U. S. DEPARTMENT OF LABOR
JAMES J. DAVIS, Secretary
BUREAU OF LABOR STATISTICS
ETHELBERT STEWART, Commissioner

BULLETIN OF THE UNITED STATES BUREAU OF LABOR STATISTICS . . . . . No. 488

INDUSTRIAL ACCIDENTS AND HYGIENE SERIES

DEATHS FROM LEAD POISONING
1925–1927

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JUNE, 1929

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1929

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NO. 488 WASHINGTON JUNE, 1929

DEATHS FROM LEAD POISONING, 1925 TO 1927

Decline in Lead Poisoning Death Rate

IN CONTINUATION of the review of the lead-poisoning situation in the United States and certain foreign countries, published in Bulletin No. 426 of the Bureau of Labor Statistics, this bulletin adds some recent statistics which bring the information down to the end of 1927. The new statistics reflect a further decline in lead poisoning as measured by the death rate, the actual number of deaths in the United States having been, respectively, 142 in 1925, 144 in 1926, and 135 in 1927. These deaths, however, are only for the United States registration area, which represents approximately 90 per cent of the total American population. It is very doubtful if in the remainder of the population not represented by the registration area the number of the deaths attained to measurable proportions. In any event, it is exceedingly doubtful if the total number of the deaths for the whole country, including Alaska, would reach, and certainly would not exceed, 150 per annum.

Of the mortality from lead poisoning in the United States, approximately 50 per cent are the deaths of painters. This is shown concisely in the following table:

Deaths from chronic lead poisoning, United States registration area, 1925–1927

Class of persons	1925	1926	1927	Total
Painters	75	74	67	216
Other males	61	61	60	182
Females	4	6	3	13
Children	2	3	5	10
Total	142	144	135	421

The average age at death for all males was 51.5 years; for painters, 52.9 years; and for all occupations, 51.5 years.

The age distribution of the deaths from lead poisoning during the last three years is shown in Table 1 for males only, differentiating painters from other males, including some unoccupied and retired.

TABLE 1.—*Deaths of adult males from lead poisoning in United States registration area, 1925 to 1927*

Age group	1925		1926		1927		Total	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Painters:								
20 to 29			4	5.4	3	4.5	7	3.2
30 to 39	9	12.0	8	10.8	9	13.4	26	12.0
40 to 49	21	28.0	22	29.7	12	17.9	55	25.5
50 to 59	19	25.3	19	25.7	20	29.9	58	26.9
60 to 69	19	25.3	15	20.3	17	25.3	51	23.6
70 to 79	7	9.4	5	6.8	5	7.5	17	7.9
80 and over			1	1.3	1	1.5	2	.9
Total	75	100.0	74	100.0	67	100.0	216	100.0
Other occupations:								
20 to 29	5	8.2	1	1.6	8	13.3	14	7.7
30 to 39	8	13.1	16	26.2	10	16.7	34	18.7
40 to 49	15	24.6	9	14.8	16	26.7	40	22.0
50 to 59	17	27.9	15	24.6	13	21.6	45	24.7
60 to 69	11	18.0	14	23.0	9	15.0	34	18.7
70 to 79	4	6.6	5	8.2	4	6.7	13	7.1
80 and over	1	1.6	1	1.6			2	1.1
Total	61	100.0	61	100.0	60	100.0	182	100.0
All occupations:								
20 to 29	5	3.7	5	3.7	11	8.7	21	5.3
30 to 39	17	12.5	24	17.8	19	15.0	60	15.1
40 to 49	36	26.5	31	22.9	28	22.0	95	23.9
50 to 59	36	26.5	34	25.2	33	26.0	103	25.9
60 to 69	30	22.0	29	21.5	26	20.5	85	21.3
70 to 79	11	8.1	10	7.4	9	7.1	30	7.5
80 and over	1	.7	2	1.5	1	.7	4	1.0
Total	136	100.0	135	100.0	127	100.0	398	100.0

The average age at death for all occupations in 1927 alone was 50.5 years against 52 years during 1925 and 1926 combined. For painters the average age at death was 53.3 years for 1927 against 52.7 years for 1925 and 1926. The indicated differences are too slight to be considered significant. In 1927 the range in ages at death for painters was from 26 years to 82 years, while for other males, the range was from 23 years to 73 years. During the previous two years, the range in ages for painters was from 22 years to 86 years, while for other males it was from 21 years to 87 years. Here again there is only a slight difference which can not be considered significant. On account of the slight variations in the average age at death from year to year, it does not seem necessary to give a table in detail for each of the three years, but Table 2 will show the average age at death in the different occupations represented in 1927 in a mortality of 127 males, showing that for all but a few of the occupations the number of deaths is too small for the average age to be considered significant for the present purpose.

TABLE 2.—*Deaths of adult males from lead poisoning in United States registration area, 1925 to 1927*

Occupation	1925	1926	1927		Total
			Number	Average age	
Painters	75	74	67	53.3	216
Laborers	11	7	17	39.0	35
Metal workers	7	6			13
Lead workers	8	5	9	45.6	22
Farmers	5	6	2	45.0	13
Commercial	6	2	1	55.1	9
Printers	5	2	5	48.8	12
Paint manufacturing	3	4			7
Miners	3	3			6
Electric storage batteries	3	2			5
Carpenters	1	3	2	62.0	6
Glass workers	1	2			3
Plumbers	1	1	4	47.5	6
Potters		1			1
Miscellaneous	2	7	17	53.0	26
Unknown and retired	5	10	3	55.3	18
Total	136	135	127	50.5	398

This table is perhaps the most valuable and important in the series as indicating the concentration of the lead hazard in fatal form in particular employments. Aside from painters, laborers naturally constitute a large number, representing unquestionably many employments connected with lead-using industries in which unskilled manual labor is required to a considerable extent. Highly suggestive is the small number of deaths of lead workers considering the wide distribution of the lead industries throughout the country. Unfortunately, the exact number of employees can not be given. Another important industry is that of printing, which for the year 1927 showed a somewhat higher mortality than during 1926, but the same as during 1925. During 1927 there were only five deaths in the printing industry, which in the aggregate employs an extremely large number of workers, of whom, perhaps only one-third are exposed to lead hazards. Again, precise figures of the number employed with exposure to lead can not be given.

Very surprising is the small number of deaths in electric storage-battery manufacture, three deaths having occurred in 1925, two in 1926, and none in 1927. Since, as is well known, the lead hazard in electric storage-battery manufacture is particularly accentuated in certain localities, it is surprising to find that there is rarely a fatal termination. This can be explained only on the ground that lead poisoning in the electric storage-battery industry in serious form is very rare, while lead absorption is extremely common.

Particularly surprising is the rarity of deaths of potters, no deaths having occurred in 1925, one during 1926, and none during 1927. The far-reaching sanitary reforms introduced into the American potteries during recent years have unquestionably been productive of excellent results.

Other occupations are numerically of small importance. There are reasons for believing that in quite a number of deaths the source of lead poisoning was nonindustrial, particularly in the case of commercial and professional occupations. In the case of farmers there is a

suspicion of lead painting being carried on privately, leading to lead infection. An exceptional case in 1927 was the death of a doctor, 63 years of age, and a case of the death of a jeweler, 71 years of age.

Aside from the foregoing there were 4 deaths of females in 1925, 6 in 1926, and 3 in 1927. Additional thereto, there were 2 deaths of children in 1925, 3 in 1926, and 5 in 1927. These were mostly infants during the first or second years of life, or cases in which lead poisoning is alleged to have resulted from the eating of paint from cribs or toys, or absorption otherwise. In the case of women the lead poisoning was nonindustrial, chiefly the absorption of drinking water conveyed through leaded pipes.

Nonoccupational Deaths

THE foregoing is highly suggestive of the nonindustrial origin of lead poisoning in many cases, even though the person was exposed to lead hazards in the occupation followed. The problem of lead poisoning from lead-piped water supplies has recently been dealt with in a contribution to the Journal of Industrial Hygiene, September, 1928, by Messrs. Wright, Sappington, and Rantoul. The observations of these authors on the results of their investigations are summarized as follows:

A chemical study was made of 102 lead-conducted water supplies—city, well, and spring waters—90 of which were used by a total of 253 persons subjected to clinical investigation. All the waters analyzed contained lead. The lead content was most strikingly related to the carbon dioxide content. There was no apparent relation between length of pipe and lead content.

Of 90 sources used by the persons studied, 35 caused poisoning as determined by certain criteria.

Of 253 exposed persons, 63, or 24.9 per cent, were poisoned.

Poisoning occurred among 14 persons ingesting as little as 0.1 mg. of lead daily over an average period of eight and one-quarter years.

The incidence of poisoning was distinctly lower in children under 10 years of age than among children from 10 to 20 years old or among adults, and was greater among adults than among children under 20.

The duration of exposure, except for very short periods, was not significant in its relation to the incidence of poisoning.

The incidence of poisoning was quite uniform among those ingesting varying amounts less than 1.5 mg. daily but was much greater as this amount was exceeded.

Under almost all conditions of comparison—by age, duration of exposure, amounts of lead ingested daily, and total amounts of lead ingested—women showed a lower incidence of poisoning than did men.

The term lead poisoning as used in the preceding discussion, however, requires qualification. The term lead absorption would in most cases have been preferable. Lead poisoning in fatal form as the result of drinking water conveyed through lead pipes causes an aggregate mortality probably not exceeding 20 to 30 deaths a year throughout the country. This phase of the question has been more exhaustively dealt with in the discussion in Bulletin 426. The present investigation shows rather a lesser than a heavier incidence due to nonindustrial sources than was shown in the former study.

Nativity Distribution of Decedents

OF SOME interest in connection with a general discussion is the nativity distribution of the deaths from lead poisoning during the last few years as shown in Table 3. The table does not indicate any particular predilection of any one nativity over another as regards liability to lead poisoning, unless it be the case of the Negro. Unfortunately, the number of colored persons employed in lead-using industries is not known, but the general mpression is that the negroes are more liable to lead poisoning than the whites, and they are certainly more liable to lead absorption. This, however, may be due to the fact that the negroes are generally employed in the dustiest and most dangerous of occupations, and particularly is this true in the manufacture of electric storage batteries, in which, however, fatal cases of lead poisoning are extremely rare.

TABLE 3.—*Deaths of adult males from lead poisoning in United States registration area, 1925, 1926, 1927, by nativity*

Nativity	1925	1926	1927	Total	
				Number	Per cent
United States [1]	(28) 91	(29) 94	(22) 86	[2]271	69.1
Canada	5	5	3	13	3.3
England	2	7	6	15	3.8
Ireland	7	1	5	13	3.3
Scotland		3	1	4	1.0
Germany	5	6	4	15	3.8
Poland	5	2	5	12	3.1
Italy	3	2	2	7	1.8
Sweden	3	2	4	9	2.3
Austria	3	1	3	7	1.8
Hungary		3		3	.8
France	2	1		3	.8
Russia	2	1	1	4	1.0
Czechoslovakia	2		1	3	.8
Croatia		1		1	.25
Galicia	1			1	.25
Lithuania		1	1	2	.5
Rumania		1	2	3	.8
Portugal	1			1	.25
Norway	1			1	.25
Armenia		1		1	.25
Mexico	1			1	.25
Switzerland			1	1	.25
Bohemia			1	1	.25
Total	134	132	126	392	100.00
Unknown	2	3	1	6	

[1] Figures in parentheses denote that one or both parents were of foreign birth.
[2] 28 of these deaths were negroes.

Geographical Distribution of Deaths

THE geographical distribution of deaths from lead poisoning in Table 4 is of interest. If required this table should be correlated to persons employed in lead-using industries rather than to the population as has been done in previous investigations. The high mortality from lead poisoning in Maine and New Hampshire in proportion to the population, as indicated in the previous report, is no longer apparent in the light of recent statistics. The relatively high rate for Massachusetts may partly be attributed to hospital facilities

in Boston, where excellent diagnostic facilities are available. But considering once more the enormous extent of lead-using industries throughout the country, the relative frequency of lead poisoning in fatal form is much less than would generally be assumed and unquestionably less at the present time, by possibly as much as 50 per cent, than 10 years ago. This is so much more significant considering the large increase in construction activities involving an ever-increasing amount of painting operations, as well as an actual increase in the output of lead-using industries, from white lead to the manufacture of electric storage batteries.

