drier containing lead is to be preferred for general use.

SERIES I—Leading case: White, male, American, aged 48 (1923), married, two children (none dead), painter by trade. Parental history negative. Patient was the oldest of six children, viz., four brothers and two sisters. Only the history of two brothers, who were also painters, is significant and will be referred to below.

Patient passed employer's entrance examination February, 1919, for job in painting department of automobile assembly plant. His work was to take off fenders and small parts from traveling chain which had carried them through a tank of black enamel (specifications: Asphaltum 16-17%, linseed oil 22-24%, lead oleate drier 1-3%, petroleum distillate 62%). An analysis by the Laboratories of the Ohio Health Department showed the petroleum distillate or "mineral spirits," used both as a cleaning fluid (degreaser) and enamel thinner, to be composed of "hydrocarbons similar to gasoline, 95% by volume distilling below 203°C., the residue being heavy mineral oil"¹². (See ¹² Circ. No. 98, U. S. Bureau of Standards, Federal Specifications No. 16, For Volatile Mineral Spirits for Thinning Paints, revised January 2, 1923).

Five men were employed in work similar to that of patient. A mechanical ventilation system was in operation but did not obviate strong odor of distillates. The work quarters were rather small, while the amount of output was large and constant.

Soon after first employment the patient was put to cleaning small parts in a tank of the cleaning fluid. After some months he was returned to the enameling process again. He was next put into the finishing room for one and one-half years, where vapors of the same distillate were much worse because the temperature was kept from 98° to 104° F. The work-day was eight hours throughout, with a half-hour lunch period; frequent overtime up to four hours—six days per week. The patient often worked eight hours at a time with his hands and forearms in the cleaner or enamel fluid several times a minute. He worked fairly steadily to

April 26, 1922, when he was forced to quit, owing to ill-health.

Early in the work (1919) he developed a series of boils, other employees being similarly affected. The chief symptoms while at work were: smarting and running eyes, burning sensation in nose and throat, headache, dizziness, anorexia, nausea, sometimes vomiting, "naphtha jags," nervousness, prostration, muscular twitchings, loss of strength (it became difficult to lift parts weighing as little as 25 lbs.), and gradual loss of weight from 138 to 121 lbs.

The patient's physician had known him for years, and attested to his previous good health,



Series I. Leading Case.—Left: Appearance at Age 25—Right: Same: Appearance at Age 40 (Central figure); Weight 138 lbs.

habits and steadiness. The patient visited the physician early in the above mentioned work, complaining of "rheumatism" starting in the back. Some other findings (above listed) began to appear. Patient failed to respond to tonics, and one year after quitting work (i.e., in March, 1923) the physician reported: "He is little better—has lost his original vigor, slowed up, has an earnest desire to work and has tried several simple jobs but can't do it. He is mentally depressed and worried. Prognosis unfavorable."

One of the patient's former foremen, who had gone into business for himself, gave the patient a job for a few days (March, 1923) painting automobiles, but found he could work no more than 15 to 20 minutes at a time, then he would stop and have to be reminded what to do. He was also too weak to work for more than a few minutes at a time and was uncertain of himself. He stated he could not make his hands go, his back got too weak to support him upright, he "got so tired had to give up."

When I first saw the patient, March 26, 1923, he appeared listless, fagged out—a thin, rather pale man. He added to the above coterie of symptoms as follows: stiffness and pain in back, cold sensations, attacks of diplopia, hearing poor and becoming worse, cough with much sputum (several recent sputum examinations reported "negative"), hot flashes, pains about heart, ankles swollen at times (but not at present). His weight was then 121 lbs., temperature 98°F., pulse 104, regular, equal both wrists; hemoglobin 95%, Wassermann test negative. Four months after this time the patient was allowed state compensation at total disability for 44 weeks (already lost), for occupational naphtha poisoning.

AFTER HISTORY: On July 22, 1923, patient took up a part-time job as an assembler in a motor fire-

truck factory, where he was not exposed to paints in any way. He was carried by state compensation on a wage impairment basis for the next five and one-half years, or until Aug. 6, 1928. During this time his new employer permitted him to work as he felt able, which was usually about three to four days per week with, often, incomplete days. The Commission's physician reported on Aug. 27, 1928: "He gets weak spells, and has to lay off and loses much time. He is small and appears stupid and dull. He weighs 118 lbs. He is mentally incompetent and unstable, and is still partially disabled." He continued to work part time until December 31, 1929, when he was laid off, and has not worked since except about the house.

PRESENT FINDINGS: I examined patient August 24, 1933, at his home in an outlying suburban district. He is now approaching 60 years of age, height 5 ft. 7 in., weight 107 lbs. (with light clothing), appearance very thin, but appears agile; gait slow, measured; mentally fairly alert, well poised; somewhat hard of hearing. Patient has been a home owner; used alcohol sparingly, never drunk; smoked cigarettes more or less since 25 years of age; used patent "tonics" off and on. No noteworthy illness prior to his exposure above described.

PRESENT COMPLAINTS: Has frequent chilly sensations, usually when in bed; more or less palpitation with pain in heart region; had a syncopal attack about two months ago which however was the first for years; becomes blinded on stooping over or on sudden rapid movement. Has a persistent cough and raises a good deal of morning sputum (has never suffered from hay fever or functional asthma). Has more or less headache with dizziness; likewise, tinnitus, especially at night. Weight has been as low as 104 lbs., with



Same: Appearance at Age 59, or 10 Years after Last Exposure; Weight 107 lbs.; Picture taken August 24, 1933

corresponding weakness and loss of strength. No particular indigestion, but has some nausea with gurgling in bowels and pains in lower abdomen. Suffers from constipation with hemorrhoids, although without bleeding. Nocturia once per night for the last three years. Sleep is disturbed and not refreshing. Able to work about the house and yard and to use street cars alone.

PRESENT PHYSICAL FINDINGS: Hair thin. Vision 20/30th each eye (wears bi-focals), pinguecula and pterygium right eye, conjunctivae slightly yellowish; senile puffiness of both lower lids.

Hearing, right ear, nearly gone; left ear impaired; drum reflexes normal. Several molar teeth missing; one pre-molar carious; lower incisors show a blue discoloration (on teeth, not in gums), some tartar, also breath odor; gums moderately retracted, somewhat purple in color; possible focal pyorrhea, but no tenderness or bleeding. Tongue rather coated. Pharynx somewhat congested. Temperature 99.4° (outdoor temperature 88°). Neck, thin, and shows moderate carotid pulsations. The chest is emaciated, the skin showing several scattered red moles and prominence of veins below the left breast. Lung examination reveals nothing of significance; heart is rapid; the patient becomes dizzy and says he is made blind by holding his breath (by test) for 20 seconds. The abdomen is scaphoid but presents no abnormalities. Each inguinal ring admits one finger tip. The skin of the buttocks is quite scaly; old hemorrhoidal tags present. The lower and upper extremities are less emaciated than the trunk. There are small superficial varicose veins in the legs. Both hand grips (dynamometer test) low normal. There is slight ataxia.

