Methods in Handling the Silicosis Problem in Ontario

By G. C. Bateman*

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The Workmen's Compensation Act of Ontario was passed in 1915 and Miners' Phthisis was added to the list of compensable industrial diseases in 1916. Under this provision of the Act only about two cases were compensated per year.

In 1924, the Department of Public Health made a survey of miners in the four principal camps—Sudbury, Porcupine, Kirkland Lake and Cobalt—and the survey indicated that an alarming proportion of the men exposed to dust had silicosis in one or other of its several stages. A number of conferences were held between representatives of the Department of Mines, the Department of Public Health, the Compensation Board and the mine operators. The operators were advised that in the earliest stages of silicosis there was no physical disability and if men in that stage were removed from underground there would be little danger of permanent disability. They were further advised that if active steps were taken at once to compensate men that had some real disability and remove from the mines men in the early stages of silicosis, the first cost would be the greatest and thereafter their liability should decrease.

As a result of this advice, and having at that time no reason to doubt the findings of the survey, the operators agreed to do all that was asked of them and cooperate with the Government in the steps believed necessary to meet the situation, and to provide compensation for the men affected.

Amendments in 1926

Arrangements were made for the necessary amendments to the Mines Act and the Workmen's Compensation Act and these amendments were passed in 1926. The Amendment to the Mines Act provided that all underground employees must be the holders of certificates certifying that they were free from tuberculosis of the respiratory organs and further provided that the certificates must be renewed annually. The Government, however, at that time refused to adopt a form of certificate for applicants certifying as to their physical fitness for underground work. The Amendments to the Compensation Act defined both silicosis and

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tuberculosis and adopted the South African basis of classification for silicosis in its three stages of anteprimary, primary and secondary. These are practically identical with the first, second and third stages used in the United States.

The Amendments further provided that to be entitled to compensation a man must have been working at the date of or subsequent to the passing of the amendments, and that he must have had five years proven exposure in Ontario mines. Exposure prior to the passing of the amendments was allowed provided the claimant was working at the time of or subsequent to the passing of the Amendments.

At that time it was considered advisable, both for the companies and for the employees, that men with silicosis should be taken out of the mines. To ensure this the Compensation Board in advising a man that he had been classified as a silicotic notified him that if he continued the work in which he was exposed to silica dust he would not be entitled to any further compensation, whether or not his disease progressed.

The award made for anteprimary or first-stage silicosis was $500. Because there was believed to be no physical disability with that stage of silicosis, the award was not considered as compensation but as a rehabilitation allowance to carry the man over the period of establishing himself in some other occupation. The award for primary or second-stage silicosis, which implied some physical disability, was $1000, and for secondary or complete disability the regular award for total disability, which is two-thirds of average earnings with a maximum of two-thirds of $2000 per year.

An examining station was established at Porcupine in charge of a doctor who was believed to be expert in diagnosing silicosis. At first this station was operated by the mines themselves but subsequently, at the request of the operators, was taken over by the Workmen's Compensation Board. The results of the early examinations showed so high an incidence of silicosis that questions naturally arose as to the accuracy of the diagnosis. It was considered advisable to get advice from South Africa, where the technique of examinations had been well established, and Dr. J. M. Smith, Chairman of the Silicosis Referee Board in South Africa, was retained to make a survey of the whole situation.

After spending three months in checking the work done up to that time, Dr. Smith reported that the actual number of silicoties was very much smaller than had been stated, and that many men having only a general fibrosis had been classified as silicoties. Dr. Smith's work resulted in the adoption of the South African standards for diagnosis in Ontario, but in the meantime a large present and prospective liability had been created for men who were not entitled to it.
As stated before, the mines had been advised that the $500 payment to men with anteprimary silicosis was for rehabilitation rather than compensation, and that with this payment to them, the liability of the mines would be practically at an end. It developed, however, that the legal position was different. Any award made by the Board, including the $500 to nondisabled silicotics, could be considered only as compensation, and compensation could be paid only for disability. It followed therefore that any increase in disability or increase in progression of the disease was considered as the result of the original disability, and for this the mines were held responsible.

