



# VOLUME I

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II. Table showing the par values of the pound (£), the dollar, and the franc in the currencies of the principal countries (1).

Country	Monetary unit	£1 =20 shillings =240 pence	One dollar =100 cents	One franc = 100 centimes
		<i>equals</i>	<i>equals</i>	<i>equals</i>
United Kingdom . . . . .	£ 1	1.00	4s. 1½ d.	9½ d.
Australia . . . . .	£ 1	1.00	4s. 1½ d.	9½ d.
New Zealand . . . . .	£ 1	1.00	4s. 1½ d.	9½ d.
South Africa . . . . .	£ 1	1.00	4s. 1½ d.	9½ d.
Canada . . . . .	dollar	4.8665	1.00	0.193
United States . . . . .	dollar	4.8665	1.00	0.193
Belgium . . . . .	franc	25.222	5.181	1.00
Bulgaria . . . . .	leve	25.222	5.181	1.00
Finland . . . . .	mark	25.222	5.181	1.00
France . . . . .	franc	25.222	5.181	1.00
Greece . . . . .	drachma	25.222	5.181	1.00
Italy . . . . .	lira	25.222	5.181	1.00
Roumania . . . . .	leu	25.222	5.181	1.00
Serbia . . . . .	dinar	25.222	5.181	1.00
Spain . . . . .	peseta	25.222	5.181	1.00
Switzerland . . . . .	franc	25.222	5.181	1.00
Argentina . . . . .	peso	5.04	1.036	0.200
Austria . . . . .	krone	24.00	4.93	0.951
Brazil . . . . .	milreis	15.00	3.14	0.606
Chili . . . . .	peso (gold)	13.33	2.74	0.53
Denmark . . . . .	krone	18.15	5.73	0.720
Germany . . . . .	mark	20.43	4.198	0.811
Hungary . . . . .	krone	24.00	4.93	0.951
India . . . . .	rupee	10.00	2.09	0.403
Japan . . . . .	yen	9.80	2.006	0.387
Netherlands . . . . .	florin	12.11	2.49	0.480
Norway . . . . .	krone	18.15	3.73	0.720
Portugal . . . . .	escudo	4.53	0.92	0.176
Russia . . . . .	rouble	9.48	1.94	0.374
Sweden . . . . .	krona	18.15	3.73	0.720
Turkey . . . . .	piastre	111.10	22.73	4.386

NOTE. This table is read as follows: £1 is equivalent to 12.11 Dutch florins; 1 dollar is equivalent to 2.49 Dutch florins; 1 franc is equivalent to 0.48 Dutch florins.

(1) In order to assist the reader in converting the long, square, and cubic measures, weights, and currencies quoted, it is proposed to print the above two tables at the end of each number of the *International Labour Review*.

**I. THE METRIC AND BRITISH SYSTEMS OF WEIGHTS  
AND MEASURES (1)**

A. Metric Measures in terms of British.			B. British Measures in terms of Metric.		
UNIT	EXACTLY	ROUGHLY	UNIT	EXACTLY	ROUGHLY
<b>A. Lineal Measures</b>					
Millim.	0.0394 inches	one 25th of an inch	Inch	25.399 mm.	4 in. = 10 cm.
Centim.	0.3937 "	10 cm. = about 4 in.	Foot	30.479 cm.	30 cm.
Metre	39.371 "	11 metres = 12 yards	Yard	0.9144 metres	11 yards = 10 metr.
Kilom.	0.6214 miles	5 furlongs	Mile	1.6093 km.	5 miles = 8 km.
<b>B. Square Measures</b>					
Sq. Metre (centiare)	1.196 sq. yds.	1 1/2 sq. yds.	Square Inch	6.451 sq. cm.	
Are	3.954 poles	10 ares = 1/4 acre	Square Yard	0.836 sq. metr.	6 sq. yds = 5 sq. metr.
Hectare	2.471 acres	2 1/2 acres	Acre	0.40467 hect.	1 acre = 2 1/2 hect.
			Sq. Mile	2.5899 sq. km.	100 sq. miles = 260 sq. km.
<b>C. Measures of Capacity</b>					
Litre	1.76 pints	4 1/2 litres = 1 gallon	Pint (liquid)	0.5679 litres	1 litre = 1 3/4 pints
Décalitre	2.201 gallons	5 décalitres = 11 gallons	Quart (liquid)	1.1859 "	—
Hectolitre	22.01 "	22 gallons	Gallon (liquid)	4.5435 "	4 1/2 litres = 1 hectol.
			Peck (dry)	9.087 "	9 litres
			Bushel	36.34766 "	36 litres
<b>D. Measures of Weight</b>					
Gramme	0.353 oz.	454 grs. = 1 lb.	Ounce	28.35 grs.	7 oz. = 200 grs.
Hectogr.	3.527 "	nearly 1/4 lb.	Pound	453.59 "	1/2 kilo
Kilogr.	2.2046 lbs.	5 kilos = 11 lbs.	Hundred-weight	50.802 kilos	22 lbs = 10 kilos
Metric Ton	2204.6 lbs.	1 Long Ton	Short Ton (2000 lbs)	901.6 "	900 "
			Long Ton (2240 lbs)	1016.04 "	1000 " (1 Met. Ton)

author furnishes evidence rather than opinions, and leaves every reader to draw his own conclusions.

TURATI, FILIPPO. *L'orario di lavoro delle otto ore. Relazione e disegno di legge approvati dal Consiglio Superiore del Lavoro nel luglio, 1919. Con prefazione di Giuseppe PRATO. (The Eight-Hour Day Report and proposed Bill adopted by the Supreme Council of Labour, July 1919. With a Preface by Giuseppe Prato).* 152 pp., Milan, Treves, 1920.

M. Turati, the well-known leader of the Right wing of the Socialist Parliamentary group, and a member of the Supreme Council of Labour, traces the history of the 8-hour day in different countries, and especially in Italy, where in 1919 four million workers had the benefit of an 8-hour day and a 48-hour week on the English system (one day's rest in seven, and a weekly half-holiday). He mentions proposals for international Conventions for an 8-hour day; he also examines the effect on production of a reduction in working hours and suggests possible remedies.

The report is followed by the text of a proposed Bill providing for the application of the 8-hour day to all undertakings, including those of agriculture, and for the prohibition of overtime work at home.

WILLIAMS, WHITING. *What's on the Worker's Mind.* 329 pp. New York, Charles Scribner's Sons. 1920.

This book gives the experiences of the author during his studies at first hand of employment conditions from the standpoint of a manual labourer in the iron and steel industry, coal mining, shipbuilding, and other big industries. Part II, called *Findings*, gives the author's interpretation of the causes of discontent and unrest among the workers, and his suggestions as to the "way out". Mr. Williams holds the management largely responsible for labour unrest. He is especially struck with the incompetence, lack of training, and brutality of the gang foreman or "straw boss". His experience as an overall-clad manual worker indicates that most of the intelligent, zealous efforts on the part of the workers to assist in keeping up production are nipped in the bud by the "straw bosses", who discourage any independent initiative from members of their gangs. This suppression of independent thinking and initiative is not confined to common labourers, but pervades all grades of workers up to the general superintendent. The cure is to give every man in an organization a chance to do his best and to identify himself with the work turned out by the establishment.

On the side of the public, legislation is recommended to ensure the creation of an employment service that will be impartial as between employer and employees, and, what is immensely more important, to make possible an organization of industry and of all the institutions of society which will give the greatest possible stability and regularity in employment.

WILSON, Dr. M. R. *The Care of Human Machinery.* 238 pp. London, Henry Frowde and Hodder and Stoughton. 1921.

The author examines various questions relating to industrial fatigue, hours of work, the problem of loss of time by workers in its effects on industrial and social finance, labour of women and young persons, waste of corporal movements in productive processes, the danger of dust, tuberculosis, ocular fatigue, and accidents, and the costs thereby occasioned, whether arising out of sickness or due on account of compensations. Dr. Wilson also discusses the principles of industrial welfare, feeding of workers, and their physical education, and concludes by an exposition of the American programme, which has been made known by the recent publication of the Public Health Service of the United States. It is of considerable value that books should be written on the subject by physicians possessing Dr. Wilson's ability to handle it in a simple and agreeable manner.

the date of the foundation of the Swiss Syndicalist Union in 1881. The book concludes with a discussion on the carrying out of social reform, which is envisaged, not as a factor contributing to the class struggle, but rather as an idealist principle, such a principle as shall, by the use of an exact knowledge, solve the problems arising out of population movements and productive processes, as also educational problems.

