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Accident Prevention

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"The Magazine of Safety"

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ARTHUR C. CARRUTHERS, Editor
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ARTHUR C. CARRUTHERS, President

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HARRY deG. ARMAND, Secretary

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"Of the two valves used on most respirators, that on the exhalation side is the more important. If the inhalation valve follows the filter and does not close at the start of exhalation, some re-breathing will result, but a leaky valve does not admit dust to the face. On the other hand, if the exhalation valve does not close automatically, as exhalation stops, dust may enter the face piece whether inspiration has begun or not. . . . Valves should not be tested by taking violent breaths as that is when they are least likely to leak, but should be tested at low air flows when the pressure differences which cause them to open or close are least."

Urges Practical Tests

In concluding, Mr. Drinker said: "While the laboratory test (for facial fit, comfort and interference with vision) has its uses, it is by no means infallible and the writer personally believes it should always be accompanied by as practical a man test as can be devised. It is well to bear in mind that the penetration of a few per cent may mean a visible deposit inside the face piece, and may easily indicate that although the filter is doing all that was expected of it, the weather is still breathing too much dust."

WORKMEN'S COMPENSATION FOR SILICOSIS

Report of the Committee on Pneumoconioses
of the
American Public Health Association

(Continued from February)

THE *Refractories Scheme* covers the processes connected with the getting, handling, moving, breaking, crushing, grinding, and sieving of refractories material containing not less than 80 per cent total silica in mines, quarries, factories and workshops; and all processes in the manipulation of such material in the manufacture of bricks or other articles containing not less than 80 per cent total silica, excluding natural sand and industries where the processes are only occasionally carried on and iron and steel works. Death, total disablement or necessity for change of work, when certified by a medical board to be due to silicosis, or silicosis and tuberculosis, are compensable. The disease is presumed to be due to the occupation when the employee has worked in it for five years, and the burden of proof to the contrary is on the employer.

The payments are made, under this scheme, from a compensation fund established by the employers themselves and maintained by subscriptions levied upon employers engaged in the industry without the intervention of an insurance company. The fund is called the *Refractories Compensation Fund, Ltd.* The Secretary of State controls the rates fixed by this fund.

The *Sandstone Industry Scheme* covers workers in mines and quarries getting and manipulating ganister, gritstone and quartzite rock, but excluding rotten stone and natural sand. Mines or quarries which come under the *Refractories Scheme* are excluded from this scheme and employers who satisfy the Secretary of State, by means of evidence based on chemical analysis, that the sandstone worked contains not more than 50 per cent of silica, free and combined, may be exempted. In all other respects, including the compensation fund arrangement, this scheme is very much the same as that of the *Refractories Industries*.

The *Metal Grinding Industries Scheme* as well as the *Various Industries Scheme*, differs from the above schemes chiefly in the fact that the claims for compensation are made in the same manner as for other personal injuries under the workmen's compensation act

and the employer may insure against them in the usual way instead of through any special fund charged against the industry. The *Metal Grinding Scheme* covers workmen employed in the grinding of metals with a grind stone composed of natural or artificial sandstone and glazing of metals where carried on in the same room as grinding, except in file manufacture where the grinding wheel is entirely enclosed and the metal immersed in water, and except where these grinding processes are only occasional. Sand-buffing is excluded from this scheme as it is provided for under the *Various Industries Scheme*. Workmen coming under the other silicosis schemes are also excluded from this one.

The processes covered in the *Various Industries Scheme* are:

1. Mining and quarrying in silica rock, i. e., quartz, quartzite, ganister, sandstone, gritstone, and chert, but not including natural sand and rotten rock;
2. Drilling and blasting in silica rock;
3. Rock drilling or blasting in any sinking pit or staple pit in coal mines, or operating drilling, cutting, or breaking machines in coal mines;
4. Sawing, planing, dressing, shaping, cutting or carving of silica rock;
5. Breaking, crushing, grinding, sieving, mixing or packing of silica rock or dry quartzose sand;
6. Handling or moving above;
7. Breaking, crushing, grinding of flint or flint materials and handling, moving, sieving, mixing or packing of ground flint or flint materials.

The following specified processes in certain trades are also covered under the *Various Industries Scheme*:

Foundries and metal works:

Crushing or grinding of silica rock or silica bricks or articles containing not less than 80 per cent total silica; freeing steel castings from adherent sand or other siliceous substances, except work done on the foundry floor; sandblasting of metal or metal articles by means of compressed air with the use

of quartzose sand or crushed silica rock or flint. The getting and manipulating of granite (including any igneous rock):

Dressing of stone by masons for building, civil engineering, or monumental purposes, but not kerb dressing if workman is employed wholly or mainly on such work.

