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Feb., 1935

MEMORANDUM ON THE INDUSTRIAL DISEASES OF

SILICOSIS AND ASBESTOSIS

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1.—Introduction.

The disease of the lungs now known as silicosis was recognised in this country in very early times as a trade disease affecting those who worked on certain kinds of stone. It occurred amongst masons working with sandstone, and was called "stone masons' phthisis"; in later times it was found in those employed in grinding metals on sandstone wheels, and was called "grinders' rot"; it appeared too in potters who worked with ground flint, and was called "potters' asthma," and amongst miners in lead, tin and gold mines, it was known as "miners' phthisis." All these terms indicate the same disease, silicosis, which may be accompanied by tuberculosis. It has been found to occur in many industries and processes, all of which have one characteristic in common—exposure of the workers to the inhalation of silica dust.

The incidence of silicosis continues to be serious and widespread. During the three years 1932-4 the Silicosis Medical Board have certified 52 cases of disablement and 17 deaths from ganister mines and silica brick works; 252 cases of disablement and 79 deaths from the getting and manipulation of sandstone at quarries or premises worked in conjunction therewith; 289 cases of disablement and 92 deaths from the pottery industry; 532 cases of disablement and 105 deaths from coal mines; 319 cases of disablement and 142 deaths from other industries. In some cases of death the workmen had previously been certified as disabled.

Asbestosis is a disease of the lungs which resembles silicosis in many ways. It is produced as a result of the inhalation of dust of asbestos, and the increased use of this mineral in manufacturing processes during recent years has been followed by the occurrence of a considerable number of cases of the disease. During the three years 1932-4 the Medical Board certified 60 cases of disablement and 5 deaths among workers in the asbestos industry.

The object of this Memorandum is to set out briefly what these diseases are, how and where they are produced, the measures which can be taken to prevent them, the provision made for compensation, and the arrangements for the medical examination and certification of workmen.

Research is going on, under the direction of a Committee appointed by the Medical Research Council, with a view to extending the knowledge and understanding of silicosis and other pulmonary diseases due to the inhalation of dusts.

2.—The origin and development of Silicosis.

Silicosis is produced by the action of minute particles of silica dust which have been inhaled in the act of breathing. These particles make their way into the deepest recesses of the lungs where some of them remain and produce a slow inflammatory process which eventually destroys the lungs.

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Silica is almost the sole constituent of rocks such as quartz, flint and chert, and forms a considerable proportion of others such as sandstones and granite. In order to produce silicosis the dust must be in the form of minute particles, so small as to be invisible to the eye, except that in a beam of sunlight they may appear as a cloud, like smoke. This dust is produced when any of these rocks are broken, crushed, ground, or cut with a chisel or drill, or when any ground silica is manipulated in the dry state, unless special means are taken to suppress the dust.

These minute particles of silica dust float in the air, and when inhaled pass through the nose and throat and along the bronchial tubes to the smallest branches which end in the expanded balloon-like air-sacs of which the respiratory tissue of the lungs is composed. The nasal passages have an important function in helping to cleanse the air from dust before it reaches the lungs, and although the value of this function varies very widely in different individuals and under different conditions, it is always better to take advantage of the protection afforded by breathing through the nose. Many of the dust particles do not come into contact with the walls of the bronchial tubes or air-sacs, but are breathed out again in the returning air stream. Some of the particles are caught on the moist lining of the bronchial tubes and are readily removed with the mucous secretion. A certain proportion of the particles which find their way to the air-sacs come to rest on the walls, and these are attacked by living cells from the lung tissues and are conveyed either outward to the bronchial tubes or towards the drainage channels and spaces of the lung. If the quantity of dust is small the cells will be able to deal with it successfully, but if it be excessive they will be unable to remove it and the dust laden cells will accumulate and give rise to an inflammatory process. Once this process has commenced it continues more or less slowly to produce a kind of scar tissue (fibrosis) which ultimately replaces the lung substance, at first in small spots or nodules which may become joined up to form larger areas. The extent of lung tissue involved will depend on the concentration of silica dust in the atmosphere and the period of time over which the worker has been exposed to it.

When silica dust is inhaled, even in injurious amount, it produces no immediate effects, because it does not irritate the nose or throat. Sooner or later, however, the effects begin to be felt. When the fibrosis of the lung has advanced to a certain extent shortness of breath appears and increases, it may be to such a degree as to render the worker incapable of continuing at work. Moreover, chest trouble arising from infections such as tuberculosis, influenza and common colds, is liable to be much more serious in persons affected with silicosis than in those with healthy lungs, and at any time in the course of its development silicosis may be-

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rocks such as quartz, proportion of others such produce silicosis the dust so small as to be invisible sunlight they may appear oduced when any of these cut with a chisel or drill, ed in the dry state, unless dust.