A workman was considered as having secondary silicosis: (1) when there was serious and permanent impairment of working capacity from uncomplicated silicosis, (2) when tuberculosis was present with any compensable degree of silicosis. Experience showed that silicosis did progress, therefore, although this was not apparent for some years, every anteprimary silicotic was considered as a potential total disability case, with an average estimated cost of $11,000. Eventually, when an award of $500 was made to an anteprimary, an additional progression liability of $10,500 was set up and the industry was asked to provide this sum as well.

As time went on, it was also found that removing the men from underground did not necessarily improve their condition or arrest the disease. In fact, as a general rule removal accelerated progression. While this was contrary to the general view, we were forced to the conclusion that there was little advantage in removing a known silicotic from his ordinary work, as a careful analysis of progression rates indicates little if any difference in favor of those removed. This, of course, is subject to the qualifications that every effort should be made to reduce the dust hazard, that silicotic workmen should not be allowed to work where the concentration of dust is high, that where periodic examinations show a rapid development of fibrosis the workman should be removed from dust exposure before he reaches the silicotic stage, that where there is a definite suspicion of tuberculosis the workman should not be allowed to work in dust exposure, and that no workman with pulmonary tuberculosis should be allowed in any position where he will be a menace to his fellow employees.

Of nine men in one mine classified as silicotic in 1926, eight are alive today, the ninth having died of pneumonia. Of the eight, aged now about 52, two were removed to the surface and have been employed there since and the other six have been continuously engaged in underground work. Except in one man, who is 61 years old, there is no evidence of slowing up. One of these men, who was rated as a primary or second stage silicotic in 1926, today, at 54 years of age, is active and healthy
looking. It is, however, only fair to say that the basis of classification has been substantially raised since 1926.

Theoretically the removal of silicotics from dust exposure should retard the progress of the disease. In actual practice our experience has been different. As a general rule, the occupations that involve dust exposure are the highest paid in industry in Ontario. A man leaving one of these positions might have to take lower pay. He might, on account of industrial conditions, be unable to get any job. Miners as a class are difficult to rehabilitate. Removal from the mine meant that their economic status was probably lowered. The award was soon spent and with the money gone and no job they often lived under conditions that accelerated progression. In addition, and perhaps most important of all, the psychological effect of the notification from the Board was very bad. Many of the men practically gave up hope and made little effort to help themselves. There was a lowering of morale, with a consequent bad effect upon a man's physical condition. These factors offset the benefits that might have been expected from removal of men from underground, and even if the economic status had remained the same it is doubtful whether removal would appreciably retard the rate of progression.

**Amendments in 1933**

Tuberculosis itself is not a compensable disease, but tuberculosis with any stage of silicosis is considered as total disability. Silicosis predisposes a man to tuberculosis and, as the Ontario Act was interpreted, the development of tuberculosis in a silicotic was considered as the result of the silicosis and as such was compensable. It did not make any difference under what conditions, or how many years after a silicotic had left the industry, if tuberculosis developed the industry was held liable. In effect the industry was required to provide insurance against the development of tuberculosis in a silicotic as long as the man lived.

These conditions created what the industry believed to be not only an onerous but an unfair burden. A large liability had been created in respect of cases which in the light of later information should not have been classified as silicotic. Men that would have been happier, and probably healthier, working were being removed from the mines. The industry felt that there should be some reasonable limit of time within which the mines would be liable for additional compensation as the result of the development of tuberculosis after a man left the employment in which he was exposed to dust.