Potteries:

Milling of flint or crushing or grinding of silica rock or dried quartzose sand;

Any process incidental to the manufacture of china or earthenware including sanitary earthenware, electrical earthenware, and earthenware tiles, up to and including the preparation for glazing, but excluding underglaze decorating and modelling and mould making where those processes are carried on in separate rooms;

Polishing, sorting, or grinding on any power driven wheel in connection with the grinding of glaze ware and tile slabbing.

Tin mines:

Any operation underground; breaking or crushing of the ore or the containing rock above ground or any handling or moving incidental thereto.

Workmen in any process covered under the other silicosis schemes are excluded from this scheme.

The Asbestos Industry Scheme covers asbestosis in breaking, crushing, opening, grinding, mixing or sieving of asbestos or any admixture of asbestos, and all processes in the manufacture of asbestos textiles except where processes are only occasional and where asbestos is impregnated with an adhesive binder.

In other respects this scheme is similar to the foregoing scheme. No special compensation fund is established but claims are paid for as for other personal injuries under the workmen's compensation act.

In connection with each of these schemes, there are also regulations issued by the Secretary of State under the Factory and Workshop Act applying rules for preventive measures to the group of industries involved.

Union of South Africa:

The whole situation in the South African mining fields is admirably described in detail by various officers, each in charge of a special department of the administration, in the Report of the International Silicosis Conference at Johannesburg, August, 1930. Miners' phthisis (silicosis) has been the subject of intensive study and much legislation ever since the appointment of the first commission in 1902 to inquire into the extent to which the disease prevailed among the gold miners on the Rand. Four commissions have reported on conditions and compensation, the latest report having been published in 1930.

Nine acts dealing with compensation for persons suffering from miners' phthisis (silicosis) and for their dependents have been passed, the latest one and the one at present in force being the Miners' Phthisis Acts Consolidation Act, No. 35 of 1925, as amended by Act No. 38, 1930. This law repeals the Miners' Phthisis Act,

No. 40 of 1919 and the Miners' Phthisis Amendment Act No. 35 of 1924 and consolidates the other acts and amendments. The most important provisions for control of dust are the detailed regulations for the use of water sprays and water drills, special rules regarding blasting, ventilation (covering the number of cubic feet of fresh air to be supplied per person), and inspection, including dust sampling. Dust masks were tried, but proved unsuccessful in strenuous underground work.

Compensation is paid through a fund raised by taxing certain listed mines where the dust is of a nature to produce silicosis. The assessment is fixed to meet the cost of compensation. It is levied in amounts proportional to the wages, to the silicosis rate, and to the income tax in each mine. This fund is administered by the Miners' Phthisis Board. In computing the silicosis rate, each or all of the following may be considered: the actuarial experience, the prevalence of silicosis as shown by periodic medical examinations, the dust sampling investigation in each mine, and the mine inspectors' reports of conditions.

The Act sets up a medical board which is known as the Miners' Phthisis Medical Bureau. It is the function of this Bureau to examine and certify all European applicants for underground work to be physically fit and free from any disease of the lungs and respiratory organs; to examine all European miners every six months to determine and report all cases of the three compensable conditions: (1) simple silicosis, (2) tuberculosis with silicosis, and (3) simple tuberculosis, and to examine at intervals, when necessary, those suspended from employment on account of silicosis and

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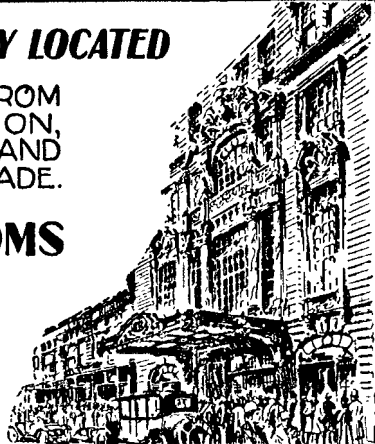
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those awarded compensation to determine whether or not the disease has progressed to a further stage.

A Medical Board of Appeal was established in 1925 to which cases are referred when there is dissatisfaction with the decision of the Medical Bureau.

"Simple silicosis" is defined to mean silicosis without recognizable or overt tuberculosis; "tuberculosis with silicosis," silicosis with overt tuberculosis; and "simple tuberculosis," tuberculosis of the respiratory organs without detectable silicosis.