The pulse is 106, soft, compressible and equal in both radials. The blood pressure (seated), without special exercise, is 123/82 in the right arm and 132/90 in the left arm. The patellar reflexes are normal, but the abdominal and cremasteric are absent; there are no abnormal reflexes. Urine negative. Blood findings show hemoglobin 90%, gross appearance and clotting time normal; differential count (%)—polymorphonuclears 70, small lymphocytes 15, large lymphocytes 12, transitionals 1, eosinophiles 1, basophiles 1. Sputum examination for tuberculosis negative.

OTHER CASES, SIMILAR EXPOSURE: (a) The man whose place patient took (1919) had quit, so patient said, because of "stomach trouble"; he later died. A fellow employee died with pneumonia within two days after ceasing work; another, who was a large, well-developed man, is now (March, 1923) "skin and bones." During the three years and two months which patient worked here, there were five different foremen of the enameling division, all of whom complained of symptoms similar to, but less marked than, the patient's. Two of these foremen, when seen, reported that men often got into "trances" while working. The workmen rarely stayed long, because of the health complaints suffered and the ill-repute of the job as a health hazard, but the pay was very good and on day-work basis. However, "work was speeded up to the limit." The plant manager (March, 1923) told the writer that this work was an acknowledged health hazard, but that several experts had so far failed to solve it. However in May, 1923, a letter was received from the chief surgeon of the corporation stating that a new system for doing this work had been perfected which would "remedy all occupational hazards now existing."

(b) One of the patient's younger brothers (married, three children), who was also a painter, worked for five years (1916-1921) at the same plant, but in the color varnish division where vapors of turpentine and mineral spirits were the chief hazard (there being no material skin-wetting by same). This man died in 1929 at the age of 54 years after being completely disabled for the last two years. His impaired health seemingly began with this exposure but was later contributed to by lead poisoning in another plant where he

worked several years in the paint department, painting and sanding lead coats. His case was carried as one of total permanent disability due to "lead poisoning" by the Industrial Commission until his death, when further benefits were awarded his dependents.

(c) In July, 1924, my attention was called to another case of exactly similar character to the leading case herewith in another employee of this same enameling process using petroleum naphtha as a cleaner and enamel thinner. Here the workman was exposed less to skin wetting, but had the added exposure of inhalation of spray. The work was carried on only at night in a rather small room which also contained the endless chain-dipping apparatus as above described. The men were still applying the first coat by dipping the parts by hand in a tank of enamel at a temperature of 88°-90°F. The parts were next baked in an oven heated to 500°F. Thereafter the parts were sprayed while still heated to 150°-200°F. This produced excessive smoke and odor, chiefly due to the linseed oil and asphaltum content of the enamel. Despite a powerful system of artificial ventilation, this workman found it necessary to discard his mask because his glasses became so obscured that he could not see. The chief hazard again was the dipping of the right hand and forearm into the black enamel solution for one to three hours at a spell.

The chief symptoms began with respiratory complaints: coughing, spitting up of black chunks, and pains in the chest. There were attacks of dizziness, frontal headaches, occasional "jags" (which were common to all the men), loss of 15 pounds in weight and progressive weakness so that, although he was transferred to lighter jobs, he had to quit because of loss of strength. When seen, this patient appeared somewhat anemic, with a yellowish tint; several sputum examinations were negative. He had considerable dyspnea but no rales. His temperature was normal. He complained of dizziness and headache. His physician, who had known him for 30 years, vouched for his previous good health.

Of the five men on the job, two had worked one year, one had worked two years, one had worked three years. The patient under investigation had worked one and one-half years.

SERIES II—LEADING CASE: White, male, American, aged 31 (1931), married, three children (none dead), shingle-stainer by trade. Family history negative (?).

Patient's work consisted in submerging wood shingles up and down by hand in a tank of shingle stain, varying as to pigments* used (never in dust form), but (of interest here) the vehicle consisting of petroleum naphtha one part, and kerosene two parts. In the case of darker colored stains, creosote might be added in the proportion of 1½ quarts to 10 gallons of total mixture (therefore about 4%). The hands and arms, nearly to the elbows, were soaked in the mixture, and the vapors arising were directly inhaled. While the building was of brick construction and the workroom was large, there was no artificial ventilation of any sort, no hoods or other protection. Even room ventilation was by windows and a door on one side only. There was no heating in the winter time. Four or five men worked at this process on

* Zinc oxide, lamp black, burnt umber, chromium oxide; lithophone; also linseed oil might be added.

a piecework basis. Three or four others applied stain, similarly prepared, by a brush method. The work hours varied from six to 14 per day, depending on orders to be filled.

Patient worked at trade in present plant for 11 months when about August 15, 1931, he began to suffer from diarrhea, prickling of the skin, numbness attacks, vertigo, gastric disturbances, weakness and loss of weight. He continued to work until October 17, 1931, when he was compelled to quit because of ill-health, and called in a physician who recorded on that date: Pulse, 110, temperature 100°F., respiration increased, paresthesia, lumbar pain, restlessness, insomnia, diarrhea, gastric upset, cardiac disturbances and headache. His color was rather sallow. Urine examination negative. The patient told him that soon after he started work he began to have irritation and rashes on his hands and arms, also inflammation of the eyes, followed after about three months with headaches, sore throat, bleeding gums and diarrhea attacks. His fingers, hands, and forearms would get numb. He had lost weight from about 170 to 130 lbs. He had enjoyed good health previous to the present employment. He reported that other employees at the same plant were similarly annoyed. His employer at this time claimed that the patient was really suffering from an attack of flu; there was, however, no epidemic of same in the vicinity at the time.

I first saw the patient on October 21, 1931, at which time he did not appear sick. However, his pulse was 92, temperature 99°F., respiration-rate normal. He had a slight cough, tongue coated, mouth condition in general good, throat injected (possibly from cigarettes), tonsils negative. There was complete absence of knee jerks, but the pupillary reflexes were normal. He complained of pain in the abdomen with cramps at intervals although local examination was negative. His wife said that he slept little, and kept talking and shouting in his sleep. He had little appetite, was very nervous and worried, particularly about losing time from work. Hemoglobin 90% and differential count (%): polymorphonuclears 66, lymphocytes 20, mononuclears 7, eosinophiles 6, basophiles 1. No stippling.

October 28, 1931: Condition the same. Temperature 99°-100°F.

October 29, 1931: Patient developed marked heart irregularity, which stopped promptly upon administration of digitalis. That same afternoon I called at the patient's residence and found him improved but still complaining of weakness, some coughing, occasional pain in the abdomen, sharp pains in the liver region, an indifferent appetite, with two or three nights of fair sleep followed by a night of restlessness. No headache remained, bowels normal. Pulse was 88, temperature 97.4°, respiration normal, circulation in feet poor, tenderness over gall bladder region, tongue badly coated, skin slightly jaundiced.

During November, 1931, an internist was called in, who reported a continuance of the same symptoms and physical findings. Laboratory tests proved essentially negative. His diagnosis was guardedly given as chronic naphtha poisoning.

February 2, 1932: Patient still disabled, general weakness, no material increase in weight. State compensation had been allowed.

July 3, 1932: Patient has slowly improved. Has been carried as a total disability to this date. Com-

pensation reduced by one-third to November 27, 1932.

November 18, 1932: Patient seen by internist sent by the Commission who reported as follows: his arms and legs give out; occasional attacks of dizziness; he feels peculiar at times; symptoms are in the main subjective; suggest that patient be placed on reduced compensation and urged to secure suitable employment. Accordingly, compensation was reduced to \$5.00 per week. The patient still continued to insist on his inability to work, although he admitted his condition was much improved. Reason: syncopal attacks upon all work efforts.

