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INDUSTRIAL ACCIDENTS AND HYGIENE SERIES

**OCCUPATION HAZARDS
AND DIAGNOSTIC SIGNS**

**A GUIDE TO IMPAIRMENTS
TO BE LOOKED FOR IN
HAZARDOUS OCCUPATIONS**

(Revision of Bulletin No. 306)

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Contents

	Page
Preface.....	v
Introduction.....	1
Section I.—Alphabetical list of hazardous occupations.....	4
Section II.—List of hazards, symptoms, occupations exposed, and methods of prevention.....	13
A. Abnormalities of temperature and humidity.....	13
1. Extreme dry heat.....	14
2. Heat and humidity.....	15
3. Sudden variations of temperature.....	15
B. Compressed air.....	16
C. Dampness.....	17
D. Defective illumination.....	18
E. Dust.....	19
1. Inorganic dust.....	20
2. Organic dust.....	21
F. Infections.....	21
1. Anthrax.....	22
2. Hookworm (ankylostomiasis).....	22
3. Septic infections.....	23
G. Radiant energy.....	23
1. X-rays, radium, and other radioactive substances (radio- thorium, mesothorium, etc.).....	23
2. Ultraviolet and infrared rays.....	24
H. Repeated motion, pressure, shock, etc.....	25
J. Poisons.....	26
1. Acetaldehyde.....	27
2. Acetanilide.....	27
3. Acetone.....	27
4. Acridine.....	27
5. Acrolein.....	27
6. Aluminum.....	27
7. Ammonia.....	28
8. Amyl acetate.....	28
9. Amyl alcohol.....	28
10. Aniline and other amino compounds of benzol and its homo- logues.....	29
11. Antimony and its compounds.....	29
12. Arsenic and its compounds.....	29
13. Arseniuretted hydrogen (arsine).....	30
14. Barium.....	30
15. Benzine (naphtha-gasoline).....	30
16. Benzol (benzene) and its homologues (toluol and xylol).....	31
17. Brass (zinc).....	31
18. Bromine.....	32
19. Butyl acetate.....	32
20. Butyl alcohol.....	32
21. Cadmium.....	32
22. Carbon dioxide.....	32
23. Carbon disulphide.....	33
24. Carbon monoxide.....	33
25. Carbon tetrachloride.....	34
26. Cellosolve (mono-ethyl ether of ethylene glycol).....	34
27. Chloride of lime.....	34
28. Chlorine.....	34
29. Chlorodinitrobenzol.....	34
30. Chloronitrobenzol.....	34
31. Chromium compounds.....	35

2.612
82 IV
U

CONTENTS

SECTION II.—List of hazards, symptoms, occupations exposed, and methods of prevention—Continued

J. Poisons—Continued

	Page
32. Cobalt.....	35
33. Copper.....	35
34. Cresol (cresylic acid).....	35
35. Cyanogen compounds.....	36
36. Dimethyl sulphate.....	36
37. Dinitrobenzol.....	36
38. Dioxan (diethylene dioxide).....	36
39. Ethyl benzene.....	36
40. Ethyl bromide and ethyl chloride.....	37
41. Ethylene dibromide.....	37
42. Ethylene dichloride.....	37
43. Ethylene oxide.....	37
44. Formaldehyde.....	37
45. Formic acid.....	38
46. Gasoline.....	38
47. Hydrochloric acid.....	38
48. Hydrocyanic acid.....	38
49. Hydrofluoric acid.....	38
50. Iron carbonyl.....	38
51. Lead and its compounds.....	39
52. Lead arsenate.....	40
53. Manganese.....	40
54. Mercury and its compounds.....	40
55. Methanol (methyl alcohol).....	41
56. Methyl bromide.....	41
57. Methyl chloride.....	41
58. Naphtha.....	42
59. Nickel carbonyl.....	42
60. Nitraniline.....	42
61. Nitrobenzol and other nitro compounds of benzol and its homologues.....	42
62. Nitroglycerin.....	42
63. Nitronaphthalene.....	42
64. Nitrous gases and nitric acid.....	42
65. Oxalic acid.....	43
66. Ozone.....	43
67. Petroleum.....	43
68. Phenol.....	43
69. Phenyl hydrazine.....	43
70. Phosgene.....	44
71. Phosphorus.....	44
72. Phosphuretted hydrogen (phosphine).....	44
73. Picric acid.....	44
74. Potassium hydroxide.....	44
75. Pyridine.....	44
76. Silver.....	45
77. Sodium hydroxide.....	45
78. Sulphur dioxide.....	45
79. Sulphuretted hydrogen.....	45
80. Sulphuric acid.....	46
81. Sulphur monochloride.....	46
82. Tar.....	47
83. Tellurium.....	47
84. Tetrachlorethane (acetylene tetrachloride).....	47
85. Tetraethyl lead.....	47
86. Thallium.....	48
87. Tin.....	48
88. Titanium oxide.....	48
89. Trinitrotoluol.....	48
90. Turpentine.....	48
91. Uranium.....	48
92. Vanadium.....	48
93. Vinyl chloride.....	49
94. Zinc.....	49
SECTION III.—Dermatoses.....	50

Preface

The first edition of this guide to the hazards of occupations and to the symptoms of the diseases they cause was intended primarily to aid the medical examiners of the Metropolitan Life Insurance Co. in the discovery of impairments among applicants for insurance. The pamphlet soon attracted the attention of others not immediately interested in insurance medical examinations. Large numbers of industrial physicians, directors of compensation boards, factory inspectors, safety engineers, industrial rehabilitation agents, faculties of medical colleges, and, most important of all, general practitioners of medicine have made a call for this work and have expressed their approval of it. The favorable response encouraged us to proceed with the preparation of a second and much enlarged edition. This edition was equally well received. Published 10 years ago, it is still in constant demand. It has been reproduced either in whole or in part in a number of works by authorities on the subject of industrial hygiene. The authors are convinced by their experience with these earlier editions that this pamphlet has served a useful purpose, and that there is a vital need for a work of this kind, which makes readily available the most recent findings on industrial hazards to those who have not the time for a thorough study. Obviously, the extension of the compensation laws of the several States to include all occupational diseases, or an increasing number of them, has made it necessary for physicians to be familiar with at least their most common symptoms.

The 10 years which have elapsed since the publication of the second edition of this guide have seen wide expansion and a marked increase in activities in the field of industrial hygiene. They have been noteworthy for the large number of scientific investigations undertaken to determine the causes of ill health among workmen and the effects of exposure to specific industrial hazards. Complete reports have been published not only on the effects of such poisons as radioactive paint, methyl bromide, and other refrigerants, and tetraethyl lead, which have become of importance only recently, but our knowledge of well-known health hazards has also been enriched. To mention only a few, benzol, spray painting, and exposure to asbestos dust and to dusts containing free silica, have been thoroughly studied and reported upon.

In preparing this, the third edition of the pamphlet, the authors have endeavored to present the most recent thought on occupational hazards expressed in this vast literature on industrial hygiene. They realize full well the inadequacy of existing knowledge of the effects of many industrial hazards, and the amount of scientific research necessary before these effects are definitely known. They have not presumed to attempt to settle controversial questions, nor have they

¹ U.S. Bureau of Labor Statistics, Bul. No. 308: Occupation hazards and diagnostic signs. Washington, 1922.

attempted to set up standards for the guidance of those whose responsibility it is to pass upon claims for compensation or damages. The symptoms, conditions, or diseases cited are those which are reported in the best works available on the several hazards. They have not been listed in the order of their importance, and many are perhaps of rather rare occurrence. Similarly, the occupations and industries listed are those which have been reported as offering exposure to such hazards, and not necessarily those in which specific cases of injury have occurred.

The form of the pamphlet has been changed somewhat to facilitate reference to the symptoms and occupations listed under each hazard. While the number of hazard groups remains the same, we have completely revised the method of presenting some of the hazards. "Extreme light", now listed as "radiant energy", has been subdivided to show separately the effects of "X-rays and radium", and of "ultra-violet and infrared rays." "Abnormalities of temperature" is now subdivided to show the effects of "heat and humidity" in addition to those of "extreme dry heat" and "sudden variations of temperature." The hazards covered now include "abnormalities of temperature"; "compressed air"; "dampness"; "defective illumination"; "dust"; "infections"; "radiant energy"; "repeated motion, pressure, shock, etc."; and the "poisons." The section on "skin irritants" is now listed under the heading "dermatoses." The number of poisonous substances considered has been increased from 52 to 94. The number of hazardous occupations listed has been increased to approximately 900.

The authors desire to acknowledge their indebtedness to the members of the medical profession of the United States and Canada, who have so graciously received the previous editions, and who have so enthusiastically cooperated in extending its scope. It would be impracticable to make personal acknowledgment of all the assistance which has been received in preparing this revision. Mention, however, should be made of the following authors and organizations from whose published works so large a part of the information used in the pamphlet was secured: Drs. Alice Hamilton, George M. Kober, Emery R. Hayhurst, Yandell Henderson, Howard W. Haggard, R. Prosser White, Carey P. McCord, Henry H. Kessler, Ralph W. Webster, Frank P. Underhill, W. Gilman Thompson, and also the International Labor Office of the League of Nations, Harvard School of Public Health, United States Bureau of Labor Statistics, United States Public Health Service, United States Bureau of Mines, and the Bureau of Industrial Hygiene of the New York State Department of Labor.

The authors are especially indebted to Dr. Anthony J. Lanza and Dr. William J. McConnell, assistant medical directors of the Metropolitan Life Insurance Co., for reviewing the entire manuscript, for assistance in the preparation of the text, and for many valuable criticisms suggested by their broad experience in the field of industrial medicine.

The detailed work of this compilation was carried out by Thomas Dublin, Lawrence Wolff, and Sol Ungar, of the Statistical Bureau of the Metropolitan Life Insurance Co.

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OCCUPATION HAZARDS AND DIAGNOSTIC SIGNS: A GUIDE TO IM- PAIRMENTS TO BE LOOKED FOR IN HAZARDOUS OCCUPATIONS

Introduction

Many occupations have injurious effects on the physical condition of those engaged in them. The health of those who work with the poisons, such as lead, arsenic, mercury, picric acid, etc., or those who are exposed for long periods to dust, heat, humidity, or to the infectious materials, may be impaired seriously as the result of their work. The occupation is now recognized as of the very first importance as a factor in the causation of disability and even of death. We see this reflected in the frequent revisions of compensation laws to include an increasing number of occupational diseases. Dr. Edsall has shown that in the clinic he conducted at the Massachusetts General Hospital many of the conditions for which treatment was sought by men of working ages were the effects of occupation. Other industrial clinics are reporting similar results. With their attention directed to occupation as a possible factor, industrial physicians are able to diagnose a great many obscure cases which previously had puzzled even the most competent clinicians. In this way they discover a great many more cases of disease of occupational origin than had before been thought possible. Thus, in 1917, about 150 cases of lead poisoning were discovered at the Massachusetts General Hospital, which are more than were recorded by this clinic during the 5-year period prior to the adoption of the more intensive methods of study. It is generally recognized that patients come to physicians with pains and complaints of an indefinite character, and it is only when consideration is given to the occupation and its possible effects that many of these cases are cleared up.

The medical examiner should therefore be very careful to see if any of the usual diagnostic signs of poisoning, dust, heat, or other hazards which are known to be inherent in occupations are in evidence among their patients, where no other explanation of the case is readily available. In the case of those exposed to lead, such as employees of storage-battery plants, white-lead workers, paint mixers, painters, etc., the blue line on the gum, the pale, sallow appearance, and the trembling fingers are significant as indications of chronic lead poisoning, and the physician should look for these signs. Physical symptoms and conditions which ordinarily might be passed by, in this way become very important if they point to the possible effect of the occupation.

This handbook has been prepared to aid physicians in general practice, industrial hygienists, safety engineers, and others who come into close professional contact with those who are engaged in industrial processes. Nine major hazards of employment are listed; namely, "abnormalities of temperature"; "compressed air"; "dampness"; "defective illumination"; "dust"; "infections"; "radiant energy"; "repeated motion, pressure, or shock"; and the "poisons." A separate section of the bulletin is devoted to a discussion of the dermatoses. Long exposure to any of these will usually leave definite physical signs which the medical examiner can discover if he will look for them. To aid him in detecting the hazards and their effects on the worker, two lists are presented. The first consists of the more common hazardous occupations, arranged alphabetically; the second consists of hazards, together with their effects or symptoms, as well as the occupations affected. After each occupation in the first list is a reference in code to the particular hazard in the second list. The capital letters after each occupation, A, B, C, etc., refer to the general hazard. The arabic numerals signify the particular hazard, as E 1, inorganic dust; E 2, organic dust.

The following example will show how this guide may be of value to the general practitioner: A man, who works in a garage, suffering from continuous headaches visits his physician. The latter can find no cause for the patient's illness. The patient shows no sign of disease other than the subjective symptoms which he describes. Perhaps the physician will recommend an examination of the subject's eyes, ears, and sinuses, which will prove negative. A correct diagnosis in a puzzling case such as this is much easier to determine when the occupation is ascertained and this guide is utilized. Alongside of "garage workers" in the Alphabetical List of Hazardous Occupations, the physician finds the symbols J 15, 24, 51, 85. "J" represents the hazard "poisons", and 15, 24, 51, 85, the particular poisons—gasoline, carbon monoxide, lead, and tetraethyl lead, respectively. Upon looking up the symptoms of these poisons in the second list, he finds that all produce headache. In such a case an effort should be made to discover which of these poisons exists as a hazard in the plant where the patient is employed. The remedy consists in the removal of the etiological factor—the specific poison.

The following procedure is therefore recommended: The medical examiner or physician should ascertain the occupation of the person undergoing examination. He should then look for it in the Alphabetical List of Hazardous Occupations (p. 4). If found there, it is possible that the person has been exposed to and is possibly suffering from the effects of some hazard of his occupation. The numerals will indicate the particular hazards of the occupation. The physician should then make special effort to discover the symptoms or signs referred to in the second list. By this means he can readily determine whether the person examined is in fact suffering from the effect of his occupation. His examination is in this way made more illuminating. Physicians, not specialists in occupational hygiene, can thus learn to detect the effects of industry and, conversely, can eliminate the occupation as the cause when certain symptoms are observed which do not fit the usually observed effects of the occupation.

Medical examiners should remember that it is often necessary to keep in mind not only the present occupation but the former one as well. Persons suffering from certain ailments may no longer be engaged in the industry which was responsible for their condition. But careful inquiry into their occupational history will sometimes result in the recording of an occupation the effects of which are clearly those from which the patient is suffering. The medical profession must give occupational findings greater weight in forming their judgments regarding physical conditions and in diagnosing and treating disease.