For purposes of compensation, the stages of disease are classified and a miner is deemed to have or to have had silicosis

- "(a) in the ante-primary stage, when it is found by the Bureau that the earliest detectable specific physical signs of silicosis are or have been present; whether or not capacity for work is or has been impaired by such silicosis;
- "(b) in the primary stage, when it is found by the Bureau that definite and specific physical signs of silicosis are or have been present and that capacity for work is or has been impaired by that disease, though not seriously or permanently;
- "(c) in the secondary stage, when it is found by the Bureau that definite and specific physical signs of silicosis are or have been present, and that capacity for work is or has been seriously and permanently impaired by that disease or when it is found by the Bureau that tuberculosis with silicosis is or has been present."

Compensation may be claimed for silicosis or tuberculosis occurring in a miner who has at any time worked underground in a scheduled mine for a period of two years or who can satisfy the Miners' Phthisis Board that he contracted silicosis in such a mine.

Compensation benefits are granted in graded lump sums calculated on the basis of wages earned in cases in the ante-primary and primary stages or cases of tuberculosis without silicosis. Cases in the secondary stage are awarded a monthly pension based on wages earned.

A miner who is found to have silicosis in the secondary stage or tuberculosis with silicosis, on periodic medical examination, is suspended immediately from underground work. A miner who is found to have simple silicosis has the option of taking an award and leaving underground work or remaining at work and postponing his award. A miner who remains at work, however, for more than three months after he is notified that he has silicosis, forfeits all right to an award during his life beyond that to which he would have been entitled when he was first notified. A miner, however, who has been granted a lump sum award and ceases underground work in the listed mines within three months of his notification that he had silicosis is entitled to further award of a monthly allowance if his disease progresses to the secondary stage of silicosis or to tuberculosis with silicosis after he stops work.

The dependents of a miner are entitled to an award of the monthly allowance after his death if the miner was entitled to it or if the Bureau certifies before or after death that he had secondary stage silicosis or tuberculosis with silicosis or that he died from silicosis or any other cause with which silicosis was present and was a predisposing factor.

For the purpose of the Act, the expression "tuberculosis" is defined to mean tuberculosis of the lungs or of the respiratory organs. A person is deemed to be suffering from tuberculosis whenever it is found by the Bureau either:

- "(a) that such person is expectorating the tubercle bacillus, or
- "(b) that such person has closed tuberculosis to such a degree as seriously to impair his working capacity and render prohibition of his working underground advisable in the interest of his health."

If a miner is suspended for tuberculosis not complicated by silicosis he benefits as though he had silicosis in the primary stage. The grounds upon which this action is taken are that the initial physical examination is so strict as to exclude practically all those who are infected with tuberculosis at the time of application for work, therefore it may be assumed that the disease was contracted during the employment and possibly due to it. Such a miner is a source of infection to others in the mine and for this reason it is deemed justifiable to suspend him and to compensate him.

For compensation purposes, tuberculosis associated with any clinical stage of silicosis is considered as secondary stage silicosis.

Native laborers: Compensation, based on wages, is also awarded to native laborers (who outnumber European miners by about ten to one). Mine medical officers—not the Medical Bureau—are responsible for both initial examination and periodic supervision of the natives.

The periodical examination as prescribed by the Regulations consists of two parts: each native employee is weighed, obligatorily every three months, actually according to the general practice once in six weeks; an additional separate stethoscopic examination is made of all natives who have worked upon any one mine for a period of five years or more. Any native found to have lost 5 pounds between two successive examinations, or 6 pounds between 3 successive examinations is examined stethoscopically by the mine medical officer. In addition, rather recently the Chamber of Mines has instituted an annual radiographic examination of all natives who have worked on any mine for 5 years or more. Any native suspected by a mine medical officer of having silicosis or tuberculosis is sent forward for a "benefits" examination by the Medical Bureau.

Although the period of work of native laborers is gradually becoming longer, even at present few remain exposed to risk long enough to contract silicosis. On

(Continued from page 122)

the other hand, the native laborers quickly contract simple tuberculosis in an acute form and become a source of infection for the silicotic European miners.

Statistics: In the annual reports of the Miners Phthisis Medical Bureau accurate statistics of silicosis and tuberculosis among the Rand miners are available as far back as 1917-1918. Prior to that statistics had been compiled and estimates made of the prevalence of the disease by the various commissions of investigation, but the information was admittedly incomplete.