PRATO, GIUSEPPE. *Problemi del Lavoro nell'ora presente. Riassunti di lezione tenuti all'Università Commerciale Bocconi dal 4 al 10 maggio 1919.* (*Present Day Labour Problems : Lectures delivered between 4 and 10 May 1919 at the Bocconi Commercial College*). 148 pp. Milan, Trèves, 1920.

In this series of lectures given at the Bocconi Commercial College in Milan, the author reviews the present position of those problems of labour and social legislation, which have especially occupied the attention of organizers and Governments since the war. He lays special stress on the the problem of unemployment, and describes the methods adopted to cope with it in different countries. He also deals with women's work, which in his opinion should be reduced to a strict minimum, and with scientific management (Taylor's system). In the following chapter, the author describes the different movements towards the democratization of industry, e.g. English Guild Socialism, the recent claims of the French General Confederation of Labour, the setting up of a National Labour Parliament in Italy. The last chapter is devoted to the preliminaries and future of the International Labour Organization.

RENARD, G. and WEULERSSE, G. *Le Travail dans l'Europe moderne* (*Labour in Modern Europe*). 524 pp. Paris, Félix Alcan. 1920. 12 francs.

The series entitled *Histoire universelle du Travail* published under the direction of M. G. Renard, Professor at the Collège de France, is continued by the issue of a first volume on Modern Europe, which follows on the volumes dealing with labour in the Roman World, the Greek World, etc. It contains a study of the economic evolution of the social classes, covering the period from the middle of the XVth to the end of the XVIIIth century. The authors examine the parallel progress of agriculture, industry, and commerce in various countries, side by side with their political progress. They describe the economic and social revolution which preceded the modern era, taking as their theme the idea that it is through a study of national economic systems and colonial expansions that we can learn to understand contemporary society. Each chapter closes with bibliographical notes. To obviate the disadvantages of the study of each country separately, the authors give, by way of conclusion, a comparative view of the evolution of the principal States.

SAND, R. *Organisation industrielle, médecine sociale, et éducation civique en Angleterre et aux Etats-Unis, (Industrial Organization, Public Health, and the Education of the Citizen in England and in the United States)*. 890 pp. Paris, J. B. Baillière; Brussels, M. Lamertin. 1920.

The notes which the author has gathered together in this abundantly documented and admirably arranged volume are the results of three inquiries successively undertaken in the United States (1918-1919) and in England (1918), and of investigations into factories, workshops, large retail shops, insurance companies, public departments, educational establishments, and social welfare institutions. In the first part, the author studies the present organization of English and American industry, and considers the labour problems which arise out of it, such as technical equipment, social welfare, medical and educational work in factories, fatigue, hygiene, work of women and children. The second part is devoted to social medicine, namely, the organization and nature of public hygiene, the Ministry of Public Health, eugenics, housing, the fight against contagious diseases, tuberculosis, alcoholism, crime, etc., protection of children and young persons, and so on. The third part deals with school and civic education. The

of Peace; the Growth of Profits; Normal Profits and Profiteering; the Uses to which Profits are put; the Rate of Interest; the Course of Wages; the Division of the Product; How Europe raised American Prices; Prices since the Armistice; General Prices and Public Utility Rates; the Theory of the New Taxes; Has the Excess Profits Tax raised Prices?; the Part played by the Banks: How can real Wages be raised? The chapters on "The Growth of Profits", "Normal Profits and Profiteering", and "Has the Excess Profits Tax raised Prices?" are especially interesting and instructive.

GOMPERS, SAMUEL. *Labour and the Employer*. 320 pp. New York, E. P. Dutton & Co, 1920.

A compilation of writings, addresses, and testimonies by Mr. Samuel Gompers, President of the American Federation of Labor, covering the period 1887—Jan. 1920. This book, a companion to *Labour and the Common Welfare*, already issued, deals with the whole subject of employment relations, from the root questions of wages, working hours, and unemployment, to the challenging issues of strikes, boycotts, the so-called closed shop, arbitration, collective bargaining, profit-sharing, and the labour view of a true democratization of industry.

JULIN, ARMAND. *Principes de Statistique théorique et appliqué (Principles of Theoretical and Applied Statistics)*. xxiv+712 pp. Paris. Marcel Rivière; Brussels, Albert Dewit. 1921. 35 francs.

This volume, containing the substance of lectures given at the University of Louvain and elsewhere by the Principal Secretary of the Ministry of Industry, Labour and Food, deals with the explanation and discussion of modern statistical methods. It is to be followed by a second and third volume dealing with the application of statistics to economic and labour questions respectively. The basis of treatment is mathematical, but, except to a slight extent towards the end, no mathematical knowledge is assumed beyond a little elementary algebra. Nearly half the volume is given up to a discussion of the difficulties and pitfalls to be avoided in the collection and preparation of statistical material, and to the description of the methods and precautions to be adopted in order to ensure the maximum usefulness of the results. In view specially of the chaotic state of international statistics, where it is almost impossible to find figures which apply to things or groups which are really comparable, it is impossible to lay too much stress on the need for more uniform theories of classification and more scientific criticism of statistical material. This part of the book will be found of interest not only to the statistician, but to everyone who wishes to understand the meaning and real value of any kind of statistical statement. The last section discusses the ordinary statistical processes—means, measures of dispersion, correlation, graphical methods, and the law of errors; the problem of fitting a group of observations to a standard curve of error and the determination of probable errors are rather beyond the scope of the book, and are only briefly referred to. The reader who wishes to go more deeply into the theory of the subject will find full lists of references at the end of each section.

LORENZ, DR. J. *Zur Einführung in die Arbeiterfrage unter besonderer Berücksichtigung schweizerischer Verhältnisse. (An Introduction to Labour Problems with special reference to Switzerland)*. 64 pp. Zürich, Orell Füssli. 1921. 3.50 francs.

After a brief examination of the industrial position in Switzerland and the origins of the social problem, the author discusses prevalent conditions among the working classes, and formulates his results thus: (1) the modern worker lives at a distance from his work; (2) he lives a hand-to-mouth existence; (3) he is no longer influenced by tradition.

Another chapter deals with the development of the class struggle, the modern working class movement, and the evolution of syndicalism from

sentiment is thoroughly American. They maintain that such aims alone have proved sufficient to organize the clothing workers and hold them together. The objects of the "New Unionism" are shown to differ essentially from those professed by the "Old Unionism", and their influence on structure and strategy, their expression in education, labour publications, co-operative enterprises, and inter-industrial relations, is described and explained. An interesting chapter speculates on the future of the movement.

DELAISI, F. *Le Pétrole (Oil)*. 158 pp. Paris, Payot. 1921.

After sketching the history of the oil question, the different phases of the rivalry between Great Britain and the United States and the position of France in this economic struggle, the author examines the origin of the San Remo agreement, criticizes French policy in the matter, points out its immediate and remote dangers, and extols the system of free competition.

FRANCKE, Dr. E. und BUCHFELD, Sanitätsrat Dr. *Die Meldepflicht der Berufskrankheiten. (Compulsory Notification of Industrial Diseases)*. 50 pp. Berlin, Julius Springer. 1921.