It is hoped in this way that the medical profession will become more and more acquainted with occupational diseases and help in the movement to discover and eliminate cases thereof. In our country, it is still true that very large numbers of working people are constantly exposed to serious occupational hazards and suffer, often unnecessarily, very seriously from the effects of such exposure. The greater interest of medical practitioners will help materially in the campaign of prevention. Medical schools can aid greatly in bringing about this result by giving due weight to the subject in their courses of study. Already the form and content of the pamphlet have recommended it to several schools, which report its value. In the same way, plant executives and safety engineers must take cognizance of the existence of these occupational diseases and look carefully into their own establishments to see to what degree the processes in their shops are devoid of the dangers which are usually associated with industrial operations. Factory inspectors, labor officials, and workmen's compensation boards will find it helpful in inspecting and evaluating the hazards of numerous industries. Many hazards may be revealed which they have not known were associated with the processes of manufacture and of which the employers themselves have been ignorant. The rapidly expanding field of industrial rehabilitation should find this bulletin an aid in selecting occupations for those with arrested cases of tuberculosis and for others weakened by disease.

Section I.—Alphabetical List of Hazardous Occupations

- Abrasives workers, E 1.
 Acetaldehyde makers, J 1, 54.
 Acetanilide workers, J 10.
 Acetic-acid makers, J 47, 54.
 Acetone workers, J 3, 54.
 Acetylene workers, E 1, J 3, 7, 13, 23, 24, 27, 31, 72.
 Acid dippers, C, J 13, 35, 47, 64, 80.
 Acid finishers (glass), J 47, 51, 80.
 Acid makers. *See* particular acid.
 Acid mixers, J 47, 64, 80.
 Acid recoverers, J 47, 64, 80.
 Acid transporters, J 47, 64, 80.
 Acridine workers, J 4.
 Acrolein workers, J 5.
 Airplane-dope makers, J 3, 8, 16, 25, 84.
 Airplane-wing varnishers, J 84. *See also* Varnishers.
 Alcohol-distillery workers, J 8, 9, 16, 45, 54.
 Aldehyde pumpmen, J 1, 55.
 Alkali-salt makers, C, J 22, 23, 47, 78, 79.
 Aluminum extractors, J 49.
 Alum workers, J 80.
 Amalgam makers, J 54.
 Amber workers, J 51.
 Ammonia workers, J 7, 24.
 Ammonium-salts makers, A 1, J 7, 23, 35, 47, 80.
 Ammonium-sulphate makers, J 80.
 Amyl-acetate workers, J 8, 9.
 Amyl-nitrite makers, J 9.
 Anesthetic makers, J 40.
 Aniline-compound workers, J 10, 31.
 Aniline-dye makers. *See* Dye makers.
 Aniline makers, J 10, 18, 16, 47, 61, 64.
 Animal-hair dressers. *See* Hair workers.
 Animal handlers, F 1, 3.
 Annealers, A 1.
 Antifreeze makers, J 55.
 Antimony extractors (refiners), A 1, J 11.
 Antimony fluoride extractors, J 49.
 Antipyrin makers, J 69.
 Arsenic roasters, A 1, J 12.
 Arseniuretted-hydrogen makers, J 13.
 Art-glass workers, J 8, 15, 49, 51, 55, 90.
 Artificial-amber makers, J 44.
 Artificial-flower makers, H, J 12, 81, 51, 54, 55.
 Artificial-gem makers, J 86.
 Artificial-ice-makers, A 8, C, J 7, 78.
 Artificial-leather workers, A 2, J 8, 8, 10, 12, 16, 20, 64, 80.
 Artificial-manure makers. *See* Fertilizer makers.
 Artificial-pearl makers, J 8, 51, 64, 84.
 Artificial-resin makers, J 34.
 Artificial-silk makers, A 2, C, J 7, 8, 13, 20, 23, 35, 44, 47, 55, 77, 79, 80, 84.
 Artificial-stone makers, J 82.
 Art-printing workers, J 35.
 Asbestos workers, A 1, E 1.
 Asphalt workers, A 1, J 23, 82.
 Auto painters, C, J 55. *See also* Painters.
 Babbitters, J 51.
 Bakelite makers, J 44, 68.
 Bakers, A 3, E 2, G 2, J 22, 24.
 Balloon (hydrogen) workers, J 13.
 Balloon inflators, J 24.
 Barbers, H.
 Barium carbonate makers, J 14, 79.
 Bar-mill workers (iron and steel), A 1.
 Barometer makers, J 54.
 Basic-slag (artificial-manure) workers, E 1.
 Batch makers (glass works). *See* Glass mixers.
 Batch makers (rubber works). *See* Compounders (rubber).
 Baters (tannery), C, F 1.
 Battery (dry) makers, E 1, J 8, 16, 81, 47, 51, 53, 54, 82.
 Battery (storage) makers. *See* Storage-battery makers.
 Beamers (textiles), E 2.
 Beamhouse workers (tannery), C, F 1.
 Beatermen (paper and pulp), C, J 28.
 Bed rubbers (marble and stone), E 1.
 Bench molders (foundry), E 1, J 17, 51.
 Benzene purifiers, J 80.
 Benzol-still men, A 1, J 16.
 Bessemer-converter workers (iron and steel), A 1.
 Beta-still operators (beta-naphthol), A 1, J 80.
 Bevelers, E 1.
 Bicyclists, H.
 Billet-mill workers (iron and steel), A 1.
 Bisque-kiln workers, A 1, E 1, J 24.
 Blacksmiths, A 1, G 2, H, J 22, 24, 35, 51.
 Blasters, E 1, J 24.
 Blast-furnace workers, A 1, J 22, 24, 35, 78, 79.
 Bleachers, A 2, 8, J 27, 28, 31, 47, 49, 64, 65, 66, 74, 77, 78.

- Bleachery driers, A 2.
 Bleaching-powder makers, J 13, 27, 53.
 Blenders (motor fuel), J 16.
 Blockers (felt hats), A 2, J 24.
 Blooders (tannery), J 51.
 Blooming-mill workers (iron and steel), A 1.
 Blowers (felt hats), E 2, J 54.
 Blowers (glass manufacturing). *See* Glass blowers.
 Blowers-out (zinc smelting), A 1, J 17.
 Blueprint makers, J 31.
 Bluers (revolvers), A 1.
 Boiler cleaners and washers, C, J 24.
 Boiler-room workers, A 1, J 22, 24.
 Boneblack makers, J 7, 71.
 Bone renderers, J 5.
 Bone workers, E 1, J 5, 35, 78.
 Bookbinders, J 8, 12, 51, 55.
 Bottle-cap makers, J 51.
 Bottlers (mineral waters), J 77.
 Brake-lining makers, J 16.
 Brass foundry, A 1, J 11, 12, 17, 22, 24, 51, 71, 78.
 Brass polishers, J 51. *See also* Polishers and cleaners (metal).
 Brazers, G 2.
 Braziers, A 1, J 17, 51.
 Brewers, A 2, 3, C, J 22, 44, 49, 68.
 Brick burners, A 1, J 22, 24, 51.
 Bricklayers, E 1.
 Brick makers, A 1, C, E 1, F 2, J 51, 78.
 Briquet makers, J 12, 82.
 Bromine makers, J 18, 28.
 Bromine-salt makers, J 18.
 Bronzers, E 1, J 7, 8, 12, 13, 15, 16, 17, 35, 47, 51, 54, 55, 79.
 Broom makers, E 2, J 23, 44, 78.
 Browners (gun barrels), J 35, 51, 54, 67.
 Brushers (felt hats), E 2, J 54.
 Brush makers, E 2, F 1, J 44, 51, 55, 82.
 Buffers, D, E 1, 2.
 Buffers (rubber), J 8, 15, 51.
 Burners (enameling), A 1, J 51.
 Burnishers (iron and steel), D, J 11, 80.
 Burnishers (rifle barrels), J 11.
 Burrers (needles), E 1.
 Burr files, E 1.
 Butchers, A 8, F 1, 3.
 Button makers, E 1, 2.
 Butyl alcohol makers, J 20.
 Cable makers, J 51.
 Cable splicers, C, J 24, 51, 79, 90.
 Cadmium-alloy makers, J 21.
 Cadmium and cadmium-compound makers, J 21.
 Cadmium platers, J 21.
 Cadmium-vapor-lamp makers, J 21.
 Caïsson workers, A 3, B, C, D, J 22, 79.
 Calcium-carbide makers, J 7.
 Calenderers (rubber), A 3, E 1.
 Calico printers, A 2, 3, J 8, 10, 11, 12, 21, 24, 28, 31, 35, 44, 47, 51, 53, 54, 55, 64, 68, 90, 90.
 Camphor makers, J 8, 10, 47, 90.
 Candle (colored) makers, J 5, 12, 31.
 Candy makers, A 2, 3.
 Canners, A 2, 3, C, F 3, J 51.
 Can (sanitary) makers, J 16.
 Cap loaders, J 54.
 Cappers (window glass), A 1.
 Carbanilide makers, J 23.
 Carbide makers, A 1, E 1, J 7, 24.
 Carbolic-acid makers, J 16, 68, 73, 80.
 Carbonated-water makers, J 22.
 Carbon-black workers, A 1, E 1.
 Carbon-brush makers, E 1.
 Carbon-dioxide-ice workers, J 22.
 Carbon-disulphide makers, J 23, 79.
 Carbonic-acid makers, J 22.
 Carbonizers (shoddy), E 2, J 13, 47, 80.
 Carbon printers (photographic), J 31.
 Carbon-tetrachloride workers, J 25, 70, 81.
 Carborundum makers, A 1, E 1.
 Carders (textiles), E 2.
 Card grinders (textiles), E 1, 2.
 Carpenters, E.
 Carpet makers, E 2, F 1, J 12.
 Carroters (felt hats), J 12, 54, 64.
 Cartridge-cup washers, C.
 Cartridge dippers, J 47, 64, 80.
 Cartridge felt and wad makers, C.
 Cartridge makers, J 51, 54.
 Cartridge shot shell paraffin dippers, A 3, C.
 Case hardeners, A 1, J 85.
 Casters (brass foundry). *See* Brass foundry.
 Casters (iron and steel), A 1.
 Casting cleaners (foundry), E 1. *See also* Acid dippers.
 Cast scrubbers (electroplaters), J 15, 16.
 Catchers (iron and steel), A 1.
 Cattle salesmen, F 1.
 Cellophane. *See* Transparent-wrap-plug-material workers.
 Cellulosolve makers, J 28.
 Celluloid. *See* Pyroxylin plastics workers.
 Cellulose-acetate makers, J 3, 84.
 Cellulose-formate makers, J 45.
 Cellulose workers, J 3, 23, 45, 78, 79, 84.
 Cementers (rubber shoes), J 15, 16, 23, 25, 55, 90.
 Cement mixers (rubber), J 15, 16, 23, 25, 81.
 Cement workers, A 1, E 1, J 47.
 Ceramic workers. *See* Pottery workers.
 Chambermen (sulphuric acid), J 78, 80.
 Charcoal burners, J 22, 24.
 Charcoal workers (sugar refining), A 2, 3, E 1.
 Chargers (smelting), A 1, E 1, J 24.

- Chargers (zinc smelting), A 1, E 1, J 11, 12, 17, 21, 24, 51, 78.
 Chasers (steel), E 1.
 Chauffeurs, H, J 15, 24.
 Chemists (radium research), G 1.
 Chimney masons, J 24.
 Chimney sweepers, E 1, J 12, 24, 82.
 Chippers, E 1, J 51.
 Chloride of lime makers, J 27, 28.
 Chlorine-compound makers, J 47.
 Chlorine makers, J 28, 47, 53, 54.
 Chloroform makers, J 3, 27, 57.
 Chrome workers, J 31.
 Chromium platers, J 31.
 Cigar makers, E 2.
 Clay and bisque makers (pottery), A 3, C, E 1, J 78.
 Clay-plug makers (pottery), C, E 1.
 Clay-products workers. *See* Pottery workers.
 Cleaners (foundry), J 24.
 Clerks, D, H.
 Cloth preparers, A 2, C. *See also* Bleachers.
 Cloth singers, J 24.
 Coal miners. *See* Miners.
 Coal passers, E 1.
 Coal-tar workers, J 10, 16, 24, 34, 35, 68, 82.
 Cobalt miners, J 32.
 Cobblers, E 2, F 1, H.
 Coke-oven workers, A 1, J 7, 16, 24, 78, 79, 82.
 Cold-storage-plant workers. *See* Refrigerating-plant workers.
 Collodion makers, J 64.
 Colored-paper workers, J 12.
 Colorers (white) of shoes, J 51.
 Color makers, A 1, E 1, J 7, 11, 12, 16, 18, 21, 28, 31, 51, 54, 57, 80, 84, 86.
 Comb makers, E 2.
 Compositors, D, E 1, H, J 10, 11, 15, 51.
 Compounders (rubber), E 1, J 10, 11, 12, 15, 16, 31, 51.
 Concentrating-mill workers (lead and zinc), C, E 1, J 51.
 Coners (felt hats), E 2, J 54.
 Confectioners. *See* Candy makers.
 Construction-camp workers, F 2.
 Construction laborers, E 1.
 Cooks, A 8, G 2, J 24.
 Copper founders, J 12, 33.
 Copper miners. *See* Miners.
 Copper refiners and smelters, A 1, J 11, 12, 24, 33, 51, 78, 83.
 Coppersmiths, J 33.
 Cord makers, J 82.
 Core makers, A 1, E 1, J 17, 24.
 Cork workers, E 2.
 Corn-products workers, A 1, 2, 3.
 Cosmetic workers, J 54.
 Cotton-mill workers, A 2, C, E 1, 2.
 Cotton-seed-oil workers, A 2.
 Cotton twisters, E 2, H.
 Cranemen (glass industry), A 1.
 Cranemen (iron and steel), A 1.
 Crayon (colored) makers, J 31.
 Creosoting-plant workers, C, J 82.
 Cresol-soap makers, J 34.
 Cresylic-acid makers, J 34.
 Crucible mixers, E 1.
 Crucible-steel-department employees, A 1.
 Crushermen (clay and stone), E 1.
 Cupola men (foundries), A 1, J 22, 24.
 Curers, vapor (rubber). *See* Vulcanizers.
 Curriers (tannery), E 2, F 1, J 12, 15.
 Cut-glass workers, E 1, J 12, 51.
 Cutlery makers, E 1, J 8, 51.
 Cutters (oxyacetylene and other gases). *See* Welders.
 Cyanamid makers, A 1, E 1.
 Cyanide workers, J 7, 35.
 Cyanogen makers, J 54, 79.
 Damascening workers, J 64.
 Dancers, H.
 Decorators (pottery), J 12, 15, 16, 51, 80.
 Degreasers (fertilizer; leather), J 15, 16.
 Degreasers (textiles), J 25.
 Denatured-alcohol workers. *See* particular denaturant.
 Dental workers, J 51.
 Dentists, J 54.
 Depilatory makers, J 86.
 Detinning workers, J 28.
 Detonator cleaners, J 54.
 Detonator fillers, J 54.
 Detonator packers, J 54.
 Devil operators (felt hats), E 2, J 54.
 Diamond cutters, E 1, H.
 Diamond polishers, J 51.
 Diatomaceous-earth workers, E 1.
 Digester-house workers (paper and pulp), A 2, 3, J 78, 79.
 Dimethyl-sulphate makers, J 13, 36, 55, 64, 80.
 Dioxan makers, J 38.
 Dippers (gun cotton), J 64.
 Dippers (rubber), J 15, 16.
 Dippers. *See also* Acid dippers.
 Disinfectant makers, J 1, 18, 27, 28, 34, 35, 44, 54, 68, 78, 86.
 Divers, B, J 22.
 Doffers (textiles), A 2, C, E 2.
 "Dope" workers. *See* Airplane-dope makers.
 Dressers (glass), A 1.
 Dresser tenders (textile), A 2, 3, C.
 Driers (felt hats), A 8, J 55.
 Driers (rubber), J 15, 16, 23.
 Drier workers (foundries), J 24.
 Drillers (rock), E 1.
 Drivers, A 8, C.
 Drop forgers, A 1.
 Dry-battery workers. *See* Battery (dry) makers.
 Dry cleaners, A 3, J 15, 16, 23, 25, 53, 65, 90.

