The Use of White Lead in Painting

The sixth item on the agenda of the forthcoming International Labour Conference is the prohibition of the use of white lead in painting. In connection with this question the Düsseldorf Chamber of Commerce has issued the memorandum which follows. In view of the interest of the information therein contained the International Labour Office decided to translate it and publish it in its series of Studies and Reports. The Office can accept no responsibility, however, for facts quoted or opinions expressed therein.

MEMORANDUM
of the Düsseldorf Chamber of Commerce

The agenda of the International Labour Conference, which is to take place in Geneva in the autumn of 1921, includes the question of the prohibition of the use of white lead in painting, which was raised by French representatives. In 1904, following on the conference of the International Association for Labour Legislation at Basle in 1903, the Düsseldorf Chamber of Commerce published a report (2) dealing with the question of the prohibition of the use of white lead. The present report completes that of 1904 by considering the whole problem of white lead since that year from the technical, hygienic, and economic point of view.

The movement against the use of white lead originated in France and spread from that country to Germany. For more than a hundred years there had been continual discussions of the danger to health arising from the use of white lead, until at last, in 1909, the Chamber passed an Act entirely

(1) Die Verwendung von Bleiweiss im Maler- und Anstreichergewerbe; issued by the Düsseldorf Chamber of Commerce, 1 April 1921. Düsseldorf, A. Bagel. Translated by permission. (Ed. Studies and Reports.)

prohibiting the use of white lead in the painting of buildings as from 1 January 1915. The extent to which the provisions of this Act concerning the prohibition of white lead have been applied and observed in practice will be examined in a later section of the present report.

In Belgium an Order concerning the use of white lead in the painting of buildings has been in force since 1910. The most important provisions of this Order are that white lead may only be used ground in oil, that dry rubbing down and scraping of paint containing white lead is prohibited, and that workers handling lead paints must undergo medical inspection every four months.

In Holland Article XXI of the Labour Act of 1911 compels every doctor to report to the General Director of Labour all cases of certain diseases, among them white lead poisoning, which occur in his practice. Provisions similar to those which existed in Germany before the war are in force as regards white lead factories.

In Austria-Hungary an Order was issued in 1908 prohibiting the use of white lead for indoor painting with three unimportant exceptions. It was also made compulsory to label all vessels used for the storage or transport of lead paints.

In Switzerland there is no prohibition. The Cantons of Geneva and Neuchâtel, however, have issued regulations permitting the sale of lead paints to painters only when ready ground. A prohibition of the use of white lead on public buildings was issued by the Federal Council, but was withdrawn a few years ago.

The Scandinavian countries, Denmark, Sweden, and Norway, have, so far as we know, issued no legal regulations for protection against white lead poisoning.

Italy has no regulations concerning the manufacture or use of white lead.

It has unfortunately been impossible to ascertain whether regulations concerning white lead have been issued in Spain. There are certainly white lead factories in Spain, so that there is evidently no general prohibition of the use of this substance.

In England the question has not gone beyond the stage of a conference between experts and the Government. At this conference, which took place in 1911 (3), it was recommended that, after the expiration of three years, the painting of carriages and other vehicles with paint containing more than 5 per cent. of lead should be prohibited.

In Germany the prohibition of white lead has been constantly demanded since the end of the nineties, and particularly since

(3) The Home Secretary appointed two Departmental Committees in January 1911 to investigate respectively the danger attendant on the use of paints containing white lead in the painting of buildings and in coach painting. The first of these Committees submitted its Report in January 1914 and the second in 1922. (Ed. Studies and Reports.)
the question was raised at the conference of the International Labour Office of Basle in 1903. The demand for legislation restricting the use of white lead was, of course, first raised by representatives of the workers, who were continually emphasising the alleged danger of industrial poisoning. In 1903 the painters' union requested the Reichstag to introduce national legislation prohibiting the use of all lead-containing paints in the painting industry. This petition was rejected by the Reichstag in full session. In 1905, however, after careful preparation, a series of regulations were laid down in an Order of the Federal Council dated 27 June 1905, to come into force as from 1 January 1906. The most important provisions of the Order were as follows:

I. In the processes of crushing, blending, mixing, and otherwise preparing white lead, other lead colours, or mixtures thereof with other substances in a dry state, the workers shall not directly handle pigment containing lead and shall be adequately protected against the dust arising therefrom.

II. The process of grinding white lead in oil or varnish shall not be done by hand, but entirely by mechanical means, and in vessels so constructed that, even in the process of filling them with white lead, no dust shall escape into the place where work is carried on.