No. VI of the series published by the Institute of Industrial Hygiene at Frankfurt-on-Main is devoted to the question of compulsory notification of industrial diseases, a question which has been discussed for many years. The report is written by Drs. Francke and Buchfeld. After expounding the various laws in force in Germany, England, the Netherlands, Austria, New York, France, and Hungary, compelling medical practitioners to notify certain industrial diseases, the report gives a summary of the replies to a *questionnaire*, sent out by the Institute, from a number of doctors, technical experts, manufacturers, and public officials. The first question was as to the desirability of adding to existing formulæ of declaration, and the second was as to the agent by whom declaration should be made. The replies to the first question were in the affirmative, but very divergent views appear as to the persons and bodies who should make and receive declarations. The persons interrogated were in favour of extending the obligation to notify to the following industrial diseases: tuberculosis among workers dealing with organic dust, in the baking industry, in the slaughter of tuberculous cattle, and in the pottery, stone-cutting, and building industries; pneumoconiosis; pneumonia due to scoriae (described by Thomas); rheumatism; deafness in noisy trades; industrial eczema in the book-producing industry and the building industry; dermatitis due to "satin" wood; cataract and syphilis among glass blowers. Some also recommend the notification of retraction of the hands and feet, and certain injuries to the eyes and hearing.

But the most important question, and the one which undoubtedly forms the kernel of the problem, is exactitude in diagnosis. In many cases the diagnosis of industrial diseases is undoubtedly very difficult, but as the medical diagnosis is the basis of notification and of the right to compensation, it follows that the physician should be well instructed in the task which he has to perform. The training of the physician should, therefore, begin while he is still at the university.

The report concludes with two draft forms of declaration proposed by the Institute.

FRIDAY, DAVID. *Profits, Wages, and Prices*. 256 pp. New York, Harcourt, Brace and Howe. 1920.

This book was apparently very rapidly put together from the knowledge gained by the author while working as an expert in the Internal Revenue Bureau of the United States Treasury Department. Some interesting statistical material is presented on the changes in the functional distribution of incomes during the war period. The chapter headings give an idea of the subjects dealt with and the method of approach. These are: The Curse

## BOOK NOTES

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*Arbeitgeber und Arbeitnehmer: Handbuch für Industrielle und Gewerbetreibende. Herausgegeben vom Hauptverband der Industrie Deutschoesterreichs. (Employers and Employed. Text-book for Manufacturer- and Business Men. Published by the Central Association for Industry in Austria).* xv+416 pp. Vienna and Leipzig, Franz Deuticke. 1920.

This manual consists of a collection of the laws and decrees, which, since the institution of the Republic, have regulated the relations between employers and workers, and effected considerable modifications in the social legislation of Austria. It includes a detailed commentary on the Works Councils Act of 15 May 1919, a criticism of the Act of 18 December 1919, concerning the establishment of Conciliation Offices and Collective Labour Agreements, a study of Labour Courts, and a summary of protective legislation and of new regulations as to labour conditions. A precise examination is also made of the present state of legislation on old age sickness, accident, and unemployment insurance. The book concludes with a summary of laws and regulations issued between 1 November 1918 and 31 August 1920, and with a useful index.

BIANCHI, GIUSEPPE. *Russia Sindacale: Commissione Confederale in Russia. (Trades Unionism in Russia: The Confederal Commission in Russia).* 407 pp. Milan, Codara, 1921.

A book of considerable interest, containing the report on their journey to Russia during the summer of 1920 of the representatives of the Italian General Confederation of Labour. It deals especially with Russian trade union organization. After describing the development of trade unionism in Russia under the Czarist régime, the author analyses the organization and functions of the factory committees, their subordination to the trade unions, and their successive transformations. A good deal of the book is devoted to the study of the organic structure of the trade unions and of their function as organs of economic reconstruction in Russia. Other problems are also examined, such as the collective management of works, the relations between trade unions and Labour Commissariat, the payment of wages in kind, bonuses on output, the feeding of the workers, illicit trading, compulsory labour, and the results of the nationalization of industry. The report is based entirely on the official documents which the author was able to obtain in Russia.

BUDISH, J. M., and SOULE, GEORGE. *The New Unionism in the Clothing Industry.* 344 pp. New York, Harcourt, Brace and Howe, 1920.

This book traces the organization and growth in power of the clothing unions in the U.S.A. and the improvement effected thereby in the standard of life of the clothing workers. The aims of the "New Unionism" are conveniently summarized in the clause from the Preamble of the Constitution of the Amalgamated Clothing Workers of America: "The industrial and inter-industrial organization, built upon the solid rock of clear knowledge and class-consciousness, will put the organized working class in actual control of the system of production, and the working class will then be ready to take possession of it". The authors contend that this objective is the natural outcome of the inevitable protest by the workers against the economic conditions incidental to the clothing industry, and in origin and



	Cases of occupational disease				Days lost on account of non-fatal diseases, 1915-16
	Non-fatal		Fatal		
	1915-16	1916-17	1915-16	1916-17	
Harmful substances (causing constitutional disturbance):					
Brass .....	1	5	—	1	4
Dusts .....	5	7	—	—	60
Gases, vapours, and fumes.	76	62	10	2	1,118
Anthrax .....	20	20	5	4	814
Lead .....	49	53	3	1	3,063
Miscellaneous .....	—	13	—	1	—
Harmful conditions:					
Compressed air .....	383	36	4	—	7,734
Extreme cold .....	77	78	2	4	2,402
Extreme heat .....	74	114	2	2	622
Eye strain .....	7	2	—	—	164
Strain, fatigue, cramp, faulty positions, "occupational neuroses", blows, vibration, pressure, etc., causing injuries to nerves, muscles, and bones .....	84	67	—	—	4,194
Miscellaneous .....	4	13	—	—	162
Irritant fluids and substances (causing local affections):					
Brass .....	21	26	—	—	600
Cement .....	4	4	—	—	97
Chemicals .....		72	—	—	—
Chrome .....	16	32	—	—	269
Cyanide and plating solutions .....	10	10	—	—	123
Dyes .....	32	27	—	—	1,028
Hides .....	14	25	—	—	352
Lime .....	51	16	—	—	580
Oil .....	48	58	—	—	514
Paint .....	4	13	—	—	340
Poisonous vines and shrubs.	45	44	—	—	981
Raw wool .....	8	9	—	—	104
Washing and cleansing fluids .....	15	27	—	—	198
Local irritations from constant vibrations, etc .....	132	78	—	1	2,234
Miscellaneous .....	171	81	—	—	3,576
<b>Total .....</b>	<b>1,351</b>	<b>992</b>	<b>26</b>	<b>16</b>	<b>31,333</b>

	Total tabulatable injuries		Occupational diseases (including poisonous and corrosive substances)		Per cent. occupational diseases are of total number of injuries	
	1917-18	1918-19	1917-18	1918-19	1917-18	1918-19
Total number of cases .....	77,505	67,240	899	555	1.2	0.8
Deaths .....	438	356	8	1	1.8	0.3
Permanent total disabilities .....	17	7	1	—	5.9	—
Permanent partial disabilities .....	2,177	1,750	2	4	0.1	0.2
Temporary total disabilities .....	74,873	65,127	888	550	1.2	0.8
Total number of days lost in temporary total disability cases ...	1,661,845	1,361,649	18,379	12,916	1.1	0.8

The following table shows the number of cases of occupational diseases in Massachusetts for the two years 1915-16 and 1916-17, classified by kind of disease. The table also shows the total number of days lost on account of the non-fatal diseases for the year 1915-16. It will be noted again that many of these so-called diseases are being compensated in States which do not cover occupational diseases in their compensation Acts.

the occupational diseases are taken from the nature of injury table. Both types of injuries are here given in order that the California data may be comparable with that of the other States.

	All injuries	Injuries caused by poisonous substances		Occupational diseases	
		Number	Per cent. of all injuries	Number	Per cent. of all injuries
Total number of cases	58,577	671	1.1	455	0.8
Deaths.....	586	1	0.2	3	0.5
Permanent disabilities.....	1,714	8	0.5	—	—
Indeterminate disabilities...	695	5	0.7	6	0.9
Temporary disabilities.....	55,582	656	1.2	446	0.8
Total number of days lost..	7,228,983	30,161	0.4	—	—

The following table shows the cases of occupational diseases as compared with the total number of injuries in Massachusetts for the four years 1915-16, 1916-17, 1917-18, and 1918-19. A large number of these so-called occupational diseases would be considered accidents in other States and compensated as such. It will be noted that the percentage of fatal occupational diseases to total fatal injuries for the four-year period is 2.9, whereas the same percentage for non-fatal injuries is 1.3.