- Drying-room workers (miscellaneous), A 3, J 22, 24.
- Dye makers, A 2, 3, J 1, 3, 4, 7, 10, 11, 12, 13, 16, 18, 27, 28, 31, 34, 35, 36, 44, 45, 47, 51, 53, 54, 55, 57, 61, 64, 65, 68, 69, 70, 73, 78, 79, 80, 86, 90.
- Dyers, A 3, J 3, 7, 8, 10, 15, 31, 47, 49, 51, 53, 61, 68, 73, 81. *See also* Mor-danters, and other preparatory process workers.
- Electricians, G 2, J 66.
- Electric-induction-furnace workers, J 54.
- Electric linemen, G 2.
- Electrode makers, J 82.
- Electrolytic process (copper) workers, J 18.
- Electroplaters, C, J 11, 12, 13, 15, 16, 21, 23, 25, 31, 35, 45, 47, 51, 54, 64, 80.
- Electrotypers, A 3, E 1, J 11, 51. *See also* Electroplaters.
- Elevator runners, H.
- Embalmers, J 44, 54.
- Embossers, J 54.
- Embroidery workers, D, J 51.
- Emery-wheel makers, E 1, J 51.
- Enamelers, A 1, C, H, J 8, 12, 15, 16, 23, 24, 31, 51, 53, 84, 90.
- Enamel makers, J 8, 11, 12, 15, 16, 23, 24, 31, 47, 51, 53, 64, 84, 90.
- Engineers (stationary), A 1, 3, E 1, J 24.
- Engravers, E 1, H, J 16, 47, 65, 80. *See also* Steel engravers.
- Etchers, J 13, 47, 49, 64, 68, 80.
- Ether makers, J 80.
- Ethyl benzene makers, J 39.
- Ethyl-bromide makers, J 40.
- Ethyl-chloride makers, J 40.
- Ethylene-dibromide makers, J 18, 41.
- Ethylene dichloride makers, J 42.
- Ethylene oxide makers, J 43.
- Explosives workers, C, J 1, 3, 7, 8, 9, 10, 16, 23, 31, 34, 44, 54, 55, 61, 62, 64, 68, 73, 80. *See also* particular occupation.
- Extractor operators (soap), A 3, C.
- Extractors (gold and silver), J 28, 35, 54.
- Extractors (oils and fats), J 16.
- Farmers, F 1, 2, J 12, 51.
- Fat renderers, A 3, J 5, 79, 80.
- Feather curers, E 2, J 12.
- Feather workers, E 2, F 3, J 10, 12, 15, 16, 55, 67, 78, 90.
- Felt extractors, A 2.
- Felt-hat makers, A 2, 3, E 2, J 12, 54, 55, 80. *See also* particular occupation.
- Felt makers, A 2.
- Ferrosilicon workers, J 12, 13, 72.
- Fertilizer makers, C, E 1, F 1, 3, J 7, 13, 22, 35, 47, 49, 53, 64, 71, 78, 79, 80. *See also* Phosphate-mill workers.
- Fiber workers, E 2.
- Filament makers and finishers (incandescent lamps), J 24, 55, 86.
- File cutters, E 1, J 51.
- Filters, E 1, J 11, 51.
- Filling-station workers, J 51, 85.
- Film makers. *See* Pyrorylin-plastics workers.
- Filter-press workers, C.
- Finishers (leather), E 2.
- Fire-extinguisher makers, J 25.
- Firemen (city), A 1, 3, C, J 24, 25.
- Firemen (stationary), A 1, 3, E 1, J 24.
- Fireworks makers, J 11, 12, 53, 54, 71, 73. *See also* Explosives workers.
- Fishermen, A 3, C.
- Fitters (shoes), J 55.
- Flangers (felt hats), A 3, J 24.
- Flatteners (glass), A 1.
- Flax-rettery workers, J 79.
- Flax spinners, A 2, E 2.
- Flint workers, E 1.
- Floor molders (foundry), A 1, E 1, J 17, 51.
- Floor-polish makers, J 61.
- Flour workers, E 2.
- Flue cleaners, E 1, J 24, 78, 82.
- Flush tenders (aluminum), C.
- Forgemen, A 1.
- Formaldehyde workers, J 44.
- Formers (felt hats), E 2.
- Formic-acid workers, J 45.
- Foundry workers, A 1, E 1, J 22, 24. *See also* particular metal.
- Frosters (glass and pottery), J 31.
- Fruit-essence makers, J 8, 9.
- Fruit preservers, J 78.
- Fulminate mixers, J 35, 54.
- Fumigators, J 24, 34, 35, 78.
- Fur carders, E 2, F 1.
- Fur clippers, E 2, F 1.
- Fur cutters, E 2, F 1.
- Fur handlers, E 2, F 1, J 12, 54.
- Furnace workers, A 1, G 2, J 22, 24.
- Furniture polishers, E 2, H, J 8, 15, 31, 55, 67, 90.
- Fur preparers, E 2, F 1, J 12, 54, 64.
- Fur pullers, E 2, F 1.
- Fusel-oil workers, J 9.
- Galvanizers, A 2, C, J 5, 7, 12, 13, 17, 47, 51, 64, 78, 80.
- Garage workers, J 15, 24, 51, 85.
- Garbage workers, F 3.
- Gardeners, J 12, 51.
- Gas (illuminating) workers, A 3, J 7, 13, 16, 24, 35, 68, 79, 82.
- Gasoline blenders, J 51, 85.
- Gasoline-engine workers, J 15.
- Gas purifiers, J 7, 35, 68, 79.
- Gassers (textile), J 24.
- Gatherers (glass), A 1.
- Gelatine makers, J 78.
- Germicide makers, J 10, 44, 73.
- Gilders, J 8, 15, 16, 35, 54, 55, 64, 75.
- Glass blowers, A 1, E 1, G 2.
- Glass colorers, J 21, 81, 83.

- Glass cutters, C, E 1.
 Glass etchers, J 44, 49.
 Glass finishers, C, E 1, J 47, 49, 51, 80.
 Glass-furnace workers, A 1, G 2.
 Glass mixers, E 1, J 11, 12, 47, 51, 53.
 Glass polishers, J 51.
 Glass workers, J 22, 78, 86.
 Glaze dippers (pottery), C, J 11, 12, 31, 47, 51, 53.
 Glaze mixers (pottery), E 1, J 11, 12, 31, 47, 51, 53.
 Glost-kiln workers, A 3, J 24, 51.
 Glove makers (leather preparers), C, E 2. *See also* Tannery workers.
 Glue workers, A 8, C, E 2, F 3, J 5, 7, 15, 16, 22, 23, 47, 78, 79, 80.
 Glycerine refiners, J 65.
 Gold beaters, E 1, H.
 Gold extractors, J 13, 18, 81.
 Gold refiners, E 1, J 12, 85, 44, 49, 51, 54.
 Grain-elevator workers, E 2.
 Granite workers. *See* Stonecutters.
 Graphite workers, A 1, E 1.
 Grinders (colors). *See* Color makers.
 Grinders (metals), C, E 1, J 11, 51.
 Grinders (rubber), E 2, J 11, 51.
 Guncotton dippers, J 64, 80.
 Guncotton pickers, E 2.
 Guncotton washers, C.
 Gypsum workers, A 3, E 1, J 79.

 Hair workers, C, E 2, F 1, 3.
 Hammermen, H.
 Hardeners (felt hats), J 54, 55.
 Hardeners (metals). *See* Temperers.
 Harness makers, E 2.
 Hat makers, felt. *See* Felt-hat makers.
 Heater boys (riveters), J 51.
 Heel makers (shoes), E 2.
 Hemp workers, E 2.
 Horn workers, E 1.
 Hospital attendants, G 1.
 Hothouse workers, A 3.
 Hot-rod rollers (iron and steel), A 1.
 House wreckers, E 1.
 Hydrochloric-acid makers, J 47, 79, 80.
 Hydrocyanic-acid makers, J 85, 80.
 Hydrofluoric-acid makers, J 49.
 Hydrogen-sulphide workers, J 79.

 Ice (artificial) makers. *See* Artificial-ice makers.
 Ice-cream makers, A 3, C.
 Imitation. *See* Artificial.
 Incandescent-lamp makers, J 24, 51, 54, 55. *See also* particular occupation.
 Incandescent-mantle hardeners, G 2.
 Ink makers, J 18, 24, 28, 31, 44, 47, 53, 61, 65.
 Insecticide makers, J 12, 23, 44, 51, 71, 81.
 Instrument dial (luminous) painters, G 1.
 Insulators, J 82.
 Iodine makers, J 23.

 Iron and steel workers (all departments), A 1, E 1, G 2. *See also* particular occupation.
 Ironers, A 3, J 24.

 Japan makers, A 3, J 12, 15, 51, 55, 90.
 Japanners, J 12, 15, 51, 55, 90.
 Jewelers, D, E 1, H, J 8, 13, 35, 47, 51, 54, 64, 80.
 Junk-metal refiners, A 1, E 1, J 17, 51.
 Jute workers, E 1, 2.

 Kiln tenders, A 1, J 24.
 Knitters, H.
 Knitting-mill workers, E 2.

 Labelers (paint cans), J 51.
 Laboratory workers (radium research), G 1.
 Lace makers, E 2.
 Lacquerers, J 3, 8, 9, 12, 15, 16, 25, 45, 51, 55, 75, 84, 90.
 Lacquer makers, J 3, 7, 8, 9, 12, 15, 16, 25, 28, 39, 45, 51, 55, 75, 84, 90.
 Lampblack makers, J 67, 68.
 Lapidaries, E 1.
 Lard makers, J 5.
 Lasters (shoes), A 3, C, E 2, J 55.
 Lathe turners, H.
 Laundry workers, A 2, 3, C, J 24, 27, 28, 66.
 Lead burners, J 13, 51.
 Lead-foil makers, A 1, J 51.
 Lead miners, J 51. *See also* Miners.
 Lead-pipe makers, J 51.
 Lead-salts makers, J 51.
 Lead smelters, A 1, E 1, J 11, 12, 24, 51, 78, 83.
 Leather workers, E 2, F 1, J 8, 47. *See also* Tannery workers.
 Leer tenders (glass), A 1.
 Letter sorters, D, H.
 Levermen (iron and steel), A 1.
 Lifters-over (glass), A 1.
 Lime burners, A 1, E 1, J 13, 22, 24.
 Lime-kiln chargers, E 1, J 22, 24.
 Lime pullers (tannery), C, F 1.
 Lime workers, E 1.
 Linen workers, E 2.
 Linoleum colorers, J 12.
 Linoleum makers, A 2, 3, C, E 1, J 5, 8, 15, 16, 31, 51, 53, 55, 80, 90.
 Linotypers, J 11, 24, 51.
 Linseed-oil boilers, J 5, 51.
 Lithographers, E 1, H, J 10, 12, 15, 18, 31, 47, 51, 54, 64, 65, 80, 84, 90.
 Lithopone makers, J 21.
 Lithotransfer workers, J 51.
 Locksmiths, H.
 Longshoremen, F 1.
 Lumbermen, A 3, F 2.
 Lutets (zinc smelting), A 1, J 17.

 Machinists, H.
 Mail sorters, D, H.
 Manganese-dioxide workers, J 53.
 Manganese grinders, J 53.
 Manganese-ore separators, J 53.

- Manganese-steel makers, J 53.
 Manometer makers, J 54.
 Marble cutters, E 1.
 Marblers (glass), A 1.
 Masons, C, E 1, H.
 Match-factory workers, C, E 1, 2, J 23, 81, 51, 53, 71, 74, 79.
 Mattress makers, E 2.
 Meat inspectors, F 1.
 Mechanics (gas engines), J 24.
 Melters (foundry; glass), A 1, G 2.
 Mercerizers, J 77, 80.
 Mercury-alloy makers, J 54.
 Mercury-boiler workers, J 54.
 Mercury bronzers, J 54.
 Mercury miners, J 54. *See also* Miners.
 Mercury-pump workers, J 54.
 Mercury-salt workers, J 54.
 Mercury smelters, A 1, J 24, 54, 78.
 Mercury-solder workers, J 54.
 Mercury-still cleaners, J 54.
 Mercury-switch makers, J 54.
 Mercury-vapor-lamp makers, J 54.
 Metal polishers and cleaners. *See* Polishers and cleaners (metal).
 Metal-polish makers, J 15, 25, 65.
 Metal refiners, J 47.
 Metal turners, E 1.
 Metal workers. *See* particular occupation.
 Methane (synthetic) makers, J 24.
 Methyl-alcohol workers, J 3, 24, 55.
 Methyl-bromide makers, J 56.
 Methyl-chloride makers, J 57.
 Methyl-compound makers, J 55.
 Mica strippers or splitters, E 1.
 Mica workers, E 1.
 Microscopists, H.
 Milkers, H.
 Millinery workers, J 10, 15, 16, 55, 67, 90.
 Miners, A 2, 3, C, D, E 1, F 2, H, J 22, 24, 79.
 Mirror silverers, A 3, C, J 1, 7, 16, 35, 44, 45, 51, 54, 76.
 Mixers (felt hats), E 2, J 54.
 Mixers (rubber), A 3, E 1, J 10, 11, 12, 15, 16, 31, 51.
 Mixing-room workers (miscellaneous), E 1, 2.
 Mold breakers (foundry), E 1.
 Mold breakers (pottery), J 24.
 Molders. *See* Bench molders; Floor molders.
 Monotypers, J 11, 24, 51.
 Mordanters, J 9, 11, 12, 15, 16, 27, 31, 35, 45, 64, 92. *See also* Dyers.
 Motion-picture-film workers, J 20, 24, 84. *See also* Pyroxylin-plastics workers.
 Motion-picture-machine operators, G 2.
 Motion-picture-studio workers and actors, G 2.
 Motormen, A 3.
 Mottlers (leather), J 8, 55.
 Muffle tenders, A 1.
 Muriatic-acid makers. *See* Hydrochloric-acid makers.
 Muriatic-acid mixers. *See* Acid mixers.
 Musical-instrument makers, J 51.
 Musicians, H.
 Neon lights letter makers, J 24.
 Nickel platers, C. *See also* Electroplaters.
 Nickel-purification workers (Mond process), J 59.
 Nitraniline workers, J 10.
 Nitrators, J 64, 80.
 Nitric-acid workers, J 7, 51, 64, 80.
 Nitrobenzine makers, J 16, 80.
 Nitrobenzol workers, J 61.
 Nitrocellulose workers, J 3, 8, 9, 13, 16, 38, 64, 80.
 Nitroglycerine makers, J 13, 51, 62, 64, 80.
 Nitrous-oxide workers, J 64.
 Nurses, G 1.
 Oilcloth makers. *See* Linoleum makers.
 Oil extractors, J 3, 23, 42, 84.
 Oil-flotation-plant workers, J 67, 78, 79.
 Oil purifiers, J 80.
 Oil refiners. *See* Petroleum refiners.
 Oil-well workers, J 67, 79.
 Open-hearth-department workers (iron and steel), A 1.
 Oxalic-acid makers, J 35, 65, 74.
 Oxyacetylene cutters. *See* Welders.
 Packing-house employees, A 2, 3, C.
 Painters, H, J 3, 8, 9, 10, 12, 15, 16, 23, 31, 51, 53, 54, 55, 90.
 Painters (luminous watch and instrument dials), G 1.
 Painters (tar), J 82.
 Paint makers, C, J 3, 8, 9, 10, 12, 15, 16, 23, 31, 47, 51, 53, 54, 55, 68, 82, 88, 90.
 Paint-remover makers, J 16, 68, 84.
 Paint removers, E 1, J 3, 8, 16, 51, 68, 84.
 Pair heaters (tin plate), A 1.
 Paper-box makers, H.
 Paper glazers, J 12.
 Paperhangers, E 1, J 12, 31, 51.
 Paper makers, A 2, 3, C, J 13, 23, 44, 47, 77, 78, 79, 80. *See also* particular occupation.
 Paraffin workers, J 3, 16, 23, 25, 67, 82.
 Paris-green workers, J 12.
 Patent-leather makers, A 3, J 8, 24, 51, 55, 80, 90.
 Pavers, A 1, H, J 82.
 Pencil makers, J 10, 12, 31, 75.
 Perfume makers, J 3, 8, 10, 20, 25, 34, 36, 45, 55, 61, 68, 80.
 Petroleum refiners, A 1, C, J 7, 15, 47, 51, 67, 77, 78, 79, 80, 82.
 Phenol makers, J 16, 68, 78, 80.
 Phenyl-hydrazine workers, J 69.
 Phosgene makers, J 24, 28, 70.
 Phosphate extractors, J 47.