TABLE 4.—*Geographic distribution of deaths of adult males from lead poisoning, 1925 to 1927*

State	1925	1926	1927	Total	State	1925	1926	1927	Total
Connecticut	1	2	1	4	Alabama	1	1		2
Massachusetts	14	10	13	37	Arkansas		1	3	4
Maine	5	4	3	12	District of Columbia		2	1	3
New Hampshire	1	3	1	5	Florida	4	1		5
Rhode Island	1		1	2	Georgia	1		3	4
Vermont	1	2		3	Kentucky	2	1		3
					Louisiana	3	3	2	8
Total	23	21	19	63	Maryland	2	1	4	7
					Mississippi	1	1		2
Delaware	1			1	North Carolina	1	2		3
New Jersey	16	8	3	27	South Carolina		1	2	3
New York	9	15	23	47	Tennessee	1	2	4	7
Pennsylvania	7	12	14	33	West Virginia	3	2		5
					Virginia	3	1	1	5
Total	33	35	40	108					
					Total	22	19	20	61
Illinois	10	10	11	31					
Indiana	2	1	3	6	California	10	8	7	25
Iowa	5	2	1	8	Colorado	1	2	1	4
Kansas	1	2	1	4	Idaho		1	3	4
Michigan	3	5	2	10	Montana		1		1
Minnesota	3	1		4	Oregon	1	2	1	4
Missouri	6	9	7	22	Utah	2	3		5
Nebraska	3	1	2	6	Washington	3	2	2	7
Ohio	10	16	11	37	Wyoming	1			1
Wisconsin	3	3	2	8	New Mexico			1	1
North Dakota			1	1					
					Total	18	19	15	52
Total	46	50	41	137					
					Grand total	142	144	135	421

To amplify the foregoing statistics for the last three years for the country at large, statistics for certain American cities for the last 10 or 15 years are given for the purpose of historical retrospection.

TABLE 5.—*Deaths from lead poisoning, in specified cities, 1915 to 1927*

Year	Detroit			Los Angeles			Boston		
	Population	Deaths	Rate per 1,000,000	Population	Deaths	Rate per 1,000,000	Population	Deaths	Rate per 1,000,000
1915	732,049	2	2.7	464,657			720,000	3	4.1
1916	788,590			488,851	2	4.1	726,000	3	4.1
1917	864,471	3	3.5	513,929			732,103		
1918	915,653	2	2.2	537,408			738,486	1	1.4
1919	968,087	1	1.0	560,837	1	1.8	744,869	1	1.3
1920	993,678	3	3.0	584,491			751,252	1	1.3
1921	994,341	1	1.0	609,821			757,634		
1922	995,004	4	4.0	634,866			764,017	1	1.3
1923	995,668	1	1.0	674,641			770,400	4	5.2
1924	1,118,856	2	1.8	714,416			776,783		
1925	1,242,044	1	.8	1,222,500			779,620	2	2.6
1926	1,290,000	3	2.3	1,300,000	3	2.3	787,000	1	1.3
1927	1,334,500			1,377,500			793,100	5	6.3

TABLE 5.—*Deaths from lead poisoning, in specified cities, 1915 to 1927*—Con.

Year	Philadelphia			Pittsburgh [1]			San Francisco [2]		
	Population	Deaths	Rate per 1,000,000	Population	Deaths	Rate per 1,000,000	Population	Deaths	Rate per 1,000,000
1915	1,696,342	5	2.9	563,028	1	1.8	465,069	2	4.3
1916	1,724,630	8	4.6	568,409			474,315	1	2.1
1917	1,753,058	4	2.3	573,790	3	5.2	483,561	1	2.1
1918	1,781,346	2	1.1	579,171			492,807		
1919	1,809,635	7	3.9	584,552	3	5.1	502,053	2	4.0
1920	1,837,924	2	1.1	591,033	3	5.1	511,300	1	2.0
1921	1,866,212	5	2.7	602,452			520,546	2	3.8
1922	1,894,500	7	3.7	607,902			529,792	1	1.9
1923	1,922,788	7	3.6	620,367			539,038		
1924	1,951,076	6	3.1	626,015	2	3.2	548,284		
1925	1,979,364	4	2.0	631,563			557,530	2	3.6
1926	2,008,000			637,000	3	4.7	567,000	1	1.8
1927	2,035,900	2	1.0	665,500			576,000	1	1.7

[1] Including 1 nonresident in 1917 and 2 in 1920.
[2] Years from 1915 to 1920 are fiscal years for this city.

These cities reflect a declining death rate from lead poisoning with the possible exception of the city of Boston, which during 1927 had five deaths from the disease, which is the highest number on record since 1915. In view of the apparent frequency of lead poisoning in the State of Massachusetts, a special return from the Massachusetts General Hospital covering the period 1918 to 1927, giving the cases of acute and chronic lead poisoning treated at that institution is shown:

Cases of acute and chronic lead poisoning treated at the Massachusetts General Hospital, 1918 to 1927

Year	Acute	Chronic	Total	Year	Acute	Chronic	Total
1918	1	5	6	1924	5	16	21
1919	2	9	11	1925	2	20	22
1920		14	14	1926	4	18	22
1921	7	8	15	1927	1	18	19
1922	1	18	19				
1923	3	30	33	Total	26	156	182

It is thus shown that the number of cases treated at the Massachusetts General Hospital has increased up to the year 1923, subsequent to which cases have declined, but not measurably so, maintaining about an average of 21 cases during the last four years. It should be explained, however, that aside from the foregoing, during the past 10 years 861 cases of lead poisoning have been treated in the out-patient department of the hospital, and of this number 236 were registered as painters. This, unfortunately, is the only occupational classification which is made in the hospital, so that no further information is available regarding other occupations.

Cases of Lead Poisoning at the Buffalo City Hospital

IN FURTHER amplification of the available data regarding lead poisoning in particular localities, through the cooperation of the superintendent of the Buffalo City Hospital, the details of 16 lead poisoning cases treated at the hospital since 1921 are given. The reports in question are probably the most nearly complete records ever made of all the facts of lead poisoning cases, but only the essential details can be given.

CASE I, A. P., APRIL 23, 1921

Admission history.

Ill 4 weeks; male; white; married; 5 children; age, 51; birthplace, Buffalo; occupation, lead burner; last date patient worked, April 23, 1921.

Present illness.

Admitted April 23, 1921. Illness began three weeks previous with nausea and vomiting, and cramps in abdomen. Trembling and pains in limbs. Appetite fairly good. Admitted as chronic lead poisoning, chronic alcohol poisoning, general arterial sclerosis.

May 14: Has almost complete paralysis of upper extremities, though he retains a slight power of flexion on the fingers. Diminished sensation to pain.

July 2: Complete paralysis extensors wrist and fingers. Some use muscles posterior shoulder girdle. Marked swelling hands and forearms—left side particularly. Some atrophy muscles legs without disability.

January 20, 1922: Improvement slow but steady. Can not shake hands or feed himself, although the movements of the shoulder girdle are limited. Still has paralysis of deltoids, with atrophy and limited abduction. Hands swollen and painful at times. Walks normally.

Physical examination No. 1.

Eyes: Pupils myotic, right slightly larger than left. Regular reaction to A. & L.

Ears: Normal.

Nose: Evidence of nose bleed. Septum deviated to R.

Mouth: Membranes of gums bluish tint. Bluish color of membrane at corners. Teeth poor condition, much pyorrhea, breath foul.

Chest: B. V. D. in right interscapular region, increased tactile and vocal fremitus. No rales heard.

Heart: Somewhat enlarged to both left and right. Muscle sounds of poor quality. No murmurs.

Arteries: Marked sclerosis.

Abdomen: Somewhat distended tympanitic to percussion. Spleen not palpated. Liver palpated just below costal margin. Diffuse tenderness, no masses.

Extremities: Normal appearance. Paresis of extensors and flexors but more pronounced in extensors of arms and legs.

Reflexes: Patellars active—achilles present. Tremor of tongue, lips, and hands.

Skin: Not remarkable.

Glands: Cervical palpable.

Diagnosis: Chronic lead poisoning; post typhoid; arteriosclerosis; chronic alcoholism; cerebro spinal syphilis.

Physician's recommendation for discharge.

I hereby recommend for discharge from the Buffalo City Hospital, A. P., effective February 22, 1922.

Admitted on April 23, 1921; admission diagnosis—chronic lead poisoning; revised diagnosis—chronic lead poisoning; complication or sequel—chronic lead poisoning, syphilis, chalazion.

Destination and recommendation regarding future conduct—To home, under care of private physician.

CASE II, R. W., JULY 24, 1920

Admission history.

Male; married; white; age, 43; occupation, lead solderer; ill since Easter Sunday.

Present illness.

Has worked for past six years as a lead solderer. Has noted bleeding of gums, lower extremities becoming weaker. Pain noted in hands, wrists, and forearms. Pain in stomach for past six weeks, of colicky type. One attack of diarrhea.

Physical examination.

General appearance: Anemic, pasty complexion.

Eyes: Slight conjunctival congestion move in right eye, pupils irregular in outline but react to light.

Ears: Negative.

Nose: Some catarrhal obstruction.

Mouth—tongue: Some tremor, brown coating.

Teeth: Very poor condition, many missing.

Gums: Blue line noted, patient says that they bled last week.

Nasopharynx: Unable to make thorough examination—gags very easily.

Cervical glands: Palpable but not tender nor hot.

Circulatory system: Radial arteries—moderate sclerosis. Pulse is small, easily compressible, regular, frequent.

Heart: Not enlarged to percussion. Heart sounds good quality, no murmurs, nor thrills.

Lungs: Respirations are increased in rate, regular but noisy due to mucus in respiratory tract. Breath sounds diminished in left lower base posteriorly, few moist subcrepitant râles heard posteriorly at both bases. An expiratory grunt heard all over chest. Vocal fremitus somewhat increased continuously right side.

Abdomen: Negative for rigidity or tenderness or masses.

Skin: Dry, anemic, and warm.

Diagnosis: Chronic lead poisoning; chronic parenchymatous nephritis.

Discharge.

Patient was discharged without consent on August 31, 1920; discharged improved; per cent of disability, 100.

CASE III, J. C., NOVEMBER 2, 1922

Admission history.

Male; age, 51.

Present illness.

Was working up to one week previous to admission, when he had to stop work on account of pain in the abdomen. The pain is of a dull character not localized in abdomen and has been present more or less for the past two months. He is troubled with flatulence and belching of gas after taking food; has never vomited. Three years previous had similar illness and spent nine weeks in bed at home. Four years ago he weighed 220 pounds; two months ago he weighed 175 pounds, a loss of 45 pounds.

Physical examination.

General condition: Patient a white male of apparently stated age, well developed, fairly nourished, pale, normal expression, lies comfortably in bed in any position, not in distress.

Respiratory system: Chest well developed, symmetrical, moves freely, only fair expansion. Slightly impaired resonance over right apex.

Circulatory system: Heart sounds normal quality, but diminished intensity.

Digestive system: Abdomen is retracted, moves freely with respiration, no rebound pain. Liver and spleen not enlarged.

Nervous system: Intellect, normal; sensation, normal.

Diagnosis: Chronic cholecystitis; chronic lead poisoning.

Discharge.

Patient discharged November 17, 1922, condition improved.

CASE IV, W. S., MALE, AGE 38

Present illness.

Began about three weeks previous to admission with dull aching pain in lower abdomen. Has poor appetite, no vomiting, no nausea at any time, constipated since onset, no cough, no sputum.

Physical examination.

General appearance: Slightly emaciated.
Respiratory system: Chest emaciated.
Circulatory system: Heart regular, rhythmic, not enlarged.
Digestive system: Abdomen sunken, emaciated. Liver enlarged, spleen not palpable.
Skin: No rashes, few scars over chest.
Diagnosis: Chronic appendicitis.

Occupation.

Patient worked in rubber factory nine months on a mixing machine, and inhaled much red blue powder, which he claimed made him sick. Worked eight hours daily at hard labor.

CASE V, L. A., APRIL 4, 1921, MALE, AGE 58

Present illness.

Weakness in forearms, loss of grip, headache, nausea, constipation.

Physical examination.

Teeth: Poor condition, much pyorrhea. No lead line.
Extremities: Varicose veins on legs, emaciation.
Diagnosis: Arteriosclerosis; chronic cardio-vascular disease; mitral insufficiency; chronic interstitial nephritis.

Discharge.

Patient discharged April 11, 1921, condition improved.

CASE VI, V. W., MALE, AGE 37

Present illness.

Sick for three weeks beginning with pain in back. Dull pain all over the abdomen with a general loss of strength and ambition. Pain has not been severe at any time. No headache and no cough. Has not been able to eat at all. No joint pains, no pain in chest.

Physical examination.

General appearance: Lies in bed in dull stupid manner, apparently quite sick and weak. Eyes react sluggishly to light and accommodation, teeth very unclean, tongue heavily coated, breath foul.
Chest: Well developed.
Heart: Normal. Action regular and rhythmical.
Diagnosis: Typhoid fever; chronic lead poisoning.

Occupation.

Pouring lead for six weeks ending two weeks prior to admission.

Discharge.

Patient discharged April 11, 1922, with consent, condition improved.

CASE VII, W. S., MALE, AGE 30, OCTOBER 17, 1924

Present illness.

Began eight days previous to admission, with diarrhea and vomiting. Was painter for 12 years.

Physical examination.