	Fatal injuries			Non-fatal injuries		
	Total cases	Cases of occupational diseases		Total cases	Cases of occupational diseases	
		Number	Per cent. of total cases		Number	Per cent. of total cases
1915-16 .....	463	26	5.6	68,180	1,351	2.0
1916-17 .....	481	16	3.3	78,789	992	1.3
1917-18 .....	438	8	1.8	77,067	891	1.2
1818-19 .....	356	1	0.3	66,884	554	0.8
Total.....	1,738	51	2.9	290,920	3,788	1.3

The following table shows the number of cases of occupational diseases and extent of disability as compared with the total tabulatable injuries in Massachusetts for the years 1917-18 and 1918-19.

Cause of injury	Total cases	Deaths and permanent total disabilities	Per- manent partial disabil- ities	Temporary total disabilities	
				Num- ber	Aver- age num- ber of days lost
Poisonous substances (ivy, brass, copper, T. N. T., etc.) .....	71	2		69	18
Gases and fumes .....	48	6		42	31
Corrosive substances (acids) .....	154		5	149	17
Occupational diseases (lead poisoning, neuritis, pneumonia, rheumatism, and typhoid fever) .....	25	( <sup>6</sup> ) 8		18	33
Total .....	299	( <sup>6</sup> ) 16	5	278	21
Total, all injuries ...	19,354	( <sup>7</sup> ) 617	607	18,130	22

The following table shows the number of cases of occupational diseases and extent of disability as compared with all injuries under the Federal Compensation Act for the year 1919. It will be noted that occupational diseases constitute less than 2 per cent. of the total injuries.

	All injuries	Occupational diseases	Per cent. occupational diseases are of all injuries
Total number of cases .....	19,354	299	1.5
Death and permanent total disability cases	617	16	( <sup>8</sup> ) 2.6
Permanent partial disability cases .....	607	5	0.8
Temporary total disability cases .....	18,130	278	1.5
Total number of days lost in temporary total disability cases .....	397,395	5,740	1.6

The following table shows the number of cases of occupational diseases, the number of injuries caused by poisonous and corrosive substances, and the total number of injuries in California for the year 1919. The injuries due to poisonous and corrosive substances are taken from the cause classification table of the Commission's report, whereas

(6) Includes one permanent total disability and six deaths from pneumonia.

(7) Includes 30 permanent total disabilities.

(8) Only 1.6 per cent. if the six pneumonia cases are excluded.

statutes. Compensation has been usually granted if one or more or all of the following conditions were present : (1) if the disease resulted in violence to the physical structure of the body, i.e. if it was traumatic or produced a lesion ; (2) if the injury occurred unexpectedly or not in the usual course of events ; (3) if the injury can be traced to a definite time and place in the employment ; and (4) if the injury was not due to a known and inherent risk of the occupation, or, even if inherent in the occupation, if the employer had neglected to provide reasonable safeguards which would presumably have prevented the injury.

The guiding principle adopted by most of the courts and commissions in occupational disease cases is stated by the Pennsylvania Workmen's Compensation Board, in awarding compensation for dermatitis due to the fortuitous presence of poison in hides handled by the employec, as follows :—

Where injuries received in the course of employment are of untraceable inception and gradual and insidious growth and cannot be traced to having been received at some certain time, and in which there is no sudden or violent change in the condition of the physical structure of the body, they must be regarded as the results of an occupational disease. However, if the disease can be traced to some certain time when there was a sudden or violent change in the condition of the physical structure of the body, as, for instance, where poisonous gases were inhaled which damage the physical structure of the body, it is an accident within the Workmen's Compensation Act of 1915, and is compensable (5).

Thus it will be seen that the additional cost to a State desiring to include occupational diseases in its compensation law will not be materially increased, because many of such diseases are already being compensated, not as diseases but as accidents.

The following table shows the number of cases of occupational diseases and average number of days lost under the Federal Compensation Act for the year 1919. It will be noted, however, that this list includes injuries, such as pneumonia and typhoid fever, poisoning from gas and fumes, etc., which have been compensated in States that do not include occupational diseases in their compensation Acts.

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(5) *Roller v. Drueding Bros. Pennsylvania Workmen's Compensation Board Decisions for 1916*, p. 86.

the several States, either as to a definition of occupational diseases or as to their practice in awarding compensation.

Occupational diseases may be classified according to cause and nature of injury, as follows :—

(1) diseases due to gradual absorption of poisons (lead poisoning);

(2) diseases in which the poison or germ enters the system through a break in the skin (anthrax);

(3) skin affections from acids or other irritants (eczema, dermatitis);

(4) diseases due to fumes or dusts entering the system through respiratory organs (tuberculosis, gas poisoning);

(5) diseases due to vibrations or constant use of particular members (neuritis, telegrapher's cramp, housemaids' knee);

(6) Miscellaneous diseases (caisson disease, miner's nystagmus).

There are, however, two additional classes of diseases, non-occupational in character, for which compensation is usually granted: (1) those diseases, such as typhoid fever, erysipelas, pneumonia, and ivy poisoning, which arise out of, and are proximately caused by, the employment; these diseases, to be compensable, however, must have had their origin in the employment and must be definitely traceable to it; (2) those diseases which either result from an accident or are aggravated, accelerated, or developed by the accident. In these cases compensation is awarded not for the disease *per se*, but for the results of the accident. Had the accident not occurred the disease would presumably never have developed; consequently the resulting disability is justly attributable to the accident.

However, in many States in which the compensation laws do not cover occupational diseases the courts and commissions in actual practice have awarded compensation for most of the diseases enumerated above (4). They undoubtedly feel that an employee who contracts an occupational disease is just as much entitled to compensation as one who sustains the loss of an arm. Consequently, in their decision under the law they have no doubt been influenced by their desire to remedy as far as possible the economic injustice of the

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(4) For example, New York, before occupational diseases were included in the Act, had awarded compensation for anthrax, gas poisoning, ivy poisoning, dermatitis, and sunstroke; Illinois, for arsenical poisoning, gas poisoning, traumatic peripheral neuritis, and sunstroke; Wisconsin, for military tuberculosis, skin affections from acids, typhoid fever, and frostbite; Michigan, for throat infection from inhalation of dusts; Minnesota, for gas poisoning and sunstroke; Ohio, for gas poisoning and sunstroke; Connecticut for housemaid's knee, erysipelas, and frostbite; and Indiana, for nephritis.

cost of occupational diseases as compared with industrial accidents in the United States. The several reports and investigations show that the maximum cost of occupational diseases, if included in workmen's compensation Acts, would not be greater than 2 per cent. of the aggregate cost of industrial accidents. The cost would probably be a great deal less than 2 per cent. The occupational diseases experience in California, Massachusetts, and under the Federal Act is shown in subsequent tables. Moreover, the Actuarial Committee of the National Council has come to the conclusion, after a detailed study, that the additional cost of occupational diseases is not of great importance, and consequently recommended that no special factor be used in the rates to measure the cost of occupational diseases. The Committee came to this conclusion because the experience of California and Massachusetts showed no results radically different from those obtained by the experience of other States, where the occupational disease hazard is not specifically covered by the statute. Furthermore, continued the Committee, "a large proportion of so-called occupational disease cases have already been carried into the experience. Such cases as lead poisoning and anthrax have, in many jurisdictions, been classified as accidents and compensated under the terms of the workmen's compensation laws provided they occurred under certain conditions" (2).

The conclusion of the Actuarial Committee to disregard the occupational disease factor in the computation of insurance rates is particularly significant in view of the fact that heretofore insurance rates had been loaded 2 per cent. in order to take care of the occupational disease hazard (3). This 2 per cent. loading had been based upon the report of a Committee on loadings and differentials made to the joint Conference on workmen's compensation insurance rates held in New York City in 1915, supplemented by a memorandum on the compensation cost of occupational diseases submitted by J. D. Maddrill to the joint Conference.

The probable increased cost of occupational diseases will depend somewhat upon the definition of an occupational disease. At the present time there is little uniformity among

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(2) *Proceedings of the Casualty Actuarial and Statistical Society of America*, 1919-1920, vol. AI, p. 280.