- Phosphate-mill workers, A 3, C, E 1, J 71. *See also* Fertilizer makers.
- Phosphine workers, J 72.
- Phosphor-bronze workers, J 71.
- Phosphoric-acid makers, J 35, 64, 80.
- Phosphorus-compound makers, J 71, 79.
- Phosphorus-evaporating-machine operators, A 3, C, J 80.
- Phosphorus extractors, J 49, 71, 72.
- Phosphorus (red) makers, J 72.
- Phosphuretted-hydrogen workers, J 72.
- Photo-engravers, J 16, 31, 55, 64.
- Photographers, D, G 2. *See also* Photographic workers.
- Photographic workers, J 1, 3, 8, 10, 16, 18, 20, 28, 31, 35, 44, 47, 54, 55, 73, 76, 80.
- Photograph retouchers, J 51.
- Photogravure workers, J 81.
- Physicians, G 1.
- Picklers, A 2, C, J 13, 35, 47, 64, 80.
- Picric-acid makers, J 16, 64, 68, 73, 80.
- Pigment makers. *See* Color makers.
- Pipe fitters, J 51. *See also* particular liquid piped.
- Pitch workers, J 12, 82.
- Pit molders (foundry), A 1, E 1.
- Planer men (stone; metal), E 1.
- Plasterers, C, E 1.
- Plaster-of-paris workers, E 1.
- Platers. *See* Electroplaters.
- Platinum extractors, J 18.
- Plumbers, J 13, 24, 51. *See also* particular substance piped.
- Pneumatic-tool workers, E 1, H.
- Polishers and cleaners (metal), D, E 1, 2, H, J 15, 35, 47, 51, 65.
- Polishers (furniture). *See* Furniture polishers.
- Polish makers, E 1, J 8, 15, 55, 90.
- Porcelain makers. *See* Pottery workers.
- Porters, H.
- Pot fillers (glass), A 1.
- Pot lifters (iron and steel), A 1.
- Pot pullers (foundry), A 1.
- Pot-room workers (aluminum foundry; carbide plant), A 1.
- Pot setters, A 1.
- Pottery workers, A 1, 2, C, E 1, J 12, 22, 24, 47, 51, 53, 54, 78. *See also* particular occupation.
- Pouncers (felt hats), E 1, 2.
- Pourers (brass foundry). *See* Brass foundry.
- Powder (smokeless) makers. *See* Smokeless-powder makers.
- Preparers (tannery), C, F 1, 3.
- Preservative makers and handlers, J 44.
- Pressers, H, J 24.
- Pressmen (oil refining), C.
- Pressmen (printers), E 1.
- Pressroom workers (rubber), A 3, J 10, 11, 12, 15, 16.
- Primers (explosives), J 54.
- Printers, E 1, J 10, 11, 12, 15, 51, 90.
- Puddlers (iron and steel), A 1, J 24.
- Pullers-out (felt hats), A 2.
- Pulp-mill workers. *See* Paper makers.
- Putty makers, E 1, J 15, 23, 51.
- Putty polishers (glass), E 1, J 51.
- Pyridine workers, J 75.
- Pyrites burners, A 1, E 1, J 12, 78, 79.
- Pyroxylin-plastics workers, E 2, J 1, 3, 5, 8, 15, 16, 20, 24, 35, 51, 55, 64, 79, 80.
- Quarrymen, E 1, F 2.
- Radioactive-paint makers, G 1.
- Radioactive-water makers, G 1.
- Radiologists, G 1.
- Radium ore reduction workers, G 1.
- Radium-research workers, G 1.
- Rag workers, E 2, F 3.
- Rayon makers, A 2, C, J 7, 8, 13, 23, 35, 44, 47, 55, 79, 80, 84.
- Reclaimers (rubber), E 2, J 10, 16, 23, 47, 51, 68, 80.
- Red-lead workers, J 51.
- Refiners (metals), A 1, J 12, 13, 24, 51, 54, 64, 78, 80. *See also* particular occupation.
- Refiners (sugar). *See* Sugar refiners.
- Refrigerating-plant workers, A 3, C, J 7.
- Refrigerator (mechanical) makers and repairmen, J 5, 40, 56, 57, 78.
- Repairers (foundries), J 24.
- Resin (synthetic) makers, J 1, 34, 44, 68.
- Riveters, H, J 51.
- Road repairers, A 1.
- Roentgenologists, G 1.
- Roller coverers (cotton mills), A 2, E 2.
- Rollers (metals), A 1.
- Roll setters (iron and steel), A 1.
- Roll wrenchers (iron and steel), A 1.
- Roofers, A 3, J 51, 82.
- Roofing-material workers, A 1, 2.
- Roofing-paper workers, J 82.
- Ropemakers, E 2.
- Roughers (iron and steel), A 1.
- Rubber-cement makers. *See* Cement mixers (rubber).
- Rubber-glove makers, J 15, 16.
- Rubber (red) workers, J 11.
- Rubber-substitute makers, J 1, 9, 28, 34, 81.
- Rubber-tire builders, J 15, 16.
- Rubber workers, A 3, E 1, 2, J 3, 8, 10, 11, 12, 15, 16, 23, 25, 31, 44, 45, 51, 55, 78, 79, 81, 84, 90. *See also* particular occupation.
- Sagger makers, C, E 1, J 51.
- Sailors, A 3, H.
- Salt extractors (coke oven by-products), J 7, 80.
- Salt preparers, A 2, 3, E 1.
- Sand blasters, E 1.
- Sand cutters, E 1.
- Sanders, E 1.

- Banding-machine operators, E 1.
 Sandpaperers (enameling and painting auto bodies, etc.), E 1, J 51.
 Sandpaper makers, E 1.
 Sand pulverizers, E 1.
 Saw filers, E 1.
 Sawmill workers, E 2, F 2.
 Sawyers, H.
 Scissors sharpeners, E 1, H.
 Scourers (metals), J 64, 80.
 Scourers, wood lasts (shoes), E 2.
 Scouring-powder makers, E 1.
 Scrapers (foundry), E 1.
 Screen tenders (pulp mill), C.
 Screen workers (lead and zinc smelting), E 1, J 51.
 Sealers (incandescent lamps), J 24.
 Sealing-wax makers, J 12, 90.
 Seamstresses, H.
 Sewer workers, C, J 7, 22, 24, 79.
 Sewing-machine operators, H.
 Shade-cloth makers, J 15, 16.
 Shale-oil workers. *See* Petroleum refiners.
 Shavers (felt hats; fur; tannery), C, E 2, F 1, 3.
 Shaving-brush makers, E 2, F 1.
 Sheep-dip makers, J 12.
 Sheet-metal workers, J 51.
 Shellackers, J 8, 15, 16, 20, 51, 55, 90.
 Shellac makers, J 7, 8, 15, 16, 20, 51, 55, 90.
 Shell fillers, J 62, 73.
 Shepherdas, F 1.
 Shoddy workers, E 2, F 3, J 13, 28, 47, 80.
 Shoe dyers, J 61.
 Shoe-factory operatives, E 2, J 8, 15, 16, 55. *See also* particular occupation.
 Shoe finishers, A 3, J 7, 8, 9, 15, 16, 55.
 Shoe makers. *See* Cobblers.
 Shot makers, J 11, 12, 51.
 Shove-in boys (glass), A 1.
 Sifters, E 1, 2.
 Silicate extractors, J 49.
 Silk workers, E 2, F 3.
 Silo workers, J 22.
 Silverers (mirrors). *See* Mirror silverers.
 Silver-foil makers, J 76.
 Silver melters and refiners, A 3, J 24, 35, 44, 76.
 Silver-nitrate makers, J 76.
 Silver platers, J 76.
 Silversmiths, J 76.
 Singers (cloth), J 24.
 Sintering-plant workers, E 1.
 Sizars (felt hats), A 2, J 54.
 Skimmers (glass), A 1, G 2.
 Slag-machine tenders (iron and steel), A 1, E 1.
 Slate workers, E 1.
 Slip makers (pottery), C, E 1, J 51.
 Slushers (porcelain enameling), J 51.
 Smelters. *See* particular metal.
 Smokeless-powder makers, J 8, 8, 9, 16, 23, 61, 64, 68, 73.
 Smoothers (glass), C, E 1.
 Soap (abrasive) workers, E 1.
 Soap makers, A 3, C, F 3, J 5, 16, 44, 45, 47, 53, 55, 61, 74, 77, 79, 80.
 Soda makers, C, J 7, 13, 22, 24, 28, 64, 79, 80.
 Sodium-hydroxide makers, C, J 77.
 Sodium-sulphide makers, J 79.
 Softeners (tannery), E 2.
 Solderers, J 13, 21, 24, 35, 47, 51.
 Solder makers, J 21, 51.
 Sois stitchers (Blake machine), J 54.
 Soot packers, J 12.
 Spinners (asbestos), E 1.
 Spinners (textiles), E 2, H.
 Spongers, A 2, C.
 Sprayers (trees), J 12, 35, 51.
 Spreaders (rubber), A 8, J 15, 16.
 Stablemen, F 1, J 7.
 Stainers (shoes), J 51.
 Stamp-mill workers, A 2, C, E 1.
 Starch makers, E 2, J 22, 79.
 Starters (felt hats), A 2, J 54.
 Statuary workers, E 1.
 Steam fitters. *See* Pipe fitters.
 Stearic-acid makers, A 3, J 5.
 Steel (chrome) workers, J 31.
 Steel engravers, D, J 51, 54. *See also* Engravers.
 Steeple jacks, J 24.
 Stereotypers, A 3, J 11, 51.
 Stiffeners (felt hats), J 54, 55.
 Still (coal tar) cleaners, A 1, J 16, 82.
 Stillmen (carbolic acid), A 1, J 68.
 Stillmen, A 1. *See also* particular chemical.
 Stitchers (shoes), J 55.
 Stokers, A 1, E 1, G 2, J 24.
 Stonecutters (dry), E 1, H.
 Stonecutters (wet process), C, E 1, H.
 Stonemasons, E 1.
 Storage-battery chargers, J 73, 80.
 Storage-battery makers, J 11, 13, 21, 51, 54, 73, 80.
 Straw-hat makers, A 3, E 2, J 44.
 Street repairers, A 1.
 Submarine workers, J 13, 22, 23.
 Sugar refiners, A 2, 3, C, E 1, 2, J 7, 22, 47, 73, 79, 80.
 Sulphates makers, J 80.
 Sulphides makers, J 79.
 Sulphite cooks (pulp mills), A 2, 3, J 73.
 Sulphur burners, A 1, E 1, J 12, 73.
 Sulphur-chloride makers, J 23, 47, 79.
 Sulphurers (malt and hops), J 73.
 Sulphur extractors, J 23.
 Sulphuric-acid workers, J 12, 13, 51, 64, 73, 79, 80.
 Sulphur miners, J 79.
 Sulphur-monochloride workers, J 51.
 Sumackers (tannery), C, F 1.
 Surgical-dressing makers, J 63.