General appearance: Well-developed and well-formed. Marked pallor, skin cold. Lead line not marked but present. Breathing normal. Heart sounds of good quality.
Diagnosis: Lead poisoning.

Discharge.

Patient discharged, without consent, October 27, 1924. Condition improved.

CASE VIII, P. H., MARCH 3, 1923, MALE, AGE 59

Present illness.

Pain in stomach for two weeks, quite severe. No vomiting or nausea. Poor appetite, constipated, no cough.

Physical examination.

General appearance: Quite thin, rather poorly nourished. Teeth very unclean, tongue coated, foul odor to breath.

Diagnosis: Chronic lead poisoning; indirect inguinal hernia; external hemorrhoid; pyorrhea alveolaris.

Discharge.

Patient discharged from the hospital April 3, 1923.

CASE IX, F. K., SEPTEMBER 5, 1924, AGE 41, MALE

Present illness.

Patient is lying on his back, in no apparent pain, with a constantly roving, searching look; some part of his body always is in motion, twitching of facial muscles or movement of lower extremities or turning of head. Face is bright, but pasty and moist. Strange urinous odor to his breath. Some evidence of unbalanced mind.

Physical examination.

Skin and mucous membranes pale, skin worst. Lead line definitely marked. Tongue moist and but slightly coated. Heart normal. Muscles flabby.

Diagnosis.

Chronic lead poisoning.

Patient expired September 7, 1924.

CASE X, JANUARY 13, 1925, MALE, AGE 44

Present illness.

Began working in shop where lead was melted in March, 1924. In July began to vomit, followed by cramps and numbness and coldness in right hand in half thumb, index finger, and half of second finger up the wrist on the radial side. Lost 18 pounds. Appetite poor.

Physical examination.

General appearance: Poorly nourished, underdeveloped, weak and anemic, suffering with gastric distress. Pus at base of teeth, lead line on gums. Chest large in proportion to rest of body. Heart rate slow.

Diagnosis.

Chronic lead poisoning with peripheral neuritis of right hand; secondary anemia; some infiltration of left lung.

Discharge.

Patient discharged on February 6, 1925, condition improved.

CASE XI, T. R., MAY 5, 1925, MALE, COLORED, AGE 27

Present illness.

Began two weeks previous. Started gradually with slight pain in abdomen, vomiting and sweet taste in mouth, and constipation. Attacks became very severe.

Occupation: Weighed lead for three months.

Physical examination.

General appearance: Well developed and nourished. Appears depressed but not acutely ill.

Diagnosis.

Lead poisoning with lead colic.

Discharge.

Patient discharged on May 28, 1925, condition improved.

CASE XII, P. B., SEPTEMBER 5, 1927, MALE, POLISH, AGE 24

Present illness.

Began one week after he started working at battery company, with occasional pain in arms, shoulders, and leg. Became constipated, lost appetite, and became generally weak, followed by severe cramps in abdomen. Three weeks' exposure to dust from scraping batteries.

Physical examination.

No previous illness, no previous complaints. Patient well-nourished and well-developed, and not markedly ill. Definite lead line in gum margins. Chest well developed. Heart regular.

Diagnosis.

Acute plumbism; slight pulmonary fibrosis.

Discharge.

Patient discharged from the hospital September 27, 1927, condition improved.

CASE XIII, J. U., APRIL 7, 1923, MALE, AGE 43

Present illness.

Sent to hospital as an alcoholic, after fainting spell. Worked as a laborer, then in a lead furnace room putting lead into large vats and ladling the molten lead Was exposed to gaseous vapors. Ate his lunches at factory but claimed he always washed his hands before eating.

Physical examination.

General appearance: Tongue thickly coated, teeth carious. Lungs, impaired resonance over bases, suspicious pneumonia. Swelling of right hand. Rather stuporous.

Diagnosis.

Acute alcohol poisoning with stupor; oral sepsis—pharyngitis; dental caries; possible pneumonia; enlarged heart.

Discharged.

Patient discharged on May 18, 1923. Disability, 25 per cent.

Patient readmitted to hospital December 11, 1926, with a carcinoma of the stomach with chronic lead poisoning. Died on January 4, 1927.

CASE XIV, R. C., AUGUST 19, 1927, MALE, AGE 49

Present illness.

Patient became ill after drinking some liquor. Severe pains in abdomen with vomiting and straining. Had one or two attacks of dizziness and was unconscious with one attack. Father and mother alive and well. One sister alive and well. No past illness. Painter, drinks considerably. Admission diagnosis: Alcoholism, chronic.

Physical examination.

Poorly nourished but not acutely ill; teeth carious; no lead line; no impairment of lungs; heart regular.

Admission history.

Scotch-American descent; decorator, painter; married twice; no children; drinking 30 years; never incapacitated.

Diagnosis.

Chronic plumbism; chronic alcoholism.

Discharge.

Patient discharged without consent, August 29, 1927.

CASE XV, G. S., JULY 27, 1927, MALE, AGE 44

Present illness.

Patient an automobile painter for 13 years. Had been well until previous August, at which time he noticed that his hands became numb and his grasp on the brush was weaker. Weakness gradually became so marked that he was

unable to feed himself. Wrist joints became swollen but never painful. Swelling gradually subsided, some strength recovered but can not extend the hand. Ankles and muscles also painful.

Admission diagnosis: Chronic lead poisoning, possible acute cholecystitis. Previous admission date, May 9, 1927.

Admission history.

Uses alcohol in moderation; smokes; married—wife, one son, and five daughters alive and well; mother, age 72, alive and well; father and one brother dead.

Physical examination.

Scalp, ears, and nose negative; teeth all out, no lead line; chest expansion good and equal; heart normal.

Diagnosis.

Double wrist drop; hypertension; possible chronic nephritis.

Discharge.

Patient discharged with consent of superintendent, May 27, to return to out patient clinic.

Readmitted on July 27, 1927. Diagnosis: Chronic lead poisoning. Discharged August 19, 1927, to return to out patient medical clinic.

CASE XVI, A. A., JULY 10, 1920, MALE, AGE 43

Present illness.

Began six weeks previous after working for three weeks in a lead factory. Had dizzy spells, felt nauseated, and stomach felt sore. Vomited often and had to stay in bed for about a week. Physician advised him to go to the hospital. Has been constipated since onset, and has lost considerable weight.

Physical examination.

General appearance very anemic, is emaciated; pulse small; heart weak at apex, hardly audible at base; no murmurs heard; teeth in very poor condition; tongue coated; breath foul; no lead line.

Diagnosis.

Thyrotoxicosis; lead poisoning; pulmonary tuberculosis.

Discharge.

Patient discharged July 28, 1920; condition improved; disability 10 per cent.

Lead Poisoning, by Industry Groups, State of New York

IT IS information of this nature which is most urgently required, but on a much larger scale, to justify definite conclusions as regards both diagnosis and treatment for lead absorption and lead poisoning properly differentiated. That we are far from being able to settle an important question of this nature is explained in a discussion of lead poisoning in the last annual report of the New York State Industrial Commissioner by Dr. May R. Mayers, medical inspector of the section of special research. This author considers in some detail the question of terminology, pointing out that the matter is still debatable as to exactly what is lead poisoning. She, however, agrees with the conclusion which is gradually gaining approval that lead absorption should be differentiated from lead poisoning and that a higher standard of diagnosis should be adopted, including laboratory analyses both of blood and urine, as the result of which the administration of compensation laws for lead poisoning cases would be greatly facilitated.

The importance of the differentiation of lead absorption and lead poisoning as a compensation factor is clearly visualized in the

statistics of the New York State Department of Labor for the two fiscal years, 1925–26 and 1926–27, as shown in Table 6. This table brings out the numerical concentration of lead poisoning cases for certain outstanding industries and the relative financial burdens resulting therefrom.

TABLE 6.—*Number of cases of temporary disability caused by lead poisoning, time lost, and compensation paid, by industry, 1925–26 and 1926–27*

Industry group	Year ending June 30, 1926			Year ending June 30, 1927		
	Cases	Time loss (weeks)	Compensation	Cases	Time loss (weeks)	Compensation
Metal goods:						
Blast furnaces	1	6	$117			
Foundries	12	150	1,649	33	447	$8,010
Lead and lead alloys	2	65	1,225	10	76	1,412
Metal fixtures				1	14	264
Metal stamping	1	27	540			
Sheet metal work	1	37	740			
Beds	1	6	78			
Cutting and welding				1	13	247
Machinery building:						
Medium machinery	3	12	230			
Special machinery	1	15	303			
Electrical apparatus, including storage batteries	133	827	11,580	133	1,005	12,236
Safes				1	3	39
Small arms				1	133	451
Automobiles and auto parts	1	7	147	6	52	993
Wood products:						
Planing mills	1	17	300	1	9	167
Brooms and brushes				1	9	67
Bakeries				1	5	90
Chemicals	6	20	359	9	47	867
Paints, inks, and dyes	20	215	2,473	22	223	3,240
Printing				3	38	681
Miscellaneous composition goods				4	32	392
Stone grinding	2	13	250			
Pottery making	1	61	532			
Glassware	2	7	93			
Miscellaneous manufacturing				1	4	77
Total, manufacturing	188	1,485	20,616	228	2,110	29,233
Construction:						
Structural iron and steel	3	25	487			
Plumbing and gas fitting	2	40	790	1	3	47
Painting and decorating	15	404	8,040	8	225	4,457
Ship repairing	1	35	698			
Total, construction	21	504	10,015	9	228	4,504
Transportation and public utilities	1	5	103	2	76	1,472
Trade	3	8	139	2	10	184
Clerical and personal service				2	25	464
Grand total, all industries	213	2,002	30,873	243	2,449	35,857

No cases of lead poisoning resulted in permanent partial disability in the years ending June 30, 1926, and June 30, 1927.

According to Table 6, the number of compensated cases of lead poisoning within the definition of the compensation law increased from 213 to 243 between 1926 and 1927. The amount of compensation paid out on account of such cases increased from $30,873 to $35,857. The number of fatal cases of lead poisoning, however, decreased from 3 to 1, while the amount paid on account of such cases decreased from $18,384 to $10,054. The major number of cases of lead poisoning occurred in the manufacture of electric storage batteries, while the number of such cases was precisely the same for both years.

Lead Poisoning in Manufacture of Electric Storage Batteries

THE following statistics are based upon a detailed analysis of certificates of lead poisoning furnished by the New York State Department of Labor, covering the year 1927, also with particular reference to compensation.

Table 7 gives an analysis of the returns for 185 battery workers, showing the average age at the time of disease occurrence and the average duration of employment.

TABLE 7.—*Average age and duration of employment in cases of lead poisoning in electric storage battery plants in New York State, by occupation, 1927*

Occupation	Age				Duration of employment (when taken sick)			
	White race		Colored race		White race		Colored race	
	Number reporting	Average (years)	Number reporting	Average (years)	Number reporting	Average (years)	Number reporting	Average (months)
Pasters	68	31.5	7	31.7	67	6.7	7	4.3
Sweepers	12	41.0			12	3.4		
Plate workers	11	29.5	1	31.0	9	5.4	1	9.0
Pitmen	6	41.0			6	3.7		
Millers	6	31.5			6	5.8		
Mixers	4	36.0	5	31.7	4	6.3	35	1.8
Electricians	3	26.0			3	8.7		
Oxide workers	3	45.7			3	6.7		
Potmen	2	46.0			2	1.5		
Truckers	2	29.5			2	6.0		
Inspectors	16	26.3			17	3.1		
Not reported	7	35.0			3	8.9		
Total	140	32.6	45	31.7	134	5.7	43	2.4

According to Table 7, while for the white employees in the manufacture of electric storage batteries the average length of employment was 5.7 years, it was only 2.4 months for the colored labor. Here the average duration of employment was lowest for mixers, only 1.8 months. The average age is almost the same.

The certificates contain very little additional information of statistical value. It is very regrettable that most of the certificates should be incompletely filled out as regards complications and previous attacks. It is to be hoped more attention will be given in the future to the practical importance of sending in completely filled out certificates, of importance for both legal and medical purposes.

Workmen's Compensation for Lead Poisoning

THE whole question of compensation law and its application to lead cases has very recently been reviewed by Dr. May R. Mayers of the Bureau of Industrial Hygiene, New York State Department of Labor, published in the Industrial Hygiene Bulletin for October, 1928. This discussion is exceedingly valuable and of great practical importance. It draws for the first time a clear distinction between lead poisoning and lead absorption, emphasizing, however, the equivalent use of these terms for compensation purposes.

The following extended extract from this discussion is quoted as of permanent value.

The plain intent of the compensation law is that, in all compensable diseases, compensation should be available to the worker injuriously affected well before the acute stage, resulting in total disability, is reached. This is clearly evidenced by section 39, above set forth, which specifically provides for compensation even where the employee is able to earn his wages at another occupation, so long as such wages do not equal his full wages prior to the date of his disablement.