(3) All classifications have some industrial disease hazard. To cover this, 1 per cent. is added to the pure premium for each class. Certain classifications have specific industrial disease hazards; as for example: lead poisoning, mercurial poisoning, compressed air sickness, etc. For each of these classifications an industrial disease pure premium is added to reflect the specific hazards. The combination of 1 per cent. on all classifications and the specific loading represents an average increase of 2 per cent. in pure premiums for those States where payments are made on account of industrial disease. (*Report of the Work of the Augmental Standing Committee on Workmen's Compensation Insurance Rates, 1917*, p. 85; issued by the National Workmen's Compensation Service Bureau.)

# WORKERS' COMPENSATION AND INSURANCE

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## Compensation of Occupational Diseases in the United States <sup>(1)</sup>

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OF the 46 compensation jurisdictions in the United States only eight (California, Connecticut, Hawaii, Massachusetts, New York, North Dakota, Wisconsin, and the Federal Government) provide compensation for occupational diseases. In Massachusetts, North Dakota, and the United States this inclusion has been effected through the commissions and courts, whereas in the other States it has been brought about by statutory enactment. The New York law limits compensation to certain specified diseases enumerated in the Act, while in the other States presumably all occupational diseases are covered. In the remaining 38 compensation jurisdictions occupational diseases are excluded, in theory at least, from the operation of the compensation acts. This exclusion has been brought about (1) by limiting the scope of the law to injuries by "accident", (2) by adverse rulings of the courts and commissions, and (3) by express provisions in the compensation Acts themselves.

Of foreign countries, Great Britain and most of the Canadian Provinces provide compensation for occupational diseases, limited, however, to certain diseases and processes stipulated in the schedule. In most of the European countries occupational diseases are taken care of under their sickness and invalidity insurance Acts.

The failure to include occupational diseases in the early American Acts was due, in part at least, to lack of information as to their prevalence and probable cost. At the time there existed no reliable statistical data showing the number of industrial diseases in the United States.

Since then the experience under the United States, California, and Massachusetts compensation Acts, together with investigations made by the Actuarial Committee of the National Council on Workmen's Compensation Insurance, have thrown considerable light upon both the number and

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(1) Reprinted from *Cost of occupational Diseases in the U. S. under the Workmen's Compensation Acts*, by Carl HOOKSTADT, in the *Monthly Labor Review*, Washington, February 1921, p. 151.



The general diminution in the number of cases of anthrax is very clearly shown in the following table:—

	1910	1911	1912	1913	1914	1915	1916	1917	1918	Remarks
Schleswig . .	7	12	11	5	6	1	—	1	2	11 fatal cases in the period 1914-1918 The last 6 cases (1 fatal) in the same factory.
Hamburg . .	—	—	—	—	18	13	1	1	1	
Hesse . . . .	—	—	—	8	4	1	—	—	1	
Saxe-Weimar .	—	—	—	11 (tanners)	1	—	—	—	—	Reduction through stoppage of importation of foreign pelts
Württemberg	—	—	—	9 (boot-making)	1 (felt hat factory)	—	—	—	—	

On the other hand, a noteworthy increase was recorded elsewhere. Thus the following figures are given for the district of Frankfurt-on-the-Oder :-

	Total No. of workers	No. of cases	Remarks
1915-16	500	2	—
1917	350	3	—
1918	320	9	including 2 deaths

to be taken inside ships' holds, even when substances were being used which were defined as inoffensive.

(22) *Naphthalene* and *anthracene* caused ulcers of the throat among the workers who were tarring wood (Arnsberg). Perchlorinated naphthalene caused nine cases of death and five cases of sickness among 90 persons in a Potsdam factory. The Bavarian Inspector stated that nitrated naphthalene, on the contrary, could be considered an inoffensive substance.

(23) One case of intoxication by *paranitroaniline* was reported in the North Palatinate district.

(24) *Ursol* was the cause of two cases of intoxication in fur dying (Chemnitz), due more particularly to paraphenylene-diamine.

### Infections

(1) In a meat-preserving factory (Hamburg), twelve women showed a kind of general intoxication in consequence of a small scratch in removing meat from bones.

(2) During the war period, the number of cases of anthrax was markedly less, on account of the stoppage of the importation of foreign raw materials (Königsberg, Bavaria). The only figures for the Stettin and Stralsund district were four cases in 1914. One fatal case of anthrax was recorded at Oppeln following a fly sting. In the Nüremberg district one fatal case, that of a brush maker, was recorded for the period 1914 to 1918; at Dresden there were three cases of anthrax in the brush and paint-brush factories. Of the three, two were fatal. In two of the cases the workers were handling foreign hairs and silks, and in one case home-grown silks. At Chemnitz a girl 17 years old, engaged in sorting sheep and goat skins, was attacked by a malignant pustule on the nape of the neck (without serious consequences). At Leipzig three cases were recorded, one case due to mohair, two cases from beating sheep and goat skins, which came from the battlefields. One of the latter cases was fatal after three days. In the Stade district, anthrax was reported in the wool-combing mills. At Cassel, one case, followed by a cure, was recorded in a woman working in a hair and silk factory. It was a case of foreign horsehair disinfected by steam, but the disinfection had been insufficient because the bale was too tightly packed. At Wiesbaden, three cases, followed by cures, were recorded among the workers working on foreign skins.

(18) Among the halogen derivatives of the homologues of methane, we have *tetrachlorethane*, which is to-day obtained in industry by means of chlorine and acetylene in the presence of chloride of antimony as a catalytic. This product is a good substitute for benzene, ether, etc., because it is incombustible and can be easily recovered. It is used as a solvent of acetylcellulose for varnishing aeroplanes on account of the special properties possessed by it. We are here dealing with a very dangerous substance which may cause a more or less serious list of symptoms, ranging from ordinary sickness, giddiness, and vomiting to cerebral congestion and death, characterized by coma and jaundice with tumefaction of the liver. Lacquers containing tetrachlorethane have been prohibited, and in practice other solvents have been found less dangerous than tetrachlorethane (Munich, Potsdam).

(19) On boiling tetrochlorethane with lime and water it loses hydrochloric acid and gives *trichlorethylene*, which is used as a de-greasing agent, and in the extraction of perfumes. The vapours, composed of light gases, cause cases of illness, with feelings of fatigue, giddiness, and sometimes even deafness, but without a fatal termination.

(20) Another substitute for benzene is *carbon tetrachloride*, used in mordanting pelts. It was the cause of numerous cases of intoxication, which were accompanied by a feeling of oppression, anæsthesia, and so on.

(21) Colours, varnishes, lacquers, and paints were the cause of numerous cases of intoxication due to substitutes for the solvents and diluents used before the war. In general, *light tar oils* are concerned, or impure products such as acetone, benzene, methyl alcohol, formic ether, etc., substitutes for turpentine and for ethyl alcohol. These products were the cause of local lesions aggravated by working in a warm atmosphere, dermatitis of the hands, arms, and face, and eczemas, which usually were accompanied by an intoxication characterized by sickness, nausea, giddiness, drunkenness, and headache. There are records of cases of pains localized in the eyes, with sight trouble, and respiratory and digestive trouble. ~~The danger was fairly great among ship painters,~~ especially when it was a matter of submarines and torpedo-boats, on account of the smallness of the space in which the workers had to operate. This question has been the object of an inquiry on the part of the Factory Inspection Office at Hamburg since 1909 and was dealt with in a circular of the Chancellor dated 18 July 1917. The Circular laid down regulations for good ventilation in the work-places, to be obtained by means of electric appliances. Another Circular, dated 8 April 1918, imposed the precautions which were

swallowing dust), with pains and nausea. With reference to the respiratory system, bronchial catarrhs and even hæmoptysias were recorded. Cases of insomnia were also frequent. In the Dresden district, the greatest care was given to hygiene, both of the mouth and of the teeth, in order to avoid troubles of gastric origin. Cases of irritation of the skin with eruptions, eczemas, etc., were the most frequent of all.