float in the air, and when t and along the bronchial l in the expanded balloon- ssue of the lungs is com- ortant function in helping s reaches the lungs, and es very widely in different ns, it is always better to by breathing through the ot come into contact with sacs, but are breathed out some of the particles are hial tubes and are readily certain proportion of the -sacs come to rest on the cells from the lung tissues bronchial tubes or towards lung. If the quantity of l with it successfully, but ove it and the dust laden l inflammatory process. tinues more or less slowly which ultimately replaces ots or nodules which may The extent of lung tissue tion of silica dust in the which the worker has been

injurious amount, it pro- es not irritate the nose or effects begin to be felt. anced to a certain extent ses, it may be to such a le of continuing at work. ctions such as tuberculosis, to be much more serious those with healthy lungs, elopment silicosis may be- come complicated by these or other infections of the respiratory organs.

It is possible to determine the concentration of particles of dust in the atmosphere of any workplace by means of instruments of several kinds. Samples of the dust can be collected and the particles counted and measured by microscopic examination. Such examinations of the atmosphere have been made in many industrial processes, and it has been found that the concentration of dust varies within wide limits of less than 100 particles to more than 10,000 particles in a cubic centimetre of air. When it is remembered that a man during ordinary quiet breathing inhales 500 cubic centimetres of air with each breath and breathes 16 times a minute, it will be seen that the number of particles which can reach the lungs during a working day is enormous.

It has not yet been possible to determine for all industries the limit within which a concentration of dust may be considered safe. Attempts have been made to determine the limit for special industries carried on under uniform conditions, as in the United States granite industry, the South Africa gold mining industry, and in tunnelling in sandstone at Sydney, Australia. Such standards may be of value in estimating the relative efficiency of the methods used for suppressing dust in a single industry, but it would be wrong to adopt any of these standards as the measure of safety under different conditions and in other industries. Before standards of safety can be set up, more knowledge must be obtained of the factors which influence the action of dusts on the lungs, and methods of precision must be devised for measuring the concentration and character of dust clouds which cause disease. Much progress has been made in these directions as a result of co-ordinated research, and more is hoped for from work at present being carried on.

3.—Industries and processes in which silicosis occurs.

Silica is widely distributed in nature and occurs as the chief constituent of many rocks such as quartz, quartzite, ganister, gritstone, sandstone, chert, flint and in the natural quartzose sands, and it is present in many of the igneous rocks, including granite. The chief areas where sedimentary silica rocks are found are in Yorkshire, Lancashire, Northumberland and Durham, Derbyshire, Cheshire and North Wales, South Wales, Somerset and Gloucestershire, and parts of Scotland, including Angus, Ayrshire, Dumfriesshire, Fifeshire, Lanark, Midlothian, Morayshire and Stirling. Granite and other igneous rocks are found principally in Cornwall and Devon, parts of Leicestershire and North Wales, the Lake District, and in the West and North of Scotland.

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Certain natural deposits of silica occur as the remains of animal and vegetable life, the best known of these deposits being perhaps kieselguhr.

All processes which involve the manipulation of any of these materials in the dry state in such a way that the silica is broken up into minute particles and inhaled, are liable to give rise to silicosis. Chief among these are :—

mining or quarrying of quartz, quartzite, ganister, sandstone, gritstone or chert ;

drilling and blasting in these rocks ;

breaking, crushing and grinding of such rocks, or of dried quartzose sand or dry deposits or dry residues of silica, and the manipulation of the crushed or ground material in the dry state ;

mason's work on sandstone or granite ;

manufacture of ganister or silica bricks and other refractory materials ;

breaking, crushing or grinding of flint, and processes in the pottery industry involving the use of powdered flint or materials containing flint ;

grinding of metals by means of grindstones composed of natural or artificial sandstone ;

fettling of steel castings ; and

sandblasting done by means of compressed air with use of quartzose sand or crushed silica rock or flint.

4.—Means of Prevention.

The most important means for prevention include (i) suppression of dust ; (ii) ventilation ; (iii) other methods of preventing the inhalation of dust ; (iv) medical examinations.

(i) *Suppression of dust* includes all measures which prevent the dust from being produced. It is sometimes successfully accomplished by the use of water, but to be effective the supply of water must be sufficient to keep all surfaces of the material wet during the whole process. In some cases, as in grinding of metals, effectual dust suppression is only attained by the complete immersion of the metal being ground.

(ii) *Exhaust Ventilation.*—One of the most widely applied means of prevention is by localised exhaust ventilation which to be effective should be applied at or as near as possible to the point of origin of the dust and so arranged with reference to the air inlets and general ventilation of the room as to prevent the dust from entering the atmosphere of the work-place. Where the dust is produced over a large surface, as in crushing machinery, conveyors, or mechanical sieves, it is usually necessary to enclose the machine as completely as

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possible and to apply exhaust draught to the inside of the housing, sufficient to maintain a slight negative pressure and prevent escape of dust from apertures. In the case of silica dust, where the particles are minute, considerable care and experience are required in designing the plant for the removal of dust. It is also necessary to prevent the dust from the exhaust plant entering the atmosphere of any room or place where persons are working, and for this reason systems of localised exhaust ventilation must be provided with dust collecting appliances.