Such being the intent of the compensation law, it would be manifestly contrary to that intent to limit the term "lead poisoning" to such cases showing acute symptoms. Only by embracing within the term all cases in which, as a result of exposure to lead, there is resulting disability, of whatever degree, and whether manifestly itself in acute or subacute, objective or subjective symptoms, can the intent of the law be carried out.

In effect, therefore, the term "lead absorption" as used in the present discussion is synomymous with the term "lead poisoning" in the compensation law. It has the advantage, however, as above pointed out, of helping to standardize both terminology and diagnosis in a disease where the lack of standardization has led to much needless disagreement among medical men and consequently no end of difficulty in the administration of the compensation law.

For this reason it is argued that the term "lead absorption" be substituted for the term "lead poisoning" in the compensation law. Article 1, section 3, subdivision 2, would then read as follows:

"*Occupational diseases.*—Compensation shall be payable for disabilities sustained or death incurred by an employee resulting from the following occupational diseases: 1. Lead absoprtion."

Clearly, the suggested substitution involves no change in the law. It is merely a substitution of convenience, as will be still further brought out in the ensuing discussion.

Before proceeding to a discussion of the procedure to be followed in determining whether a claimant is suffering from incapacity due to lead absorption as just defined, there are several fundamental points to be kept in mind:

1. In any given individual, lead may be present in his body either in toxic or nontoxic form. In an individual where all of the lead present in his body has been stored in his bones it is nontoxic to him for the time being.

2. Lead which is present, however, in the circulating blood may be either toxic or nontoxic, depending upon the quantity of lead present. It is only those cases where toxic quantities of lead appear in the circulation that any incapacity may occur and it is only those cases which are, therefore, of any interest to the compensation tribunal.

3. Lead workers are just as subject as any individual to the ordinary ailments such as ordinary stomach ache, gastric ulcer, appendicitis, etc. It is quite obvious, therefore, that all other causes be definitely eliminated in considering the health of a lead worker quite as much as in making a differential diagnosis in any other individual.

Confining ourselves to those cases where lead is thought to be actively present in the body in toxic amounts, resulting in clinical manifestations of disability, we may divide these for the present purpose into two groups, depending upon whether the manifestations are such as to produce definite demonstrable disability, or are merely subjective, resulting in a claimed disability, the existence of which may be difficult to prove.

The foregoing interesting discussion is followed by a consideration in detail of cases with positive disability and cases with doubtful disability. The former is subdivided into cases with positive laboratory findings and cases with negative laboratory findings. In each case the procedure to be followed is indicated and diagnostic possibilities are pointed out. As regards the diagnostic possibilities in cases with positive laboratory findings, it is stated:

Diagnostic possibilities.—Cases with objective clinical manifestations (positive disability) and positive laboratory findings present the following diagnostic possibilities:

1. If the disability is such as to be definitely associated with lead absorption and this is further confirmed by the laboratory, there can be no doubt as to the diagnosis.

2. If the disability is such that its relation to lead absorption is in doubt, the presence of laboratory evidences of lead absorption should, generally speaking, be presumptive evidence in favor of lead as a cause for the disability—other possibilities, of course, being ruled out in the usual manner.

As regards the diagnostic possibilities in cases with negative laboratory findings the observation reads that—

Diagnostic possibilities.—The cases which can arise under this group present several diagnostic possibilities.

1. If the disability is such as to leave no doubt whatever as to its relation to lead absorption the absence of laboratory confirmation should not prevent a positive diagnosis being made.

2. If the disability is such as to leave some doubt as to its relation to lead absorption, the absence of laboratory confirmation should, generally speaking, be presumptive evidence against lead as a cause for the symptoms. In these cases repeated laboratory tests should be made, however. If no other cause for the disability can be established, a medical expert should be called into consultation.

3. If the disability is definitely one which has never been associated with lead absorption, and the laboratory findings are negative, the presumption is against lead as a cause for disability.

To the foregoing are added the diagnostic possibilities in cases with doubtful disability as a matter of record.

If the symptoms of which the worker complains, though ever so vague, are those definitely associated with lead absorption, and the laboratory findings are positive, the presumption is in favor of lead as a cause for the sumptoms and consequent disability. All other possible causes for these symptoms must, of course, be ruled out as indicated above.

2. If the symptoms complex is a doubtful one, and the laboratory findings show lead absorption, the presumption of evidence is still in favor of lead as a cause for the symptoms and the disability.

3. If the clinical picture is doubtful and the laboratory findings negative the presumption of evidence is definitely against the possibility of lead absorption as cause for the symptoms.

United States Workmen's Compensation Data

UNDER the Federal compensation act, cases of lead poisoning are compensable in the same manner as industrial accidents. Through the courtesy of the secretary of the commission the returns for the period 1920 to 1927, giving details of 198 cases, of which 9 or 4.5 per cent terminated fatally, are shown in Table 8. The total amount paid for compensation on account of all cases, with the estimated valuation for permanent total-disability cases and deaths, was $119,207.70 for the period under review, giving an average compensation of about $600.

TABLE 8.—*Number of cases of lead poisoning and compensation paid under Federal compensation act, 1920 to 1927*

Year	Total number of cases	Permanent, partial, and temporary total disability cases.		Permanent total disability cases		Death cases	
		Number	Amount of compensation	Number	Estimated valuation	Number	Estimated valuation
1920	16	15	$2,324.34	1	$13,222.00		
1921	8	6	655.60			2	$15,068.00
1922	8	7	2,546.31			1	7,764.00
1923	7	5	6,418.83			2	15,717.00
1924	57	54	2,490.17	2	21,509.00	1	6,276.00
1925	72	71	6,218.11			1	123.00
1926	12	11	738.34			1	4,470.00
1927	18	17	1,374.00			1	12,293.00
Total, 8-year period	198	186	22,765.70	3	34,731.00	9	61,711.00

Lead Poisoning in the United States Navy, 1913–1927

IN A previous report, are given some statistics of lead poisoning in the United States Navy, which are now brought down to the end of the year 1927. Table 9 has been derived from an article on five cases of lead poisoning occurring on board the U. S. S. *Wyoming* in 1926, by Lieut. Commander W. W. Hargrave, United States Navy.

TABLE 9.—*Lead poisoning admissions and deaths in United States Navy, 1913 to 1927*

Year	Average strength	Cases of acute lead poisoning	Cases of chronic lead poisoning	Year	Average strength	Cases of acute lead poisoning	Cases of chronic lead poisoning
1913	65,926	25	36	1922	122,126	7	7
1914	67,141	34	30	1923	116,565	[1] 25	8
1915	68,075	46	24	1924	119,280	1	6
1916	69,294	45	20	1925	115,391	6	3
1917	245,580	19	21	1926	113,756	26	9
1918	503,792	12	13	1927	115,316	27	7
1919	293,774	19	[1] 11				
1920	140,773	4	1	Total	2,310,650	[1] 299	[1] 197
1921	148,861	3	1				

[1] Including 1 death.

A surprising fact in this experience has been the small number of deaths considering the relatively large number of acute and chronic cases. In proportion to the Navy personnel the rate of incidence has been 215 per million exposed to risk. It may be observed in this connection, however, that of the 26 cases of acute lead poisoning in 1926, 13 cases were caused by lead paint, but the manner in which the men were poisoned was not specified. Five other cases were caused by particles of dust from paint. Poor ventilation in double bottoms and bilges was regarded as the cause in six cases. One man was poisoned by a native drink, "aguardiente," which was distilled in containers lined with lead, and one by coming in contact with red lead. In 1927, 9 of the 27 cases of acute lead poisoning resulted from chipping and painting aboard ship, but the circumstances which caused the poisoning were not mentioned. Chipping and painting in double bottoms caused poisoning in 13 cases and chipping in double bottoms in 5. In these cases deficient ventilation was regarded as the primary factor.

It would appear, however, from the foregoing that the cases in question were lead absorption rather than lead poisoning, for the small fatality rate is suggestive of the certainty that in the Navy, cases of lead absorption are early recognized and receive prompt as well as qualified attention.

Lead Poisoning Statistics of Metropolitan Life Insurance Co.

THE statistician of the Metropolitan Life Insurance Co. has been good enough to supply the returns of lead poisoning deaths in the industrial experience of that company down to the end of 1927, as shown in Table 10. The tabulation shows a slight increase over the rate of 1925 during the last two years, but a much lower rate than during the early years of the experience under review.

TABLE **10.**—*Deaths from chronic lead poisoning, industrial department of Metropolitan Life Insurance Co., 1911 to 1927*

Year	Number exposed to risk [1]	Number of deaths	Rate per 1,000,000	Year	Number exposed to risk [1]	Number of deaths	Rate per 1,000,000
1911	7,790,227	17	2.2	1920	13,086,725	29	2.2
1912	8,219,695	37	4.5	1921	13,500,762	26	1.9
1913	8,696,543	35	4.0	1922	13,776,239	30	2.2
1914	9,247,323	39	4.2	1923	14,534,242	33	2.3
1915	9,665,699	30	3.1	1924	15,423,236	24	1.6
1916	10,177,060	33	3.2	1925	16,271,168	26	1.6
1917	10,847,852	25	2.3	1926	17,087,706	30	1.8
1918	11,553,347	29	2.5	1927	17,521,595	31	1.8
1919	12,424,509	26	2.1				

[1] Ages 1 year and over.

Lead Poisoning in New York City

STATISTICS for the city of New York have been given in a previous review but they are here brought down to the end of 1927. The number of lead poisoning cases in 1925 was 5, in 1926, 10, and in 1927, 12. There has, therefore, been a substantial increase suggestive of the possible neglect of known safety precautions or the none too rigorous enforcement of the law governing the protection of the workers.

Compensation for Lead Poisoning in Ohio

EQUALLY interesting statistics have recently been made available through a publication of the industrial commission of Ohio. The number of compensated claims for lead poisoning from July 1, 1924, to July 1, 1927, in that State was 907. Of this number, 37, or 4.1 per cent, terminated fatally. The number of cases of permanent disability was only 1, while the number with a disability of more than 7 days was 759, and cases with disability of less than 7 days, 45, aside from 65 cases which suffered no time lost. The occupational distribution of compensated claims for lead poisoning and the number of days lost, with compensation costs, and medical costs for each industry group have been as follows:

TABLE **11.**—*Compensated claims for lead poisoning in Ohio, July 1, 1924, to July 1, 1927*

Industry group	Number of claims	Days lost		Compensation cost		Medical cost
		Total	Average	Total	Average	
Building construction	84	42,790	509	$43,313	$516	$6,916
Chemicals	112	24,431	218	20,301	181	5,208
Clay, glass, and stone	57	32,711	574	20,019	351	2,363
Leather and leather goods	1	11	11	8	8	51
Lumber and wood products	21	14,746	702	18,484	880	1,518
Blast furnaces	4	139	35	256	64	99
Machinery manufacturing	29	7,157	247	5,111	176	884
Metal goods	356	45,907	129	44,990	126	15,221
Vehicles	161	40,094	249	35,651	221	8,265
Paper and printing	25	35,002	1,400	19,287	771	2,771
Rubber	15	7,488	499	9,775	652	486
Textiles and clothing	1	24	24	45	45	30
Miscellaneous	8	503	63	1,188	149	509
Transportation	1	3	3			
Utilities	1	18	18	29	29	64
Commercial	17	7,299	429	8,865	521	1,154
Care of grounds	6	6,280	1,047	7,106	1,184	387
Public employees	6	6,318	1,053	7,086	1,181	295
Food and beverages	2	6,106	3,053	246	123	72
Total	907	277,027	305	241,769	267	46,293
Fatal cases	37	222,000	6,000	133,584	3,610	8,888

As shown by Table 11, the 907 compensated cases of lead poisoning involved a time loss of 277,027 days or an average loss of 305 days per case. The compensated cost was $241,760 or an average compensation return of $267. The total medical cost was $46,293, or an average medical cost of $51. The 37 fatal cases involved an estimated time loss of 222,000 days, or an average loss of 6,000 days. The compensation cost on account of such deaths was $133,584, or an average cost of $3,610. The total medical cost on account of fatal cases was $8,888.