April 18, 1933: Patient called at my office, when I found his weight to be 160 pounds. He was apparently normal in appearance, but complaining of night sweats two or three times a week, faintness attacks, knees giving out, coughing at night but no expectoration, soreness in chest and over liver region, dyspneic attacks, nightmare, headaches "all the time," aching in legs, could not stay in one position any length of time, weight varying from 142 to 160 pounds within three to four weeks' time, bowels varying between constipation and diarrhea, nocturia three or more times nightly, easily irritated, etc. Patient considered that he was at his best now. Physical examination revealed slight cough at intervals, heart rates 120 per minute increased to 144 on moderate exercise, returning to 112 after three minutes, respirations 28-30, breath-holding 25 seconds, sensitiveness of abdomen, patellar reflexes absent, blood pressure before exercise 124/80, after exercise 118/78; mental condition calm. A very complete laboratory investigation was ordered, which was carried out at the University Hospital. This included electro-cardiograph, blood findings, basal metabolism, urine, and x-ray of the chest. These were reported April 23, 1933, as entirely negative except that the heart rate was 90, regular.

In the meantime I examined the patient at his residence, where he was working a small home garden on April 20, 1933. Noted an occasional unproductive cough, blood pressure (after rest) 116/70, pulse 104, breath-holding 23-24 seconds. He complained of weakness in the knees and blind spells on work effort.

April 27, 1933: Patient called at my office. Pulse 110 (after rest). He was still drawing \$5.00 per week compensation, and wanted to go to work if he could but feared he could not. Despite his complaints and rapid pulse, I advised outdoor work without heavy lifting or prolonged strain, cessation of compensation, family care by Red Cross, and tried to convince him of the necessity of self-confidence. I considered him a complete neurasthenic at the time—left that way, however, by the effects of prolonged absorption of petroleum distillates.

October 3, 1933: Patient has been slumping for the past several weeks. His physician sent him to a radiologist who, September 20, 1933, reports: "Considerable fine infiltration of both lungs which looks mighty suspicious of beginning tuberculosis." Patient has lost some weight, complains of numbness and prickling sensations in hands and arms, general skin sensitiveness, rather marked shortness of breath, chilly sensations with night sweats, considerable cough with some expectoration (repeatedly reported negative for tuberculosis), weakness in the knees in attempting fairly long

walks, so that had to give up an attempt at squirrel hunting.

OTHER CASES, SAME EXPOSURE: (a) The above case could not stand by itself as an occupational disease. It is particularly important, however, because it brought out the following: The patient's father-in-law, aged 49 (1929), formerly a farmer and carpenter in good health, worked for six months at the same plant as a shingle-stainer when he quit, so he claimed, because of ill-health which he laid to the absorption and inhalation of the staining solution. He was working in the darker stains containing a low percentage of creosote in the naphtha-kerosene mixture. His symptoms were constant skin itching, occasional rashes and nervousness. No bowel disturbances. After some months he again went to work in the same plant (1930), when he quit after two months because of the more marked return of the same symptoms. During this period he worked on light-colored stain containing no creosote. After a few weeks' lay-off he again tried the same job but worked only one and one-half days when he quit because of marked dermatitis. This disappeared in the main, very promptly, but was followed by generalized pruritis and frequent recurrence of a low macular dermatitis on the arms.

I saw this patient first October 18, 1931, when he was still complaining of the same symptoms, although he appeared normal. He had been put on State compensation. From superficial observation I discovered the case as one of malingering or neurasthenia.

This man again called on me, September 26, 1933, having, in the meantime, made the rounds of eight or 10 physicians, including several specialists. He had drawn a small amount of State compensation to September 3, 1932, when this was stopped. His symptoms were still typically neurasthenic, with a great deal of complaint of generalized pruritis and restlessness.

(b) Son of the above case (a), aged 27 (1930), single. Worked at the same place for one and one-half years, when he quit because of general ill-health, principally insomnia, nervousness, pruritis, paresthesias and occasional skin rash. No bowel disturbance. While the pay had been good he had preferred to take up insurance work at which he was now employed. He had not filed claim for compensation.

I next saw this young man on January 27, 1933, when he called upon me, stating that he had been employed in the same plant for the past four and one-half months but that he had just quit because he was suffering from sleeplessness, chronic headache, pain in the eyes, loss of appetite, constipation, "crawly" skin, and nervousness. He was next employed for a time by the City Relief Division. On September 26, 1933, he was still complaining of the same symptoms, and claimed loss of weight from 165 to 145 pounds. He is now under State compensation.

(c) Another employee, aged 27 (October, 1931), married, no children, still at work as a brusher, was complaining of the usual protean symptoms. He continued to work until December 23, 1931, when he quit because of symptoms described by still another physician as "weakness, gastric cramps, eye strain, vertigo, insomnia, constant headache, cramps in legs, dental caries, very nervous, and anorexia."

On August 1, 1933, this patient had not worked

since quitting his job December 23, 1931. He had been seen by several physicians and an internist employed by the Commission. He has been carried on partial State compensation to date. He claimed loss of weight from 155 to 134 pounds. He did not appear materially sick on first observation, but he had the usual complex of neurasthenic symptoms, which in themselves fluctuate greatly from week to week. "Whenever he thinks he is well, he suffers a prompt relapse." It was noted that his hand was very moist in shaking hands.

On this date, August 1, 1933, he was seen by another internist to whom he was referred by the



Series II. (Case C); 22 Months after Quitting Job; Still Disabled; Picture taken October 2, 1933

Industrial Commission. I am indebted to this internist for the following additional report: Age 29; cold, sweaty hands and feet; reflexes moderately exaggerated; diarrhea two to four times daily; tender abdomen; potential inguinal hernia; sensory system tests normal; gums recessed and tonsils badly infected, throat injected, teeth in fair condition; urine negative (two specimens); Wassermann negative; blood pressure 112/72; hemoglobin 80%, red cells 4,100,000, white cells 6,200, differential count: Polys 54, small lymphs 42, large lymphs 2, mononuclears 2. Heart and lungs negative. Reflex emptying of stomach about normal.

His physician reported his findings to the Industrial Commission, August 14, 1933, as: gastric cramp (not from indigestion), anorexia, conjunctivitis, easily exhausted, weak, lost weight, insomnia, constant headache, dental caries (low resistance, gums easily infected), diarrhea at various times, secondary anemia, hands and feet perspire, vertigo, pruritis. On September 12, 1933, the same symptoms prevailed, as well as dizzy spells; "patient is becoming cachectic." On this same date his physician reported the findings of many blood cells in the urine which, he said, had not been a constant finding. And on the same date, an outside laboratory reported hemoglobin 68%, red cells 3,705,000, white cells 11,700, differential count (%): polys 70, small lymphs 20, large lymphs 6, mononuclears 1.

October 2, 1933: I saw patient at his residence on this date. He was seated on the front porch and apparently in no immediate distress. He felt that he was improving, but stated he could maintain no continued effort at anything. The palms of his hands were very moist. His complaints were: chilly sensations with sweats, cardiac pains, and

pains in the back and legs, pruritis, continued headaches with dizziness, some recent painfulness of urination, about one good night's sleep per week. His appetite varied greatly. He stated that he had worked about two years at brushing the stain on shingles, not dipping shingles, so that this exposure had been chiefly to the inhalation of vapors. His work varied from six to 14 hours per day. His onset symptoms had been headache, dyspepsia, pains in the calves of the legs, general pruritis.