The percussive drills worked by compressed air, which are largely used at mines and quarries and produce large quantities of fine dust, can now be provided with a " dust trap " which gives the workman efficient protection. A considerable number of these dust traps are now in use. The principle in these drills has been adapted to pneumatic tools for stone dressing by a device the working of which is demonstrated at the Home Office Industrial Museum.*

In this Museum there are also exhibited a series of photographs of the chief processes in the pottery, metal grinding, and refractories industries, and the protective measures required, as well as specimens of the materials giving rise to silica dust, microphotographs and dust counts of the dust content of the atmosphere of the work-places, and X-ray photographs of the lungs of workers affected by silicosis due to work in these industries.

(iii) *Other preventive measures.*—A breathing apparatus consisting of a helmet or closely fitting facepiece provided with an air supply drawn through a tube from a pure source affords protection for workmen employed in processes giving rise to dust and is most useful in industries which are carried on occasionally only or for short periods.

Respirators can never be regarded as a substitute for exhaust ventilation, but for processes which are outside the range of such ventilation an efficient respirator is desirable. Respirators at present available with a filtering medium of fibre or tissue afford insufficient protection against fine dusts, but investigations are being made by the Department of Scientific and Industrial Research with a view to the provision of a satisfactory type. Considerable progress has been made and it is hoped that before long a respirator possessing the necessary properties will be produced.

The effectual segregation of dusty processes, so as to protect workers employed in non-dusty processes from unnecessary exposure to dust, should be adopted wherever practicable. It is required, for example, in racing grindstones by the Grinding of Cutlery and Edge Tools Regulations.

* At 97 Horseferry Road, Westminster, S.W.1. Open on every week-day 10 a.m. to 4 p.m. Admission free.

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The success of preventive measures depends not only on the satisfactory design and installation of the exhaust ventilation system, but to an even greater extent on the proper maintenance of the apparatus or plant provided. In this connection there is a responsibility on the workman as well as on the management, and the undermentioned codes of Regulations make it obligatory on the workmen employed to make full and proper use of the appliances provided and to report forthwith to the management any defect in the same.

Regulations to safeguard the workman against the inhalation of silica dust are now in force for the grinding of metals and cleaning of castings,* the manufacture of cutlery and edge tools,† handling, moving, breaking, crushing, grinding or sieving of refractory material, and the manufacture of silica bricks,‡ and certain processes in the manufacture of pottery.§

For the detailed requirements regarding each industry reference should be made to the particular code of Regulations, but broadly they consist of the effective enclosure of the apparatus with provision of efficient localised exhaust ventilation, and an approved system of mechanical general ventilation, the provision of a steam or water spray, the segregation of the dusty processes; and general measures for securing greater cleanliness of the premises and appliances.

In factories and workshops to which special Regulations do not apply, the powers given in section 74 of the Factory and Workshop Act to require the provision of localised exhaust ventilation or other mechanical means for removing dust for any process in which dust is generated to an injurious extent are exercised to prevent exposure to silica dust.

Section 78 of the Coal Mines Act, 1911, requires generally that mechanical drills used for drilling in highly siliceous rocks shall be provided and used with an efficient means to prevent the escape of dust into the air.

Under the same Act general Regulations‖ have been made for ganister mines, and under the Metalliferous Mines and Quarries Acts, special rules have been established in tin mines and in many quarries where ganister, sandstone and other silica rocks are worked.

(iv) *Initial and periodic medical examinations.*—Workers in certain processes are required to be examined medically when

* The Grinding of Metals (Miscellaneous Industries) Regulations, 1925 S.R & O. 1925, No. 904).
† The Grinding of Cutlery and Edge Tools Regulations, 1925 (S.R. & O. 1925, No. 1089).
‡ The Refractory Materials Regulations, 1931 (S.R. & O. 1931, No. 359.)
§ The Pottery (Silicosis) Regulations, 1932, (S.R. & O. 1932, No. 393).
‖ S.R. & O. 1920, No. 873.

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first employed; and also at intervals during their employment.* The object of the initial examination is to prevent workmen whose respiratory physique is defective and who, if not more liable to contract silicosis, run much greater danger if silicosis develops, from entering the industry. The periodic medical examinations which are carried out at the works should be of great value as a preventive measure. They enable cases of silicosis to be detected at an early stage, and if the workman is then excluded from, or voluntarily gives up, further employment in the dusty processes, the development of the disease may be arrested. They also enable persons found to be suffering from pulmonary tuberculosis, who not only expose themselves to additional risk by remaining in the dusty industries but are also a possible source of infection to their fellow workers, to be eliminated; and they provide cumulative evidence as to the changes in the workman's condition which is of the greatest assistance in diagnosis when the question arises of certification for purposes of compensation. Further, they indicate where the conditions are still giving rise to the disease, and may thus be of material assistance in enabling the necessary precautions to be taken.