- Table hands (tannery), C, F 1.
 Table operators (iron and steel), A 1.
 Table turners (enameling), A 3, E 1, J 51.
 Tailors, H.
 Takers-down (glass), A 1.
 Talc workers, E 1.
 Tallow refiners, F 3, J 5, 23, 80.
 Tankmen, A 2, C.
 Tannery workers, C, F 1, 3, J 7, 8, 10, 12, 15, 22, 27, 31, 35, 44, 45, 47, 51, 54, 65, 77, 78, 79, 80.
 Tapers (airplanes), J 84.
 Tappers (smelting), A 1. *See also* particular metal.
 Tar-distillery workers, J 34, 82.
 Taxidermists, E 2, F 1, J 12, 54.
 Tear-gas makers, J 18, 28, 73.
 Teazers (glass), A 1, J 24.
 Telegraphers, H.
 Telephone linemen (trench work), C, J 24.
 Temperers, A 1, 2, J 24, 35, 51, 67, 80.
 Tetraethyl-lead makers, J 18, 51, 85.
 Textile-comb makers, E 1.
 Textile printers. *See* Calico printers.
 Textile workers, A 2, 3, C, E 2. *See also* particular occupation.
 Thallium workers, J 86.
 Thermometer makers, J 54, 86.
 Thread glazers, A 2, 3.
 Tile makers, A 2, 3, C, E 1, J 51.
 Tin-foil makers, A 1, J 51.
 Tinner, A 1, C, J 5, 7, 12, 13, 47, 51.
 Tin-plate-mill workers. *See* Iron and steel workers.
 Tire builders. *See* Rubber-tire builders.
 Tobacco moisteners, C, J 22.
 Tobacco rollers, E 2.
 Tobacco workers, E 2.
 Tongsmen (iron and steel), A 1.
 Toolmakers, E 1.
 Topfillers (foundry), A 1, E 1, J 24.
 Towermen (sulphuric acid), J 13, 64, 78, 80.
 Toy makers, J 8, 12, 51.
 Train dispatchers, D.
 Transfer workers (pottery), J 51, 90.
 Transparent-wrapping-material workers, A 3, J 3, 23, 47, 77, 79, 80.
 Transporters of hides and wool, F 1.
 Tree sprayers. *See* Sprayers (trees).
 Trench diggers, F 2.
 Trinitrotoluol makers, J 16, 61.
 Tube makers (glass), A 1.
 Tubulators (incandescent lamps), J 24.
 Tumbling-barrel workers, E 1.
 Tunnel workers, B, D, F 2, J 22, 79.
 Turners-out (glass), A 1.
 Turpentine extractors, A 2, J 90.
 Type cleaners, J 15, 55.
 Type foundry, J 11, 51.
 Type melters, J 3, 51.
 Typesetters, J 51.
 Typists, H.
 Ultramarine-blue makers, J 78.
 Upholsterers, E 2, J 55.
 Vanadium-steel workers, J 92.
 Vapor curers. *See* Vulcanizers.
 Varnishers, J 1, 3, 8, 9, 10, 15, 16, 20, 45, 51, 53, 55, 84, 90.
 Varnish makers, A 3, J 1, 3, 5, 7, 8, 9, 10, 15, 16, 20, 45, 51, 53, 55, 84, 90.
 Vatmen, A 2, C, J 22.
 Vault workers, J 22.
 Velvet makers, A 2, J 12.
 Veterinarians, F 1, 3.
 Vignettiers, J 47.
 Vinegar workers, J 1, 22.
 Vintners, J 22.
 Vinyl chloride makers, J 93.
 Vulcanizers, A 3, J 10, 11, 15, 16, 22, 23, 25, 31, 55, 78, 79, 81.
 Vulcanizers (steam), A 2, C.
 Wall-paper printers, A 2, 3, J 12, 31, 51.
 Warming-house employees (guncotton), A 3.
 Washers, C.
 Washwomen, C, H.
 Watch-dial (luminous) painters, G 1.
 Watchmakers, D, H.
 Water gilders, J 54.
 Waterproofers (paper and textile), J 15, 16, 31, 44.
 Wax-ornament makers, J 12, 31.
 Wax refiners, J 80.
 Weavers, E 2, H.
 Weighers, E 1, 2.
 Welders, A 1, G 2, J 16, 17, 21, 24, 51, 54.
 Well workers, J 22.
 White-lead workers, J 22, 51.
 Window-shade makers, J 15, 16.
 Wire drawers, J 12, 47, 80.
 Wirers (incandescent lamps), J 8.
 Wood-alcohol distillers, J 3, 24, 55.
 Wood-last scourers (shoes), E 2.
 Wood preservers, J 12, 54, 68, 82.
 Wood polishers. *See* Furniture polishers.
 Wood stainers, J 31, 51.
 Woodworkers, E 2, J 15, 55.
 Wool carders, E 2, F 1.
 Wool scourers, A 3, C, F 1.
 Wool spinners, E 2, F 1.
 Wool workers, E 2, F 1. *See also* particular occupation.
 Wringers (guncotton), J 64.
 X-ray photographers, G 1.
 X-ray technicians, G 1.
 Yeast makers, J 1, 22, 80.
 Zincers, J 35.
 Zinc-chloride makers, J 13, 28, 47.
 Zinc-electrode makers, J 54.
 Zinc miners, J 12, 51, 53. *See also* Miners.
 Zinc smelters and refiners, A 1, E 1, J 11, 12, 17, 21, 24, 51, 78.

Section II.—List of Hazards, Symptoms, Occupations Exposed. and Methods of Prevention

A. Abnormalities of Temperature and Humidity

Exposure to environmental temperature beyond the action of the body's thermostatic control primarily results in disturbances of the circulatory system. The cutaneous circulation responds to heat stimulation in the skin by increasing the blood flow through the capillaries. The capillaries, responding to a reflex action of the nerves in the skin, dilate and induce the flow of a greater volume of blood through the cutaneous circulation. Cold, on the other hand, constricts the blood vessels of the skin, causing a diminished blood supply through the cutaneous circulation and not infrequently a serious congestion of the internal organs. Abrupt changes of temperatures, particularly from extreme heat to cooler temperatures and often to cold currents of air or drafts, are of more frequent occurrence, resulting in much bodily discomfort, and are contributory causes of neuralgia and respiratory diseases. Extremes of temperature may produce acute symptoms in the body directly attributable to the temperature. Thus, exposure to excessively high temperatures results in heat exhaustion or heat stroke; to excessively low temperatures in frostbite or gangrene and death.

The relative humidity is an important factor to consider in connection with temperature. It is contended that a low relative humidity tends to dry up the mucous membranes of the nose, throat, and lungs, thus lowering the resistance of these organs to infection. An excessively high relative humidity, on the other hand, is undesirable because of its interference with the normal evaporation of moisture from the skin. Under extreme conditions of high temperatures and high relative humidities there occurs a marked increase in the pulse rate, systolic blood pressure, and in the body temperature. Low temperatures and high relative humidities have the effect of undermining the general vitality of the organism, weakening its resistance to diseases of the respiratory passages, and to neuralgia and rheumatic affections. With the above data in mind, abnormalities of temperature have been classified under three headings, namely, "sudden variations of temperature", "extreme dry heat", and "heat and humidity." "Extreme cold" has not been listed as a distinct hazard, because temperature so low as to cause the direct effects mentioned above is rarely met in industry. It is evident that the occupations listed in the divisions "extreme dry heat", and "heat and humidity," are exposed not only to the danger of the direct action of the high temperatures but also to the hazard, "sudden variations of temperature."

The prevention of diseases due to exposure to extremes of temperature consists, obviously, in the avoidance of sudden variations of

temperature. Workers in cold processes should keep active and avoid chill. The hot-process worker should allow his body to cool off gradually after completion of the day's work. He should carefully regulate his diet, drinking plenty of water. As direct preventive measures for the effects of extreme heat, it is advisable to make use of shields, helmets, goggles, water-cooled furnace doors, exhaust systems, cold air, fans, etc.

Our knowledge of the responses of the body to atmospheric conditions has been greatly enhanced recently by studies of American and foreign investigators. Men undergoing exposure to varying degrees of temperature, humidity, and movement of air have been medically examined. It has been amply demonstrated that these variable factors must be jointly considered in determining whether working conditions are inimical to health. Zones of comfort and discomfort and of effective working conditions have been charted. Means to mitigate the hazards of high temperature and humidity in certain industries have been devised. Those who have need for technical data on these subjects will find much of value in the paper by Dr. R. R. Sayers and Sara Davenport, entitled "Review of Literature on the Physiological Effects of Abnormal Temperatures and Humidity", in the United States Public Health Service Reports, April 8, 1927, page 933, and in reports of cooperative studies conducted by the United States Public Health Service, United States Bureau of Mines, and the Research Laboratory of the American Society of Heating and Ventilating Engineers.

A. Abnormalities of Temperature and Humidity

1. Extreme Dry Heat

Symptom, condition, or disease to look for

Heat stroke preceded by a rise in body temperature, increase in pulse rate, flushing of skin, profuse sweating, fall of diastolic pressure with rise in systolic blood pressure.

Anemia, general debility, catarrh, stiff joints, cramps, lumbago, Bright's disease.

Skin eruptions.

Cataracts, retinitis, conjunctivitis.

Occupations which offer such exposure

Ammonium salts makers	Blooming-mill workers (iron and steel)	Chargers (smelting)
Annealers	Blowers-out (zinc smelting)	Chargers (zinc smelting)
Antimony extractors (refiners)	Bluers (revolvers)	Coke-oven workers
Arsenic roasters	Boiler-room workers	Color makers
Asbestos roofing makers	Brass foundry	Copper smelters
Asphalt workers	Brasiers	Core makers
Bar-mill workers (iron and steel)	Brick burners	Corn-products workers
Benzol-still men	Brick makers	Cranemen (glass indus- try)
Bessemer converter workers (iron and steel)	Burners (enameling)	Cranemen (iron and steel)
Beta-still operators (beta naphthol)	Cappers (window glass)	Crucible-steel-department employees
Billet-mill workers (iron and steel)	Carbide makers	Cupola men (foundries)
Bisque-kiln workers	Carbon-black workers	Cyanamid makers
Blacksmiths	Carborundum makers	Dressers (glass)
Blast-furnace workers	Case hardeners	Drop forgers
	Casters (iron and steel)	Enamelers
	Catchers (iron and steel)	Engineers (stationary)
	Cement workers	Firemen (city)

Firemen (stationary)	Mercury smelters	Roofing-material work- ers
Flatteners (glass)	Muffle tenders	Roughers (iron and steel)
Floor molders (foundry)	Open-hearth-department workers (iron and steel)	Shove-in boys (glass)
Forgemen	Pair heaters (tin plate)	Skimmers (glass)
Foundry workers	Pavers	Slag-machine tenders (iron and steel)
Furnace workers	Petroleum refiners	Still (coal tar) cleaners
Gatherers (glass)	Pit molders (foundry)	Still men (carbolic acid)
Glass blowers	Pot fillers (glass)	Still men, operating
Glass-furnace workers	Pot lifters (iron and steel)	Stokers
Graphite workers	Pot pullers (foundry)	Street repairers
Hardeners (metals)	Pot-room workers (alu- minum foundry; car- bide plant)	Sulphur burners
Hot-rod rollers (iron and steel)	Pot setters	Table operators (iron and steel)
Iron and steel workers (all departments)	Pottery workers	Takers-down (glass)
Junk (metal) refiners	Pourers (foundry)	Tappers (smelting)
Kiln tenders	Puddlers (iron and steel)	Teazers (glass)
Lead-foil makers	Pyrites burners	Temperers
Lead smelters	Refiners (metals)	Tin-foil makers
Leer tenders (glass)	Road repairers	Tinners
Levermen (iron and steel)	Rollers (metals)	Tongsmen (iron and steel)
Lifters-over (glass)	Roll setters (iron and steel)	Top fillers (foundry)
Lime burners	Roll wrenchers (iron and steel)	Tube makers (glass)
Luters (zinc smelting)		Turners-out (glass)
Marblers (glass)		Welders
Melters (foundry; glass)		Zinc smelters

2. Heat and Humidity

Symptom, condition, or disease to look for

Heat stroke preceded by a rise in body temperature, increase in pulse rate, flushing of skin, profuse sweating, fall of diastolic pressure with rise in systolic blood pressure.

Anemia, general debility, catarrh, stiff joints, cramps, lumbago, Bright's disease.

Skin eruptions.

Occupations which offer such exposure

Artificial-leather workers	Dye makers	Sizers (felt hats)
Artificial-silk workers	Felt extractors	Spongers
Bleachers	Felt-hat makers	Stamp-mill workers
Bleachery driers	Felt makers	Starters (felt hats)
Blockers (felt hats)	Flax spinners	Sugar refiners
Brewers	Galvanizers	Sulphite cooks (pulp mill)
Calico printers	Laundry workers	Tank men
Candy makers	Linoileum makers	Temperers
Canners	Miners	Textile workers
Charcoal workers (sugar refinery)	Packing-house employees	Thread glazers
Cloth preparers	Paper makers	Tile makers
Corn-products workers	Picklers	Turpentine extractors
Cotton-mill workers	Pottery workers	Vatmen
Cottonseed-oil workers	Pullers-out (felt hats)	Velvet makers
Digester house workers (paper and pulp)	Pulp-mill workers	Vulcanizers (steam)
Doffers (textile)	Roller coverers (cotton mill)	Wall-paper printers
Dresser tenders (textile)	Roofing-material workers	
	Salt preparers	

3. Sudden Variations of Temperature

Symptom, condition, or disease to look for

Congestion of internal organs, catarrh, neuralgic and rheumatic affections, gastro-intestinal and vesical catarrh, pneumonia, Bright's disease.

Occupations which offer such exposure

Artificial-ice makers	Felt-hat makers	Roofers
Bakers	Firemen (city)	Rubber workers
Bleachers	Firemen (stationary)	Sailors
Brewers	Fishermen	Salt preparers
Butchers	Flangers (felt hats)	Shoe finishers
Caisson workers	Gas (illuminating) workers	Silver melters
Calenderers (rubber)	Glost-kiln workers	Soap makers
Calico printers	Glue workers	Spreaders (rubber works)
Candy makers	Gypsum workers	Stearic-acid makers
Canners	Hothouse workers	Stereotypers
Cartridge shot shell paraffin dippers	Ice-cream makers	Straw-hat makers
Charcoal workers (sugar refining)	Ironers	Sugar refiners
Clay and bisque makers (pottery)	Japan makers	Sulphite cooks (pulp mill)
Cooks	Lasters (shoes)	Table turners (enameling)
Corn-products workers	Laundry workers	Textile workers
Digester-house workers (paper and pulp)	Linoleum makers	Thread glazers
Dresser tenders (textile)	Lumbermen	Tile makers
Driers (felt hats)	Miners	Transparent-wrapping-material coaters and driers
Drivers	Mirror silverers	Varnish makers
Dry cleaners	Mixers (rubber)	Vulcanizers
Drying-room workers (miscellaneous)	Motormen	Wall-paper printers
Dye makers	Packing-house employees	Warming-house employees (guncotton)
Dyers	Paper makers	Wool scourers
Electrotypers	Patent-leather makers	See also Occupations exposed to extreme dry heat.
Engineers (stationary)	Phosphate-mill workers	
Extractor operators (soap)	Phosphorus evaporating machine operators	
Fat renderers	Pressroom workers (rubber)	
	Refrigerating-plant workers	

B. Compressed Air

In building tunnels, laying deep foundations for large buildings, etc., it is necessary for the work to be carried on under increased air pressure in order to prevent the entrance of water into the excavations. The laborer is lowered gradually and, at short intervals, the pressure of the air in the compartment is increased. The first sensation of compression is felt on the eardrums, which may be relieved by the act of swallowing. If the air is too quickly compressed hemorrhage may occur. The greater part of the danger of working in compressed air lies in hasty decompression. While under compression the blood and tissue juices dissolve an increased amount of air, the gases of which are released when the pressure is suddenly decreased. The bubbles of nitrogen thus formed cut off the blood supply from various parts of the body by blocking up the capillaries. The symptoms of compressed-air illness, the so-called "bends", are the result.

Workers in compressed air must follow strictly the rules governing gradual compression and decompression. State regulations regarding work in compressed air cover limits of pressure, hours of labor under varying pressures, time of compression and of decompression, physical requirements, and other safety measures; see, for example, Industrial Code: Rules Relating to Work in Compressed Air, Bulletin No. 22, of the New York State Department of Labor, 1922, and the amendment to these rules reported in Special Bulletin No. 135 of the New York State Department of Labor, 1925, page 24.