Here it may be useful to recall the importance of the technical knowledge required by doctors treating these cases ; in fact, cases due to picric acid have been diagnosed and treated as phosphorous anaemia and intoxication because the doctor did not know the analogy of the picric and phosphorous accidents<sup>(5)</sup>. The duration of picric accidents varies greatly according to the gravity of each case. Slight cases of digestive troubles last on the average about ten days. One case in a factory manager, who had conjunctivitis provoked by contact with fingers soiled by picric acid, lasted nearly three months. The precautions adopted were almost always similar ; an attempt was also invariably made to improve the diet of the workers handling picric acid.

Dinitrophenol also caused numerous cases of intoxication (with cyanosis), several of them fatal, but there are no details on this subject.

(16) *Nytroglycol*. This product, which is more volatile than nitro-glycerine, was used in loading cartridges with other explosives, but the most exposed workers were those whose job it was to enter the generating chambers. Although staying there but a very short time, workers complained of cerebral congestion and violent attacks of giddiness. Nevertheless, fairly rapid immunization was observed. Precautions taken were the installation of a powerful exhaust system, and the lowering of the temperature during the nitration and washing of the substances.

(17) *Tetranitromethane* is a frequent impurity of nitrotoluenes and especially of T.N.T. It appears that several cases of intoxication attributed to T.N.T. were due to tetranitromethane. This substance is very toxic and has caused numerous very serious cases of intoxication, several of them fatal, after pulmonary œdema. The gas when breathed exerts a local irritant action and a general toxic action on the blood and on the circulatory system. In serious cases, foci of broncho-pneumonia were observed with pulmonary œdema, but without the well-known latent period of intoxication by nitrous gases.

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(5) After having eliminated the biliary pigments in the urine examined, picric acid is tested for by the Grimbert method, which makes use of the Mithouard reaction.

nium nitrate. Cases of intoxication were recorded also among the workers handling donaunite containing 15.2% of nitro-aromatic derivatives, and even among the super-phosphate workers, who were using sulphuric acid which was the waste product of a powder factory. The workers intoxicated complained of sickness, general faintness, a sensation of lassitude, headache, dryness of the throat, giddiness, anorexia or very acute feeling of hunger, tingling in the legs. Several workers had even to leave work on account of these troubles. In the more serious cases pallor or oedema of the face was recorded, distortion of the face, cyanosis, yellow colouring of the integuments and mucous membranes, irritations of the eyes, nose, and larynx. There are records of cases of disease of the respiratory or digestive passages and even of the circulatory system. Behind the list of symptoms there are gastric troubles which are connected with bad feeding. The kidney also may be attacked, and hence the necessity of examination of the urine for albumen. In six fatal cases sudden acute atrophy of the liver was in question. Mention has already been made of irritation of the skin due to nitro-aromatic substances, showing itself in dermatitis of every kind, usually serious and accompanied by general troubles. Three cases were reported among women workers, one of whom was 14 years old. The cases in general lasted a fairly long time. Two cases of blindness (Düsseldorf) were given, one of them fatal, but it was supposed that this last was a case of poisoning by methylated spirit or benzene. It must be remembered that several cases were ascribed to tetronitromethane and dinitrobenzol, but it must be said that the toxicity of these substances is closely connected with the degree of their purity. The wearing of gloves is a good preventive measure against dermatitis. An order of the Imperial Chancellor dated 28 September 1916 regulates work on nitro-compounds.

(15) *Nitrophenol*, better known by the name of *picric acid*, is chemically a trinitrophenol, 1-2-4-6, which is the final product of the action of azotic acid on phenol. It is used both in the solid and liquid states, and in consequence, its action on the organism can be exerted either by dust or by vapours. Absorption can thus take place either through the skin or through the digestive passages. Frequent intoxication was reported in all districts in which there were explosive or projectile factories. In general, it was a question of women who were engaged on the compression of explosives. There is a statement (Potsdam) that the workers become immune to the action of the picric acid even without the appearance of slight troubles.

If cases are on record of workmen who did not suffer from the picric acid, there is, on the contrary, a long series given of more or less serious cases with yellow colouration of the skin and hair, headache, anaemia, gastric trouble (through

SICKNESS AND DEATH STATISTICS FOR WORKERS IN CONTACT WITH  
DINITROBENZOL AND TRINITROANISOL IN AN EXPLOSIVES FACTORY  
(DÜSSELDORF)

	No. of workers	Cases of sickness per 100 workers	No. of days' sickness per worker	No. of deaths
1912	Men 407	40.0	5	1
	Women 16	12.5	7	1
1913	Men 478	47.7	6	1
	Women 12	—	—	—
1914	Men 1480	26.0	3.1	2
	Women 231	20.3	1.5	—
1915	Men 1650	55.2	5.6	17
	Women 535	62.2	10.0	3
1916	Men 1641	47.6	6.1	8
	Women 735	46.4	6.7	3
1917	Men 2055	57.7	7.6	19
	Women 952	41.7	8.8	5
1918	Men 1911	55.0	8.4	21
	Women 886	42.4	8.2	9

The workers who are sick usually report to the doctor sickness, faintness, loss of appetite, buzzings in the ears, nausea and vomiting, irritations, sweats, insomnia. The examination of the patient adds to these cyanosis of the lips, pallors, troubles of varying degrees of seriousness in the respiratory, circulatory, and nervous systems, cramps, and, among women, paralytic symptoms. There is also record of a special syndrome of the visual organs characterized by loss of central vision, but it is suspected that these cases had been caused deliberately.

For the prevention of intoxications, mechanical processes have been called in, with localized exhaust ventilation, and substitution, when possible, of other less toxic products, for instance, ammonium nitrate and dicyandiamide. In 1912 a decision was taken in Bavaria making obligatory the declaration of cases of intoxication by D.N.B., and a Ministerial Decree of 20 November 1911 laid down regulations for work in factories handling D.N.B.: instructions to the worker, individual cleanliness, and periodical medical supervision. As already stated above, however, the lack of soap, the difficulty in obtaining milk, etc., made it impossible to apply the medical prescriptions with the necessary strictness.

(14) At this point the cases due to the action of the *aromatic nitro-compounds* and especially of *nitrotoluene* may be mentioned. It may be said that the toxicity of these products increases with the number of the nitro groups. The nitro-compounds form a large part of the explosives used for filling bombs and shells, either alone or mixed with ammo-

SICKNESS AND DEATH STATISTICS FOR WORKERS IN CONTACT WITH  
DINITROBENZOL IN AN EXPLOSIVES FACTORY (DÜSSELDORF)

		No. of workers	Cases of sickness per 100 workers	No. of days' sick- ness per worker	No. of deaths
1912	Men	550	69	14	2
	Women	—	—	—	—
1913	Men	590	83	13	2
	Women	—	—	—	—
1914	Men	660	82	12	3
	Women	130	5.5	0.4	—
1915	Men	1603	64	7	7
	Women	710	84	12	—
1916	Men	1516	56.7	11	10
	Women	873	66	13	1
1917	Men	1998	89	11	25
	Women	1350	91	13	6
1918	Men	2209	100.5	18	26
	Women	909	119	26	3

SICKNESS AND DEATH STATISTICS FOR WORKERS PREPARING  
OR WORKING WITH TRINITROBENZOL GAS OR TRINITROANISOL  
IN AN EXPLOSIVES FACTORY (DÜSSELDORF)

	No. of workers	Intoxications: Cyanogen			Occupational diseases due to trinitroanisol			Other diseases		
		Cases per 100 workers	Days per worker	Deaths	Cases per 100 workers	Days per worker	Deaths	Cases per 100 workers	Days per worker	Deaths
1914	M. 254	1.6	7.0	—	3.1	6.7	—	65.0	14.0	8
1915	M. 2289	28.2	9.2	2	37.8	12.3	—	36.2	12.6	15
	F. 348	33.6	8.6	—	11.2	11.3	—	29.7	13.2	—
1916	M. 2517	9.4	9.7	4	20.9	12.7	—	57.5	13.2	17
	F. 796	13.8	9.6	—	16.0	11.4	—	51.2	18.2	—
1917	M. 4234	20.1	13.7	6	5.3	12.8	—	64.3	17.3	33
	F. 1298	18.6	9.2	—	3.4	8.2	—	58.3	11.9	2
1918	M. 2703	8.9	14.2	2	3.6	11.5	—	90.3	18.3	29
	F. 573	4.0	12.4	1	3.6	14.1	—	79.1	15.2	6

2.27% of the workwomen were intoxicated by D.N.B. in the course of twelve months. It was further stated that there was no immunity, and that the same workers could be intoxicated several times. The reports of the inspectors called attention to an increase in intoxication during the summer months, and insisted on the possibility of maintaining a relatively good state of health, even among the workers who showed cyanosis. The sanitary conditions of the workers in contact with D.N.B. are given in the following statistics (4).