5.—Provision for compensation.

Compensation in cases where death or disablement is caused by silicosis or silicosis accompanied by tuberculosis contracted during employment is now payable in all the industries where a serious risk of the disease exists. Owing to the nature of the disease a special compensation procedure different from the ordinary provisions of the Workmen's Compensation Acts has had to be devised. Special Compensation Schemes have been made by the Home Office under the powers given by Parliament for the purpose, a list of which, and an indication of the processes to which they apply, is given in Appendix II. Before making claims to compensation or applications to the Medical Board for Certificates (see below) the actual Compensation Schemes should be carefully studied, particularly the definitions of the processes given in paragraph 2 of the Schemes.

6.—Medical Arrangements for examination and certification of cases.†

Any workman desiring to make a claim to compensation must have a certificate from the Medical Board appointed by the Home

* See the Silicosis and Asbestosis (Medical Arrangements) Scheme, 1931, paragraphs 12 and 13 as amended by the Scheme of 1934. The requirements apply to the processes in the Refractories, Sandstone and Pottery Industries which are set out in the Schedule to the Scheme of 1934.

† These arrangements are based on the recommendations of a Departmental Committee appointed to advise as to the medical arrangements which could be made for the diagnosis of silicosis. The Report of the Committee was published by H.M. Stationery Office in 1929. Price 6d.

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Office unless his employer agrees that he is liable to pay compensation without such certificate.

This Medical Board, consisting of a Chief Medical Officer and eight Medical Officers, is divided up into four "panels" of two Medical Officers each, with centres at Bristol, Manchester, Sheffield and Stoke-on-Trent. The Chief Medical Officer is stationed at Sheffield. A list of the panels and the area assigned to each is given in Appendix III.

The remuneration and expenses of the Medical Board are paid out of a general Medical Expenses Fund, which is maintained out of fees payable by the employers and workers or their dependants. These fees, and the directions as to when and how they are to be paid, are set out in Appendix IV.

The Medical Expenses Fund is administered by five Trustees, consisting of two employers' and two workers' representatives and one official representative. The present address of the Secretary of the Fund is the Home Office, Whitehall, London, S.W.1.

Certificates of disablement or suspension.—A workman desiring to apply to the Medical Board for a certificate is advised in his own interests to consult, in the first instance, his Approved Society, who will arranged for him to be examined by the Regional Medical Officer appointed under the National Health Insurance Acts. This examination will be free of cost to the workman. If the Regional Medical Officer is satisfied that there is reasonable cause for suspecting the existence of silicosis he will certify accordingly. On production of this certificate the workman will be entitled to examination by the Medical Board at a reduced fee. He should send the certificate, together with the prescribed fee, either to the chief officer of the Medical Board, or to the senior member of the panel for his area (see Appendix III) stating the Compensation Scheme under which the claim is made, the name and address of the works of the employer who last employed him in a process included in the Scheme, the nature and duration of the employment and the date when he left the employment. The Medical Board will then fix a time and place for the examination and will notify the workman accordingly.

There is no appeal from the Medical Board's decision, and hence it is important that all material information and especially the employment history should be given to the Board.

If the workman fails to obtain the certificate from the Regional Medical Officer he may still decide to proceed with his application for examination by the Medical Board, but in that case he will be required to deposit a fee based on the full cost of the examination, part of which will, however, be refunded to him if the Medical Board issue a certificate and the liability of the employer has been established.

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Before issuing any certificate the Medical Board send a notice to the employer, or, where a Compensation Fund has been established under the Scheme, to the Fund, and consider any statement made or submitted to them in writing by or on behalf of the employer or the Fund.

Except in cases of death—see below—the Medical Board are not required to issue a certificate unless the workman is found to be suffering from silicosis or silicosis accompanied by tuberculosis to such a degree as to make it dangerous for him to continue work in the industry or process, but an intimation of the result of the examination is sent to the workman in every case.

If a workman who is subject to initial or periodic medical examination is, as the result of such examination, excluded from employment on account of silicosis or silicosis accompanied by tuberculosis, the Board issue a certificate (for which no fee is payable), and on this the workman can base a claim to compensation subject to the provisions of the appropriate Compensation Scheme.