Lead Poisoning in New Jersey, 1924–25 to 1926–27

FOR the State of New Jersey, statistics are rather fragmentary but nevertheless of interest in connection with the preceding discussion. Workmen's compensation benefits in industrial poisoning by lead, etc., became effective in New Jersey in 1924. During the fiscal year ending June 30, 1924, 38 cases of lead poisoning were reported to the department of labor, but the report for that year gives no further information. During the fiscal year 1924–25, the number of reported cases of lead poisoning was 164, of which 14 terminated fatally. For this year the industries in which lead poisoning occurred are specified in the annual report as follows:

TABLE **12.**—*Cases of lead poisoning in New Jersey, 1924–25*

Industry group	Fatal	Nonfatal	Total	Industry group	Fatal	Nonfatal	Total
Chemical plant		1	1	Oil refining		1	1
Enameling		8	8	Paint and dry colors		9	9
Ink manufacturing		1	1	Painters		12	12
Insecticides		2	2	Red lead		3	3
Junk yard		1	1	Soldering		3	3
Lead batteries		1	1	Tetraethyl lead	12	85	97
Lead cables		2	2				
Lead refining	2	19	21	Total	14	150	164
Lead oxide		1	1				
Oilcoth		1	1				

Of outstanding significance is, of course, the large number of cases and deaths due to tetraethyl lead. But suggestive also is the large number of cases in lead refining. The outbreak of tetraethyl lead poisoning was attributable to ignorance as regards the required precautions in the manufacture of a new type of gasoline which attracted nation-wide attention and led to the appointment of a special committee of inquiry by the United States Public Health Service, which published an extended report in 1926. The report, however, does not include an extended consideration of the cases which had occurred in different parts of the country in a form useful for the present purpose. The report concerns chiefly persons employed in the handling and manufacturing of ethyl gasoline. The resulting recommendations were widely adopted and few deaths have since occurred in this country and abroad.

During the year 1925–26 the number of cases of lead poisoning entitled to compensation in the State of New Jersey was 32, only 1 of these terminating fatally, that of a painter, 51 years of age. Two

of the cases suffered temporary disability of from one to two weeks and 29 extended over two weeks. The total number of days lost on account of disability was 7,816, on account of which the total indemnity was $9,478. The amount paid for medical aid for reported cases was only $100.

During 1926–27 the number of cases of lead posioning receiving compensation in the State of New Jersey was 48. Only 1 of these terminated fatally, 8 being partially but permanently disabled, while 39 suffered temporary disability. The total amount of disability suffered was 13,773 days, on account of which a total compensation of $21,167 was paid. The total medical cost on account of 23 cases was $1,007.

The foregoing statistics clearly emphasize that lead poisoning in the State of New Jersey is no longer a question of very serious importance. Certainly considering the extent of the pottery industry alone in that State, many more fatal cases might have been expected. In a survey of the pottery industry of New Jersey made by Newman, et al., in behalf of the United States Public Health Service in 1921, it was found that among 2,422 male pottery employees in that State, 16 gave a positive diagnosis of lead absorption, but among 480 female employees, there was one case. In addition, there were 20 male cases presumptive of lead absorption, and 3 females, as well as 18 additional suggestive cases for males and 2 for females. In the State of Ohio, among 6,171 male pottery employees, 57 positive cases of lead absorption were found, while among 2,868 females, there were 10 cases positively diagnosed as lead absorption. In addition thereto, however, 43 males and 22 females were considered presumptive of lead absorption and 76 males and 27 females suggestive. Combining the four States of New York, Ohio, Pennsylvania, and West Virginia, among 12,297 pottery employees, of whom 1,902 were considered exposed to risk of lead poisoning, and of whom 1,809 were examined, 139 were positively found to be suffering from lead absorption, 106 from presumptive lead absorption, 168 gave suggestive symptoms, while 1,396 were negative. It was therefore concluded that considering only positive cases of lead poisoning, the rate of lead injury was 8.8 per cent for the men, 3.5 per cent for the women, and 7.7 per cent for both, or at a rate of 77 per 1,000 of those examined. But if both positive and presumptive cases are considered, the rate of lead absorption was 135 per 1,000. But since this report was made, conditions have unquestionably considerably improved in the State of New Jersey, at least so far as positive evidence of deaths from lead poisoning may be accepted as a clear indication. The more minute the diagnostic procedure, of course, the more certain it is that small traces of lead will be discovered which may or may not necessarily be of industrial origin. Methods of diagnosis vary so widely that no exact comparison between the different industrial employments or different services can be looked upon as entirely conclusive. In other words, deaths from lead poisoning are a more certain indication of the seriousness of the situation than cases of lead absorption of a widely varying degree of pathologic or physiologic significance.

Lead Poisoning in Great Britain, 1918 to 1927

IN CONTINUATION and elaboration of the foregoing analysis of statistics of lead poisoning for the United States, certain international statistics of lead poisoning are inserted for a few important countries as a matter of convenient reference. The first of these tables shows the number of reported cases of lead poisoning according to the reports of the chief inspector of factories and workshops of Great Britain for the years 1918 to 1927 with the corresponding number of deaths and the percentage of deaths to the number of cases. Except as indicated for 1927, Table 13 does not include painting of buildings.

TABLE 13.—*Lead poisoning in Great Britain, 1918 to 1927*

Year	Cases	Deaths	Fatality per cent	Year	Cases	Deaths	Fatality per cent
1918	144	11	7.6	1924	486	32	6.6
1919	207	26	12.6	1925	326	13	4.0
1920	243	23	9.5	1926	242	28	11.5
1921	230	23	10.0	1927	[1] 347	[1] 35	[1] 10.1
1922	347	26	7.5		[2] 249	[2] 14	[2] 5.6
1923	337	25	7.4				

[1] Including painting of buildings. [2] Not including painting of buildings.

In this connection the senior medical inspector, Dr. John C. Bridges, observes as follows:

Poisoning by lead produces a definite train of symptoms, though in certain cases these may be ill-defined. A worker exposed to lead has on more than one occasion been notified as suffering from lead poisoning which, on investigation, has proved to be a septic infection of an injury. Such cases have been excluded in calculating the total number of notified cases, but a diagnosis such as this may lead to difficulty for the employee and employer. The decline in the reported cases noted last year, is continuing, there being 84 fewer cases than in 1925 and 244 less than in 1924. Some of this diminution is undoubtedly due to the adverse conditions of trade, although electric accumulator works, from which 21 fewer cases of lead poisoning have been reported, do not appear to have been so seriously affected. It is to be hoped, therefore, that the greater protection afforded by the code of regulations, which came into force in March, 1925, may, at any rate to some extent, be responsible for this fall in the number of cases. There is reason to believe that the overtime which has been worked occasionally in the manufacture of electric accumulators has contributed to the incidence of lead poisoning in the industry. Overtime in work exposing the workers to lead, or indeed any toxic substance, is to be discouraged, for each additional hour worked means an increase in the inevitable daily dose of lead dust or other harmful material. There is, however, room for further improvement in the observance of the regulations affecting this industry, not so much in the mechanical arrangements for exhaust ventilation—though these are by no means perfect in all cases—but in attention to the details of the regulations which concern cleanliness of floors and benches. Constant supervision of the exhaust plant is undoubtedly essential, for a new plant, which may be admirably designed and fulfil its purpose well at the outset will, unless constantly tested and overhauled, become of little value. This refers not only to works under the electric accumulator regulations, but to all exhaust plants designed for the removal of dust or fume. A striking example of this may be cited. In 1914 a modern and up-to-date plant was installed in a factory for the manufacture of litho-transfers. This year three cases of poisoning occurred in rapid succession, and it was then found that the exhaust plant and the inclosed machines had become ineffective and failed to prevent the

escape of the lead dust, generated in fine powder during the process, into the air of the workroom. Attention to the exhaust plant might have prevented these three cases and saved the firm much anxiety and trouble.

In elaboration of the foregoing, a statement by Doctor Bridges from the annual report for 1927 is quoted, as follows:

The general health of the workers, particularly the younger ones, has, I believe, improved during the past few years. The factors which have contributed to this improvement are many, and not the least, I consider, is "summer time," which enables the workers to take advantage of the recreational facilities now provided by many employers. An increase of such facilities, whether by individual firms or by municipalities, will, in the future, be reflected in the improved health of the workers. There can be no doubt that the arrangements for welfare, now made by many firms, benefit the health of their employees. Progress has been made from year to year in this movement, but there is still a tendency to limit the application of welfare to female employees. Of particular importance are those projects which have for their object recreation outside working hours for juvenile employees. These, if well organized, can not fail to counteract the potential ill effects of monotony and tedium consequent upon the many mechanical and repetitive occupations unavoidable in modern industry.

Reference is next made in the report to the effects of the lead paint (protection against poisoning) act of 1926, which has come into force. This act made compulsory the notification of lead poisoning among workers engaged in the painting of buildings, and gave the secretary of state power to make regulations. It is possible that the discrepancies in the returns for the two years are explained on this ground in that the returns for 1927 include cases of lead poisoning among painters which apparently are not included in the returns for the previous year. The report includes some brief observations on lead poisoning in the manufacture of electric storage batteries, which are also quoted as a matter of convenient reference.

Activity in this industry has continued, and 58 cases were notified, being an increase of 6 over those of last year. Twenty-four of these cases, as compared with 14 last year, occurred in work involving exposure to dust from pasted plates, in such occupations as trimming, trucking, and packing, where it is difficult, and in some cases impossible, to control the dust effectively. With the exception of lead burning, which accounted for 6 cases, as compared with 3 last year, and casting, with 2 cases as against 6 last year, the incidence in other processes remains much the same. One large works have appointed a whole time works doctor. This appointment, following as it does on the establishment of a dental clinic at these works, is clear evidence of the anxiety on the part of the firm to safeguard the health of their workers.

The following observations on the painting of buildings are suggestive of the practical value of the new act which came into force the 1st of October during the preceding year:

On January 1 lead poisoning occurring among workers employed in or in connection with the painting of buildings became compulsorily notifiable. The number, 98, shows an increase of 8 over that of last year. This small increase, even in spite of compulsory notification, may be ascribed to the fact that for the past two or three years all cases of lead poisoning which have come to the notice of the union officials have been referred by them to the department. It was observed by Sir Thomas Legge some years ago, in his annual report, that the percentage of severe cases amongst house painters was very much higher than among other lead workers. A review of the cases notified this year confirms this view. It may be that once a man becomes a painter he is always a painter, while in other industries where the use of lead is involved a man, after an initial attack of lead poisoning, can turn his attention to other work not involving exposure to lead. The fatalities, 21 in number, account for 60 per cent of all the fatalities due to lead poisoning. These have occurred in men who have been employed for many years as painters, the average age at death being 54. The distribution of the cases has been widespread, and among 92 firms 6 having

had two cases each. The regulations which came into force on the 1st day of October have not and can not be expected to have produced any effect on the incidence of lead poisoning amongst this group of workers, although from the reports it appears that in the majority of cases an effort has been made to comply with them. Some years must elapse before an appreciable effect is produced. An even longer period must elapse before the fatality rate falls.

Finally, there are some brief observations on color spraying, with particular reference to women:

Three females, ages 20 to 24, employed for four to six months in spraying leather with various colors in liquid form were found by Doctor Henry to be suffering from signs of lead absorption, slight punctate basophilia being present in every case. Two of the colors in use were found to contain lead to the extent of 18.6 per cent and 1.3 per cent, respectively, calculated as lead monoxide.

Table 14, derived from the annual report of the registrar-general for England and Wales for the period 1916 to 1926, shows the sex distribution of the deaths from lead poisoning throughout England and Wales as well as the rate per million of population for both sexes combined.

TABLE **14.**—*Deaths from industrial lead poisoning in England and Wales, 1916 to 1926*

Year	Population	Male	Female	Total	Rate per 1,000,000
1916	34,642,000	54	1	55	1.6
1917	34,197,000	41	2	43	1.3
1918	34,024,000	35	1	36	1.1
1919	35,427,000	48	-------	48	1.4
1920	37,237,000	56	5	61	1.6
1921	37,887,000	56	2	58	1.5
1922	38,158,000	43	5	48	1.3
1923	38,403,000	51	4	55	1.4
1924	38,746,000	47	2	49	1.3
1925	38,890,000	28	3	31	.8
1926	39,067,000	44	3	47	1.2
Total	406,678,000	503	28	531	1.3

According to this table it is shown that during the first five years of the period there were 243 deaths, and during the second five years there were 241 deaths, or an average of about 48 per annum for the decade. But during 1926 the number of deaths was 47, so that the resulting rate was 1.2 per million for that year against 1.3 for the whole period. Evidently the lead poisoning situation is slowly improving, and that is made particularly evident by the returns for 1927, not included in the tabulation, showing that during that year there were 44 deaths among the males and no deaths among the females.

Lead Poisoning in Canada

FOR Canada the information as yet is limited to the years 1921 to 1926, but is of interest by way of comparison with the corresponding rate for the United States and England and Wales. The information is exclusive of deaths from lead poisoning in the Province of Quebec, which at the time was not in the Canadian registration area.

TABLE 15.—*Deaths from lead poisoning in Canada (excluding Province of Quebec), 1921 to 1926*

Year	Population	Males	Females	Total	Rate per 1,000,000
1921	6,406,000	2	1	3	0.5
1922	6,507,000	4		4	.6
1923	6,577,000	4	1	5	.8
1924	6,659,000	6		6	.9
1925	6,737,000	7		7	1.0
1926	6,815,000			6	.9

The foregoing tabulation is supplemented by a more extended statement for the Province of Ontario for the period 1910 to 1927, including also the rates per million of population.