(d) September 26, 1933: Another employee, brother to (b) above, aged (about) 33, has worked at this plant for several years, but has been in the shingle staining process for only the past year. He presents the same complaints, but has less exposure because work has been more irregular. He is still so employed.

(e) Another employee, aged about 50, was similarly disabled in 1930, after about six months' employment. He was given State compensation, and left the state.

SERIES III — LEADING CASE: Female, aged 20 (summer, 1931), single, born in Ohio, of native parents. Height 66 inches, weight 158 lbs. Completed second year high school. "Always previously healthy." Stock-clerk in art works about two years, then assigned, with five other girls, the task of cleaning metal trays with petroleum naphtha to free same of dirt and grease preparatory to enameling. The trays were dipped in a can containing several gallons of the naphtha where the patient scrubbed them with a cloth. She was thus exposed to skin absorption and inhalation of va-



Series III. Leading Case—Left: at Age 19, Before Exposure, Summer 1931; Weight 158 lbs.—**Right:** Same: at Age 20, Four Months after Ceasing Exposure of Five Weeks, November-December, 1931; Weight 92 lbs.; Picture taken May, 1932. (Patient lost about 25 lbs. more weight in the course of the next four months, or down to 67 lbs.)

pors. Patient was the only "washer," the other girls doing the drying. Patient worked eight and one-half hours daily, Saturday five hours; overtime to 7:30 P.M. "quite a number of evenings." Began such work the latter part of November, 1931. Work was in closed room without ventilation. Total exposure, about five weeks.

Symptoms began with eyes smarting, throat burning, drowsiness, loss of appetite. Noticed headache almost from first day, also nausea and gen-

eral tired feeling. Laid off January 1 to 3, 1932, with acute throat, "different from any she had ever had." Returned to work January 4; remained to January 7, when severe headache, weakness, nervousness, involuntary muscular twitching and near-collapse compelled cessation from work. Four physicians who saw her, one until about February 7, 1932, were told of gasoline or naphtha exposure but hesitated to diagnose the case. The consensus



Same: at Age 21; Picture taken August 27, 1933, or Five Months after Recovery Began; Health Apparently Restored; Weight 140 lbs.

of medical opinion seemed to be that the girl had developed an acute psychosis—possibly post-infectious (following sore throat). The family physician reported that she lost her mental faculties after a few days and remained so until he was dismissed from case (February 7).

Her parents then removed her to a "rational living" rest home in a neighboring city because, they said, medical opinion was that rest and proper food offered the only hope in the case. Here she was without medical care. She grew worse, but remained at the place until about May 1, 1932, when she was brought back home and another physician saw her. He found her greatly emaciated, weight 92 lbs., with severe headaches, insomnia, extreme nervousness, mentality "somewhat affected." She also complained of sore mouth and throat; she had continual spitting of slimy saliva with occasional vomiting of large quantities of mucus. The bowels were very loose. She had involuntaries when she stood up. She was unable to eat or drink while standing or to take nourishment except while lying down; anorexia was marked. Some temperature at times. Urinary suppression two or three days at a time.

June 25, 1932: A record on an official form reported: sore throat, and mouth, headache, no control of muscles, complete loss of appetite; sore hands.

July 18, 1932: Her physician reported (in addition): constant working of phlegm from stomach. vomiting, marked loss of weight.

August 2, 1932: Her physician reported: spitting and vomiting of mucus continues; mouth and throat have exceedingly foamy spittle. (The mother later stated that long tough strings, or bands, of mucus were pulled out of mouth and throat "every little while" by wrapping same on a cloth). Diarrheic stools, three to eight times a day, often involuntary. Choreiform movements at times; strong sedatives to produce sleep; must

be cared for like a child; has recently had large gatherings of pus on face and hands which are now peeling off with large patches of skin. Patient's weight 85 lbs.

September 5, 1932: Diarrhea, six to eight involuntaries daily. Eating better, but weight decreasing; can't be moved for trip to hospital.

On September 15, 1932, I examined patient at her home, securing additional findings as follows:

FAMILY HISTORY: The patient was the older of two children—the other a brother of 17, living and well. Father and mother living and well. Father's father died at 50 years (typhoid fever); father's mother living at 80 years. Mother's parents both living and well.

PAST ILLNESS: Usual children's diseases without complications. Had pneumonia of moderate severity when 7 to 10 years of age. Always well, and in robust health otherwise.

PRESENT ILLNESS: Menstruation stopped December, 1931; appeared only once or twice to date; Wassermann (and associated tests) negative; in recent past, unable to talk for weeks or to sign her mark to official papers. Hair came out markedly. Diarrhea, which began July 4, 1932, is now much better; abdomen formally tender; hands burned.

PRESENT CONDITION: In bed, greatly emaciated, weight about 70 lbs. (it decreased to about 65 lbs. in the next few weeks). Skin dry, shriveled; healing scars of recent infections on face, hands, and left shin. Answers questions in monosyllables, mentally semi-stuporous. Complains that feet burn, but are not tender; hands burn only slightly. Headache all the time.

Scalp and hair normal; desquamation on hands and neck. Pupils somewhat dilated (eyes not tested for vision); ocular reflexes normal; lids pale. Ears, mastoids and nose negative. Lips pale. Teeth show some caries with marked tartar deposit (had fine teeth before present illness); some dental inlay noted. Gums somewhat retracted, some pyorrhea. Tongue coated, fissured, slightly tremulous. Tonsils somewhat enlarged, but not inflamed. Pharynx somewhat injected; voice husky (only able to talk for past six weeks). Neck negative (except emaciation and skin desquamation).

Chest flat, spaces sunken; there is great emaciation of thoracic wall; also limited expansion—breath sounds barely audible; breasts appear completely atrophied. Heart rapid, normal otherwise. Abdomen and pelvis scaphoid; normal otherwise. Kidneys now functioning normally (several urine examinations reported negative). Slight inguinal adenitis. Rectum somewhat prolapsed; old tags of hemorrhoids; healing bed score scar on right buttock.

Lower extremities greatly emaciated; arches high but some foot-drop (disuse). Hands, wrists and fingers show scaling with redness; nails negative. Radial pulses equal, rate 120.

Reflexes: patellar exaggerated; balance negative or absent.

March 16, 1933: Her physician reported: skin on entire body, especially hands to elbows, still very dry and scaly; mental condition still impoverished.

LATER HISTORY (from patient and parents), Aug. 27, 1933: Began to mend rapidly in March, 1933. Appetite became voracious, strength and weight increased rapidly, was able to do light work about house in April. Went to work, nine hours daily (50 hours per week), in a glove factory about

June 15, 1933, where she is now employed except that the NRA has reduced hours of work to eight per day and maximum of 40 hours per week. She sews wristbands on cotton gloves, using an electric sewing machine, piece-work.

Now feels entirely normal. Weight 140 lbs. (was 142 lbs. a few weeks ago). Only remaining complaints: skin of hands sensitive; feet swell at times; six teeth have had to be filled, while a low-grade abscess about a lower right molar has been lanced three times and is still under observation. Teeth, however, appear excellent, none missing.