Certificates of death.—In cases of death from silicosis, compensation can only be claimed on a certificate given by the Medical Board. Save in exceptional cases where the deceased workman was entitled to weekly payments under a Compensation Scheme during life and the Medical Board are satisfied that a post mortem examination is unnecessary, this certificate will only be given after a post mortem examination. It is important, therefore, that when it is desired to claim compensation for the death of a workman, application should be made without delay to the Medical Board, who will arrange for the post mortem examination except where H.M. Coroner orders one to be made. The application should be accompanied by the fee prescribed by the Regulations (see Appendix IV), and information as to the nature and duration of the deceased workman's employment. In cases where inquests are held, H.M. Coroners have been invited to consult with the Medical Board as to the arrangements for the post mortem examination, and to give the Board an opportunity either of making or of being represented at the examination.

Disposal of certificate.—If, as in the Refractories and Sandstone Industries, Joint Committees representing both employers and workers have been appointed for the settlement of claims, the Medical Board will forward the certificate to the Secretary of the appropriate Joint Committee, who will communicate with the workman or his dependants, as the case may be, in regard to the claim.

In cases arising in other industries the certificate will be sent to the workman or his dependants who should then notify the claim to compensation direct to the employer. Under the Schemes for these other industries, compensation is recoverable from the employer who last employed the workman in one or more of the

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processes, and the procedure for recovering compensation is substantially the same as that laid down in the Act for recovering compensation for accidents or scheduled diseases.*

7.—Asbestosis.

Asbestosis is a disease of the lungs produced as a result of the inhalation of asbestos dust usually over a period of several years and occurs in workers in occupations associated with production of asbestos dust in a fine state of division. It is characterised by a special type of fibrosis of the lung tissue which resembles silicosis in its general features of causation and development, but differs from it in some of its clinical and pathological manifestations.

The characteristics of the dust which gives rise to the disease differ in some ways from the silica particles which cause silicosis. In the case of asbestos, owing to the fibrous character of the mineral, many of the free particles are elongated and extremely thin.

The change produced in the lungs is a gradually developing fibrosis in the form of a network throughout the lungs. The nodular distribution of the fibrosis, so characteristic of silicosis, is not seen. Tuberculosis may co-exist but apparently does not supervene so frequently as in silicosis.

Once the fibrous tissue change is established in the lungs, the disease becomes progressive. The first prominent symptom is usually shortness of breath and it remains the most prominent one throughout. Bronchitis, bronchiectasis and broncho-pneumonia are complications frequently met with.

Industries and processes in which asbestosis occurs.—Processes involving exposure to asbestos dust which are known to give rise to asbestosis or in which the conditions are such as to be liable to produce the disease, are the breaking, crushing, disintegrating, opening and grinding of asbestos and the mixing or sieving of asbestos or any admixture of asbestos, the manufacture of asbestos textiles, the making of insulating slabs or sections and the making or repairing of insulating mattresses composed wholly or partly of asbestos, and the sawing, grinding and turning in the dry state of articles composed wholly or partly of asbestos such as motor car brake and clutch linings, jointings, electric insulating materials and some types of electrodes.

Means of prevention.—As in the case of silicosis, suppression or control of the dust is the chief means of preventing the disease. The Asbestos Industry Regulations† require the adoption of wet methods, effective enclosure of dust-producing machines, adoption

* See Home Office Memorandum on the Workmen's Compensation Acts, 1925–1931. H.M. Stationery Office, price 3d.

† S.R. & O. 1931, No. 1140.

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of enclosed mechanical methods instead of hand conveyance and dusty hand work generally, and application of exhaust draught at dust-producing points.

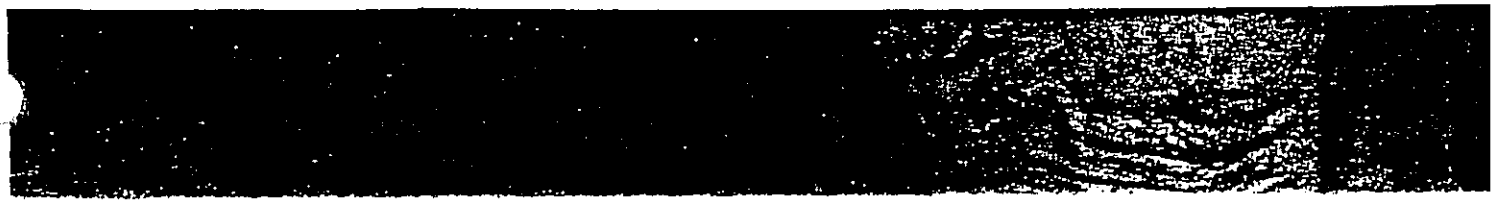
As in the silica industries, initial and periodic medical examinations may be of great value as a means of preventing or arresting the development of asbestosis; and these are obligatory* for workmen employed in the processes of breaking, crushing, disintegrating, opening or grinding of asbestos, and the mixing or sieving of asbestos or any admixture of asbestos, and in the making of asbestos textiles and insulating mattresses.