This provision shall apply to other lead colours, provided that such lead colours may be ground by hand by male workers over eighteen years of age, if not more than one kilogram of red lead and one hundred grammes of other lead colours are ground by any one worker in any one day.

III. The processes of rubbing down and pumice-stoning dry coats of oil colour or stopping which are not demonstrably free from lead shall only be carried out after damping.

All sludge and debris produced by rubbing down and pumice-stoning shall be removed before it becomes dry.

IV. The employer shall see that every worker who handles lead colours or mixtures thereof is provided with, and wears, during working hours, a painter's overall or other working clothes completely covering him, as well as a head covering.

V. There shall be provided for all workers engaged in processes of painting, distempering, whitewashing, plastering, or varnishing, in which lead colours are used, washing utensils, nail brushes, soap, and towels. If such processes are carried on in a new building or in a workshop, provision shall be made for the workers to wash in a place protected from frost, and to store their clothing in a clean place.

VI. The employer shall inform workers who handle lead colours or mixtures thereof of the danger to health to which they are exposed, and shall hand them, at the commencement of employment, a copy of the accompanying leaflet (4), if they are not already provided with it, and also a copy of these Regulations.

The second part of the Order contains regulations for the processes of painting, distempering, whitewashing, plastering, or varnishing when carried on in connection with another industry. The most important of these provisions are the prohibition of smoking and of the consumption of alcoholic drinks in the workrooms.

(4) This leaflet is not reprinted in this translation. (Ed. Studies and Reports.)
These measures satisfied most of the demands which had at that time been forward by experts. The regulations as such are suitable and sufficient to restrict lead poisoning, if not to prevent it altogether. Their success, however, as the Ministerial Counsellor, Dr. Koelsch, points out, depends entirely on the way in which they are carried out in practice, and the strictness with which they are observed. If this is not effective, the protective measures must necessarily fail. It must be admitted that the peculiar nature of the painting industry makes the application of the Order more difficult than is usually the case with state regulations in Germany. The painting industry is generally not carried on in any one spot; the workers move from place to place. This makes it very difficult for the factory inspectors to exercise satisfactory control. It is particularly difficult to supervise the execution of regulations in small undertakings. Again, it is by no means easy to induce the workers to apply measures for the protection of their own health with the necessary strictness. The inevitable consequence is that, even after the Order was issued, the number of cases of plumbism, so far at least as is shown by the statistics of the most important sick funds up to the beginning of the war, has remained comparatively high, and the demand for further protective measures and in the last resort for absolute prohibition of the use of white lead has continually been raised. In 1910 the Society for Social Reform presented a petition to the Ministry of the Interior asking for a far-reaching prohibition of the use of lead paints, especially in indoor painting. This petition also asked that it should be made compulsory for vessels and packages to be labelled “Containing Lead—Poisonous”. Although the Government at first thought it necessary to take account of the interests of the white lead industry, which would be seriously injured by such a prohibition, the authorities of the Federal States soon decided to issue partial prohibitions of the use of white lead on their territory.

The Minister of Public Works issued the following Circular on 11 November 1913:

The use of lead paints, especially of white lead, may be prohibited in principle in indoor painting, as satisfactory substitutes (lithopone and zinc white) are available. Their use for this purpose should only be allowed when there are special reasons of a technical or artistic nature and on condition that they are not supplied in powder form, but are ground in linseed oil. In the case of outdoor painting, white lead cannot as yet be dispensed with, as the substitutes have less covering power and are more liable to crack.

The most far-reaching prohibition is contained in a regulation of the Central Railway Office, which was issued to all coachbuilding works, ordering the substitution of non-poisonous paints for white lead in all cases. It is curious
to note that this regulation is in direct contradiction to an Order which was also issued by the Central Railway Office in 1907:

As it has been shown by careful experiments extending over many years that non-poisonous colours, especially lithopone and permanent white, do not form a satisfactory substitute for white lead, we suggest that the aforesaid colours should not be used in future for the painting of wood and other parts of railway carriages.

This sudden change of opinion on the part of the Central Railway Office concerning the value of white lead and the possibility of finding substitutes for it cannot fail to strike an impartial observer; it is possibly to be attributed not so much to conviction as to external political influences. Similar Orders were issued by the Prussian Ministry of War, the German Admiralty, the German Postmaster-General, and other national and State authorities.