Neither the men nor the mines were satisfied, therefore further conferences were held between the mines, the Department of Health, the Department of Mines and the Compensation Board, with a view to amending the Act. The Amendments were introduced in 1933. Briefly, they provided that the old classification in three stages should be done
away with—and with it, of course, went the lump-sum awards for ante-
primary and primary cases. While not provided for in the Act, it was
also agreed that men in the early stages of silicosis should be allowed to
continue in their ordinary occupation—provided, of course, there was no
tuberculosis, or even a reasonable suspicion of tuberculosis. The
Amendments further provided that while the industry would be responsi-
bility at any time for increased disability as the result of the progression
of uncomplicated silicosis, it would not be responsible for increased dis-
ability as the result of tuberculosis unless the tuberculosis developed
within two years from the time of leaving employment in which the
workman was exposed to dangerous dust.

The draftsmanship of the Amendments was faulty, so that there is
some question of the interpretation. As a result, individual cases are
very largely dealt with on their merits, instead of in a strict legal manner.
While this has certain disadvantages, it also has something to commend
it, particularly when there is, as in Ontario, a competent, intelligent and
impartial Board. There is also some question as to whether or not two
years is too short a period, and this may possibly be lengthened.

**Competent Diagnosis**

The principle upon which practically all compensation acts are based
is payment for impairment of working capacity. In connection with
silicosis, this is difficult to determine. Silicosis is an insidious disease
which among miners in Ontario takes usually 15 to 18 years to develop.
The diagnosis, particularly in the earlier stages, is dependent almost
entirely upon an X-ray film. There may be few if any physical or clinical
signs. It is quite probable that a man with anteprimary silicosis could
be examined by a clinic of doctors and that without the X-ray film they
would be unable to say that there was anything wrong with him.

A good deal of what may be read into a film depends upon the tech-
nique of taking the film. Its interpretation is to a considerable degree a
matter of personal opinion. Other diseases and chest conditions may
give in the film an appearance so closely simulating silicosis that differ-
entiation is practically impossible. There are few normal adult chests.
The great majority of X-ray pictures of adults that have had no industrial
dust exposure show some scar tissue and general fibrosis. Often there is
a considerable development of general fibrosis, and some cases have been
found of people that have had no industrial dust exposure that if they
had been miners would certainly have been diagnosed as silicotic.

We believe there is a tendency on the part of medical men to estimate
disability on the basis of a pathological condition as indicated by an
X-ray film rather than on actual impairment of working capacity. In
any event, doctors are not always the best judges of what constitutes
working disability, and the X-ray film alone is not a satisfactory basis for
estimating disability for compensation purposes. We also believe that once a man has been classified as silicotic there is a tendency to claim that any increase in disability is attributable to the silicosis, although it may be the result of advancing years or due to causes that cannot be definitely laid to silicosis. This is particularly true when the heart is involved, although there is a tendency toward heart conditions in older miners that have no silicosis. However, because the heart condition might be the result of silicosis, it is generally attributed to it.

I should like to emphasize the necessity of having competent examiners, who have been specially trained in the diagnosis of silicosis by both clinical and X-ray examinations. The opinion of the general practitioner, and even that of the roentgenologist and expert chest man, may be of little value. The matter is so important that the necessity for competent medical advice cannot be emphasized too strongly. We consider ourselves fortunate in Ontario in having in charge of this work doctors that are both competent and sincere. We may not always agree with them, but this does not prevent us from acknowledging their ability.

**Administration of the Act**

Administration naturally falls into four divisions—examinations, compensation, assessments and costs.

*Examinations.*—The Ontario Act provides that all underground men shall be the holders of certificates, and that they shall be examined annually. There are three permanent examining stations, and a traveling examiner for the outside mines. Each of these clinics is in charge of a doctor that has had special training and experience. These doctors do the routine examinations and issue or refuse the certificates. The doctors and the stations are under the jurisdiction of the Compensation Board. In addition, there is a Referee Board, consisting of doctors of the Provincial Department of Public Health, and no claim for silicosis is allowed by the Compensation Board until the claimant has been examined by the Referee Board. The permanent stations are located in the principal camps, and can examine an average of 4000 men a year each.