Provision for Compensation.—Compensation is provided for under a special Scheme in cases of death or disablement caused by asbestosis or asbestosis accompanied by tuberculosis. This Scheme applies to workmen employed in the processes, a list of which is given in Appendix II, at any time on or after 1st May, 1931. The compensation is recoverable from the last employer who employed the workman in the processes and the procedure for recovering compensation is substantially the same as that laid down in the Act for recovering compensation for accidents or scheduled diseases.

Medical arrangements for examination and certification of cases.—The medical arrangements for the examination and certification of cases are similar to those described in the earlier pages of this Memorandum for silicosis.

* Silicosis and Asbestosis (Medical Arrangements) Scheme, 1931, pars. 12 and 13 (S.R. & O. 1931, No. 341), as amended by the Scheme of 1934 (S.R. & O. 1934, No. 889).

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(9) "Report of the Departmental Committee on Compensation for Silicosis dealing with the Pottery Industry." H.M. Stationery Office, 1928.

(10) "Report of the Departmental Committee as to the Medical Arrangements which could be made for the Diagnosis of Silicosis." H.M. Stationery Office, 1929.

(11) "Silicosis—Records of the International Conference held at Johannesburg in August, 1930." International Labour Office, Geneva, 1930.

(12) "Report on the International Conference on Silicosis held at Johannesburg in August, 1930." By Dr. E. L. Middleton. H.M. Stationery Office, 1931.

(13) "Physical Methods for the Estimation of the Dust Hazard in Industry, with special reference to the Occupation of the Stonemason." By H. L. Green and H. H. Watson. Special Report No. 199 of the Medical Research Council of the Privy Council. H.M. Stationery Office, 1935.

(14) "Report on Effects of Asbestos Dust on the Lungs, and Dust Suppression in the Asbestos Industry." By Dr. E. R. A. Merewether and Mr. C. W. Price. H.M. Stationery Office, 1930.

(15) "The Occurrence of Pulmonary Fibrosis and Other Pulmonary Affections in Asbestos Workers." By Dr. E. R. A. Merewether. *Journal of Industrial Hygiene*, May and June 1930.

(16) "A Memorandum on Asbestosis." By Dr. E. R. A. Merewether. *Tubercle*, November and December, 1933 and January, 1934.

(17) "Report on Conferences between Employers and Inspectors concerning Methods for Suppressing Dust in Asbestos Textile Factories." H.M. Stationery Office, 1931.

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APPENDIX II.

LIST OF COMPENSATION SCHEMES AND THE PROCESSES TO WHICH THEY APPLY.

1. *Refractories Industries (Silicosis) Scheme*, 1931*.—A Scheme for the Refractories Industries, that is, the getting of ganister and other highly siliceous materials, and the manipulation of such materials in the manufacture of silica bricks and other articles for lining furnaces.

2. *Sandstone Industry (Silicosis) Scheme*, 1931†.—This Scheme covers the getting and manipulation of sandstone with a view to manufacture, sale or use at mines or quarries or on premises worked in conjunction with a mine or quarry.

3. *Metal Grinding Industries (Silicosis) Scheme*, 1931‡.—This Scheme deals with the grinding of metals on grindstones composed of natural or artificial sandstone, and certain incidental processes.

4. *Various Industries (Silicosis) Schemes*, 1931, 1934 and 1935§.—A general Scheme embracing a variety of processes in different industries, including mining and quarrying of silica rock except in so far as this is covered by the Refractories Industries and Sandstone Industry Schemes (see above); drilling and blasting in silica rock in or incidental to the getting of other minerals; any operations underground in coalmines and haematite iron ore mines; stone mason's work on silica rock or granite or other igneous rock (in so far as it is not included in the Sandstone Industry); breaking, crushing, grinding, sieving, mixing or packing of silica rock and certain other highly siliceous materials or dry admixtures containing such materials; certain specified processes involving exposure to silica dust in or incidental to the manufacture of china or earthenware including sanitary earthenware, electrical earthenware, and earthenware tiles; fettling of steel castings; sandblasting of metal or articles of metal by means of compressed air with the use of quartzose sand or crushed silica rock or flint; and all underground and certain surface operations at tin mines.

5. *Asbestos Industry (Asbestosis) Scheme*, 1931‖.—This Scheme covers the following processes in which *asbestosis* is liable to occur, namely, breaking, crushing, disintegrating, opening and grinding of asbestos, mixing or sieving of asbestos or any admixture of asbestos, the manufacture of asbestos textiles, the making of insulation slabs or sections or mattresses composed wholly or partly of asbestos, other manufacturing processes carried on in the same room as any of the foregoing processes, the cleaning of machinery and plant used in the processes and of chambers, fixtures and appliances for the collection of asbestos dust, and the sawing, grinding and turning in the dry state of articles composed wholly or partly of asbestos, except articles composed wholly or partly of woven asbestos impregnated with bitumen or other bond of an adhesive nature.