SICKNESS AND DEATH STATISTICS FOR A DINITROBENZOL  
FACTORY (HESSE)

	Work units (full-time workers) for 300 days or working periods	Cases of sickness per 100 workers	Cases due to nitro-compounds of	
			Sickness	Death
1916	1018	6.4	112	3
1917	1214	9.5	201	7
1918	1490	8.5	130	3
	335 women in this section		Only 165 men out of the total of 443	Only 3 men out of the total of 13

SICKNESS STATISTICS FOR WORKERS IN CONTACT WITH AROMATIC  
NITRO COMPOUNDS (POTSDAM)

*Average Numbers*

<i>Men</i>	1916 145	<i>Women</i>	1916 380
	1917 340		1917 620

	Diseases of	Men		Women	
		Cases of sickness per 100 workers	Days of sickness	Cases of sickness per 100 workers	Days of sickness
1916	Skin . . . . .	11.7	203	9.7	183
	Respiratory system . .	10.3	182	10.5	205
	Digestive system . . .	9.0	110	28.7	597
	Blood vessels . . . .	1.4	10	20.5	477
1917	Skin . . . . .	7.1	100	10.5	186
	Respiratory system . .	16.5	273	13.7	394
	Digestive system . . .	20.3	330	46.1	994
	Blood vessels . . . .	4.1	121	27.4	664
	Jaundice . . . . .	1.2 <sup>(1)</sup>	34	1.5 <sup>(2)</sup>	38

(1) 2 deaths included.

(2) 5 deaths included.

(4) The sickness societies, from 1 January 1915 to the end of the war, received notification of 1,000 cases (some of them slight, lasting five days), with 12 deaths. In a factory employing 874 workmen (123 full-time workers) from December 1916 to October 1918, out of a total of 68,767 work-days and an average of 119.6 full-time workers, there were 340 cases of intoxication (284.3 per 100 full-time workers) and a monthly average of 14.7 (12.2 per 100 full-time workers). In another factory employing 816 workers (77 full-time), in 8 months, out of a total of 17,756 work-days and an average of 88.7 full-time workers, there were 314 cases of intoxication (323.7 per 100 full-time workers), and a monthly average of 39.2 (44.2 per 100 full-time workers), nearly four times as high as in the first factory.



analogous to minium ("Siderosth") for painting boilers, can be assigned to the solvent, which was a substitute analogous to benzene. Cases of dizziness after a bout of gaiety and cases of loss of consciousness among painters of the insides of holds of ships called for the intervention of the legislator. Some precautions were taken at Danzig, in particular in brush painting with colours containing benzene.

(12) The *nitro compounds* industry was regulated by the authorities of Anhalt as follows: Ventilation of the melting chambers with removal by suction of dust, gas, and vapours (15 times a day), washing of the floor and the walls, avoiding contact with the hands, strict individual cleanliness, wash basins, baths, foot baths, facilities for drying the hair, masks, shifts of 1½ hours, change of work for persons particularly susceptible, periodical inspection, oxygen within reach of the workers for cases of intoxication.

(13) Even when prepared and handled with all necessary precautions (closed vessels, localized ventilation, wearing of masks, education of the worker, individual cleanliness, sanitary supervision, etc.) *dinitrobenzene* everywhere caused numerous cases of intoxication, which were often fatal (of six cases, four showed serious acute jaundice). It must, however, be said that in certain cases it was not possible to determine the share of intoxication and that of another non-occupational cause. Dinitrobenzene is the most dangerous of the polynitrous derivatives of benzene, on account of its noxious action on the elements of the blood, on the haemoglobin, which it transforms into methaemoglobin, and on the liver. The means of entry of the poison are respectively the respiratory passages (for vapours), the digestive passages (for dust), and the skin and mucous membranes, even if they are unbroken (during the handling of the substances). It has been stated that individual pre-disposition plays a large part, but it must also be admitted that the weak powers of resistance of masses of workpeople, especially women and young persons, explain the frequency and the gravity of the intoxication. It was not possible to exclude women from the factories in which dinitrobenzene was handled (projectile filling), although the poor power of resistance of the women exposed to the action of D.N.B. was evident. The following were, however, excluded: old men; persons susceptible by reason of an already existing intoxication (alcoholism, tabacosis, plumbism), or of infections (syphilis), or other diseases such as diabetes; workers with a tendency to retinitis; workers rejected on account of a general special state (women during the menstrual period, or during pregnancy). The frequency of intoxication was very marked. The following figures are typical. In a Luneburg factory, during four months in 1918, among 200 workers (50 of them women) 68 cases (34%) were observed, with 769 days' absence. In two factories in the Upper Palatinate district 5.44% and

lack of sufficient means of heating made it necessary to use brasiers (Minden). But the majority of cases of carbon monoxide intoxication occurred in the vegetable drying industry, which is carried on in ovens heated by coke or coal containing 1—1.25% of sulphur impurities (Luneburg). Experiment proved that, with a good ventilation system, the cases of intoxication could be reduced in number, or even suppressed. In any case, the law excludes women under 18. One compulsory rest hour is prescribed after each hour of work. The statistics of the Schleswig district give a fairly high sickness-rate among the men and women workers in this industry. In fact, the average sickness-rate per month in summer was 11.1% in one factory, and 20.5% in another, while the average of the local sick benefit society was only 4%. Another local society which showed an average sickness rate of 3.55% gave as figures for the drying industry: 19.07%, 11.64%, and 17.01%. The injuries reported can apparently be assigned to the harmful influence of hot air. In fact, an analysis of the air (taken at 1.50 metres from the floor), which was made in one factory showed the existence of traces only of carbon monoxide, 1.1% of carbon dioxide, 0.6% to 0.9% of sulphurous acid, and 14% to 16% of oxygen. A mouse placed at different heights from 10 to 60 centimetres, at a temperature of 35-54° C., died after 1 hour and 45 minutes. The analysis of its blood did not show oxycarbonized methaemoglobin, and death apparently was due to the action of heat and of sulphurous acid.

Other cases of intoxication by carbon monoxide were reported in blast furnaces, and two cases also in autogenic soldering (Potsdam).

(8) *Carbon oxychloride* caused numerous slight cases of intoxication, and also some fatal cases, occurring in the form of lesions of the respiratory structure (Wiesbaden).

(9) *Nitrous gases* were the cause of numerous slight cases of intoxication (Wiesbaden) and some fatal cases. It is stated that after three or four hours' work, the use of an ordinary mask is insufficient to protect the workman.

(10) After a *bromo-methyl* explosion in a Wiesbaden factory, four workers were intoxicated by the vapours on entering the factory. One of the victims died on resuming his work after a fortnight's interval. A leak in the piping was the cause of six other cases of poisoning, two of them fatal. Bromo-methyl is a poison of the nervous system, fatal in a very short time. It is stated that the odour of this gas is not strong enough to indicate the presence of vapours in the air.

(11) Among the many cases of injuries caused by *benzene*, there should be mentioned cases of irritation of the conjunctiva, through the use of a substitute containing benzene for dressing straw hats. Cases of deafness, caused by the use of a preparation

washing and drying of the fulminate of mercury did not cause accidents, but the later manual processes were more noxious. The symptoms generally observed were headache, abdominal pains, and locally irritation of the neck and inflammation of the mucous membrane of the eyes. This was morbid syndrome, and was generally considered to be due to etheric products. The most dangerous operation of all was the mixing and homogenization of the detonating compound and the filling of the caps, an operation which attacked the hands of the workwomen. One of them even had two nails missing. Numerous cases of intoxication due to mercurial vapours were observed in a factory in the same district, in which rejected fulminate of mercury caps were destroyed by fire. The same accidents were observed in the Swabian cap and detonator factories, especially in the operations of compressing the charges and filling the caps (Düsseldorf). The very fine dust which came off settled on the face and back of the hands, especially in summer, and with the combined action of perspiration gave rise to ulcerations, lumps, lesions of the skin, and inflammation of the mucous membranes of the mouth and nose, these last being often accompanied by ulcers. Gingivitis and blackening of the teeth were also frequently observed symptoms. Workers who were also suffering from venereal diseases showed moist and running eruptions of the face. On the other hand, in Upper Bavaria no accident was recorded in establishments of a precisely similar character.