The doctors also examine all applicants. If silicosis is to be controlled, the standard of men allowed to enter the industry must be high. Standards for acceptance have been adopted and have gradually been raised, and the initial examinations have been made more rigid in order to keep out of the industry men with the type of chest that would indicate their susceptibility to tuberculosis or silicosis.

Uncomplicated silicosis is not a serious problem. The dangerous factor is tuberculosis, which is the most active known agent in the development of fibrosis of the lungs. A tubercular person may be just as dangerous on the surface as underground, and arrangements are now being
made to have the examination of surface men made a regular part of the work. Men with tuberculosis are not allowed to work underground and the doctors remove men from underground work when there is a definite suspicion of tuberculosis.

Compensation.—A claim for silicosis compensation may be made by the claimant himself, by his employer, by the doctor, or by anyone acting on his behalf. The first thing the Board does is to obtain full particulars from the claimant and his employer, including a statement of his earnings, and to establish whether or not he has had five years proven exposure in Ontario mines. If the latter cannot be proved, the claim is not allowed. If the man is eligible for compensation, the claim is passed on to the Referee Board, which examines the claimant and reports to the Compensation Board. When there is tuberculosis with silicosis the man is classified as a total disability. In other cases the Referee Board may estimate a percentage of disability due to silicosis, or may find that the man does not have a compensable degree of silicosis, or may find that the man does not have silicosis within the meaning of the Act. When the Referee Board has made its report, the claims officer and the rating officer complete the file and submit it with their recommendation to the three members of the Compensation Board. Except in cases of total disability from tuberculosis, all claims for silicosis are generally passed upon by the full Board, which may or may not, but usually does, accept the opinion of the Referee Board as to the degree of disability, if any.

Except in the case of silicosis complicated by tuberculosis, total disability compensation amounts to two-thirds of average earnings up to a maximum of two-thirds of $2,000 a year, with a minimum of $12.50 per week. Partial disability is paid on a proportionate basis. Tuberculosis is not a compensable disease, and because all men are liable to it, and because a certain proportion of the men classified as silicotic would develop tuberculosis whether or not they had silicosis, the rate of compensation for silicosis complicated with tuberculosis is 50 per cent of average earnings, up to a maximum of 50 per cent of $2000 a year.

Medical aid, including hospital or sanatorium costs, is payable in addition to compensation and there is no limit to the amount of medical aid that may be paid.

If death ensues, compensation is also payable to dependents. A widow receives $40 a month for life, or until remarriage, with an additional $10 a month for each child up to the age of 16 years. The pension to the widow and children is the same no matter what compensation the claimant may have been receiving; provided, of course, that death is considered to be the result of the disability.

The total average estimated cost of a total disability silicosis case is approximately $11,000, divided roughly as follows: compensation to
claimant, $3000; medical and sanatorium treatment, $4000; pension to dependents, $4000.

Silicosis Assessments.—The original survey of the Department of Health indicated a considerable variation in the incidence of silicosis as between the different mining camps of Ontario, and this difference has been confirmed by subsequent periodic examinations.

There was considerable objection to having silicosis made a part of the accident rate, and under an arrangement between the Ontario Mining Association and the Compensation Board the following basis was agreed upon.

For the purpose of silicosis assessments only, the mines of the Province were divided into five groups: (1) Porcupine, (2) Kirkland Lake, (3) Sudbury, (4) silver mines, (5) all other mines. If a particular camp included in group 5 grows to a sufficient size, a new group may be established.

Each group bears the cost of the silicosis charged against the mines of that group. For purposes of record, a silicosis case is charged against the mine where the man last worked, even although the man may have worked in other mines of the same group, or in mines of other groups. A good deal of consideration was given to this decision, but it was believed impossible to allocate cost according to exposure. The development of the fibrosis is not necessarily proportionate to the exposure in any one mine. Many of the mines in which claimants claimed exposure were closed down before the Act came into effect, and in any event the Compensation Board is interested only in proving five years exposure. While for purposes of record the case is charged against the mine where the claimant last worked, that mine is not individually liable for the cost.