TABLE 16.—*Deaths from lead poisoning in the Province of Ontario, 1910 to 1927*

Year	Population	Deaths	Rate per 1,000,000	Year	Population	Deaths	Rate per 1,000,000
1910	2,489,241	3	1.2	1919	2,851,584	1	0.4
1911	2,523,274	3	1.2	1920	2,892,623	2	.7
1912	2,564,313	4	1.6	1921	2,933,662	1	.3
1913	2,605,352	1	.4	1922	2,981,182	4	1.3
1914	2,646,390	1	.4	1923	3,028,907	3	1.0
1915	2,687,429	4	1.5	1924	3,062,150	2	.7
1916	2,728,468	5	1.8	1925	3,103,000	3	1.0
1917	2,769,507	5	1.8	1926	3,150,000	3	1.0
1918	2,810,546	3	1.1	1927	3,200,000	9	2.8

Lead Poisoning in Germany

FOR Germany statistics of lead poisoning are rather fragmentary and not available for the entire Republic. For Berlin the statistics have not been tabulated since 1921 on account of the simplification of the tabulation of the causes of death. This is rather disconcerting since Berlin has a considerable number of lead-using industries, including several large plants manufacturing electric storage batteries, in which lead-poisoning cases, certainly in nonfatal form, have by no means been rare. As a matter of fact a personal investigation in 1926 brought home the conclusion that in all probability cases of lead poisoning were relatively more common in the manufacture of electric storage batteries in Berlin than in some of our representative industrial plants in this country. The Prussian statistical office, however, has furnished the returns of lead-poisoning cases in Prussia for the period 1910 to 1925, which makes an interesting contribution.

TABLE 17.—*Deaths from lead poisoning in Prussia, 1910 to 1925*

Year	Population	Deaths	Rate per 1,000,000	Year	Population	Deaths	Rate per 1,000,000
1910	39,551,351	35	0.9	1918	42,421,556	19	0.4
1911	40,500,283	22	.5	1919	39,340,447	23	.6
1912	41,074,664	23	.6	1920	37,890,862	15	.4
1913	41,649,062	22	.5	1921	38,887,722	22	.6
1914	42,223,453	21	.5	1922	38,095,628	11	.3
1915	42,223,453	23	.5	1923	38,589,045	14	.4
1916	42,223,453	16	.4	1924	37,695,833	15	.4
1917	42,421,556	10	.2	1925	38,054,894	15	.4

An elaborate report on the occurrence of lead poisoning in the manufacture of electric storage batteries was published by the Imperial Health Department in 1898 but seems not to have been followed up in future extended investigations. It is chiefly a descriptive account of processes of manufacture, amplified by regulations adopted in 1898 and not substantially altered in important details. As regards the effects of the regulations in Great Britain in reducing the incidence of lead poisoning in the manufacture of electric storage batteries, it may be of value to quote the following statement on the number of cases previous to 1926. (Parliamentary proceedings.)

Mr. Robinson asked the home secretary how many cases of lead poisoning occurred among pasters engaged in the manufacture or repair of electric accumulators in the years 1921, 1922, 1923, and 1924, respectively; and whether any cases had been reported since the new code of regulations came into force on March 1, 1925. Sir William Joynson-Hicks replied: There were 5 such cases reported in 1921, 11 in 1922, 44 in 1923, and 42 in 1924. Since March 1 last, there have only been 15 cases among pasters. The new regulations can not be expected to have their full effect for a considerable time, but they appear to have already caused a substantial reduction in the number of cases.

Lead Poisoning in France

AS REGARDS cases of lead poisoning in the manufacture of electric storage batteries in France, the following is quoted from a brief letter from the Paris correspondent of the Journal of the American Medical Association, dated October 5, 1925.

Balsac, Lafont, and Feil recently published in the Medical Bulletin the results of an inquiry made to complete their previous investigation of occupational morbidity among workmen employed in the manufacture of accumulators. They found that lead poisoning in workmen so engaged is frequent. They examined 50 workers, 2 women and 48 men. Of the latter, 19 were Frenchmen and 29 were Moroccans. Only 2 of the workers were under 20 years of age, while 8 were past 40. The stigmas of lead poisoning and of preliminary stages, which the authors studied particularly, are: Urticaria, basophilic stippling of red-blood cells, nucleated red-blood cells, Teleski's sign (extensors of the wrist too weak to raise the hand above an angle of 45° when the forearm is extended), and finally lead colic. For the 19 Frenchmen and 2 French women, the findings were: Urticaria or wheals, 8 (38 per cent); red-blood cells with granulations, 15 (71 per cent); nucleated red-blood cells, 0; sign of the extensors, 7 (33 per cent); lead colic, 9 (43 per cent). For the 29 Moroccans the findings were: Wheals, 21 (72 per cent); red-blood cells with granulations, 23 (80 per cent); nucleated red-blood cells, 22 (79 per cent); sign of the extensors, 14 (49 per cent); lead colic, 3 (11 per cent).

In elaboration of the foregoing, through the courtesy of the bureau of public hygiene of the city of Paris, returns of lead-poisoning cases for the period 1910–1924 have been obtained. These show the population of Paris, the number of deaths from lead poisoning, and the rate per million of population for each year.

TABLE 18.—*Deaths from lead poisoning in Paris, 1910 to 1924*

Year	Population	Deaths	Rate per 1,000,000	Year	Population	Deaths	Rate per 1,000,000
1910	2,822,329	18	6.4	1918	2,900,960	2	0.7
1911	2,888,110	13	4.5	1919	2,902,799	8	2.8
1912	2,889,946	14	4.8	1920	2,904,635	5	1.7
1913	2,891,782	15	5.2	1921	2,906,472	5	1.7
1914	2,893,618	9	3.1	1922	2,899,464	6	2.1
1915	2,895,454	7	2.4	1923	2,892,456	5	1.7
1916	2,897,291	8	2.8	1924	2,885,448	3	1.0
1917	2,899,000	7	2.4				

It is shown by this table that the rate from lead poisoning has very materially declined in Paris from an alarmingly high rate of 6.4 per million to a rate of 1 per million in 1924.

Lead Poisoning in Scandinavia

A RETURN from the statistical office of Norway, limited, however, to the city of Oslo, for the period 1910 to 1925, shows only one death from lead poisoning during the entire period of 16 years. The population of Oslo in 1925 was about 260,000. The same rarity of lead poisoning is found in other parts of Scandinavia. According to returns furnished by the statistical department of Denmark, not a single death from lead poisoning was reported for the city of Copenhagen during the same period of 16 years. The population of Copenhagen in 1925 was 729,000. Precisely the same results were reported by the statistical bureau of Sweden for the city of Stockholm for the period 1910 to 1925, according to which not a single death from lead poisoning occurred in that city during the 16 years under review. The population of Stockholm in 1925 was 442,000.

Lead Poisoning in South Africa

RETURNS for the Union of South Africa cover the period 1912 to 1926 and indicate that during recent years lead poisoning in that country has become of rare occurrence. This is most extraordinary in view of the development of mining and smelting industries in connection with which lead poisoning cases are more likely to occur.

TABLE **19.**—*Deaths from lead poisoning in Union of South Africa, 1912 to 1926*

Year	Population	Deaths	Rate per 1,000,000	Year	Population	Deaths	Rate per 1,000,000
1912	1,305,247	2	1.5	1920	1,499,911	1	0.7
1913	1,320,053	6	4.5	1921	1,523,403	1	.7
1914	1,354,889	1	.7	1922	1,546,895		
1915	1,379,725			1923	1,579,733		
1916	1,404,561			1924	1,610,774	1	.6
1917	1,429,397	1	.7	1925	1,637,472		
1918	1,454,113			1926	1,677,520	1	.6
1919	1,476,419						

Lead Poisoning in Japan

OF RATHER unusual interest is the return for the city of Tokyo, furnished by the local statistical office for the period 1910 to 1925, suggestive of an increase in the frequency of lead poisoning, probably largely to be explained on the ground of a considerable development of lead-using industries within recent years.

TABLE **20.**—*Deaths from lead poisoning in Tokyo, 1910 to 1925*

Year	Population	Deaths	Rate per 1,000,000	Year	Population	Deaths	Rate per 1,000,000
1910	2,006,900			1918	2,156,500	3	1.4
1911	1,871,400			1919	2,218,000	7	3.2
1912	1,871,900	3	1.6	1920	2,173,200	2	.9
1913	1,780,200	1	.6	1921	2,204,400	5	2.3
1914	1,870,300	2	1.1	1922	2,236,000	1	.4
1915	1,870,500			1923	2,265,300	3	1.3
1916	1,870,900	2	1.1	1924	2,917,308		
1917	1,871,400	2	1.1	1925	1,995,567	3	1.5

Physical Condition of Lead Workers

ASIDE from the foregoing statistics of the general frequency of lead poisoning in fatal form, information regarding the physical condition of lead workers in certain lead-using industries make an extremely interesting addition to general knowledge. It is recognized that the physical condition of lead workers has an important bearing upon their predisposition to lead absorption and lead poisoning, particularly lead poisoning. But heretofore data regarding the physical condition of lead workers have been very fragmentary and broadly speaking not comparable with statistics of other employments.

For the present purpose the following information has been collected: First, 3,879 examinations of workers in a representative electric storage battery plant; second, 921 examinations in a white-lead plant in the Central West; third, 527 examinations of workers in the same plant for the year 1927; and fourth, 833 examinations of workers in a white-lead plant on the Atlantic coast. The results of these examinations are given in detail and in a fairly comparable manner, although the variations in the blanks used make precise comparison on all points somewhat difficult. Another complication arises out of the varying racial compositions of the labor force. As far as practicable, however, this has been taken into account. The statistics of the electric storage battery plant employees cover height, weight, and pulse rate with due regard to racial composition and age. The average age of about 3,880 examinations was 27.4 years; the average height, 66.6 inches; the average weight, 147 pounds, and the average pulse rate, 74.4 per minute. By racial composition, as regards height and weight the figures are shown in Table 21.

TABLE 21.—*Height and weight of workers in an electric storage battery plant*

Race or nationality and age group	Height (inches)		Weight (pounds)		Race or nationality and age group	Height (inches)		Weight (pounds)	
	Number reporting	Average	Number reporting	Average		Number reporting	Average	Number reporting	Average
American:					Southern European:				
Under 30 years	840	67.0	841	143	Under 30 years	495	64.9	500	139
30 to 39 years	209	67.4	211	155	30 to 39 years	119	65.3	120	155
40 years and over	136	67.8	136	158	40 years and over	93	65.4	94	155
Total	1,185	67.2	1,188	147	Total	707	65.0	714	144
Canadian:					Colored:				
Under 30 years	433	66.8	425	140	Under 30 years	200	67.9	200	156
30 to 39 years	93	66.9	90	150	30 to 39 years	87	67.7	87	161
40 years and over	33	67.4	33	153	40 years and over	47	66.9	47	163
Total	559	66.8	548	142	Total	334	67.7	334	158
British:					Miscellaneous:				
Under 30 years	208	66.4	207	139	Under 30 years	57	65.9	57	144
30 to 39 years	103	67.1	103	150	30 to 39 years	20	65.2	20	151
40 years and over	84	66.9	84	151	40 years and over	3	66.7	3	168
Total	395	66.7	394	144	Total	80	65.8	80	147
Eastern European:					Not reported:				
Under 30 years	164	65.3	162	136	Under 30 years	150	67.5	150	148
30 to 39 years	71	66.1	71	157	30 to 39 years	46	66.8	47	158
40 years and over	37	66.0	37	154	40 years and over	52	66.5	52	157
Total	272	65.6	270	144	Total	248	67.1	249	152
Northern European:					All races:				
Under 30 years	49	67.4	49	147	Under 30 years	2,596	66.5	2,591	142
30 to 39 years	28	67.5	28	155	30 to 39 years	776	66.8	777	155
40 years and over	22	66.1	22	151	40 years and over	507	66.8	508	156
Total	99	67.2	99	150	Total	3,879	66.6	3,876	147

These and other results following may be compared with the physical measurements made of conscripts during the World War. The total number of men measured was 868,445, of an average height of 67.49 inches. In the final report on the measurements there is included a standard table of heights for certain European races giving an average of 67.9 inches for Scotch, 67.8 for English, 67.7 for Germans, 67.5 for Irish, 66.7 for Poles, and 65.0 for Italians. No measurements are given for persons of Mexican origin. The average height of white soldiers on demobilization was 67.7 inches, and of negro soldiers, the same. It would, therefore, appear that the average height of electric storage battery workers is somewhat below the average, due obviously to the inclusion of many South Europeans. The average height of white American workers and colored American workers in the electric storage battery plant corresponds almost precisely to the average revealed by the Army measurements on demobilization. The average weight of 872,419 draft recruits measured during the World War was 141.5 pounds. This is 5 pounds less than the average weight of electric storage battery workers according to the preceding table. It illustrates that the men employed in this industry are well nourished and more so in view of the slightly lower height which would give a larger proportionate weight to every inch of height, which for standard purposes is usually placed at two pounds to the inch. No comparative weights for other races are conveniently available, but the heigher weight of colored men conforms to the general experience of a higher actual as well as relative weight for persons of color when compared with white persons of corresponding age.