Further examination shows tonsils more or less visible with slight anterior cervical adenitis (no tenderness). Lungs, heart, abdomen negative. Patellar reflexes slightly exaggerated. Pulse 68, regular and equal in both wrists; normal response to (light) exercise. Hand grips, breath-holding and other strength tests normal. Blood pressure: right arm 112/72; left arm 110/78. Hemoglobin 100%. Blood smears show reds and whites normal. Differential count (%): polymorphonuclears 50, large and small lymphocytes 41, large monocytes 6, eosinophiles 1, basophiles 2; clotting time normal. Urine negative. Mentality tests entirely negative.

SIMILAR CASES, SAME EXPOSURE: (a) The five other girls working with patient during her five weeks of naphtha exposure also complained of symptoms similar to patient, but not so marked. They did not have their hands and forearms wet in the naphtha. Their task was to wipe, arrange and stack up the trays after patient scrubbed them in the naphtha. They were also not directly over the can of cleaning naphtha, and evidently did not breathe the vapors in equal concentration, but patient said the whole room smelled strongly of the vapors of naphtha.

(b) A young man, aged 19, who was put on to take the patient's place, when she was forced to quit (January 7, 1931), worked for two weeks, when he experienced similar symptoms which became so marked that he was compelled to give up the work at the end of that time. He was disabled for about two months, but was up and around most of this time during which, according to witnesses, he frequently acted and talked as though he were drunk. He eventually recovered and returned to work at another job in the same factory. The job in question—washing metal trays in naphtha—was discontinued when this young man became disabled.

SERIES IV—SIGNIFICANT CASES: 1. This case has been referred to me by Dr. Ira S. Wile, New York City. Male, white, American, aged 26 (1933), single, weight normally 148, height 5 ft. 10 in., no previous illnesses save grippe (tonsils were removed in 1911), no accidents, habits normal, family history negative.

Employed four years in an oil refinery, where was subjected to distillates escaping from petroleum stills, more exposure last two years. The petroleum stills were under cover and the patient was busied in a supervising capacity, being called to "trouble" points where the distillates were naturally more prevalent. Once, when transferred to another place, there was more than the usual exposure over a period of a few days (followed by breathing difficulty and substernal pains). Apparently some other employees had mild symptoms of poisoning, which had been recognized and no doubt overlooked in a few instances of men

who felt incapable of continuing the work. No other workers, however, developed a symptomatology as complete as the patient's.

Symptoms began about the beginning of the second year of employment and involved lethargy, fatigability, some embarrassment of respiration, interference with gait, some loss of attention, interest and capacity for prolonged mental application, and later muscular twitchings. There was some throat irritation, along with enlargement of glands at various times. The case went unrecognized by physicians for more than a year.

In the spring of 1933 this patient was subjected to appendectomy because of tenderness in abdomen. Later he was referred to a neurologist who, after a thorough examination, reported no organic causes for his condition. Among the features reported by the neurologist (June 1, 1933) were recurrent attacks of pain in the left shoulder and neck and, later, extending to the right side.

After getting up from the appendectomy, which was performed under spinal anesthesia, it was noted that his left calf muscles were smaller than the right. However, there was no change in the ankle jerk on that side and the motor power of that group of muscles was perfectly normal, from which it was concluded that this condition was local in the muscle itself. Extensive laboratory examinations proved negative. The red cell count was: R.B.C. 5,200,000; W.B.C. 7,900; hemoglobin 90%; platelets 240,000; polynuclear staff 2%; polynuclear segment 61%; eosinophiles 1%; lymphocytes 30%; monocytes 5%. The metabolic rate was minus 16 on June 22, 1933, at which time his weight had increased four lbs. from a previous loss of about 20 pounds in less than two years.

At the height of the affliction (April and May, 1933) patient's weight had fallen from 148 to 132 pounds, but he was apparently in good health, although thin appearing. The physical findings of significance were: occasional cough accompanied with pain and rarely a little red tinged expectoration; physical examination of chest negative (no x-rays taken). Tenderness over the appendix later resulted in operation as above stated. There was complaint of difficulty in walking, with perhaps tendency to steppage gait. Basal metabolism was minus 24. later minus 16. There had been no skin involvement at any time. The patient's complaints were, very occasionally, slight febrile disturbances (T 99.2° mouth), palpitation on slight exertion, headache (at times quite severe), "having to drag self to work," some anorexia. Sleep was varied according to work shift.

September 14, 1933: Patient's general condition improved, weight 140 lbs.

This case is of interest because of general resemblance in its principal features to the group cases reported elsewhere in this paper. By itself, and unassociated with its history of industrial exposure to petroleum distillates, it would be entirely anomalous. It will be watched with interest. Is there a definite relationship?

Case 2. White, male, aged 27, American, married, rubber worker, engaged in preparing dry rubber stock with benzine, from 1927 to August, 1932. Had previously worked in another rubber company (occupation unspecified). Noticeable symptoms appeared August 12, 1932, with bleeding from nose and gums, headache, dizziness, numbness of hands and feet, weakness, loss of weight, loss of appetite, nausea, dryness of throat and loose

teeth. Anemia and weak pulse were also noted. The doctor reported that the teeth became loose with occasional bleeding as far as six months previously and that stiffness of joints had been noted in the interim. Laboratory tests were negative for syphilis and tuberculosis.

August 19, 1932: Patient quit work. Up to about one year previous he had "used a lot of benzine" in swabbing bands.

September 27, 1932: Employer reported that the patient's exposure was only to high test gasoline and in no way to benzol. Also that he was not using such at present but it was used in the department in which he was employed.

October 24, 1932: Hemoglobin 60%, red cells 3,760,000, color index 0.8, white cells 10,700. Differential count: polys. 75 (non-seg. 18, seg. 57, shift 1-3.2), small lymphs. 24, eosinophiles 1.

November 14, 1932: The physician wrote that all the teeth had been x-rayed showing a necrotic process going on in the jaw bones, and that the teeth had become very loose and very brittle. Apparently there was nothing other than benzine in his occupation to which he was exposed, and the question arose whether the persistent anemia was the cause of the mouth condition or vice versa.

March 10, 1933: Is showing marked improvement. Still has secondary anemia, epistaxis and asthenia.

April 27, 1933: Hemoglobin 75%, red cells 4,210,000, color index 0.9, white cells 12,200. Differential count: polys. 76 (non-seg. 27, seg. 49 and shift 1.8), small lymphs. 22, large lymphs. 1, eosinophiles 1.

August 6, 1933: Weakness, bleeding from gums, anemia, and dizziness.

September 13, 1933: Nose bleed persists. Nervousness, weakness, has lost weight from a claimed original 147 pounds to present 121 pounds. Anorexia, weakness, anemia, heart rapid and irregular. All of upper teeth and several of lower teeth have been extracted. In general appearance is a tall, thin individual who is an anemic in aspect.

Case 3. White, female, aged 41, Polish, divorced, occupied for two months in "building" rubber tubes by moistening the ends of the tubes with a benzine soaked sponge prior to July 7, 1933. She had been previously employed at "flipping" tires, from 1931 to 1932. The chief symptoms and conditions began July 7, 1933, with weakness, dizziness and tired feeling, dryness of nose and throat, dry cough, nervousness, loss of appetite, nausea, loss of weight, drowsiness, some bleeding from nose and gums. Anemia also was noted. There were no complicating diseases such as alcoholism, tuberculosis, syphilis, etc.