B. Compressed Air

Symptom, condition, or disease to look for

Weakness, vertigo, pains in the back and legs, paralysis of legs and arms, painful constriction of the chest, cerebral hemorrhage and aphasia, coma, subcutaneous hemorrhages, impairment of hearing.

Occupations which offer such exposure

Caisson workers

Divers

Tunnel workers

C. Dampness

Most processes in which dampness is a hazard are associated with high or low temperature and high relative humidity, and have been dealt with under "abnormalities of temperature." There remains, however, to be considered, exposure to wet conditions where temperature and humidity are apparently not abnormal. Such conditions are brought together under the heading "dampness." Tank and vat men, washers and flushers, for example, are required to carry on their duties constantly in wet clothes. Drivers and other outdoor workers are also subject to frequent wetting from exposure to the weather.

Exposure to dampness generally has been considered to be a contributing factor in diseases of the respiratory system, neuralgic and rheumatic affections. Possibly dampness, like sudden variations in temperature, taxes the heat-regulating mechanism of the body.

When dampness is a feature of any industrial process, work places should be supplied with drain channels to prevent the accumulation of water, or use should be made of duck boarding. Adequate waterproof clothes should be supplied, such as rubber boots, rubberized aprons, etc.

C. Dampness

Symptom, condition, or disease to look for

Diseases of the respiratory passages, neuralgic and rheumatic affections.

Occupations which offer such exposure

Acid dippers	Clay-plug makers (pottery)	Glass finishers
Alkali-salt makers	Cloth preparers	Glaze dippers (pottery)
Artificial-ice makers	Concentrating-mill workers (lead and zinc)	Glove makers (leather preparers)
Artificial-silk makers	Cotton-mill workers	Glue workers
Auto painters	Creosoting-plant workers	Grinders (metals)
Baters (tannery)	Doffers (textile)	Guncotton washers
Beamhouse workers (tannery)	Dresser tenders (textile)	Hair workers
Beatermen (paper and pulp)	Drivers	Ice-cream makers
Boiler washers	Electroplaters	Lasters (shoes)
Brewers	Enamelers	Laundry workers
Brickmakers	Explosives workers	Lime pullers (tannery)
Cable splicers	Extractor operators (soap)	Linoleum makers
Caisson workers	Fertilizer makers	Masons
Canners	Filter-press workers	Match-factory workers
Cartridge-cup washers	Firemen (city)	Miners
Cartridge felt and wad makers	Fishermen	Mirror silverers
Cartridge shot shell paraffin dippers	Flush tenders (aluminum)	Nickel platers
Clay and bisque makers (pottery)	Galvanizers	Packing-house employees
	Glass cutters	Paint makers
		Paper makers
		Petroleum refiners
		Phosphate-mill workers

Phosphorus evaporating machine operators	Shavers (felt hats; fur; tannery)	Tablehands (tannery)
Picklers	Slip makers (pottery)	Tank men
Plasterers	Smoothers (glass)	Tannery workers
Pottery workers	Soap makers	Telephone linemen (trench work)
Preparers (tannery)	Soda makers	Textile workers
Pressmen (oil refining)	Sodium hydroxide makers	Tile makers
Pulp-mill employees	Spongers	Tinners
Refrigerating - plant workers	Stamp-mill workers	Tobacco moisteners
Sagger makers	Stonecutters (wet process)	Vatmen
Screen tenders (pulp mill)	Sugar refiners	Vulcanizers (steam)
Sewer workers	Sumackers (tannery)	Washers
		Wool scourers

D. Defective Illumination

Defective illumination, characterized by insufficient quantity of light, glare, unsuitability of color, and improper diffusion and distribution of light, is the cause of eye fatigue, headache, dizziness, and errors of refraction. Miners' nystagmus, a condition in which the eyeball acquires a peculiar oscillatory movement, is an outstanding example of the effects of insufficient illumination. This disease is very common among British miners, but apparently is not found to any extent among American miners. The explanation for the favorable situation of the American miner probably lies in the better illumination of the American mines. Not only is defective illumination the cause of these serious impairments of vision but it is an important factor in reduced working efficiency in industry generally, and it is a very frequent cause of industrial accidents.

The hazard of defective illumination is not limited to any single industry or group of industries. It may be present in any plant. Men engaged in occupations requiring close, fine work, such as jewelers, engravers, clerks, and mail sorters, are especially liable to suffer from exposure to this hazard.

It is a comparatively simple matter to provide for all the requirements for properly illuminating workplaces in some industries, while in others the advice of illuminating engineers is required. The American Standard Code of Lighting for Factories, Mills, and Other Work Places, prepared by the Illuminating Engineering Society of New York City, is an excellent reference work for those who have need of a knowledge of the technical requirements of the work.

D. Defective Illumination

Symptom, condition, or disease to look for

Nystagmus, eyestrain, deficient vision due to astigmatism or hyperopia, headache, giddiness. Eyestrain contributes to neurasthenia.

Occupations which offer such exposure

Virtually all occupations. The following and similar occupations are especially subject to this hazard:

Buffers	Embroidery workers	Steel engravers
Burnishers (iron and steel)	Jewelers	Train dispatchers
Caisson workers	Mail sorters	Tunnel workers
Clerks	Metal polishers	Watchmakers
Compositors	Miners	
	Photographers	

E. Dust

Dusts have been divided into two kinds—organic and inorganic. Organic dusts do not cause pulmonary lesions, while inorganic dusts produce fibrosis of the lung tissue, the extent of which depends upon the kind of dust, the size of the dust particles, the concentration of dust, and the length of exposure to the particular dust inhaled. Dr. H. R. M. Landis found that, when fibrosis was present in the lungs of men exposed to organic dust, the latter was always mixed with some form of inorganic dust. Workers exposed to organic dust for years showed no pulmonary changes other than those found in people living in the city. Dust, whether organic or inorganic, by acting as a carrier of bacilli, may increase their number in the lungs. In this way men exposed to dust may be in greater danger of contracting tuberculosis than others.

Whether or not all inorganic dusts, per se, are capable of producing lung fibrosis, given a sufficient length of exposure and a high enough concentration of dust, is still an open question. Many inorganic dusts found in industry have been inhaled for long periods without noticeable injury. Dusts containing free silica, however, are definitely known to be extremely harmful, producing serious pulmonary damage in a comparatively short time. The pathological condition resulting from exposure to silica dust is properly referred to as silicosis. X-ray pictures of the silicotic lung show a characteristic mottling due to the formation of fibrotic nodules where silica has lodged in the lymphatic system. Symptoms of the disease may not show until it is well advanced, when there is a decreased lung expansion, marked shortness of breath, and cough. The silicotic lung is a fertile field for the tubercle bacillus; a very large percentage of cases of silicosis terminate in a fatal tuberculosis. The action of silica on the lungs is to promote the growth of connective tissue.

Asbestos dust is another dust which, it has recently been definitely determined, produces a lung fibrosis under existing industrial conditions, although its action is apparently milder than that of free silica. The relation of tuberculosis and asbestos dust is not entirely clear.

Complete protection for workmen exposed to silica dust has been found difficult in many processes. X-ray pictures, therefore, should be taken at regular intervals of all workmen exposed. It is of the utmost importance that these pictures be interpreted by a physician familiar with the appearance of the lungs at various stages in the development of silicosis. Workmen who are found to be affected should be transferred to other jobs, where they will not be exposed to dust.

There are four methods that may be used to keep down the amount of dust generated through industrial processes. No one of these can apply to all conditions, but the particular method to be used must be adapted to the peculiarities of the process.

1. The use of water or oil to wet the dust, thus preventing it from rising and filling the atmosphere. This method is now believed to be of doubtful value in some processes, and in these should not be relied upon when other methods are practicable.

2. The use of exhaust systems which remove the dust at the point of origin.

3. The use of enclosed chambers in which the dust-producing processes are confined, the processes being regulated by the operator from the outside.

4. The use of helmets covering the head and neck, preferably those which permit supplying air through a pipe from a nondusty area.

E. Dust

1. Inorganic Dust

Symptom, condition, or disease to look for

Cough, dyspnea, pleuritic pains, hemoptysis, deficient expansion, dullness, diminished resonance, mucous râles, fibrosis, inflammatory condition of eyes, ears, nose, and throat, colds, chronic catarrh of respiratory tract, chronic catarrh of digestive tract, pleurisy, tuberculosis.

Occupations which offer such exposure

Abrasives workers	Construction laborers	Lithographers
Acetylene makers	Core makers	Marble cutters
Asbestos workers	Cotton-mill openers	Masons
Basic slag (artificial manure) workers	Crucible mixers	Match-factory workers
Battery (dry) makers	Crushermen (clay and stone)	Metal turners
Bed rubbers (marble and stone)	Cut-glass workers	Mica strippers or splitters
Bench molders (foundry)	Cutlery makers	Mica workers
Bevelers	Cyanamid makers	Miners
Bisque-kiln workers	Diamond cutters	Mixers (rubber)
Blasters	Diatomaceous - earth workers	Mixing-room workers (miscellaneous)
Bone workers	Drillers (rock)	Mold breakers (foundry)
Bricklayers	Electrotypers	Paint removers
Brickmakers	Emery-wheel makers	Paper hangers
Bronzers	Engineers (stationary)	Phosphate-mill workers
Buffers	Engravers	Pit molders (foundry)
Burrers (needles)	Fertilizer makers	Planer men (stone; metal)
Burr filers	File cutters	Plasterers
Button makers	Fillers	Plaster of paris workers
Calenderers (rubber)	Firemen (stationary)	Pneumatic-tool workers
Carbide makers	Flint workers	Polishers
Carbon-black workers	Floor molders (foundry)	Polish makers
Carbon-brush makers	Flue cleaners	Pottery workers
Carborundum workers	Foundry workers	Pouncers (felt hats)
Card grinders (textiles)	Glass blowers	Pressmen (printers)
Casting cleaners (foundry)	Glass cutters	Printers
Cement workers	Glass finishers	Putty makers
Charcoal workers (sugar refining)	Glass mixers	Putty polishers (glass)
Chargers (smelting)	Glass mixers (pottery)	Pyrites burners
Charges (zinc smelting)	Gold beaters	Quarrymen
Chasers (steel)	Gold refiners	Rubber workers
Chimney sweepers	Graphite workers	Sagger makers
Chippers	Grinders (metals)	Salt preparers
Clay and bisque makers (pottery)	Gypsum workers	Sand blasters
Clay-ping makers (pottery)	Horn workers	Sand cutters
Coal passers	House wreckers	Sanders
Color makers	Iron and steel mill workers	Sanding-machine operators
Compositors	Jewelers	Sandpaperers (enameling and painting auto bodies, etc.)
Compounders (rubber)	Junk (metal) refiners	Sandpaper makers
Concentrating-mill workers (lead and zinc)	Jute workers	Sand pulverizers
	Lapidaries	Saw filers
	Lead smelters	Scissors sharpeners
	Lime burners	Scouring-powder makers
	Lime-kiln chargers	
	Lime workers	
	Linoleum makers	

Scrapers (foundry)	Soap (abrasive) workers	Sulphur burners
Screen workers (lead and zinc smelting)	Spinners (asbestos)	Table turners (enameling)
Sifters	Stamp-mill workers	Talc workers
Sintering-plant workers	Statuary workers	Textile comb makers
Slag workers	Stokers	Tile makers
Slate workers	Stonecutters (dry)	Toolmakers
Slip makers (pottery)	Stonecutters (wet process)	Top fillers (foundry)
Smelters (metal)	Stonemasons	Tumbling-barrel workers
Smoothers (glass)	Sugar refiners	Welders

2. Organic Dust

Symptom, condition, or disease to look for

Dryness of nose, throat and mouth, cough, anaphylaxis, asthma, bronchitis, emphysema, tuberculosis.

Occupations which offer such exposure

Bakers	Fur clippers	Roller coverers (cotton mills)
Beamers (textiles)	Fur cutters	Ropemakers
Blowers (felt hats)	Fur handlers	Rubber workers
Broom makers	Fur preparers	Sawmill workers
Brushers (felt hats)	Fur pullers	Scourers, wood lasts (shoes)
Brush makers	Furniture polishers	Shavers (felt hats; fur; tannery)
Buffers	Glove makers (leather preparers)	Shaving-brush makers
Button makers	Glue workers	Shoddy workers
Carbonizers (shoddy)	Grain-elevator workers	Shoe-factory operatives
Carders (textiles)	Grinders (rubber)	Sifters
Card grinders (textiles)	Guncotton pickers	Silk workers
Carpet makers	Hair workers	Softeners (tannery)
Cigar makers	Harness makers	Spinners (textiles)
Cobblers	Heel makers (shoe)	Starch makers
Comb makers	Hemp workers	Straw-hat makers
Coners (felt hats)	Jute workers	Sugar refiners
Cork workers	Knitting-mill workers	Taxidermists
Cotton-mill workers	Lace makers	Textile workers
Cotton twistlers	Lasters (shoes)	Tobacco rollers
Curriers (tannery)	Leather workers	Tobacco workers
Devil operators (felt hats)	Linen workers	Upholsterers
Doffers (textiles)	Match-factory workers	Weavers
Feather curers	Mattress makers	Welders
Feather workers	Mixers (felt hats)	Wood-last scourers (shoes)
Felt-hat makers	Mixing-room workers (miscellaneous)	Wood workers
Fiber workers	Polishers	Wool carders
Finishers (leather)	Pouncers (felt hats)	Wool spinners
Flax spinners	Pyroxylin-plastics workers	Wool workers
Flour workers	Rag workers	
Formers (felt hats)		
Fur carders		

F. Infections

Infectious diseases are frequently of occupational origin. Among the more common of these are anthrax, hookworm, tetanus, trachoma, glanders, tularemia, actinomycosis, ringworm, athlete's foot, undulant fever, and septic infections. Anthrax, hookworm, and septic infections are of especial interest because of the frequency of their occurrence in industry. A brief summary, therefore, of the symptoms of these diseases and the principal occupations in which infection is likely to occur have been included.

Prevention of these diseases lies in the observance of the well-established rules of general sanitation. The following special measures are also recommended:

1. *Anthrax*.—All hides and animal hair must be thoroughly sterilized. Foreign skins or hair should not be carried on the unprotected shoulder. The hands should be frequently washed with bichloride of mercury. Hair sorters should wear respirators.

2. *Hookworm*.—Workers in mines and others who are exposed to infected soil should make special effort to keep the skin clean. Shoes must always be worn and gloves are also of value in preventing the entrance of the hookworm through the skin. Infected soil should be disinfected and kept dry. The utmost attention should be given to the prevention of soil pollution.

3. *Septic infections*.—Cuts, scratches, or abrasions should be treated at once to avoid infection. Men having open wounds should not be allowed to work with putrid material.