Table 22 concerns the physique of lead workers in a white lead plant in the Central West, and represents about 950 examinations.

TABLE 22.—*Results of examination of workers in a white lead plant in the Central West, 1926*

Race or nationality and age groups	Age (years)		Height (inches)		Weight (pounds)		Duration of employment (months)		Number of children	
	Number reporting	Average	Number reporting	Average	Number reporting	Average	Number reporting	Average	Number reporting	Average
American:										
Under 30 years	77	24.6	74	68.1	77	152	76	2.9	21	1.0
30 to 39 years	31	32.7	26	68.6	31	164	31	6.5	18	1.8
40 years and over	30	47.8	29	67.9	29	170	29	5.7	17	1.7
Total	138	31.4	129	68.1	137	159	136	4.3	56	1.5
Colored:										
Under 30 years	320	24.8	310	68.9	320	158	313	.9	179	.9
30 to 39 years	140	34.0	136	68.3	140	162	135	1.2	103	1.4
40 years and over	23	43.6	22	68.0	23	163	23	3.3	16	1.2
Total	483	28.2	468	68.7	483	159	471	1.1	298	1.1
Eastern European:										
Under 30 years	25	24.8	25	67.3	25	149	25	.8	4	1.3
30 to 39 years	64	35.3	63	67.0	64	156	63	.9	32	1.9
40 years and over	44	44.2	43	66.0	44	158	44	3.3	18	2.3
Total	133	36.2	131	66.7	133	155	132	1.7	54	2.0

TABLE 22.—*Results of examination of workers in a white lead plant in the Central West, 1926*—Continued

Race or nationality and age groups	Age (years)		Height (inches)		Weight (pounds)		Duration of employment (months)		Number of children	
	Number reporting	Average	Number reporting	Average	Number reporting	Average	Number reporting	Average	Number reporting	Average
Northern and Western European:										
Under 30 years	47	25.0	46	68.4	47	154	47	2.0	10	1.2
30 to 39 years	28	34.0	27	67.5	28	159	28	2.0	14	2.1
40 years and over	27	46.9	24	67.6	27	160	26	3.7	14	2.0
Total	102	33.4	97	67.9	102	157	101	2.5	38	2.0
Mexican:										
Under 30 years	52	24.5	51	66.4	52	141	52	1.7	13	1.8
30 to 39 years	12	33.7	12	65.4	12	141	12	1.9	10	2.3
40 years and over	5	41.2	5	66.2	5	150	5	1.4	3	2.3
Total	69	27.3	68	66.2	69	142	69	1.7	26	2.1
Miscellaneous:										
Under 30 years	6	25.5	6	68.0	6	164	6	2.1	3	1.0
30 to 39 years	14	34.6	14	65.3	14	147	14	.6	7	2.9
40 years and over	8	43.3	8	67.0	8	161	8	3.1	7	2.6
Total	28	35.1	28	66.4	28	154	28	1.7	17	2.4
Grand total	953	30.5	921	68.0	952	157	937	1.9	489	1.4

Race or nationality and age group	Conjugal condition			Previous lead employment			General appearance		
	Single	Married	Widowed	Yes	No	Not reported	Good	Fair	Not reported
American:									
Under 30 years	52	25	-------	18	46	13	63	8	6
30 to 39 years	7	24	-------	17	8	6	26	2	3
40 years and over	7	20	3	12	12	6	24	2	4
Total	66	69	3	47	66	25	113	12	13
Colored:									
Under 30 years	130	190	-------	52	241	27	266	6	48
30 to 39 years	24	115	1	31	97	12	107	12	21
40 years and over	5	16	2	6	15	2	18	4	1
Total	159	321	3	89	353	41	391	22	70
Eastern European:									
Under 30 years	18	6	1	4	19	2	21	3	1
30 to 39 years	28	36	-------	21	39	4	44	12	8
40 years and over	21	23	-------	16	21	7	28	10	6
Total	67	65	1	41	79	13	93	25	15
Northern and western European:									
Under 30 years	36	11	-------	6	32	9	36	[1] 6	5
30 to 39 years	14	14	-------	8	17	3	21	4	3
40 years and over	10	15	2	5	18	4	21	3	3
Total	60	40	2	19	67	16	78	13	11
Mexican:									
Under 30 years	38	14	-------	6	41	5	45	4	3
30 to 39 years	1	11	-------	-------	11	1	7	3	2
40 years and over	2	3	-------	2	3	-------	1	3	1
Total	41	28	-------	8	55	6	53	10	6
Miscellaneous:									
Under 30 years	3	3	-------	-------	5	1	3	1	1
30 to 39 years	6	7	-------	5	9	-------	12	-------	2
40 years and over	1	7	-------	2	4	2	6	1	1
Total	10	17	-------	7	18	3	21	2	4
Grand total	403	540	9	211	638	104	749	84	119

[1] Including 1 "poor."

According to Table 22 the average height of white lead workers is 68 inches, while the average weight is 157 pounds. The tabulation includes numerous detailed observations which need not be enlarged upon. Certain details are given by racial composition and by selected divisional periods of life.

The preceding statistics are for the year 1926. Corresponding figures for a white lead plant in the central West in 1927 are given in Table 23, the number of employees reported, by departments, being as follows: Yards, 230; oxide, 77; track, 52; cartage, 43; metal shipping, 38; repair, 34; general, 21; power, 18; mill, 16; total, 529.

TABLE 23.—*Results of examination of workers in a white lead plant in the Central West, 1927*

Race or nationality and age group	Age (years)		Height (inches)		Weight (pounds)		Duration of employment (months)		Number of children	
	Number reporting	Average	Number reporting	Average	Number reporting	Average	Number reporting	Average	Number reporting	Average
American:										
Under 30 years	54	23.8	54	68.9	54	159	54	2.0	4	0.5
30 to 39 years	21	33.7	21	68.7	21	160	21	4.9	12	2.0
40 years and over	9	49.6	9	67.2	9	180	9	7.9	3	2.0
Total	84	29.0	84	68.7	84	162	84	3.3	19	1.7
Colored:										
Under 30 years	174	24.6	174	69.7	174	165	170	.7	59	1.5
30 to 39 years	117	33.5	116	69.0	117	167	117	1.1	72	1.7
40 years and over	15	43.1	15	68.4	15	170	14	1.2	9	2.6
Total	306	28.9	305	69.4	306	166	301	.9	140	1.7
Eastern European:										
Under 30 years	3	20.7	3	68.4	3	166	2	2.8	----	----
30 to 39 years	10	35.8	10	65.6	10	161	8	3.6	5	2.2
40 years and over	10	44.6	10	66.0	10	156	10	6.3	7	3.1
Total	23	37.6	23	66.1	23	159	20	4.9	12	2.8
Northern and Western European:										
Under 30 years	15	24.1	15	68.3	15	160	14	2.6	4	1.8
30 to 39 years	9	36.1	9	67.5	9	161	9	.8	3	2.7
40 years and over	11	45.4	11	67.1	11	163	11	3.6	7	1.0
Total	35	33.9	35	67.7	35	161	34	2.5	14	1.6
Mexican:										
Under 30 years	35	23.7	35	66.2	35	145	35	1.2	4	.5
30 to 39 years	14	33.1	14	65.9	14	147	14	1.7	4	2.5
40 years and over	3	43.0	3	66.3	3	149	3	1.9	2	1.5
Total	52	27.3	52	66.1	52	146	52	1.4	10	1.5
Miscellaneous:										
Under 30 years	14	24.4	14	67.7	14	155	14	2.1	2	1.0
30 to 39 years	7	34.4	7	66.0	7	153	7	3.6	2	3.5
40 years and over	6	46.7	6	66.7	6	164	6	6.4	3	3.7
Total	27	31.9	27	67.0	27	156	27	3.4	7	2.9
Grand total	527	29.6	526	68.6	527	162	518	1.7	202	1.8

TABLE 23.—*Results of examination of workers in a white lead plant in the Central West, 1927*—Continued

Race or nationality and age group	Conjugal condition			Previous lead employment			General appearance		
	Single	Married	Widowed	Yes	No	Not reported	Good	Fair	Not reported
American:									
Under 30 years	42	12	-------	6	4	8	44	7	3
30 to 39 years	6	15	-------	-------	10	11	17	4	-------
40 years and over	4	5	-------	1	1	7	7	2	-------
Total	52	32	-------	7	15	26	68	13	3
Colored:									
Under 30 years	7	95	-------	29	129	16	155	6	13
30 to 39 years	18	99	-------	28	75	14	102	11	4
40 years and over	1	14	-------	5	6	4	15	2	-------
Total	26	208	-------	62	210	34	272	19	17
Eastern European:									
Under 30 years	3	-------	-------	1	1	1	3	-------	-------
30 to 39 years	4	6	-------	-------	7	3	9	1	-------
40 years and over	3	7	-------	3	2	5	6	3	1
Total	10	13	-------	4	10	9	18	4	1
Northern and Western European:									
Under 30 years	8	6	-------	2	10	3	13	3	-------
30 to 39 years	6	3	-------	1	5	3	7	1	1
40 years and over	3	8	-------	2	3	6	11	-------	-------
Total	17	17	-------	5	18	12	31	4	1
Mexican:									
Under 30 years	30	5	-------	5	24	6	29	[1] 4	2
30 to 39 years	8	6	-------	4	7	3	8	2	4
40 years and over	3	-------	-------	1	1	1	2	1	-------
Total	41	11	-------	10	32	10	39	[1] 7	6
Miscellaneous:									
Under 30 years	7	4	-------	1	9	4	14	-------	-------
30 to 39 years	4	3	-------	1	5	1	7	-------	-------
40 years and over	1	5	-------	1	2	-------	3	3	-------
Total	12	12	-------	3	16	5	24	3	-------
Grand total	158	293	-------	91	301	96	452	50	28

[1] Including 1 "poor."

During 1927 the average height was 68.6 inches, against 68 inches during the preceding year. The average weight was 162 pounds, against 157 pounds during 1926.

The returns for examinations of employees in a white-lead plant on the Atlantic seacoast are shown in Table 24. These examinations show trade life, height, weight, pulse, and blood pressure. Efforts are now being made to bring about standardization of reporting so that in the future it may be possible to present uniform returns for different plants, which, of course, would very materially increase their value.

TABLE 24.—*Results of examination of workers in a white lead plant on the Atlantic seaboard, 1926*

Age group	Trade life (months)		Height (inches)		Weight (pounds)		Pulse (per minute)		Blood pressure			
									Systolic		Diastolic	
	Number reporting	Average	Number reporting	Average	Number reporting	Average	Number reporting	Average	Number reporting	Average	Number reporting	Average
Under 30	354	9.5	353	66.8	354	148	357	76	356	121	354	67
30 to 39	244	28.1	247	66.4	249	154	250	77	246	122	245	69
40 and over	186	96.2	182	65.9	187	157	188	77	185	137	185	77
Not reported	49	67.4	50	63.7	50	154	53	78	26	126	25	68
Total	833	37.7	832	66.3	840	152	848	77	813	125	809	70

The data following contain information concerning 128 examinations of workers in a white-lead plant in the Central West. The number of cases is too small for a safe generalization but the information is included as a matter of interest, suggestive of further studies in this direction.

TABLE 25.—*Results of 128 examinations in a white lead plant in the Central West*

Department	Number	Per cent	Department	Number	Per cent
Yard	49	38.3	Mechanics:		
Oxide	24	18.7	Engine room	11	8.6
Mill	17	13.3	Carpenters	6	4.7
Lead	8	6.2	Electric helpers	1	.8
Warehouse	4	3.1	Pipe fitters	1	.8
Corroding	3	2.3	Blacksmiths	2	1.6
Shipping	1	.8			
Office	1	.8	Total	128	100.0

Condition of—	Cases	Per cent	Condition of—	Cases	Per cent
Gums:			Teeth:		
Pyorrhea	85	66.4	Bad	64	50.0
Bad	5	3.9	Fair	42	32.8
Fair	12	9.4	Good	20	15.6
Normal	4	3.1	Not stated	2	1.6
Good	20	15.6			
Not stated	2	1.6			

History of—	Number reporting	Number of cases	Per cent
Previous lead employment	128	68	53.1
Lead poisoning	128	16	12.5
Rheumatism	128	26	20.3

The average duration of employment of the 127 reporting on this subject was 40.5 months, and the average age of 118 was 37 years. Of the 124 reporting as to dependents, 98 reported an average of 2.5 dependents.