An inquiry of the Medical Director of the plant where this woman worked disclosed that she was exposed to high test gasoline only. She handled a swab dampened with the gasoline for a period of about two seconds out of every minute. The gasoline was kept in a container with a perforated top, and the swab rested on this top when not in use. The fumes of the gasoline could not be detected by smell 15 inches from the perforated top. The room was very spacious, with windows opened on two sides. The operation had been in effect for five years with no other reported cases.

Our laboratories analyzed a specimen of the gasoline used, with the following findings: Specific Gravity 0.705; Refractive Index 1.3980; Distillation 10% at 73°C., and 95% at 131°C.—from

of hydrocarbon oils similar to naphtha."

Case 4. White, female, aged 39, American, single, occupied at "flipping" beads in a rubber tire factory—specifically taking wrinkles out of beads with benzine—for a period of about three years to July 24, 1933. Prior to that she had been employed for three years in making paper boxes. Her symptoms came on gradually with weakness, dryness of nose and throat, dry cough, anorexia, nausea, vomiting, tired feeling, bleeding from nose and gums, nervousness, drowsiness, headache, dyspnoea, and loss of weight. The physician noted an increased bleeding time. There were no complicating diseases such as alcoholism, syphilis, tuberculosis, etc.

A laboratory check-up on this case showed the exposure to be due to petroleum with distillation points indicative of gasoline.

July 25, 1933: Hemoglobin 68%, red cells 4,040,000, white cells 8,900. Differential count: polys. 50, small lymphs. 28, transitionals 2, eosinophiles 20. Platelets 100,000. The doctor explained the eosinophilia by stating that the patient at that time had asthma. Subsequent blood findings were as follows: (a) August 31, 1933: Hemoglobin 83, red cells 4,200,000, white cells 12,900. Differential count: polys. 71, small lymphs. 24, large lymphs. 3, transitionals 2. (b) September 6, 1933: White cells 12,500. The patient ceased work about August 25, 1933.

September 12, 1933: I saw the patient at her home in company with several physicians, including her own physician. She was in no apparent distress and stated that she had ceased to work because she felt too weak, that she had lost 30 pounds (although she now looked well-nourished and of proper weight for her height); she possibly appeared somewhat anemic. The gums looked normal. She fell down that morning and scuffed the skin below both knees while on a trip to a neighboring store. She did not remember having tripped or whether she slumped without apparent reason. She stated that she was also nauseated, had little appetite, was nervous and drowsy, but could not sleep. She complained of nearly constant headaches and dizziness. She thought she was better now than she had been.

Case 5. White, female, aged 20, occupied at washing parts of household appliances, in an electrical manufacturing company, in naphtha to which her bare hands were exposed. The period of employment was one month. The room where patient worked was not provided with windows and had only one air duct. She had had no prior employment, and her previous health was reported as good. Her symptoms began July 20, 1933, and consisted of dizziness, fainting, anorexia, loss of appetite and nausea. Her hands became red and swollen, and the skin came off over the entire surface. A marked injection of the pharyngomucosa was noted. There were no complicating diseases such as alcoholism, syphilis, tuberculosis, etc.

The reporting physician stated that at about the time he saw this patient quite a number of other girls were carried out unconscious from the plant. The patient also showed conjunctivae red.

We referred the situation to the local health officer, who reported, August 7, 1933, that the girls in this department were cleaning off a tar-like substance from refrigeration units prior to final in-

spection. The process was carried out in a main room of the factory with a fair amount of ventilation. There was a very noticeable saturation of the air with naphtha fumes on entering the quarters, and no doubt on a very hot day with no outdoor breezes, such would become very disagreeable. He was also informed by one of the employees that during the hot weather it was no unusual thing for as high as seven girls to be carried out, but that this disability apparently was only temporary, as most of them immediately returned to their positions. It is interesting to note that the company physician who saw the above case at the time of the skin eruption did not consider it a case of naphtha poisoning.

Summary

THREE series of cases of chronic poisoning with petroleum distillates, each representing two or more cases, and a group of six significant individual cases, from as many different places of employment, are presented.

2. Periods of exposure have ranged from five weeks to three or four years before employment disability began.

3. Onset symptoms were pre-eminently subjective, also manifold—chiefly complaints of headache, dizziness, loss of appetite, dyspepsia, itching of the skin of the hands and arms, burning of the eyes, restlessness at nights with insomnia; pains in the back, legs and cardiac region; slight cough and shortness of breath, a feeling of weakness, and impending ill-health. Intercurrent mouth and throat infections were common.

4. The typical picture associated with disability came on with a complaint of loss of weight, worry, a feeling of "slipping" in physical and mental well-being, accompanied by a bizarre neurasthenic and psychasthenic symptomatology. The objective findings may be grouped as follows: (a) loss of weight from 10 to 60% over months of time with periods of partial recovery nearly to normal; (b) pulse rate increased, sometimes notably; (c) blood picture showing moderately severe secondary anemia—hemoglobin 60 to 90%, red cells decreased 20-35%, color index less than 1, slight leucocytosis—10,000 to 14,000 (secondary infection?) and trend toward eosinophilia in some cases; (d) skin irritation with tendency to rashes, furunculosis, local abscesses, etc., followed by a persistent if not permanent generalized pruritis; (e) mouth infection—especially tonsils and gums; (f) diarrhea, often persisting over weeks of time, sometimes alternating with constipation; (g) mental depression and even slowed mentality extending perhaps to semistupor and complete disorientation; (h) muscular twitching and bodily tremors, slight ataxia.

5. Great variability of both subjective complaints and objective findings occurred over periods of months and years. A chronic case invariably gives the impression at first of malingering or extreme neurasthenia following upon mouth or throat infection (which is commonly a part of the history just before quitting work).

6. Great chronicity has followed the onset of actual disability. The duration of disability has appeared to be related to the period of exposure as (a) in one case, two weeks' exposure followed by two months' disability, (b) five weeks' exposure followed by 15 months' disability; a year or more exposure followed by years of partial or complete disability.

7. There appears to be a question about complete recovery, although ability to do part time work returned as a rule. Normal weight was never fully recovered.

8. Actual skin-wetting, as by having the hands and forearms in petroleum distillate mixtures, has produced the most marked cases. Inhalation cases have shown a lessened degree of symptoms and findings, but such warn of the necessity of forced or controlled ventilation.

9. The loss in weight appears to affect chiefly the fatty tissues, since there are no actual paralyses. Likewise, the reflexes are retained (one case excepted). It seems logical to assume that the dissolving effect of the distillate upon the fat of the central nervous system, the medullary sheaths of peripheral nerves, the heart muscle, liver, and elsewhere in the body is the explanation of the disability.

Conclusions

WORKERS should not be exposed to skin wetting by petroleum distillates under any prolonged condition of employment; they should also be protected from unusual or protracted inhalation of the vapors of such distillates.

[EDITOR'S NOTE: A subsequent paper will be devoted to the presentation of the details of additional cases, and to a critical consideration of the literature related to the toxicity of solvents derived from petroleum.]