Each year the Board estimates the cost for each group, and the amount is divided among the members of that group according to dust shifts. In estimating cost, the Board not only makes provision for the immediate cost of each case allowed but also includes a reserve for progression. The dust shifts are the shifts worked by all underground men, by men employed in dry-crusher stations on the surface, and by men employed in the grinding department of assay offices. Millmen engaged in a wet process are not included.

Each year the individual mines are required to report the dust shifts worked. The Board having determined the total dust shifts for a group, and having estimated the cost of silicosis for that group, divides one by the other to determine the cost per dust shift. The cost for each mine is then found by multiplying the dust shifts of the individual mines by the average cost per dust shift for the group. To this must be added the cost of examinations, Referee Board, etc. The total cost of these items is divided by the total dust shifts reported from all mines in the Province,
and a flat rate per dust shift is obtained, which is added to the cost per dust shift of the individual mines.

While the cost per dust shift is the same for each mine of a group, it may and in fact does vary considerably for the different groups. For example, the cost per dust shift for the 1936 silicosis assessment was as follows: (1) Cobalt, $0.0933; (2) Kirkland Lake, $0.0361; (3) Porcupine, $0.0919; (4) Sudbury, $0.0194; (5) all others, $0.0896. These figures are considerably below the general average and are given only to show the variation among the camps.

Costs.—There is probably no other industrial disease about which more loose talking is done, therefore some actual figures based upon experience in Ontario may be of interest (Table 1). In considering these figures it should be remembered that the provisions of the Ontario Workmen’s Compensation Act are more liberal than those of most such acts, and that the 1926 and 1927 examinations included an accumulation of cases prior to 1926. Many men in those years were classified as silicotic that would not be so classified today, but these cases did create a large liability, both direct and potential. Also, as a general rule, the workman receives the benefit of the doubt.

The silicosis amendments were passed in 1926. It is therefore a fair assumption that in taking the figures from 1926 to 1936 inclusive, and including miners’ phthisis with silicosis, both the number of cases and the cost are greater than they should be.

For purposes of comparison some information is also given regarding accident compensation rates, and deaths from accidents underground, as the latter provide a fair basis of comparison for men subject to the dust hazard.

General.—The figures in Table 1 show that from the point of view of both cost and hazard silicosis is not nearly as dangerous as ordinary underground work. Every effort is being made however to improve conditions and reduce the hazard. That these efforts are meeting with success is shown by the reduction in the number of new cases. The average number of cases allowed by the Board from 1926 to 1936 inclusive, was 36, while for the past five years the number has been reduced to 18. The period of exposure for the development of silicosis has also been lengthened from an average of between 10 and 11 years to an average of approximately 18 years.

This improvement has been brought about as a result of the active and intelligent cooperation of the industry. Recognizing that if silicosis is caused by dust, the removal of the dust will remove the cause, large sums have been spent by individual companies in ventilation. As the dust that causes the damage is practically invisible, dust sampling is used to give definite information regarding conditions. A great deal of atten-
tion has been paid to blasting practice, as blasting is believed to be the chief cause of dangerous dust in mines. Water sprays after blasting and at dusty chutes are extensively used. Considerable work has been done with dustless fronthead drills, and with respirators to be worn in dusty places. Some experimental work has also been carried on with various kinds of tamping to determine the silica content of clay tampings and with a view to finding a satisfactory substitute for clay tamping.