During the war there was on the whole very little discussion of the white lead question, as at that time very small quantities of this substance were being produced, and its use almost ceased owing to the stoppage of building operation. On the proposal of the Commission on Unhealthy Processes, however, the Governing Body of the International Labour Conference, which was held at Washington in 1919, placed the prohibition of the use of white lead in painting on the agenda of the 1921 Conference. It was owing to French influence, as has already been said, that the representation of employers, workers, and governments on the preliminary committees was abandoned. As a result the resolution was placed on the agenda without preliminary examination. The Memorandum accompanying the resolution was written by the chief of the Industrial Hygiene Section of the International Labour Office, and is in the main based on the assumption that the use of white lead in the painting industry is dangerous to health, and that it can be satisfactorily replaced by other less poisonous paints, especially by zinc white.

The Memorandum refers in particular to the investigations and experiments carried out for many years by French experts. The Düsseldorf Chamber of Commerce, in its previous report, criticised the methods of investigation by which the French experts attempted to establish that white lead can be replaced by less poisonous or non-poisonous paints, especially by zinc white. The latest French experiments carried out in

(5) During its session on 20 November 1919, the Washington Conference unanimously adopted the proposal put forward by Dr. Miall, Technical Adviser to the British employers' delegates, to the effect that an Advisory Committee, composed of representatives of governments, employers' and workers' organisations, should be immediately appointed to follow up the work of the Industrial Hygiene Section of the International Labour Office.

This Commission has not been constituted and will take up its work in the near future (Ed. Studies and Reports).
various institutions have followed the same method, and therefore came to the same conclusions. It is not necessary to repeat the criticisms of these methods. The following report, however, deals with the feasibility of substitutes for white lead from the standpoint of German technical methods and practice.

II

It was stated in our previous report that in Germany opinions on the possibility of finding substitutes for lead paints differ enormously. The situation has altered little, if at all, since that time.

The majority of the workers and their representatives state that zinc oxide and lithopone are satisfactory substitutes for white lead; but in our opinion they have not advanced satisfactory proof in support of their assertions.

It does not appear to be disputed that in indoor painting white lead is not indispensable, at any rate for top coats. The difficulty of using absolutely leadless paints in outdoor work, however, is shown by the fact that even those in favour of the prohibition of the use of lead paints are willing to allow a certain proportion of lead in "leadless" paints. In other words, they merely recommend in reality the use of paints with a low lead content. Many chemical experiments on substitutes for lead paints have been made in the last ten years. The Berlin Chamber of Commerce summarised a number of important investigations of this kind in a report published in 1909, which contains the following passage:

Neither zinc white nor such paints as lithopone, "brilliant white", etc., which are now on the market, can be regarded as a satisfactory substitute for white lead. The difference in the resistance to the weather offered by white lead and zinc is due to their chemical composition. White lead and zinc white are not neutral body colours, but form a chemical compound with the linseed oil varnish used as a solvent by the formation of lead soap and zinc soap. Hydrolysis, i.e. the chemical effect produced by water on the component parts of the paint film, both glycerides and soaps, takes place very slowly and gradually in lead soap, while in the case of zinc soap it takes place much more rapidly. Thus if zinc paint is exposed to the atmosphere, which always contains a considerable amount of moisture, or to water, it is bound to perish sooner than lead paint. When lithopone is used, conditions are even more favourable to rapid deterioration. Lithopone consists of sulphide of zinc and barium sulphate, and sulphide of zinc does not combine with fatty acids; therefore zinc soap is not formed in a paint made of lithopone and oil. The result is that a coat of paint of this kind perishes at least as quickly as a coat of varnish without paint. Lithopone cannot, therefore, be considered as a substitute for white lead. The same applies to "brilliant white", etc.

These facts, which have been proved by chemical experiment, have been frequently confirmed by the statements of experts. The master painters' guilds of which we have made enquiries are unanimous in declaring that white lead is indispensable.
The Berlin Painters' Guild, in the Berliner Malerzeitung of 17 October 1920, issued an appeal containing the following passage:

If more southern countries than our own have been unable to maintain the prohibition of the use of white lead in painting, such a prohibition is an economic impossibility in a northern country like Germany. Climatic conditions are the determining factor in painting. For outdoor painting, e.g. house fronts, windows, doors, eaves, zinc roofing, wooden and iron railings, iron girders, iron bridges, etc. there is no material which can replace white lead. This has been conclusively proved by many experiments and by the observation of years.