The consensus of opinion based on the statistics in the report of the Commission of Enquiry 1929-1930 was that, all things considered, there has been a marked decline in the new cases of simple silicosis produced in the mines in 1928-1929. The following table is quoted to show the attack rates:

STATEMENT I.

Comparison of Attack-Rates percent for Simple Silicosis at Certain Durations of Underground Service and at the Periods Stated

Attack Rates, percent, for Simple Silicosis				
	At Fifth Year	At Tenth Year	At Fifteenth Year	At Twentieth Year
1918-20	.. 0.74	8.94	14.56	14.13
1920-23	... 0.32	5.00	6.98	7.04
1928-29	0.22	2.55	5.31	6.68

The cost of miners' phthisis on the Rand is thought to be £1,000,000 per year, or about 7s 6d per underground European shift.

With regard to the progression of the disease even after removal from exposure, figures given in the report of Fraser and Irvine at the Johannesburg Conference show that at the end of six years out of 895 cases of primary silicosis certified in 1917-1920, 27.6 per cent had died and 21.4 per cent had advanced into the secondary stage, while out of 728 ante-primary cases certified during the period of 1920-1923, 23.5 per cent had died, 27.2 per cent had survived in the primary stage, and 22.9 per cent in the secondary stage. It is believed that these figures indicate that a change to a more infective type of the disease has been taking place. The average period from the date of certification to death or progression to a further stage of disease appears to be as follows: ante-primary stage, about 4.6 years; primary stage, 3.8 years; secondary stage, 7.3 years.

The expectation of life however depends upon a different calculation and is estimated for a miner certified to be in the ante-primary stages as 13.66 years. There is some slight evidence though not enough to be conclusive, that in those in the ante-primary stage who leave the mines the disease progresses as rapidly as in those who remain at work.

The incidence of silicosis and tuberculosis among the native laborers on the Rand shows a very interesting contrast to that among the European miners. In Europeans active simple, tuberculosis occurs in a very small

proportion of the compensable cases when first certified, less than 2 percent, while, the great majority of compensable cases are of simple silicosis. In the natives the majority of compensable cases are simple tuberculosis, sometimes accompanied by silicosis in those of longer service. This is said to be accounted for by a higher susceptibility in the African native to tuberculosis and to the fact that his service in the mines is usually much shorter and less steady.

Australia and New Zealand:

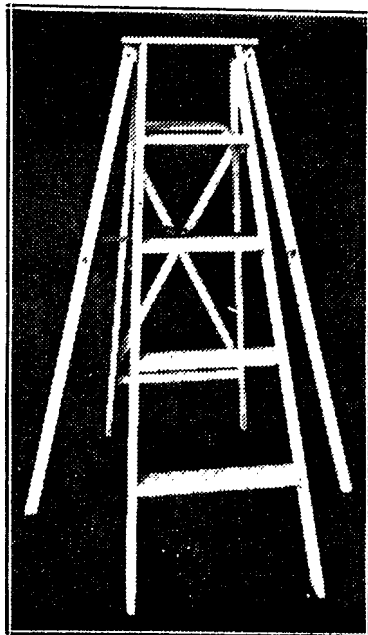
In Australia, the various states have dealt with silicosis and miners' phthisis and pneumoconiosis in different ways. Some states, such as New South Wales and Western Australia cover compensation for these diseases in two ways at once: 1. (a) by authorizing the Minister of Labour to make special schemes as in Great Britain (New South Wales), (b) under the workmen's compensation act itself (Western Australia); and 2. by means of a special miners' phthisis act effective only in certain districts (Broken Hill Acts, New South Wales, and Miners' Phthisis Act 1922, amended 1925, and Mine Workers Relief Act, 1933, Western Australia). Queensland also covers compensation for silicosis in certain specified industries by listing it in the schedule of compensable diseases, as follows:

Description of Disease	Description of Employment
Silicosis of the lungs, miners' phthisis; pneumoconiosis; pulmonary tuberculosis	Mining or quarrying or stone crushing or cut- ting
Bakers' phthisis	Baking
Millers' phthisis	Flour milling

Queensland does not, apparently, have any special miners' phthisis act in addition. The Commonwealth of Australia (Employees) Act of 1930 and the Compensation Act of the Territory of North Australia, 1931, cover "pneumoconiosis" in "quarrying or stone crushing or cutting" only. South Australia and Victoria do not schedule any of these diseases as compensable, but South Australia schedules "asthma or asthmatic attacks due to contact with or inhalation of blackwood pine dust." In Victoria investigations in the Bendigo mining district gold fields have established the fact that there is a very excessive mortality rate from tuberculosis among miners. The Mines Act includes a regulation which states that a jet or spray of water must be directed into machine drilled holes while drilling.