### Table 1.—Data on Silicosis in Ontario

<table>
<thead>
<tr>
<th>Period of Time</th>
<th>Description</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926–1936, incl.</td>
<td>Number of men employed per year in the mining groups</td>
<td>14,000</td>
</tr>
<tr>
<td>1926–1936, incl.</td>
<td>Number of men employed underground per year</td>
<td>8,500&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>1926–1936, incl.</td>
<td>Number of silicosis and miners' phthisis cases allowed per year by the Workmen's Compensation Board</td>
<td>36</td>
</tr>
<tr>
<td>1926–1936, incl.</td>
<td>Number of deaths per year allowed by the Workmen's Compensation Board as deaths from silicosis</td>
<td>3.4&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>1926–1936, incl.</td>
<td>Number of deaths per year terminated otherwise</td>
<td>9.3</td>
</tr>
<tr>
<td>1926–1936, incl.</td>
<td>Number of deaths per year from accidents to underground employees only</td>
<td>32</td>
</tr>
<tr>
<td>1932–1936, incl.</td>
<td>Number of men employed underground per year for the five years</td>
<td>10,000&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>1932–1936, incl.</td>
<td>Number of silicosis cases allowed per year by the Workmen's Compensation Board</td>
<td>18</td>
</tr>
<tr>
<td>1916–1936, incl.</td>
<td>Accident assessment rate per $100 of payroll for all industries in Ontario coming under the Workmen's Compensation Board</td>
<td>$1.17</td>
</tr>
<tr>
<td>1926–1936, incl.</td>
<td>Accident assessment rate per $100 of total payroll for mining groups only</td>
<td>$2.63</td>
</tr>
<tr>
<td>1926–1936, incl.</td>
<td>Silicosis assessment rate per $100 of total payroll for mining groups only</td>
<td>$1.17&lt;sup&gt;c&lt;/sup&gt;</td>
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</tbody>
</table>

<sup>a</sup> Estimated.

<sup>b</sup> The average of 3.4 cases per year which terminated otherwise than as deaths from silicosis includes silicotics that have died from accidents or other causes and also silicotics that have been repatriated and whom no further information is available.

<sup>c</sup> While silicosis assessments are levied only on dust shifts, the cost for purposes of comparison is calculated at the rate per $100 of total mining payroll, as it would be difficult to separate out the accident rate per $100 of payroll for those men exposed to dust.

Through the cooperation of the Department of Health much more attention is being paid to the control of tuberculosis among the general population of mining camps. The opinion seems to be gaining ground that the development of tuberculosis in miners is due largely to outside contacts. Some of the mines also have their own nursing service to follow up on tuberculosis contacts.
Research

In addition to measures for the control of silicosis adopted by the individual mines, the industry through the Ontario Mining Association finances both medical and engineering research.

Medical and pathological research is carried on by the Banting Institute under the direction of Sir Frederick Banting, and in cooperation with the Technical Silicosis Research Committee of the Association. During the past two years the Association has contributed $30,000 to the Banting Institute for this work.

The Silicosis Research Committee was appointed by the members of the Ontario Mining Association. It consists of four technically trained men, employees of mines in the different areas, who have made a special study of this subject and who have the research type of mind. The Committee employs a full-time engineer whose work consists largely of various phases of engineering research, including detailed studies of ventilation at different mines, on which reports go to the individual mines and to the Mining Association; studies of underground conditions and measures for dust control at the different mines; determination of the pH of mine atmospheres; the collection of underground dust, ore and rock samples for experimental purposes; the collection of data from various mines in connection with the Banting Institute research; and the collection of data regarding experimental work and new developments both in Ontario and other places. The Association keeps its members advised of the work of the Committee.

The intelligent approach to the problem and the active interest of the industry has had a marked effect in reducing both the incidence and cost. Silicosis is essentially an employer's problem, and the sooner this fact is recognized by an employer the better off he will be. The work done to date indicates that silicosis can be controlled. It is quite within the realm of possibility that measures for control can so lengthen the period of exposure for the development of silicosis that its onset will be coincident with the age when a man would ordinarily cease gainful employment. If this occurs, the burden on industry need not be heavy.