In proof of its statements the Guild adduces the result of an investigation made by its Committee on Materials into the durability of base colours for outdoor painting:

That colour is the most durable which remains longest in combination with the oil, i.e. which offers the longest resistance to the saponification of the oil by carbonic acid and sulphurous vapour fumes in the atmosphere. This colour is white lead. Owing to its metallic character it remains longest in combination with the oil used as solvent, because the decomposition of lead by sulphurous vapours is a slow process. Zinc white has less covering power than white lead, and gives very little protection to the oil solvent, because, owing to its volume, a great deal of oil is combined with a small quantity of colour. It reacts very strongly to carbonic acid, and the destruction of the linseed oil solvent is thus hastened.

Lithopone absorbs the oil, because the decomposition of the vehicle goes on not only from without but from within. The components of lithopone, barium carbonate and zinc sulphide, are in themselves destructive agents of the acid-absorbing linseed oil.

The Union of Painters' Guilds of the Rhineland and Westphalia, at a conference held in October 1920, considered the question of the prohibition of the use of white lead in painting, and stated in a resolution that white lead was indispensable for outdoor work. No other white paint approached white lead in durability, and all others soon deteriorated when exposed to the weather and lost their tint.

We have made enquiries of ever thirty master painters' guilds in all, and all have come to the conclusion that it is absolutely impossible to replace white lead. It must be remembered, moreover, that master painters and their organisations have not the slightest reason to defend the use of white lead, as the observation of the protective regulations dealing with it is very trying for them. In the long run it is surely a matter of indifference to the master painter whether he carries out his contracts with lead or any other kind of paint.

We have further consulted a large number of ship-building and ship-fitting firms. With a few exceptions they all state that it would be very difficult for them to dispense with white lead. After the unfavourable experience of leadless paints
which most shipbuilders had during the war, the majority have returned to the use of white and red lead for the painting of ships. The North German Lloyd considers lead paints indispensable for shipbuilding, because they constitute a complete protection of the metal against the weather and against acids, and thus ensure a much longer life for the ships than if these were painted with mineral colours, for instance. This is the great value of red lead. Even those shipyards, however, which employ exclusively lithopone and zinc white for the painting of ships, emphasise the value of white lead for putty and filling. No colour is so suitable as white lead for hardening the oil solvent without admitting air, thus preventing the entrance of sea water. Although the use of white lead has considerably decreased in nearly all shipyards in comparison with 1914, this is not, as the workers claim, because substitutes have been found, so much as because hardly any white lead was manufactured during the war, and because immediately after the war it could not be used owing to its high price and to the shortage of pure linseed oil. (White lead will not combine with linseed oil substitutes.)

In coachbuilding works lead paints may not be used on government work under the Order of the Central Railway Office referred to above. Consequently, both the relative and absolute decrease in the use of white lead in these establishments since 1913 has been extremely marked. Some works, more or less by force of necessity, have entirely given up the use of white lead; but most of them continue to use lead paints for all but government coachbuilding. The majority of the reports which we have received from these establishments are in favour of the continued use of lead paints. The importance of these paints is shown by the statement of one coachbuilding firm that foreign railway companies attach great importance to white lead painting and order it in their specifications, as it has a much greater power of resistance than the substitutes made of zinc white and lithopone. Surely this is a striking testimony to the impossibility of replacing German lead paints. Mention may also be made in this connection of the decision of the German Zinc White Convention, which certainly cannot be suspected of partiality in favour of white lead. In the opinion of the Zinc White Convention the use of white lead in outdoor painting is unavoidable, as neither zinc white nor lithopone is an efficient substitute. The covering power of zinc white is less than that of white lead; in addition, the Convention states that zinc white painting does not last so long as white lead painting, and this has been proved by many experiments. Thus zinc white cannot compete with white lead for painting, for in Germany, as in most other European countries, zinc white is used for indoor painting only, and then generally in the form of varnish paint, while white lead is used for outdoor work. Zinc white can only be used for outdoor work in certain countries, e.g.
in the extreme north of Europe. Lithopone, according to the Convention, is a cheap substitute for white lead, and is often used by painters for the two first coats on the outsides of houses, while white lead must be used for the final coat. Lithopone may be regarded as a cheap substitute for white paint, consisting of 70 parts of heavy spar and only 30 parts of zinc sulphide. Being composed of these substances, concludes the Convention, lithopone painting only lasts for a short time.