Conclusions

SINCE most of the foregoing data are entirely new in the study of the subject, it is felt that it would be premature to enlarge upon the resulting conclusions. The data are made public chiefly for the purpose of suggesting new lines of research which could be followed to much practical advantage. To illustrate, however, the great practical urgency of uniformity in the medical and physical examination blanks used for the different establishments, as previously intimated, efforts are being made with a promise of good results. The foregoing observations may properly be concluded with a brief abstract from an address on "Some Clinical Aspects of Industrial Poisoning," by Dr. N. C. Sharpe, University of Toronto, and Division of Industrial Hygiene, Ontario Board of Health, January 30, 1923.

In so many cases of industrial poisoning from chemicals the early subjective symptoms are the same and there is no known early diagnostic test. This would indicate, then, that an intimate knowledge of the occupation and its risks are necessary for diagnosis in order to remove the man from danger of further absorption—and yet not to unnecessarily interfere with his work. In many of the cases of industrial poisoning (especially the slight acute intoxications from volatile bodies) either no physician is summoned or if he is, the man has frequently recovered by being placed in the fresh air alone. Yet, although he seems to have fully recovered, repeated exposures and similar intoxications must undermine his health, and a knowledge of the occupation is necessary so that precautions may be suggested to do away with the exposure if at all possible.

Lead-Using Industries

IN THE interpretation of the preceding and earlier statistics suggestive of a decline in lead poisoning it is, of course, of the utmost importance that use should be made of correlation data as regards the corresponding changes in the lead-using industries. An accurate comparison of this kind, however, is not feasible until the manufacturing census for 1928 is available. But certain statistics can be utilized, although the most important data for the construction industry, in which, of course, painting figures to a large extent, are not available. The quantity of lead produced in the United States during recent years has changed as follows:

In 1917 the production of smelted and refined lead in the United States was 614,704 tons. This by 1921 had decreased to 445,654 tons, but increased by 1926 to 814,086 tons. The output of refined primary lead in the United States, from domestic ore, in 1927, amounted to 668,320 short tons. The production was nearly 2 per cent less than in 1926. The apparent consumption of refined primary lead in the United States in 1926 amounted to about 663,000 short tons as compared with about 718,000 tons in 1926.

The production of lead pigments since 1917 is given in Table 26, derived from the preliminary report on the Mineral Resources of the United States, by A. Stoll, published by the United States Bureau of Mines in 1927.

TABLE 26.—*Lead pigments sold by domestic manufacturers in the United States, 1917 to 1927 (short tons)*

Year	White lead		Basic lead sulphate or sublimed lead		Red lead	Litharge
	Dry	In oil	White	Blue		
1917	27,869	87,331	8,231	1,369	25,478	44,102
1918	20,089	82,799	7,403	1,343	30,069	48,874
1919	30,085	109,005	9,068	1,350	32,362	46,739
1920	33,478	112,017	12,412	928	34,431	62,329
1921	26,738	143,545	11,568	463	21,805	41,909
1922	41,598	153,393	13,765	972	30,509	58,261
1923	37,786	125,087	11,949	800	38,037	75,107
1924	42,622	144,872	14,572	1,088	36,813	74,724
1925	43,426	120,479	14,996	1,090	41,669	86,546
1926	37,968	111,845	12,271	1,236	42,550	82,540
1927	38,669	119,026	13,482	1,061	39,073	81,655

Since some of the industrial lead poisoning is known to arise from the manufacture and use of lead pigments, the preceding table sustains the conclusion that the industry in this respect has made substantial progress in total production during recent years, with a coinciding decline in the actual number of deaths from lead poisoning. According to a preliminary statement by the Department of Commerce, the total amount of lead and zinc pigments produced during 1927 shows an increase in basic lead sulphate or sublimed lead from 12,271 tons in 1926 to 13,482 tons in 1927 for white lead, while for blue lead there was a decrease from 1,236 tons to 1,061 tons, comparing 1926 with 1927. There was also a reduction in the amount of red lead produced, or from 42,550 tons in 1926 to 39,073 tons in 1927, and a slight decline in the production of litharge from 82,540 tons in 1926 to 81,655 tons in 1927, while the production of dry white lead increased from 37,968 tons in 1926 to 38,669 tons in 1927. There was an increase in the production of white lead in oil from 111,845 tons in 1926 to 119,026 tons in 1927. Lithopone increased from 159,931 tons to 176,994, and zinc sulphate from 3,649 tons to 8,971 tons.

Building construction involving painting indoors and outdoors has been maintained at a higher level during the last few years than during the years preceding. There are, therefore, no reasons for believing that the actual decline in industrial lead poisoning is measurably attributable to a decline in the primary production of lead pigments for industrial purposes. Quite to the contrary, there are reasons for believing that a substantial increase has taken place in both mining and manufacturing of lead and lead productions, particularly electric storage batteries, compared with the earlier period covered by the present review.

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The Lancet, November 6, 1927.

LIST OF BULLETINS OF THE BUREAU OF LABOR STATISTICS

The following is a list of all bulletins of the Bureau of Labor Statistics published since July, 1912, except that in the case of bulletins giving the results of periodic surveys of the bureau only the latest bulletin on any one subject is here listed.

A complete list of the reports and bulletins issued prior to July, 1912, as well as the bulletins published since that date, will be furnished on application. Bulletins marked thus (*) are out of print.

Conciliation and Arbitration (including strikes and lockouts).

*No. 124. Conciliation and arbitration in the building trades of Greater New York. [1913.]
*No. 133. Report of the industrial council of the British Board of Trade on its inquiry into industrial agreements. [1913.]
No. 139. Michigan copper district strike. [1914.]
No. 144. Industrial court of the cloak, suit, and skirt industry of New York City. [1914.]
No. 145. Conciliation, arbitration, and sanitation in the dress and waist industry of New York City. [1914.]
*No. 191. Collective bargaining in the anthracite coal industry. [1916.]
*No. 198. Collective agreements in the men's clothing industry. [1916.]
No. 233. Operation of the industrial disputes investigation act of Canada. [1918.]
No. 255. Joint industrial councils in Great Britain. [1919.]
No. 283. History of the Shipbuilding Labor Adjustment Board, 1917 to 1919.
No. 287. National War Labor Board: History of its formation, activities, etc. [1921.]
No. 303. Use of Federal power in settlement of railway labor disputes. [1922.]
No. 341. Trade agreement in the silk-ribbon industry of New York City. [1923.]
No. 402. Collective bargaining by actors. [1926.]
No. 468. Trade agreements, 1927.
No. 481. Joint industrial control in the book and job printing industry. [1928.]

Cooperation.

No. 313. Consumers' cooperative societies in the United States in 1920.
No. 314. Cooperative credit societies in America and in foreign countries. [1922.]
No. 437. Cooperative movement in the United States in 1925 (other than agricultural).

Employment and Unemployment.

*No. 109. Statistics of unemployment and the work of employment offices in the United States. [1913.]
No. 172. Unemployment in New York City, N. Y. [1915.]
*No. 183. Regularity of employment in the women's ready-to-wear garment industries. [1915.]
*No. 195. Unemployment in the United States. [1916.]
No. 196. Proceedings of the Employment Managers' Conference held at Minneapolis, Minn., January 19 and 20, 1916.
*No. 202. Proceedings of the conference of Employment Managers' Association of Boston, Mass., held May 10, 1916.
No. 206. The British system of labor exchanges. [1916.]
No. 227. Proceedings of the Employment Managers' Conference, Philadelphia, Pa., April 2 and 3, 1917.
No. 235. Employment system of the Lake Carriers' Association. [1918.]
*No. 241. Public employment offices in the United States. [1918.]
No. 247. Proceedings of Employment Managers' Conference, Rochester, N. Y., May 9–11, 1918.
No. 310. Industrial unemployment: A statistical study of its extent and causes. [1922]
No. 409. Unemployment in Columbus, Ohio, 1921 to 1925.

Foreign Labor Laws.

*No. 142. Administration of labor laws and factory inspection in certain European countries. [1914.]

Housing.

*No. 158. Government aid to home owning and housing of working people in foreign countries. [1914.]
No. 263. Housing by employers in the United States. [1920.]
No. 295. Building operations in representative cities in 1920.
No. 469. Building permits in the principal cities of the United States in [1921 to] 1927.

Industrial Accidents and Hygiene.

*No. 104. Lead poisoning in potteries, tile works, and porcelain enameled sanitary ware factories. [1912.]
No. 120. Hygiene of the painter's trade. [1913.]
*No. 127. Dangers to workers from dusts and fumes, and methods of protection. [1913.]
*No. 141. Lead poisoning in the smelting and refining of lead. [1914.]
*No. 157. Industrial accident statistics. [1915.]
*No. 165. Lead poisoning in the manufacture of storage batteries. [1914.]
*No. 179. Industrial poisons used in the rubber industry. [1915.]
No. 188. Report of British departmental committee on the danger in the use of lead in the painting of buildings. [1916.]
*No. 201. Report of committee on statistics and compensation insurance cost of the International Association of Industrial Accident Boards and Commissions. [1916.]
*No. 207. Causes of death, by occupation. [1917.]
*No. 209. Hygiene of the printing trades. [1917.]
*No. 219. Industrial poisons used or produced in the manufacture of explosives. [1917.]
No. 221. Hours, fatigue, and health in British munition factories. [1917.]
No. 230. Industrial efficiency and fatigue in British munition factories. [1917.]
*No. 231. Mortality from respiratory diseases in dusty trades (inorganic dusts). [1918.]
*No. 234. Safety movement in the iron and steel industry, 1907 to 1917.
No. 236. Effects of the air hammer on the hands of stonecutters. [1918.]
No. 249. Industrial health and efficiency. Final report of British Health of Munition Workers' Committee. [1919.]
*No. 251. Preventable death in the cotton-manufacturing industry. [1919.]
No. 256. Accidents and accident prevention in machine building. [1919.]
No. 267. Anthrax as an occupational disease. [1920.]
No. 276. Standardization of industrial accident statistics. [1920.]
No. 280. Industrial poisoning in making coal-tar dyes and dye intermediates. [1921.]
No. 291. Carbon-monoxide poisoning. [1921.]
No. 293. The problem of dust phthisis in the granite-stone industry. [1922.]
No. 298. Causes and prevention of accidents in the iron and steel industry, 1910–1919.
No. 306. Occupation hazards and diagnostic signs: A guide to impairments to be looked for in hazardous occupations. [1922.]
No. 339. Statistics of industrial accidents in the United States. [1923.]
No. 392. Survey of hygienic conditions in the printing trades. [1925.]
No. 405. Phosphorus necrosis in the manufacture of fireworks and in the preparation of phosphorus. [1926.]
No. 425. Record of industrial accidents in the United States to 1925.
No. 426. Deaths from lead poisoning. [1927.]
No. 427. Health survey of the printing trades, 1922 to 1925.
No. 428. Proceedings of the Industrial Accident Prevention Conference, held at Washington, D. C., July 14–16, 1926.
No. 460. A new test for industrial lead poisoning. [1928.]
No. 466. Settlement for accidents to American seamen. [1928.]

Industrial Relations and Labor Conditions.

No. 237. Industrial unrest in Great Britain. [1917.]
No. 340. Chinese migrations, with special reference to labor conditions. [1923.]
No. 349. Industrial relations in the West Coast lumber industry. [1923.]
No. 361. Labor relations in the Fairmont (W. Va.) bituminous-coal field. [1924.]
No. 380. Postwar labor conditions in Germany. [1925.]
No. 383. Works council movement in Germany. [1925.]
No. 384. Labor conditions in the shoe industry in Massachusetts, 1920–1924.
No. 399. Labor relations in the lace and lace-curtain industries in the United States. [1925.]

Labor Laws of the United States (including decisions of courts relating to labor).

No. 211. Labor laws and their administration in the Pacific States. [1917.]
No. 229. Wage-payment legislation in the United States. [1917.]
No. 285. Minimum-wage laws of the United States: Construction and operation. [1921.]
No. 321. Labor laws that have been declared unconstitutional. [1922.]
No. 322. Kansas Court of Industrial Relations. [1923.]
No. 343. Laws providing for bureaus of labor statistics, etc. [1923.]
No. 370. Labor laws of the United States, with decisions of courts relating thereto. [1925.]
No. 408. Laws relating to payment of wages. [1926.]
No. 444. Decisions of courts and opinions affecting labor, 1926.
No. 467. Minimum-wage legislation in various countries. [1928.]
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*No. 266. Seventh, Seattle, Wash., July 12–15, 1920.
No. 307. Eighth, New Orleans, La., May 2–6, 1921.
No. 323. Ninth, Harrisburg, Pa., May 22–26, 1922.
No. 352. Tenth, Richmond, Va., May 1–4, 1923.
*No. 389. Eleventh, Chicago, Ill., May 19–23, 1924.
*No. 411. Twelfth, Salt Lake City, Utah, August 13–15, 1925.
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No. 248. Fourth, Boston, Mass., August 21–25, 1917.
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