F. Infections

1. Anthrax

Symptom, condition, or disease to look for

Anthrax (external):

(a) *Malignant pustule*.—Begins as inflamed pimple or boil. Papule becomes hard, with a purple center and deep red zone of infiltration surrounding, appearance of minute vesicular areola. Central papule becomes vesicular, discharges thick, bloody serum, later forming a brown gangrene. A painful lymphangitis with hard edema extending over neck and arm. Local phlebitis in the edematous area, chilliness, anorexia, vomiting, prostration, high temperature, feeble pulse.

(b) *Malignant edema*.—A spreading inflammation of loose connective tissue accompanied by sloughing and gangrene. Constitutional symptoms those of pyemia.

Anthrax (internal):

High fever, pains in head and back, vomiting, constipation, pain and tenderness in the abdomen, rapid, feeble pulse, palpable spleen, dyspnea, cyanosis. May be hemorrhage from bowels. When lungs are involved, there are additional symptoms—cough, pain in the chest, suffocation.

Occupations which offer such exposure

Animal handlers	Fur clippers	Shaving-brush makers
Baters (tannery)	Fur cutters	Shepherds
Beamhouse workers (tannery)	Fur handlers	Stablemen
Brush makers	Fur preparers	Sumackers (tannery)
Butchers	Fur pullers	Table hands (tannery)
Carpet makers	Hair workers	Tannery workers
Cattle salesmen	Leather workers	Taxidermists
Cobblers	Lime pullers (tannery)	Transporters of hides and wool
Curriers	Longshoremen	Veterinarians
Farmers	Meat inspectors	Wool carders
Fertilizer makers	Preparers (tannery)	Wool spinners
Fur carders	Shavers (felt hats; fur; tannery)	Wool workers

2. Hookworm (ankylostomiasis)

Symptom, condition, or disease to look for

Anemia, pallor of the face, even when the blood count is not very low; a dull, heavy, listless expression, manner, speech, and gait; itching sores; perversion of taste; increasing muscular weakness; occurrence of parasites in stool. Victims often complain of gastrointestinal pains and cramps; in exaggerated cases there are edema, ascites, progressive emaciation, protuberant abdomen, and increasing stupor.

Occupations which offer such exposure

Brick makers	Lumbermen	Sawmill workers
Construction-camp workers	Miners	Trench diggers
Farmers	Quarrymen	Tunnel workers

NOTE.—This disease occurs in the Southeastern States, and is prevalent also among the gold miners of California.

3. Septic Infections

Symptom, condition, or disease to look for

Skin infections, such as boils, carbuncles, blood poisoning, localized lymphangitis or cellulitis.

Occupations which offer such exposure

Animal handlers	Handlers of putrid or decomposing animal products	Silk workers
Butchers	Preparers (tannery)	Soap makers
Canners	Rag workers	Tallow refiners
Feather workers	Shavers (felt hats; fur; tannery)	Tannery workers
Fertilizer makers	Shoddy makers	Veterinarians
Garbage workers		
Glue makers		
Hair workers		

G. Radiant Energy

1. X-rays, Radium, and Other Radioactive Substances (radiothorium, mesothorium, etc.)

The increasing use of X-rays and of radium in the detection and treatment of disease and the more extended use of X-rays in industry as an aid in detecting hidden defects in metals have greatly added to their importance as potential sources of occupational disease. Recently, radioactive substances (radium, radiothorium, mesothorium) have been added to the list of occupational hazards found in manufacturing industries following upon the discovery that these substances were responsible for the serious impairment and death of several young women who had been employed in the painting of luminous watch dials with radioactive paint. The hazard is now known to be present also in several other industries.

Exposure to X-rays and emanations from radium and other radioactive substances may produce serious burns and cancer, while the blood and blood-forming organs are profoundly affected. Anemia and leukopenia are frequently associated with exposure to radiations.

Much has been learned concerning adequate measures for the protection of workers exposed to X-rays and radioactive substances since the early days of their discovery, when many pioneers in medical treatment with these new agencies, suffered severe mutilating disabilities because of their unmitigated exposure. Protective measures today have been worked out in considerable detail for the variety of conditions met with. See for example, The Journal of the American Medical Association, April 27, 1929, pages 1428-1430, and the Monthly Labor Review for June 1929, pages 22-24. Also, the brochure entitled "Protective Measures Against Dangers Resulting from the Use of Radium, Roentgen, and Ultra-Violet Rays", published by the League of Nations Health Organization, August 1931.

G. Radiant Energy

1. X-rays, Radium, and Other Radioactive Substances (radiothorium, mesothorium, etc.)

Symptom, condition, or disease to look for

Anemia, leukemia, leukopenia, necrosis of bones, burns, dermatitis, cancer, sterility.

Occupations which offer such exposure

Chemists and laboratory workers (radium research)	Radioactive-paint makers
Painters of luminous watch dials and painters of instrument dials, and other workers in plants manufacturing luminous dials	Radioactive-water makers
Physicians, nurses, and hospital attendants	Radiologists
	Radium ore reduction workers
	Radium specialists
	Roentgenologists
	X-ray technicians and photographers

2. Ultraviolet and Infrared Rays

Ultraviolet and infrared rays are an industrial hazard in a number of occupations, chiefly welding and cutting. Although we cannot see ultraviolet and infrared rays, they are very active and powerful and are usually coexistent with excessive radiance.

Ultraviolet rays are chemical in their action, and cause intense irritation of the eyes and burns of the skin, similar to sunburn. Snow blindness, desert blindness, and the "eye flashes" of welders are one and the same condition, all due to the action of ultraviolet rays upon the eye; their effects can be very painful and cause disability for several days, though usually they do not cause permanent damage.

Infrared rays act upon the eyes simply as heat, but may cause permanent damage. There is little definite evidence that welding may cause cataract, similar to glassblower's cataract, but it is probable that prolonged exposure to infrared rays may cause haziness of the cornea (part of eyeball).

The injurious effects resulting from excessive light due to defective illumination are not considered here, but treated as a separate hazard. See Hazard D.

Goggles, helmets, shields, and masks, equipped with colored lenses especially designed to exclude the kinds and intensities of rays met with, afford protection to the eye. Booths should be provided for welders working indoors to protect others working nearby. Clothing which covers the body completely protects the skin from irritation caused by the rays.

2. Ultraviolet and Infrared Rays

Symptom, condition, or disease to look for

Burns, cataract, conjunctivitis, dermatitis, electrical ophthalmia, photophobia, retinitis.

Occupations which offer such exposure

Bakers	Cooks	Electricians
Blacksmiths	Cutters (oxyacetylene and other gases)	Electric linemen
Brazers		Furnace workers

Glass blowers	Iron and steel mill work-	Motion - picture - machine
Glass-furnace workers	ers	operator
Incandescent - mantle	Motion - picture - studio	Photographers
hardeners	workers and actors	Stokers
		Welders

H. Repeated Motion, Pressure, Shock, etc.

Under this heading are included the occupational neuroses, those muscle-strain conditions which are caused by continuous repetition of movements, pressure, or blows peculiar to many occupations. This section is not concerned with the neurasthenic phenomena following accidental injuries, commonly referred to as traumatic neurosis. Everyone is familiar with the muscular strain experienced in performing for the first time some exercise, such as rowing, long walking, etc. Men newly introduced into a process requiring such repeated action are affected similarly but often much more severely, so as to disable them temporarily for the particular job. After long-continued exposure the muscles involved do not function when called upon to perform the accustomed task, although their function is unimpaired for other activities. The injury does not stop with muscular strain but may even cause inflammation of the surrounding sheaths or paralysis of the parts concerned.

Where continuous pressure or shock is the cause, pads or cushions are often beneficial. Workers who have to grasp tools tightly would do well frequently to change their method of holding the instrument, if this is possible. Occasional rest periods will do much toward the prevention of muscular pains and cramps.

H. Repeated Motion, Pressure, Shock, etc.

Symptom, condition, or disease to look for

Pain of muscle used, set up by a myositis, bursitis, synovitis, or other local changes of a chronic inflammatory nature; trembling, gradual emaciation and partial paralysis of parts, acroparesthesia.

Occupations which offer such exposure

Artificial-flower makers	Jewelers	Porters
Barbers	Knitters	Pressers
Bicyclists	Lathe turners	Riveters
Blacksmiths	Letter sorters	Sailors
Carpenters	Lithographers	Sawyers
Chauffeurs	Locksmiths	Scissors sharpeners
Clerks	Machinists	Seamstresses
Cobblers	Mail sorters	Sewing-machine opera-
Compositors	Masons	tors
Cotton twisters	Microscopists	Spinners (textiles)
Dancers	Milkers	Stonecutters
Diamond cutters	Miners	Tailors
Elevator runners	Musicians	Telegraphers
Enamelers	Painters	Typists
Engravers	Paper-box makers	Washwomen
Furniture polishers	Pavers	Watchmakers
Gold beaters	Pneumatic-tool workers	Weavers
Hammermen	Polishers	

J. Poisons

The continued introduction of new processes making use of new poisonous substances and the increasing use in industry of other substances well known to be injurious to health make this section of more and more importance. During comparatively recent years the highly poisonous chemicals, tetraethyl lead and radio-active paints, have been introduced into manufacturing processes and have been productive of serious poisoning. A group of refrigerants (methyl bromide, methyl chloride, etc.) have found widespread use in the manufacture of refrigerators and have proved injurious to the health of workmen. Phosphorus, tetrachlorethane, and certain other chemicals, on the other hand, have decreased in importance. Industrial poisoning caused by these substances is comparatively rare today. Since we cannot foretell, however, when a new use will be found in industry for a poisonous substance, the inclusion of these chemicals in our list has been thought desirable.

The revised List of Industrial Poisons, compiled by Sommerfeld and Fischer for the International Association for Labor Legislation, has formed the basis for the data presented in this section.¹ The material in that list has been revised and brought up to date. A number of poisons have been added, and the occupations exposed are given for each poison. The symptoms cited are those which are reported in the best works available. In order to avoid swelling the list of poisons to unwarranted proportions, substances, the effects of which are similar, have been grouped. Thus all nitro compounds of benzol and its homologues have been included under one heading, and the same procedure has been followed with amino compounds. The next section (p. 50) is devoted to the substances occurring in industry which produce typical occupational dermatoses. Because of the very large number of substances in the latter class it has not been possible to treat them as fully as the other poisons.

To prevent industrial poisoning the following precautions should be taken:

Workers must be instructed as to the toxicity of the substance handled. Frequent medical examinations of workers must be made to detect early symptoms of disease. Before new substances are employed in industrial processes their toxicity should be determined.

Personal cleanliness must be maintained, and proper washroom facilities, therefore, should be provided. Men should not be allowed to eat in workrooms where poisonous substances are handled. Work clothes should receive special attention and should be removed at the end of the day's work. The use of gloves and boots is often necessary.

Mechanical devices for confining the poisons are of prime importance. Reference should be made in this connection to the preventive measures discussed under "Dust." Fumes and gases should be taken care of by proper ventilation, the use of exhaust systems, fans, and blowers. Men who work in an atmosphere polluted by poisonous fumes and gases should always wear gas masks properly suited for the obtaining conditions.

¹ See U.S. Bureau of Labor Statistics Bul. No. 100. Washington, 1912.

J. Poisons

1. Acetaldehyde

Symptom, condition, or disease to look for

Irritation of mucous membranes of eyes and respiratory tract, dyspnea and cough, acceleration of heart, profuse night sweats.

Occupations which offer such exposure

Acetaldehyde workers	Photographic workers	Varnishers
Aldehyde pumpmen	Pyroxylin-plastics workers	Varnish makers
Disinfectant makers		Vinegar workers
Dye makers	Resin (synthetic) makers	Yeast makers
Explosives workers	Rubber (synthetic) makers	
Mirror silverers		

2. Acetanilide. *See Aniline*

3. Acetone

Symptom, condition, or disease to look for

Irritation of skin and mucous membranes of eyes and respiratory tract.

Occupations which offer such exposure

Acetone workers	Lacquer makers	Pyroxylin-plastics workers
Acetylene workers	Methyl-alcohol makers	Rubber workers
Airplane-dope makers	Nitrocellulose workers	Smokeless-powder makers
Artificial-leather makers	Oil extractors	
Cellulose acetate makers	Painters	Transparent-wrapping-material workers
Chloroform makers	Paint makers	Varnishers
Dye makers	Paint removers	Varnish makers
Dyers	Paraffin workers	Wood-alcohol distillers
Explosives workers	Perfume makers	
Lacquerers	Photographic workers	

4. Acridine

Symptom, condition, or disease to look for

Irritation of skin and mucous membranes of eyes and respiratory tract, violent sneezing.

Occupations which offer such exposure

Acridine workers	Dye makers
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5. Acrolein

Symptom, condition, or disease to look for

Irritation of skin and mucous membranes of eyes and respiratory tract, bronchial catarrh.

Occupations which offer such exposure

Acrolein workers	Linoleum makers	Stearic-acid makers
Bone renderers	Linseed-oil boilers	Tallow refiners
Candle makers	Pyroxylin-plastics workers	Tinners
Fat renderers		Type melters
Galvanizers	Refrigerator makers and repair men	Varnish makers
Glue makers	Soap makers	
Lard makers		

6. Aluminum

Not generally regarded as an industrial poison.

7. Ammonia

Symptom, condition, or disease to look for

Irritation of respiratory passages, cough and dyspnea, pulmonary edema, bronchitis, severe irritation of eyes, conjunctivitis, caustic action on skin.

Occupations which offer such exposure

Acetylene workers	Explosives workers	Salt extractors (coke-oven byproducts)
Ammonia workers	Fertilizer makers	Sewer workers
Ammonium-salts makers	Galvanizers	Shellac makers
Artificial-ice makers	Gas (illuminating) workers	Shoe finishers
Artificial-silk makers	Gas purifiers	Soda (Solvay) makers
Boneblack makers	Glue makers	Stablemen
Bronzers	Lacquer makers	Sugar refiners
Calcium carbide makers	Mirror silverers	Tannery workers
Coke-oven workers	Nitric-acid makers	Tinners
Color makers	Petroleum refiners	Varnish makers
Cyanide makers	Refrigerating-plant workers	
Dye makers		
Dyers		

8. Amyl Acetate

Symptom, condition, or disease to look for

Irritation of mucous membranes of eyes, nose, throat, and bronchial tubes, headache and vertigo, fullness of the head, drowsiness, oppression in chest, cough, nausea.

Occupations which offer such exposure

Airplane-dope makers	Explosives workers	Polish makers
Alcohol-distillery workers	Fruit-essence makers	Pyroxylin-plastics workers
Amyl acetate workers	Furniture polishers	Shellackers
Art-glass workers	Gilders	Shellac makers
Artificial-leather workers	Jewelers	Shoe-factory workers
Artificial-pearl makers	Lacquerers	Shoe finishers
Artificial-silk makers	Lacquer makers	Smokeless-powder makers
Battery (dry) makers	Leather workers	Tannery workers
Bookbinders	Linoleum makers	Toy makers
Bronzers	Mottlers (leather)	Varnishers
Buffers (rubber)	Nitrocellulose workers	Varnish makers
Calico printers	Painters	Virers (incandescent lamps)
Camphor makers	Paint makers	
Cutlery makers	Paint removers	
Dyers	Patent-leather makers	
Enamelers	Perfume makers	
Enamel makers	Photographic-film makers	
	Polishers (wood)	

9. Amyl Alcohol

Symptom, condition, or disease to look for

Irritation of eyes and respiratory tract, headache and vertigo, dyspnea and cough.