III

For our investigations it is necessary to ascertain the relative cost of painting with different colours. The price of dry white lead is the highest; zinc white costs rather less, while lithopone is by far the cheapest. Dry white lead now hardly appears on the market, and we have therefore ignored the prices of dry colours. For colours ground in oil we were given the following prices for a certain day at the end of 1920:

<table>
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<tr>
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<th>marks per kilogramme</th>
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<tr>
<td>white lead</td>
<td>15</td>
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<tr>
<td>zinc white</td>
<td>17</td>
</tr>
<tr>
<td>lithopone</td>
<td>12</td>
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It is obvious from this comparison that zinc white ground in oil is dearer than white lead ready for use. The reason for this is that zinc white requires a great deal more linseed oil than white lead to dilute it sufficiently for use. Generally speaking the proportion of linseed oil which has to be added to white lead is 30 per cent., to zinc white 70 per cent., and to lithopone 40 per cent. As the raw materials of linseed oil are imported, the price is extremely high owing to the unfavourable state of the German exchange, and this largely affects the cost of zinc white in prepared form. At the above prices for basic colours the cost of one coat of paint per square metre of smooth surface on a house would be as follows:

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<tr>
<td>in white lead</td>
<td>1.85-1.90</td>
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<tr>
<td>in zinc white</td>
<td>1.40-1.45</td>
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<tr>
<td>in lithopone</td>
<td>1.15-1.20</td>
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In calculating these prices, the covering power per kilogramme of ground colour is assumed as follows:

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<tr>
<th></th>
<th>square metres</th>
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<tr>
<td>white lead</td>
<td>7 1/2-8</td>
</tr>
<tr>
<td>zinc white</td>
<td>10 1/2-12</td>
</tr>
<tr>
<td>lithopone</td>
<td>9 1/2-10</td>
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</tbody>
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These prices make no allowance for wages and depreciation of tools; they are merely cost prices of raw materials. It might be supposed from the figures that zinc white was
cheaper than white lead, but this is not the case. As zinc white has less covering power, more coats are required than in the case of white lead to produce the same effect. This is frankly admitted by the Zinc White Convention itself.

Mr. Odo Meisl, the proprietor of the well-known Viennese painting firm, states in the English periodical *The Journal of Decorative Arts* (1912) that the use of zinc white increases two of the principal factors in cost, namely, the consumption of linseed oil and labour. As wages account for 60 per cent., and raw materials for 40 per cent., of the cost of outdoor painting, and as two coats of white lead generally have at least as much covering power as three of zinc white, it can surely not be denied, in spite of the lower cost of the materials for a single coat of zinc white, that total costs are lower if white lead is used. Taking as basis the costs of a single coat as calculated above, the cost of finished painting per square metre with the two materials would be as follows:

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<thead>
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<th></th>
<th>marks</th>
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<tbody>
<tr>
<td>white lead</td>
<td>3.70-3.80</td>
</tr>
<tr>
<td>zinc white</td>
<td>4.20-4.35</td>
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To this must be added wages and depreciation of tools. Maintenance costs are still more important than the initial cost of painting. It has been shown by experience that lead painting which has been well done will last from six to eight years, while painting which has been done with substitutes must as a rule be renewed every two or three years. This is attested by a great number of the reports which we have received. The Master of the Düsseldorf Painters' Guild reports that the old Cologne lattice railway bridge was only painted six times with lead paints, including once with red lead, between 1859 and 1910, and is at present being used as a crane support in a North German shipyard, the paint still being in good condition. Mr. Betzler, the proprietor of one of the largest painting businesses in Cologne, states that a certain piece of white lead painting has lasted nine years and still looks well. Another piece of painting, which was done in 1918 with lithopone as an experiment on a ground which had been previously oiled twice, peeled off some time ago. When the occupants of the house cleaned the window sills and wall footings a few months after the painting had been done, the paint washed off completely in some places. Privy Councillor Lehmann of Würzburg, the well-known hygiene expert, personally verified these facts. This should be a sufficient proof that the apparent cheapness of lithopone painting means in the long run more expense than painting with white lead, owing to its high cost of maintenance.

The only remaining reason for the prohibition of the use of white lead is the danger of lead poisoning, which, it is asserted, is very great and cannot be obviated by preventive measures. As we have already stated, this question
has aroused great interest in nearly all civilised countries, and has led in France to the prohibition by law of the use of white lead in painting. The French Act, however, we have been informed, has never been strictly applied, fell into desuetude during the war, and now exists only on paper. If an over-zealous official should happen to refer to the prohibition, the matter is soon shelved. Our French informant considers that under existing conditions there is not likely to be any further serious resistance to the use of white lead in France, as the danger involved can easily be lessened and in some circumstances entirely avoided. As a matter of fact France has imported considerable quantities of white lead from abroad, even, since the war, from Germany, as her own factories are unable to satisfy the demand, though they have been working again for some time. The Reconstruction Committee has actually made a claim for the delivery of 2,000 tons of white lead from German factories. This shows what importance the French Government attaches to the danger of lead poisoning, and how far it disregards its own law on the subject.