(5) In a safety-lamp factory (Zwickau), an interesting case was observed of a workman employed in a workshop for making *nickel-cadmium* plates for electric lamps. This workman had attacks of faintness, loss of appetite, and giddiness, which lasted three weeks. The doctor's opinion was that this form was due to cadmium oxide making its way into the digestive passages. The toxic action of the substance on the stomach was proved by experiments made at the *Zentralstelle für öff. Gesundheitspflege* at Dresden. The cadmium "dust" was not composed of pure cadmium, but of the oxide and of minute traces of insoluble cadmium salts which could not menace the health of the worker. In every case an exhaust apparatus for removing the dust was installed and gloves and masks distributed to the workmen.

(6) Before ending this rapid survey of the chief intoxications due to metals, we may refer to *foundry fever*, some cases of which were recorded in the Dresden district. The symptoms consist of headache, shivering fits, nocturnal sweats and high fever. The installation of a good system of ventilation in the workshops led to the disappearance of this morbid symptom.

(7) *Carbon monoxide*. We may first remind the reader of the intoxications which occurred in workshops, where the

gastric and intestinal pains, myalgia, general and nervous asthenia. But cases of arthritis, nephritis, cephalgia, dental decay, etc., were also recorded. These were special cases, for which it would be necessary to take into account the influence of the substitutes used for solvents, which without doubt complicated the conditions of the disease.

(3) In the Arnsberg district accidents were recorded caused by the *gases* and *vapours* generated in the acid bath rooms, which made it necessary to instal exhaust apparatus. In a sulphuric acid factory in the same district the gases passed through an electric field of 80,000 volts, in which the ironised particles of dust were fixed on threads and sieves. The dust so collected was forced down by air compressed at four atmospheres into a dust chamber.

(4) The use of *mercury* has in all cases given rise to hydrargyriasis. At Munich, in the Stade and Magdeburg districts, cases of intoxication were reported due to the mercurial vapours evolved during the use of a mercury solder as a substitute for tin solder. Similarly, in a metal foundry (making chairs for rails), where an alloy containing mercury was used in the course of operations, mercurial vapours caused a certain number of intoxications. In the district of Upper Bavaria, symptoms of intoxication were reported in an acetone and acetylene works, where mercury was transformed into its oxide and then back into mercury in a closed cycle. Numerous slight cases were recorded among the workers engaged in determining the specific weight (hydrostatic equivalent) of compressed "Ammon" powder, by the process of the determination of its loss of weight in mercury (Coblenz, Hesse). These workers were attacked by mercurial intoxication, especially those engaged in handling the paste after it was taken out of the mercury baths, an operation attended by some danger. On this occasion, the Prussian Decree of 15 May 1889 on mirror factories was once more put into operation. Periodical inspection of the workers took place, and only a few cases in all of intoxication were recorded. However, the adoption of preventive measures was hindered by many difficulties, such as lack of good soap, and the difficulty of getting the country workers to take baths.

*Fulminate of mercury* gave rise to ordinary symptoms of mercurial intoxication, especially to cutaneous eruptions and running eczemas, in a factory for priming percussion-caps and detonators and unpriming unusable detonators (Spandau). At Merseburg, the only symptom occurring was a case of stomatitis, while at Erfurt, the accidents observed were more numerous and their pathogenesis could be studied with a fair amount of detail. During the operation of the nitration of mercury, toxic nitrous gas emanations were given off. The

Factory	Year	No. of workers	Per 100 workers			
			No. of cases of sickness	No of days of sickness	No. due to plumbism	
					Cases of sickness	Days of sickness
White lead Works	1912	95	26.3	686.3	4.2	141.0
	1913	73	10.9	317.8	2.7	89.0
	1914	33	54.5	900.0	6.0	181.8
Glausthal Factory	1914	173	54.3	1224.8	4.0	88.4
	1915	148	57.4	1767.5	6.0	131.7
	1916	164	50.0	1051.2	3.0	49.5
	1917	160	61.2	1498.7	1.2	16.2
	1918	150	70.6	2000.6	2.6	129.3
Lautenthal Factory	1914	66	37.8	1296.9	9.0	153.0
	1915	66	36.3	562.1	4.5	181.8
	1916	67	44.7	826.8	4.4	70.1
	1917	25	48.0	805.3	1.3	8.0
	1918	60	48.3	926.6	—	—

In the lead foundries of Hildesheim the figures for general and saturnine sickness were as follows:—

	Average number of workers		Total number of	
	examined	in contact with lead	cases of sickness	days of sickness
1914	516	164	700	6,676
1915	571	27	423	4,953
1916	605	23	369	3,363
1917	490	16	380	3,497
1918	677	6	612	5,788

In a Hamburg zinc foundry the following cases of sickness were given:—

	No. of workers	No. of cases of sickness	Saturnine colic and paralysis	Nephritis	Rheumatism	Digestive diseases	Respiratory diseases	Various
1914	675	312	18	—	11	100	11	169
1915	438	103	2	—	6	16	9	70
1916	246	68	3	—	6	10	10	38
1917	{ 262 M	71	1	—	7	12	11	40
	{ 188 F	46	—	—	4	10	3	29
1918	{ 308 M	91	—	—	6	17	18	46
	{ 136 F	27	—	—	1	2	4	18

Cases of plumbism were reported among the workers in an enamelling works in the Potsdam district, where a white powder was used, prepared by a German house and containing white lead. Previously an enamelling powder of French origin was used, which never caused any accidents. The symptoms recorded by the inspector as most frequent were

The manufacture of *arsenical by-products* also caused accidents. The liberation of fumes in the course of operations produced chronic irritant lesions. Sometimes more acute local phenomena were produced, such, for instance, as tumours and inflammations on the exposed parts of the body. In the Nuremberg district *arseniuretted hydrogen* caused nine cases of intoxication, one followed by death, among the workmen in a ferro-vanadium factory. At Dresden, in a chemical works, two cases of fatal intoxication were produced during the handling of sulphuric acid constaining arsenic and guaranteed "chemically pure".

(2) All districts publish statistical data on *plumbism*. During 1915, 1916, 1917, and 1918, lead intoxication diminished perceptibly and actually disappeared in 1918 through shortage either of work and workers or of lead ore and lead paints. In any case, the authorities have always required preventive precautions to be taken against intoxication.

Out of 780 cases recorded, the following distribution may be noted :—

Paint and house painting trades . . . . .	198
Accumulators . . . . .	35
Lead foundries and machinery . . . . .	23
Book trade . . . . .	173
Pottery trade . . . . .	14

Cases of plumbism were recorded in a factory making pharmaceutical products, among tin-plate workers, and one inexplicable case in a young locksmith. It must be said, however, that the different reports did not always give either the figures of the cases reported, nor the occupations in which the intoxications were observed. The reduction in the number of serious cases of plumbism is due also to the substitution of harmless products for toxic. In a file factory, for instance, lead beds were replaced by aluminium. Detailed precautions were exercised in lead-mercury soldering. In foundries, where the work was done in three shifts, gloves were distributed to the workmen.

Although the white lead works had to stop work in 1918, through shortage of raw materials, some of them nevertheless had tried to improve their technique, and in two white lead works a wet process had been applied, which continued automatically from the initial to the final operation. The report for the Saxe-Coburg-Gotha district records that the number of workers in one white lead works, which was 30 before the war, fell to 10. Production had ceased at the end of the war and was limited to minium and litharge. The number of cases of plumbism was 3 in 1914, 3 in 1915, and 1 in 1916. In a white lead works in the Hildesheim district the sickness figures were as follows:—