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6. Federal Specifications Board: Gasoline; Motor, United States Government (VV-G-101), July 21, 1931.
7. _____: Motor-Fuel V (VV-M-571), July 21, 1931.
8. _____: Ether; Petroleum (O-E-751), Jan. 6, 1931.
9. _____: Thinner; Paint, Volatile Mineral Spirits (TT-T-291), March 31, 1931.
10. _____: Thinner; Paint, (For) Semipaste Paints (TT-T-271), March 31, 1931.
11. _____: Drier; Paint, Liquid (TT-D-651), Mar. 31, 1931.
12. U. S. Bureau of Standards, Circ. No. 98, Federal Specifications No. 16; For Volatile Mineral Spirits for Thinning Paints. Revised (January 2) 1923. See GARDNER, HENRY A., Physical and Chemical Examination of Paints, Varnishes, and Colors. Paint Mfg. Ass'n., Etc. 1922.

New York Safety Conference

THE Seventh Annual Greater New York Safety Conference will be held at the Hotel Astor, New York City, Tuesday, Wednesday, Thursday, March 3rd, 4th and 5th, 1936, under the auspices of the Metropolitan Chapter of the American Society of Safety Engineers, the Engineering Section of the National Safety Council and other cooperating organizations.

There will be sessions on Occupational Disease; on the Safety Problem of Hospitals; Construction; Marine Hazards; Recreation; Organizing a Community Street Safety Program; Commercial Ve-

hicles; Marketing Petroleum; Modernizing Police Methods; Small Plants; Handling Materials; Handling Traffic Violations; Aeronautical Problems; Safety Training; Hotels and Restaurants; Home Safety; Accident Prevention Equipment; Mercantile Problems; Public Employees; Training Drivers in the High Schools; Industrial Health; Child Education; The Highway and The Pedestrian; First Aid; Building Operation and Maintenance.

Of particular interest to industrial physicians and surgeons will be the session on Occupational Disease to be held Tuesday afternoon, March 3rd, at 2:15 p.m. The chairman is Dr. Donald B. Armstrong, Third Vice-President, Metropolitan Life Insurance Company, New York City, and the following subjects will be presented:

"Dust Inhalation: Its Effects upon the Respiratory System," by Dr. Leroy U. Gardner, Director of the Saranac Laboratory at Saranac Lake, N.Y.—discussion will be opened by Dr. A. J. Lanza.

"Volatile Solvent Hazards," by Dr. Henry Field Smyth, Director Laboratory of Hygiene, University of Pennsylvania School of Medicine—discussion is to be opened by Dr. Leonard Greenburg.

"The Menace of Industrial Skin Disease," by Dr. C. Guy Lane of Boston—discussion is to be opened by Dr. Samuel M. Peck, New York City.

Another session of interest will be what is called "Occupational Disease Forum," of which it is arranged to have two sessions, one on Wednesday, March 4, at 10 a.m., and the other on the same day at 2:15 p.m. The chairman of this session is Lewis A. DeBlois, Consulting Engineer, New York City, and arrangements have been made to have a "panel" of various well informed persons who will answer questions on different phases of occupational disease problems. The panel selected is as follows: Ray Caverly, Vice-President, Fidelity & Casualty Co. of N.Y.; Warren A. Cook, Industrial Hygienist, Bureau of Occupational Diseases, Connecticut State Department of Health; Dr. R. R. Sayers, Medical Officer in charge of Industrial Hygiene and Sanitation, U. S. Public Health Service, Washington, D.C.; Dr. Leonard Greenburg, Executive Director, Division of Industrial Hygiene, New York State Dept. of Labor, New York City; Leonard E. Hatch, Past-Member, Industrial Board, New York Dept. of Labor; Dr. Wm. J. McConnell, Asst. Medical Director, Metropolitan Life Insurance Company, New York City; Leon S. Senior, General Manager, Compensation Insurance Rating Board, New York City; and Dr. William P. Yant, Supervising Engineer, Bureau of Mines Experiment Station, Pittsburgh, Pa.

A session on Industrial Health will be held Thursday, March 5, at 10 a.m., Dr. C. H. Watson, Medical Director, American Telephone and Telegraph Company, and President, National Safety Council, presiding. In this session, the following papers will be given:

"Personal Experience in Health Betterment among Organized Groups," by Dr. William R. P. Emerson, Boston, Mass.;

"Physical Examination and Health Supervision as an Aid to Transfer and Promotion," by Dr. William A. Sawyer, Medical Director, Eastman Kodak Company, Rochester, N.Y.; and

"Shall We Promote Industrial Health and Efficiency or Only Industrial Safety," by Dr. C-E. A. Winslow, Prof. of Public Health, Yale School of Medicine, New Haven, Conn.

A First Aid session will also convene on Thurs-

day, March 5, at 2:15 p.m., Mrs. William Kinnicutt Draper, Chairman of Board of Directors, New York Chapter, American Red Cross, presiding. Dr. Cary T. Grayson, Chairman, American National Red Cross, Washington, D.C., will present the subject "Highway First Aid Stations." The subject of "Practical First Aid," will be discussed by Dr. W. R. Redden, Director First Aid, New York Chapter, American Red Cross. First aid demonstrations will be given by teams from the Volunteer Fire Department, Westchester County—Boys from New York School for the Deaf—Girls from the Bronx Vocation School, these demonstrations taking the nature of the practical solution of three problems by first aid teams composed of five persons. Music will be furnished by the Band of New York School for the Deaf.

Comment Obvious!

SYPHILIS and gonorrhea cost employers millions of dollars a year in compensation relief and medical attention, especially in cases characterized by delayed convalescence and prolonged disability, plus the difficulties of labor turnover and temporary substitute employees, and the decreased efficiency or even accident-producing illness of the workmen. A locomotive engineer who was responsible for a bad wreck explained that one of his "spells" had come on him and he had run by a siding. Examination showed that he was suffering from dementia paralytica, softening of the brain due to syphilis, which might have been prevented had treatment been given in time.¹

BETWEEN 20 and 30% of all employees of business concerns are mildly crazy, Dr. Robert N. McMurray, head of the Chicago office of the Psychological Corporation, told executives attending the meeting of the American Management Association at the Palmer house (February 6, 1936).²

"Among the rank and file," Dr. McMurray said, "these conditions manifest themselves by such symptoms as: seclusiveness or a tendency to too much day-dreaming; insubordination; chronic ill health without demonstrable organic basis; oversuspiciousness of associates and superiors; extreme defensiveness and oversensitivity to slights; easy fatigability and overtendency to errors and accidents.

"And," said Dr. McMurray, "the same tendencies are prevalent among executives at about the same ratio as among employees."

Dr. McMurray said that such disorders can be profitably studied and treated in an industrial concern, improving the efficiency of the employees and general morale and reducing the tendency toward labor disputes.

THE Merchants' Association³ has re-affirmed at Albany its past action in opposition to measures of the character of the McCaffrey bill amending the workmen's compensation law by providing compensation from the date of disability. The present law provides that no compensation shall be allowed for the first seven days

of disability, except where the disability exists for more than 35 days. It is held that to make the proposed change will invite fraud by encouraging malingering and will unduly burden the employer with a multiplicity of unjust claims.