In Germany opinions on the danger of poisoning owing to the use of white lead vary greatly. The workers describe its dangers in the most lurid colours, while the employers maintain that few if any cases of white lead poisoning occur in their works. The master painters' guilds from which we have made enquiries are almost unanimous in stating that the number of cases of poisoning has greatly decreased in recent years, and that in the last few years there have been hardly any. The Master of a well-known guild states that three of his uncles, who worked with lead colours almost all their lives, reached the ages of 82, 84, and 87 respectively without ever showing the slightest symptoms of lead poisoning. The report of the sick fund of the Düsseldorf Painters' Guild mentions only one case of white lead poisoning in the last four years; the Essen Painters' Guild writes that plumbism among its members is a thing of the past. At a meeting of master painters of the Rhineland which took place recently at Cologne, attended by over 220 members, an enquiry by the chairman elicited a reply from only one man, who stated that he had once suffered from lead poisoning some years ago. The sick fund of the Dortmund Painters' Guild, out of an average of 1,000 members, had 6 cases of white lead poisoning in 1911, 7 in 1912, 10 in 1913, and none in 1919, when the number of members was 500. A strong contrast to these figures, which are on the whole favourable, as supplied by independent painters and painters' associations, is presented by the pre-war statistics which we have received from the local sick funds of certain large towns. We will only reproduce the statistical returns of two important funds, the Berlin Local Sick Fund and the Central Sick Fund of German Painters, which has its headquarters at Hamburg. The figures unfortunately only reach 1911 and 1912 respectively.
NUMBER OF CASES AND DAYS OF ILLNESS AMONG MALE MEMBERS OF BERLIN LOCAL SICK FUND

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cases</th>
<th>Total Days</th>
<th>Days/Per 100 members</th>
<th>Total Cases</th>
<th>Total Days</th>
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<tr>
<td>1903</td>
<td>2,146</td>
<td>61,633</td>
<td>48.8</td>
<td>1,401.7</td>
<td>16,268</td>
<td>10.7</td>
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<tr>
<td>1904</td>
<td>2,534</td>
<td>74,683</td>
<td>50.4</td>
<td>1,485.0</td>
<td>17,066</td>
<td>10.2</td>
</tr>
<tr>
<td>1905</td>
<td>2,431</td>
<td>75,120</td>
<td>45.6</td>
<td>1,409.9</td>
<td>16,585</td>
<td>8.8</td>
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<tr>
<td>1906</td>
<td>2,318</td>
<td>68,817</td>
<td>43.3</td>
<td>1,285.1</td>
<td>12,872</td>
<td>6.5</td>
</tr>
<tr>
<td>1907</td>
<td>2,360</td>
<td>74,250</td>
<td>45.8</td>
<td>1,435.9</td>
<td>13,451</td>
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<td>1908</td>
<td>2,276</td>
<td>71,137</td>
<td>45.6</td>
<td>1,425.0</td>
<td>13,223</td>
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<tr>
<td>1909</td>
<td>2,065</td>
<td>65,427</td>
<td>43.2</td>
<td>1,368.5</td>
<td>11,769</td>
<td>6.0</td>
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<tr>
<td>1910</td>
<td>2,114</td>
<td>68,230</td>
<td>42.6</td>
<td>1,375.6</td>
<td>11,135</td>
<td>5.5</td>
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<tr>
<td>1911</td>
<td>2,285</td>
<td>70,092</td>
<td>45.8</td>
<td>1,407.2</td>
<td>12,139</td>
<td>6.0</td>
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<tr>
<td>1912</td>
<td>2,361</td>
<td>72,155</td>
<td>46.7</td>
<td>1,428.2</td>
<td>9,704</td>
<td>4.8</td>
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<tr>
<td>Total</td>
<td>22,899</td>
<td>701,574</td>
<td>45.7</td>
<td>1,401.8</td>
<td>134,212</td>
<td>7.1</td>
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<table>
<thead>
<tr>
<th>Year</th>
<th>Total Cases</th>
<th>Total Days</th>
<th>Days/Per 100 members</th>
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</tr>
<tr>
<td>1903</td>
<td>177</td>
<td>5,666</td>
<td>2.4</td>
<td>76.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1904</td>
<td>198</td>
<td>5,881</td>
<td>2.4</td>
<td>71.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1905</td>
<td>193</td>
<td>6,151</td>
<td>2.1</td>
<td>64.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1906</td>
<td>149</td>
<td>7,596</td>
<td>1.5</td>
<td>76.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1907</td>
<td>185</td>
<td>6,777</td>
<td>1.8</td>
<td>66.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1908</td>
<td>181</td>
<td>4,931</td>
<td>1.8</td>
<td>50.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1909</td>
<td>176</td>
<td>5,018</td>
<td>1.9</td>
<td>54.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>161</td>
<td>4,839</td>
<td>1.8</td>
<td>54.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1911</td>
<td>163</td>
<td>4,606</td>
<td>1.7</td>
<td>48.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,757</td>
<td>57,776</td>
<td>1.9</td>
<td>64.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There is no doubt that according to this information health conditions among workers in the painting trade before the war were far from ideal. Nevertheless, among the members of the Berlin Local Sick Fund the number of cases of lead poisoning per 100 persons fell from 10.7 in 1903 to 4.8 in 1912, and among the members of the Central Sick Fund of German Painters from 2.1 in 1903 to 1.7 in 1911. The question remains whether these returns are entirely reliable. According
to Lehmann, a critical examination of these figures will lead to conclusions which imply the contrary of what might be assumed from a superficial inspection. It is well known that a large number of paint workers, owing to their belief that they are constantly exposed to the danger of lead poisoning in their work, become hypochondriacs on the subject of lead. If they suffer from any ailment they at once think of plumbism, and go to the doctor with a ready-made diagnosis. The doctor very often has no standard by which to determine symptoms of lead poisoning, and in cases of doubt often certifies the lead worker or painter as suffering from plumbism, although this is by no means certain. The subject has only recently been elucidated by scientific investigation, particularly by blood tests. The medical officer of the Leipzig Local Sick Fund, Dr. Schoenfeld, published the results of his blood tests under the title *Zur Frühdiagnose der Bleivergiftung* (*The Diagnosis of Plumbism in its early Stages*)\(^6\) in 1921. Dr. Schoenfeld gives figures which prove that all pre-war statistics on the subject are, to say the least, unreliable. The investigations, which were made in the district of the Leipzig General Local Sick Fund, only applied to persons incapable of earning. The results were as follows:

**INCAPACITY FOR EARNING DUE TO PLUMBISM**

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Days of sick pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>1910</td>
<td>258</td>
<td>26</td>
<td>9,465</td>
</tr>
<tr>
<td>1911</td>
<td>199</td>
<td>21</td>
<td>7,138</td>
</tr>
<tr>
<td>1912</td>
<td>170</td>
<td>24</td>
<td>5,670</td>
</tr>
<tr>
<td>1913</td>
<td>211</td>
<td>45</td>
<td>9,126</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>838</strong></td>
<td><strong>116</strong></td>
<td><strong>31,399</strong></td>
</tr>
<tr>
<td><strong>Yearly average</strong></td>
<td><strong>210</strong></td>
<td><strong>29</strong></td>
<td><strong>7,850</strong></td>
</tr>
<tr>
<td>1919</td>
<td>19</td>
<td>1</td>
<td>486</td>
</tr>
<tr>
<td>1920</td>
<td>5</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td><em>(up to 1 Oct.)</em></td>
<td>5</td>
<td>1</td>
<td>—</td>
</tr>
</tbody>
</table>

Dr. Schoenfeld considers that this satisfactory decrease in the figures of plumbism is accounted for, in addition to other clinical symptoms, entirely by the strict application of blood tests, which distinguish persons actually suffering from plumbism from hypochondriacs and malingerers. The figures of other individual local sick funds since the war are equally good. The Munich General Local Sick Fund, which in 1919 had a membership of 217,777, only reports one case of industrial lead poisoning in that year. The Magdeburg General Local Sick Fund, which had 40,325 members in 1919,

\(^6\) Reprinted from the *Zentralblatt für Gewerbehygiene*
also had only one case of plumbism, and the Dresden General Local Sick Fund, with a membership of 157,777, had no cases at all in the same year. Immediately after the war the decreased production and greatly diminished use of white lead may have had some effect on the number of cases. Careful investigation and accurate diagnosis of plumbism, however, clearly had more effect.