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* S.R. & O. 1931, No. 345. This Scheme superseded the Refractories Industries Schemes, 1919 (S.R. & O. 1919, No. 12) and 1925 (S.R. & O. 1925, No. 79).

† S.R. & O. 1931, No. 346. This Scheme superseded the Sandstone Industry Scheme, 1929 (S.R. & O. 1929, No. 171).

‡ S.R. & O. 1931, No. 343. This Scheme superseded the Metal Grinding Scheme, 1927 (S.R. & O. 1927, No. 380), as amended by the Order of 1930 (S.R. & O. 1930, No. 118).

§ S.R. & O. 1931, No. 342, 1934, No. 1155 and 1935, No. 69. The 1931 Scheme superseded the Various Industries Scheme, 1928 (S.R. & O. 1928, No. 975), as amended by the Order of 23rd December, 1930 (S.R. & O. 1930, No. 1095).

‖ S.R. & O. 1931, No. 344.

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APPENDIX III.

Silicosis and Asbestos Medical Board.

The Chief Medical Officer is C. L. Sutherland, M.D., D.P.H., 37 Exchange Street, Sheffield 2.

The centres at which panels have been set up, the members of the panels, and the areas assigned to the panels are as follows:—

Centre, and Members of Panel.	*Area.*
Sheffield, 37, Exchange Street. S. Bryson, M.B., Ch.B. (Senior Member). H. Blyth, M.B., Ch.B.	The Counties of York East and West Ridings, Nottingham and Lincoln, part of the County of Derby, viz., the Boroughs of Buxton, Chesterfield and Glossop; the Urban Districts of Bolsover, Brampton and Walton, Clay Cross, Dronfield, and New Mills; and the Rural Districts of Chapel-en-le-Frith, Chesterfield, Clown, Glossop Dale, Hayfield and Norton.
Manchester, 14a, Blackfriars Street. J. M. Tyrrell, M.B., Ch.B. (Senior Member). J. C. McVittie, M.B., Ch.B.	The Counties of Northumberland, Durham, York North Riding, Cumberland, Westmorland and Lancaster; and Scotland.
Bristol, Atlas Buildings, Clare Street. N. Keating, L.R.C.P., L.R.C.S. (Senior Member). R. W. Thomas, M.D.	The Counties of Cornwall, Devon, Dorset, Gloucester, Hereford, Monmouth, Salop, Somerset, Warwick, Wilts and Worcester; and Wales.
Stoke-on-Trent, Lonsdale House, Lonsdale Street. A. Meiklejohn, M.D. (Senior Member). F. N. R. Price, M.B., Ch.B.	The Counties of Chester and Stafford and the County of Derby *except* the portion assigned to the Sheffield Panel.

For any area not assigned to any of the above-mentioned panels of the Board, arrangements will be made by the Chief Medical Officer as and when necessary.

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DICAL BOARD.

d, M.D., D.P.H., 37 Exchang:

:p, the members of the panels, :ollows:—

Area.

Counties of York East and st Ridings, Nottingham and coln, part of the County of by, viz., the Boroughs of :ton, Chesterfield and Glossop; Urban Districts of Bolsover, .mpton and Walton, Clay ss, Dronfield, and New Mills; the Rural Districts of .pel-en-le-Frith, Chesterfield, vn, Glossop Dale, Hayfield and ton.

Counties of Northumberland, 'ham, York North Riding, ıberland, Westmorland and caster; and Scotland.

'ounties of Cornwall, Devon, set, Gloucester, Hereford, uth, Salop, Somerset, ck, Wilts and Worcester; Wales.

Counties of Chester and ford and the County of by *except* the portion assigned he Sheffield Panel.

bove-mentioned panels of the Medical Officer as and when

APPENDIX IV.

FEES PAYABLE FOR EXAMIN.TIONS AND CERTIFICATES BY MEDICAL BOARD.

Prescribed by the Silicosis and Asbestosis (Medical Fees) Regulations (S.R.O. 1931, No. 412 and 1934, No. 1063).

No. of Fee.	Description of examination or certificate in respect of which fee is payable, and directions as to payment.	Amount of Fee.
	Cases of death (see paragraph 7 of Scheme).*	
1	On application for certificate ... ... *This fee is payable by or on behalf of the applicant through the Medical Board.*	£2 2s. This fee, less 12s. is returnable to the applicant if the Medical Board issue a certificate that the death was due to the disease and Fee No. 2 referred to below has been paid over to the Fund.
2	On issue of a certificate that the death was due to the disease ... ... *This fee is payable by or on behalf of the employer† on demand from the Secretary to the Silicosis and Asbestosis Medical Expenses Fund.*	£10
	Cases of Total Disablement or of Suspension (see paragraph 8 of Scheme).	
3	On application for examination— (i) where there is produced a certificate of the Regional Medical Officer of the Ministry of Health that there is reasonable cause for suspecting the disease	£1 10s. This fee, less 10s. is returnable to the applicant if the Medical Board issue a certificate of total disablement or suspension on account of the disease and fee No. 4 referred to below has been paid over to the Fund.