HENRY FORD has to provide an average of \$9,007.37 capital to set up a job for each worker—\$2,008.55 for land and buildings, \$2,670.59 for machinery and tools, \$664.78 for materials, and \$3,663.45 "to maintain materials, power and machine replacement." Of every dollar of Ford Company income, 94 cents goes to its own and other employees. The company gets only 1½ cents.⁴

THE Westinghouse Relief Department,⁵ established in 1907, was the outgrowth of an employees' sick benefit association formed some years before at the East Pittsburgh Works. Benefits for lost time due to illness or to accident off duty, and death, are supported by employee contributions. The company contributes the cost of administration and matches death benefit payments. Death gratuities paid by the company under this plan since its inception total \$477,864. The organization at present includes 25,263 employees. Benefits, exclusive of the death benefits paid by the company, totaling \$8,616,103 have been paid since 1907. Several subsidiaries not participating in the Relief Department carry health and accident coverage to which employees contribute. During the period these several contracts have been in effect, disbursements under them have totaled approximately \$390,000. With the establishment of the Relief Department came the need for a Company Physician to examine new applicants. This beginning became the foundation of a comprehensive medical program. At present there are 25 physicians and 20 nurses in Westinghouse clinics. While it functions primarily for the care of employees who may be injured while at work, improvement in safety records is permitting the Medical Department to devote more of its attention to a program of keeping employees fit. Several plants have gone an entire 12 months without a single lost-time accident; and today reliable statistics show that every Westinghouse plant has a safety record better than the average of all industrial plants in the state in which it is located.

Sulphur

VOIT and Schmidt direct attention to studies conducted by Vita and Salmoiraghi.* In animal experiments on the action of colloidal sulphur in carbon monoxide poisoning, these investigators were able to show that guinea pigs treated with sulphur survived carbon monoxide poisoning and recovered in a relatively short time, while the control animals died. When the animals were exposed to fatal doses, those which had received prophylactic injections of sulphur survived three times as long as those which had not. In spectroscopic studies on the detoxication mechanism in experimental carbon monoxide poisoning it had been determined that at the time the signs of

1. From "Venereal Disease—The Modern Plague," by MASON GIESKE, in *Hygeia*, January, 1936.

2. *Chicago Daily News*, February 6, 1936.

3. *Greater New York*, February 11, 1936.

4. R. C. FORBES, in *Chicago Herald-Examiner*.

5. "Notes on Fifty Years of Industrial Relations," Westinghouse Electric & Manufacturing Company—1886-1936.

**Munchen med. Wchnschr.*, Munich, August 30, 1935; abstr., *J.A.M.A.*, October 26, 1935.

poisoning disappear there appears a blood spectrum that greatly resembles the spectrum of carbon oxysulphide in the blood. From this observation it was deduced that carbon oxysulphide is formed in the blood during carbon monoxide poisoning and that this is a detoxication process. It was thought that the injection of sulphur might accelerate the formation of carbon oxysulphide. The authors decided to investigate whether the prophylactic treatment with sulphur would prevent the development of erythrocytosis, leukocytosis and hyperglycemia, which frequently develop in the course of carbon monoxide poisoning. They studied the action of sulphur on acute as well as on chronic cases. They found that the injection of sulphur prevents the development of hyperglycemia and erythrocytosis. The observation of Vita and Salmoiraghi that the animals treated with sulphur have a greater resistance to carbon monoxide poisoning could be corroborated in the majority of animals, but not in all.

Decision on Silicosis

THE plaintiff sought damages* from the defendant because of the contracting of silicosis while employed in the latter's factory. It was alleged that the disease was due to the defendant's failure to exercise reasonable care and to perform its statutory duties in the operation of its factory.

Silicosis was not an "injury" or "personal injury" compensable under the workmen's compensation law, nor was it included among the occupational diseases named in such law as being compensable.

The workmen's compensation law, among other things, provided that the liability of an employer, prescribed by the statute, for injury or death, should be exclusive and in place of any other liability whatsoever "on account of such injury or death."

The defendant's motion to dismiss the complaint was denied in two lower courts, and the matter for decision was stated by the Court of Appeals as follows:¹ "... The question now arises whether the right to compensation for disability or death resulting from accidental injury under the workmen's compensation law is the sole right which an employee now has against his employers for injury suffered in the course of employment and excludes and takes the place of all common law remedies, not only for compensable injuries but for injuries entirely outside the scope of the act."

This conclusion reached by the court was that the action could be brought. The following are brief excerpts from the opinion: "... Here, as we have said, the action is brought for an industrial injury entirely outside the scope of the statute. The statute provides that the statutory liability for injury or death shall be exclusive and in place of any other liability 'on account of such injury or death.'

"By no other construction, even though forced, can these words be found to mean that the right to compensation in case of certain injuries should be exclusive and in place of liability for other injuries. ... There still is a field in which the statute fails to impose liability on the part of an employer,

to provide compensation for injury or death, regardless of fault; and in which an injured person may seek damages by action at law, where there has been fault. ..."

Rejection Percentages

SEVERAL attempts have been made to establish averages as to the relative number of men applying for work in industry who are physically unfit.

These averages, however, have not been very satisfactory, except in purely local instances. The most elaborate study was made by the National Industrial Conference Board in 1926. In its investigation of the practice of physical examination of workers in 255 plants, 20 reported that no employees were rejected on account of the physical findings. These were large organizations with a variety of occupations providing considerable opportunity for the placement of persons not so seriously incapacitated as to be unable to carry on any productive work. Rejections in other plants varied from less than 1% to 50% or more; only one plant, however, reporting more than 50%. The higher percentage occurred in those plants engaged in specialized work in which there were special hazards which only physically perfect workmen could successfully avoid. The number of plants reporting on this question, together with the range of their rejection percentages, was as follows:

Plants	Rejections	Plants	Rejections
38 reported	0 to 2%	5 reported	7 to 8%
28 reported	2 to 3%	5 reported	8 to 9%
18 reported	3 to 4%	2 reported	9 to 10%
6 reported	4 to 5%	23 reported	10 to 20%
29 reported	5 to 6%	3 reported	20 to 30%
5 reported	6 to 7%	2 reported	30 to 50%

The defects which were the most common causes of rejection for employment were: tuberculosis, venereal disease, hernia, heart disease, blindness in one eye, amputation of members, mental deficiency, defective hearing, varicocele and hydrocele, epilepsy, contagious and infectious diseases, kidney disease, rheumatism, arteriosclerosis, chronic alcoholism and drug addiction, spinal trouble, goiter.

The exact percentage of rejections for hernia alone is almost impossible of determination, and it is not much easier to find out the prevailing figures on hernia and herniotomies. An examination of 900 men ranging from 50 to 76 years of age employed in one situation indicated that 21% of all examined had varicose veins, and 16% had hernia. This is probably the highest average found in any study.

Another company, in pre-examining 547 applicants for employment, identified various degrees of hernia in 55 of them, approximately 10%. Since the average age of these people differed materially from the ages of the men examined in the other situation mentioned, it is probable that comparisons would be worthless. In another instance, there was a prevailing rate of hernia among applicants for employment of about 4½%. This figure was based upon a comparatively small number of examinations.

Later, when the number of examinations exceeded 120,000, indications of complete or incomplete hernia dropped to about 2%.

*Public Health Reports, V. 50, No. 39, September 27, 1935.
1. *Barrencotto v. Coker Saw Co., Inc.*, 194 N.E. 61.