If, in spite of all preventive measures, cases of lead poisoning still occur, they are principally due to the fact that it has been impossible as yet to abolish carelessness, stupidity, and lack of cleanliness as completely as could be wished. It is well known that lead is absorbed into the system by the inhalation of lead dust or by the entry of lead into the stomach. The danger of the inhalation of lead dust may be regarded as non-existent since the Order of the Federal Council of 1906 prohibited the dry rubbing down and pumice-stoning of white lead paint, and since it has become almost universal for painters to buy their white lead ready ground. The entry of lead into the stomach is comparatively easy to avoid if proper care is taken and the hands are always washed before food is taken. Indeed, as Lehmann and Koelsch state, the whole question of lead is more or less a question of cleanliness. On the basis of the protective measures which have been laid down it must be possible for the employers and workers, if they are willing, to obviate most, if not all, of the danger. The best regulations can do nothing against ill will and indifference. It should be regarded as one of the duties of trade unions, sick fund authorities, works councils, factory inspectors, and other officials and organisations entrusted with the application of labour legislation to make constant efforts to educate both employers and workers and to convince them that the regulations are not an unnecessary nuisance, but are for their own good. If both sides apply the necessary intelligence to the regulations which were made in their interest, the danger of plumbism will disappear without its being necessary to have recourse to the extreme step of prohibiting the use of white lead.

In the memorandum of the International Labour Office, which reads almost like an indictment, the difficulty of supervising the application of protective measures is mentioned as one of the principal reasons for prohibiting the use of white lead. We have already referred to these difficulties, which are in the main inherent in the nature of the painting industry. In our opinion, however, they are not in themselves a sufficient justification for the prohibition of the use of white lead; for what guarantee is there that it will be any easier to supervise the prohibition of its use than to supervise the strict application of the protective measures already in force? It is this consideration which gives rise to the doubts expressed by Dr. Fischer, the state and industrial physician, who is well known as one of the principal
supporters of an unconditional prohibition of the use of white lead, in his article entitled 
*Ueber das Bleiweissverbot in Deutschland (The Prohibition of the Use of White Lead in
Germany)* (7):

The mere prohibition of the use of white lead or of lead paints is, of course, not enough in itself. There must at the same time be practical and effective provision for inspection, and the application of these provisions will probably be by no means so easy and satisfactory as is often supposed.

If the supervision of an absolute prohibition of the use of lead paints presents so many difficulties, how much more difficult would be the supervision of the use of colours containing a certain percentage of lead, which, according to the memorandum of the International Labour Office, would be allowed. It would then be necessary, as Rambousek stated in the *Chemikerzeitung* (8), "to undertake, instead of a simple qualitative test, a very accurate quantitative test of the specimens taken by the inspectors"; for any layman must admit that it is easier to test whether paints contain any lead than whether their lead content exceeds a certain amount. A further difficulty is that from the standpoint of health it would be impossible to abolish protective regulations entirely if such paints containing small quantities of lead were used. In any case it has been shown by experience that the worker, in spite of the indifference to the dangers of his occupation which comes from habit, is generally comparatively careful in using paints which he knows to be poisonous. The less poisonous the paint is, the less care will he think it necessary to take, although even the smaller quantity of poison may be dangerous to him. The supporters of paints with a low lead content, however, state that paint containing 4 per cent. of lead, as suggested by the memorandum of the International Labour Office, could in no case injure the health of the workers. This view is definitely opposed by Schoenfeld. In his opinion the quantity of lead which is absorbed is not the important thing. Poisoning is always poisoning. Rambousek also takes the view that the continuous careless use of paints containing even a small quantity of lead can very easily cause plumbism, especially in those persons who are peculiarly susceptible to lead.

The prohibition of the use of white lead in painting would have a most serious effect on the lead smelting industry, the whole lead paint industry, and the thousands of workers which they employ. The sales of the lead smelting works are largely dependent on the demand for lead paints. Before the war the total amount of lead produced in Germany was

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(7) *Sozialechnik*. No. 22, 1912.
(8) No. 18, 1913, p. 181.
about 160,000 tons. One-third of this was used by the lead paint industry, and 48,000 tons were used for the manufacture of white lead alone. These figures suffice to show the great extent to which the lead smelting industry depends on the existence of a flourishing lead paint industry. This is not, however, the only industry which would be affected by the destruction of the lead paint industry. A number of other industries, such as the pottery, enamel, linoleum, printing and lithograph, varnish, wallpaper, accumulator, rubber, and cable industries, as well as the entire glass industry, are dependent on lead colours for the manufacture of their products.

All these industries would be most seriously affected by the prohibition of the use of lead paints. A step which involves such grave consequences as the universal prohibition of the use of white lead should not be supported by statements which, as our investigation of 1904 showed and as is confirmed by the present report, either rest on an insecure foundation or are incorrect.

Düsseldorf. 1 April 1921.
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