Tasmania has no workmen's compensation act covering occupational diseases but passed an act in 1929 intended to cover workmen or their dependents in case of death or total incapacity from certain listed occupational diseases in the mining industry only among them silicosis, pneumoconiosis, and fibrosis. From the wording of this act, it would seem, however, that it is more in the nature of a mutual benefit fund than a compensation act, since it permits the employers to deduct a

(Continued on page 128)



A NEW KIND OF SAFETY LADDER

A NEW kind of safety ladder with a pyramid principle has just been announced by the Security Manufacturing Co. of Bucyrus, Ohio. The ladder is like an ordinary sturdy step-ladder, with the addition of a lateral leg on each side that prevents toppling and removes the danger of falling, an important factor in the accident rate. Thus besides the four pediments of the ordinary step-ladder, the new ladder has two other points of application to the ground, providing a real pyramid base with six corners.

Peace of mind while working on a ladder is assured by this safety apparatus. There is no need to worry that the ladder will careen to one side with a sudden swerve.

The manufacturers point out that the lateral legs are folded by means of a ball and socket arrangement working with the locking spreader, so that if they should ever interfere with any special use to which the ladder is to be put, they can be quickly dropped out of the way. In other respects, the ladder is every whit as convenient as an ordinary step-ladder.

(Continued from page 126)

small sum from the wages of the employees as their contribution to the fund. In other respects this act is similar to other miners' phthisis acts in its administrative set-up including provisions for medical control.

New Zealand provides under the Pensions Act (1926, Sec. 32-40) only for miners who are incapacitated for work due to miners' phthisis and for the relief of the families of miners who die from that disease. None of the respiratory diseases caused by dust are scheduled under the New Zealand Workmen's Compensation Act.

New South Wales:

The details of the somewhat intricate act dealing with dust diseases in the lungs in New South Wales follows:

In New South Wales, the Workers' Compensation Act, 1926-1929 defines the word "injury" to include

SAFETY TREAD COMPANIES ORGANIZE

A TRADE association has been formed by the leading manufacturers of metal safety treads. It is the Metal Safety Tread Association, and has its offices in New York City. The members are the American Abrasive Metals Company, Irvington, N. J.; the American Mason Safety Tread Company, Lowell, Mass.; the Safe Tread Company, New York City; the Standard Safety Tread Company, New York City, and Wooster Products, Inc., Wooster, O.

Information and consultation regarding the eradication of walkway hazards and the use of metal safety treads will be furnished without obligation upon application to any of the member companies.

LECTURERS ON OCCUPATIONAL DISEASE

THE series of six lectures on occupational diseases, now being given at the Engineering Societies Building in New York City, under the auspices of the New York Tuberculosis and Health Association and the Committee on Public Health Relations of the New York Academy of Medicine, has so far been addressed by Dr. A. J. Lanza, assistant medical director of the Metropolitan Life Insurance Company; Dr. Henry H. Kessler, medical director of the New Jersey Rehabilitation Commission; Dr. A. D. Lazenby, chief surgeon of the Maryland Casualty Company, and Verne A. Zimmer, director of the Division of Workmen's Compensation of the New York State Department of Labor.

The speakers at the remaining three sessions will be Dr. Adelaide Ross Smith, chief of the Occupational Disease Clinic of the Vanderbilt Clinic; Dr. Leonard Goldwater, chief of the Occupational Disease Clinic of New York University and Bellevue Hospital Medical College; Dr. Leonard Greenburg, associate director of the John B. Pierce Laboratory of Hygiene of Yale University; Dr. George Baehr, of Mount Siani Hospital in New York City, and Wesley M. Graff, director of the Safety Engineering Division, National Bureau of Casualty and Surety Underwriters.

diseases arising out of or in the course of employment whether of a sudden onset or of such a nature as to be contracted by gradual process other than a disease caused by silica dust. This could be interpreted to include pneumoconiosis from various kinds of dust if such cases arise but diseases caused by silica dust are specifically exempted because they are dealt with in the special Silicosis Act of 1920. This act empowers the Minister of Labour to make special schemes for the compensation of fibroid phthisis or silicosis of the lungs or other diseases of the pulmonary organs caused by exposure to silica or other dust (except at Broken Hill Mines) and to establish a fund for this purpose. This is the same method which is followed in the British act for dealing with silicosis.

To be continued in future issues of SAFETY ENGINEERING