* Throughout these Regulations "Scheme" means the Silicosis and Asbestosis (Medical Arrangements) Scheme, 1931 (S.R. & O. 1931, No. 341), as amended by the Silicosis and Asbestosis (Medical Arrangements) Amendment Scheme, 1934 (S.R. & O. 1934, No. 889).

† Paragraph 21 (2) of the Scheme provides that where a fee is prescribed as payable by or on behalf of an employer, and no provision is made in the Compensation Scheme for the payment of such fees from a Compensation Fund, the employer liable to pay the said fee shall, except as otherwise provided, be the employer from whom the compensation due to the workman is recoverable.

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No. of Fee.	Description of examination or certificate in respect of which fee is payable, and directions as to payment.	Amount of Fee.
	(ii) where no such certificate is produced *This fee is payable in either case by or on behalf of the applicant through the Medical Board.*	£8. This fee, less 10s., is returnable to the applicant if the Medical Board issue a certificate of total disablement or suspension on account of the disease and Fee No. 4 referred to below has been paid over to the Fund.
4	On issue of a certificate of total disablement or of suspension on account of the disease ... ... *This fee is payable by or on behalf of the employer on demand from the Secretary to the Silicosis and Asbestosis Medical Expenses Fund.*	£8.
	Re-examinations of workmen (see paragraph 9 of Scheme).	
5	On application for any such re-examination *This fee is payable by or on behalf of the applicant through the Medical Board.*	£1 10s. And in any case where a radiographic examination is directed by the Medical Board, an additional fee of £1 11s. 6d.
	Initial examinations of newly engaged workmen (see paragraph 12 of Scheme).	
6	For every such examination ... ... *This fee is payable by or on behalf of the employer responsible for arranging for the examination, either through the member of the Board or other medical practitioner making the examination or, where not so paid, on demand from the Secretary to the Silicosis and Asbestosis Medical Expenses Fund.*	6s.
	Periodic Examinations (see paragraph 13 of Scheme).	
7	For every such examination of a workman, including the issue of any certificate as the result of such examination ... ... *This fee is payable by or on behalf of the employer by whom the workman is employed at the time of the examination, on demand from the Secretary to the Silicosis and Asbestosis Medical Expenses Fund.*	19s. And in any case where a radiographic examination is directed by the Medical Board, an additional fee of £1 11s. 6d.

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.e and	Amount of Fee.
duced :se by rough	£8. This fee, less 10s., is returnable to the applicant if the Medical Board issue a certificate of total disablement or suspension on account of the disease and Fee No. 4 referred to below has been paid over to the Fund.
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graph	
ation ehalf dical	£1 10s. And in any case where a radiographic examination is directed by the Medical Board, an additional fee of £1 11s. 6d.
ork- ... lf of going the tical n or, . the tosis	6s.
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nan, e as ... lf of n is ina- y to tical	19s. And in any case where a radiographic examination is directed by the Medical Board, an additional fee of £1 11s. 6d.

No. of Fee.	Description of examination or certificate in respect of which fee is payable, and directions as to payment.	Amount of Fee.	
	Arbitrations or other Proceedings in the County Court.		
8	Where a reference is made to the Medical Board for a certificate under section 19 of the Workmen's Compensation Act, 1925—		
	(i) if the workman has previously been examined by the Medical Board	£2 10s.	And in any case where a radiographic examination is directed by the Medical Board, an additional fee of £1 11s. 6d.
	(ii) if the workman has not previously been examined by the Medical Board	£6 10s.	
	This fee is payable in either case by the applicant for the reference as and when directed by the County Court Registrar.		
9	Where the Medical Board make a report on a case under section 23 or paragraph (11) of the First Schedule of the Act—		
	(i) if the workman has previously been examined by the Medical Board	£2 10s.	And in any case where a radiographic examination is directed by the Medical Board, an additional fee of £1 11s. 6d.
	(ii) if the workman has not previously been examined by the Medical Board	£6 10s.	
	This fee is payable in either case by the employer or workman as and when directed by the County Court Judge or other arbitrator or the County Court Registrar.		
10	Where in the case of a workman desiring to receive his compensation abroad, in pursuance of section 16 of the Act, a reference is made to the Medical Board for a certificate as to the permanent nature of the incapacity	£1 10s.	
	This fee is payable by the workman on application to the County Court for the reference.		
	Miscellaneous.		
11	For a copy of any certificate issued by the Medical Board under the Scheme ...	1s.	
	This fee is payable by the applicant for the certificate at the time of the application.		

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