Occupations which offer such exposure

Alcohol-distillery workers	Lacquer makers	Shoe finishers
Amyl-acetate makers	Mordanters	Smokeless-powder makers
Amyl-nitrite makers	Nitrocellulose workers	Varnishers
Explosives workers	Painters	Varnish makers
Fruit-essence makers	Paint makers	
Fusel-oil workers	Rubber (synthetic) makers	
Lacquerers		

10. Aniline and Other Amino Compounds of Benzol and Its Homologues

Symptom, condition, or disease to look for

Pallor followed by cyanosis, especially of lips and finger tips, weakness, somnolence, irritability, mental confusion, headache and vertigo, unsteady gait, muscular tremor and convulsions, eczematous eruptions, anemia, weak pulse, brownish discoloration of the blood and urine, disorders (tumors, etc.) of the bladder.

Occupations which offer such exposure

Acetanilide workers	Feather workers	Pressroom workers (rubber)
Aniline makers	Gerulicide makers	Printers
Artificial-leather makers	Lithographers	Reclaimers (rubber)
Calico printers	Millinery workers	Rubber workers
Camphor makers	Mixers (rubber)	Tannery workers
Coal-tar workers	Nitraniline workers	Varnishers
Compositors	Painters	Varnish makers
Compounders (rubber)	Paint makers	Vulcanizers
Dye makers	Pencil (colored) makers	
Dyers	Perfume makers	
Explosives workers	Photographic workers	

11. Antimony and Its Compounds

Symptom, condition, or disease to look for

Irritation and eczematous eruptions of the skin, inflammation of mucous membranes of nose, mouth, and throat, gastro-intestinal disorders with vomiting, diarrhea, intestinal colic.

Occupations which offer such exposure

Antimony extractors (refiners)	Compounders (rubber)	Linotypers
Battery (storage) makers	Copper refiners	Mixers (rubber)
Brass foundries	Dye makers	Monotypers
Burnishers (iron and steel)	Electroplaters	Mordanters
Burnishers (rifle barrels)	Electrotypers	Pressroom workers (rubber)
Calico printers	Enamel makers	Printers
Chargers (zinc smelting)	Fillers	Rubber (red) workers
Color makers	Fireworks makers	Shot makers
Compositors	Glass mixers	Stereotypers
	Glaze dippers (pottery)	Type foundries
	Glaze mixers (pottery)	Vulcanizers
	Grinders (metals)	Zinc refiners
	Grinders (rubber)	
	Lead smelters	

12. Arsenic and Its Compounds

Symptom, condition, or disease to look for

Headache, eruptions and bronzing of skin, loss of nails and hair, keratosis, inflammation of mucous membranes, gastro-intestinal disturbances with nausea, vomiting, and severe diarrhea and abdominal pains, peripheral polyneuritis, muscular weakness and paralysis, perforation of nasal septum.

Occupations which offer such exposure

Arsenic roasters	Carroters (felt hats)	Decorators (pottery)
Artificial-flower makers	Chargers (zinc smelting)	Dye makers
Artificial-leather makers	Chimney sweepers	Electroplaters
Bookbinders	Colored-paper workers	Enamelers
Brass foundries	Color makers	Enamel makers
Briquet makers	Compounders (rubber)	Farmers
Bronzers	Copper foundries	Feather curers
Calico printers	Copper smelters	Feather workers
Candle (colored) makers	Curriers (tannery)	Felt-hat makers
Carpet makers	Cut-glass workers	Ferrosilicon workers

Fireworks makers	Mixers (rubber)	Sheep-dip makers
Fur handlers	Mordanters	Shot makers
Fur preparers	Painters	Soot packers
Galvanizers	Paint makers	Sprayers (trees)
Gardeners	Paper glazers	Sulphur burners
Glass mixers	Paper hangers	Sulphuric-acid workers
Glaze dippers (pottery)	Paris-green workers	Tannery workers
Glaze mixers (pottery)	Pencil (colored) makers	Taxidermists
Gold refiners	Pitch workers	Tinners
Insecticide makers	Pottery workers	Toy makers
Japan makers	Pressroom workers (rubber)	Velvet makers
Japanners	Printers	Wallpaper printers
Lacquerers	Pyrites burners	Wax ornament makers
Lacquer makers	Refiners (metals)	Wire drawers
Lead smelters	Rubber workers	Wood preservers
Linoleum colorers	Sealing-wax makers	Zinc miners
Lithographers		Zinc refiners

13. Arseniuretted Hydrogen (arsine)

Symptom, condition, or disease to look for

Feeling of faintness and weakness, intense headache, nausea and vomiting, jaundice, abdominal pains, hemoglobinuria, shivering and chills, gastric disorders.

Occupations which offer such exposure

Acetylene workers	Dye makers	Paper makers
Acid dippers	Electrolytic-process (copper) workers	Picklers
Aniline workers	Electroplaters	Plumbers
Arseniuretted hydrogen makers	Etchers	Refiners (metals)
Artificial-silk makers	Ferrosilicon workers	Shoddy workers
Balloon (hydrogen) workers	Fertilizer makers	Soda makers
Battery workers	Galvanizers	Solderers
Bleaching-powdermakers	Gas workers	Submarine workers
Bronzers	Gold extractors	Sulphuric-acid workers
Carbonizers (shoddy)	Jewelers	Tinners
Chemical workers	Lead burners	Towermen (sulphuric acid)
Dimethyl-sulphate makers	Lime burners	Zinc-chloride makers
	Nitrocellulose makers	
	Nitroglycerine makers	

14. Barium

Most of the salts of barium are poisonous when ingested. Few cases of industrial poisoning, however, have been reported. The symptoms reported in industrial poisoning include whitening and loss of hair, paralysis, acceleration of the heart, cyanosis of the skin, gastric pain, and vomiting.

15. Benzine (naphtha-gasoline)

Symptom, condition, or disease to look for

Headache and vertigo, nausea and vomiting, irregular respiration, drowsiness, irritation of skin and mucous membranes, "naphtha jag" (a condition resembling mild alcoholic intoxication), visual disturbances, twitching of the muscles.

Occupations which offer such exposure

Art-glass workers	Chauffeurs	Driers (rubber)
Bronzers	Compositors	Dry cleaners
Buffers (rubber)	Compounders (rubber)	Dyers
Cast scrubbers (electroplaters)	Curriers (tannery)	Electroplaters
Cementers (rubber shoes)	Decorators (pottery)	Enamelers
Cement mixers (rubber)	Degreasers (fertilizer; leather)	Enamel makers
	Dippers (rubber)	Feather workers
		Furniture polishers

Garage workers	Painters	Shade-cloth makers
Gasoline-engine workers	Paint makers	Shellackers
Gilders	Petroleum refiners	Shellac makers
Glue workers	Polishers	Shoe-factory workers
Japan makers	Polish makers	Shoe finishers
Japanners	Pressroom workers	Tannery workers
Lacquerers	(rubber)	Type cleaners
Lacquer makers	Printers	Varnishers
Linoleum makers	Putty makers	Varnish makers
Lithographers	Pyroxilin-plastics workers	Vulcanizers
Metal-polish makers	Rubber-glove makers	Waterproof-cloth makers
Millinery workers	Rubber-tire builders	Window-shade makers
Mixers (rubber)	Rubber workers	Woodworkers
Mordanters		

16. Benzol (benzene) and Its Homologues (toluol and xylol)

Symptom, condition, or disease to look for

Headache and vertigo, hemorrhages, spots of extravasated blood on the skin, anemia, injury to blood-forming organs, kidneys, liver and nervous system, marked susceptibility to infection, local irritation (bronchitis, conjunctivitis, stomatitis, etc.), narcosis (acute poisoning).

Occupations which offer such exposure

Airplane-dope workers	Enamel makers	Picric-acid makers
Alcohol (denatured) workers	Engravers	Pressroom workers (rubber)
Aniline makers	Explosives workers	Pyroxilin-plastics workers
Artificial-leather makers	Extractors (oils and fats)	Reclaimers (rubber)
Battery (dry) makers	Feather workers	Rubber-tire builders
Benzol-still men	Gas (illuminating) workers	Rubber workers
Blenders (motor fuel)	Gilders	Shade-cloth makers
Brake-lining makers	Glue workers	Shellackers
Bronzers	Lacquerers	Shellac makers
Can (sanitary) makers	Lacquer makers	Shoe-factory workers
Carbolic-acid makers	Linoleum workers	Shoe finishers
Cast scrubbers	Lithographers	Silverers
Cementers (rubber)	Millinery workers	Smokeless-powder makers
Cement mixers (rubber)	Mixers (rubber)	Soap makers
Coal-tar workers	Mordanters	Still (coal tar) cleaners
Coke-oven workers	Nitrobenzene makers	Treaders (rubber)
Color makers	Nitrocellulose workers	Trinitrotoluol makers
Compounders (rubber)	Oilcloth makers	Varnishers
Decorators (pottery)	Painters	Varnish makers
Degreasers (fertilizer; leather)	Paint makers	Vulcanizers
Dippers (rubber)	Paint-remover makers	Waterproof-fabric makers
Driers (rubber)	Paint removers	Welders
Dry cleaners	Paraffin makers	Window-shade makers
Dye makers	Phenol makers	
Electroplaters	Photo-engravers	
Enamelers	Photographic workers	

17. Brass (zinc)

Symptom, condition, or disease to look for

Headache, general malaise, irritation of throat, cough, slight nausea, severe chills with fever, profuse perspiration, trembling, muscular pains, exhaustion.

Occupations which offer such exposure

Bench molders (foundry)	Bronzers	Junk-metal refiners
Blowers-out (zinc smelting)	Chargers (zinc smelting)	Luters (zinc smelting)
Brass foundries	Core makers	Pourers (brass foundry)
Braziers	Floor molders (foundry)	Welders
	Galvanizers	Zinc smelters

18. Bromine

Symptom, condition, or disease to look for

Violent irritation of air passages, bronchitis, and conjunctivitis, sensation of suffocation, skin eruptions, brownish discoloration of skin and mucous membranes.

Occupations which offer such exposure

Bromine salts makers	Ethylene dibromide makers	Platinum extractors
Color makers	Gold extractors	Tear-gas makers
Disinfectant workers	Ink makers	Tetraethyl-lead makers
Dye makers		Photographic-film makers

19. Butyl Acetate. See Amyl Acetate

20. Butyl Alcohol

Animal experimentation showed marked dermatitis, early liver degeneration, a definite increase in red blood cells, with an absolute and relative lymphocytosis.

Occupations which offer such exposure

Artificial-leather workers	Perfume makers	Shellac makers
Artificial-silk workers	Photographic-film makers	Varnishers
Butyl-alcohol makers	Pyroxylin plastics workers	Varnish makers
Motion-picture-film workers	Shellackers	

21. Cadmium

Symptom, condition, or disease to look for

Weakness, loss of appetite, nausea, vomiting, headache, shivering, dryness of throat, rapid pulse, fatty degeneration of liver, inflammation of kidneys, brown urine. Animal experimentation shows generalized pneumonia.

Occupations which offer such exposure

Cadmium-alloy makers	Calico printers	Solderers
Cadmium and cadmium-compound makers	Chargers (zinc smelting)	Solder makers
Cadmium platers	Color makers	Storage-battery makers
Cadmium-vapor-lamp makers	Electroplaters	Welders
	Glass colorers	Zinc smelters and refiners
	Lithopone makers	

22. Carbon Dioxide

Carbon dioxide is now generally regarded as a simple asphyxiant. The symptoms preceding asphyxia are: Headache and vertigo, dyspnea, drowsiness, muscular weakness, flushing of face, tinnitus aurium.

Occupations which offer such exposure

Alkali-salt makers	Divers	Submarine workers
Bakers	Drying-room workers	Sugar refiners
Blacksmiths	Fertilizer workers	Tannery pit men
Blast-furnace workers	Foundry workers	Tobacco moisteners (storehouse)
Boiler-room workers	Furnace workers	Tunnel workers
Brass founders	Glass workers	Vatmen
Brewers	Glue makers	Vault workers
Brick burners	Lime burners	Vinegar makers
Caisson workers	Lime-kiln workers	Vintners
Carbonated-water makers	Miners	Vulcanizers
Carbon-dioxide-ice workers	Pottery workers	Well workers
Carbonic-acid makers	Sewer workers	White-lead makers
Charcoal burners	Silo workers	Yeast makers
	Soda makers	

23. Carbon Disulphide

Symptom, condition, or disease to look for

Headache, vertigo, weakness, psychical effects (hilarity, agitation, irritability, hallucinations, mania), disturbances of sensation, particularly of sight, peripheral neuritis, digestive disturbances.

Occupations which offer such exposure

Acetylene workers	Driers (rubber)	Paint makers
Ammonium-salts makers	Dry cleaners	Paraffin workers
Artificial-silk makers	Electroplaters	Putty makers
Asphalt testers	Enamelers	Reclaimers (rubber)
Carbanilide makers	Enamel makers	Smokeless-powder makers
Carbon-disulphide makers	Explosives workers	Sulphur extractors
Cellulose workers	Glue workers	Tallow refiners
Cementers (rubber shoes)	Insecticide makers	Transparent-wrapping-material workers
Cement mixers (rubber)	Match-factory workers	Vulcanizers
	Oil extractors	
	Painters	

24. Carbon Monoxide

Symptom, condition, or disease to look for

Tightness across forehead, painfulness of the eyeball, dilatation of cutaneous vessels, headache (frontal and basal), throbbing in temples, weariness, weakness, dizziness, nausea and vomiting, loss of strength and muscular control, increased respiration and pulse, collapse, anemia, polycythemia, presence of carbon monoxide hemoglobin.

NOTE—Poisoning may proceed in some persons to the stage of collapse without causing any subjective symptoms.

Exposure to high concentrations of carbon monoxide for short periods, may, through the effect of oxygen deprivation, cause degenerative changes in various tissues of the body. Chronic exposure to low concentrations for long periods of time according to some investigators, may produce permanent injury.

Occupations which offer such exposure

Acetylene workers	Drier workers (foundries)	Lime-kiln chargers
Ammonia makers (Haber-Bosch method)	Drying-room workers (miscellaneous)	Linotypers
Bakers	Enamelers	Mechanics (gas engines)
Balloon inflaters	Enamel makers	Mercury smelters
Bisque-kiln workers	Engineers (stationary)	Methane (synthetic) makers
Blacksmiths	Filament makers and finishers (incandescent lamps)	Methyl alcohol (synthetic) makers
Blasters	Firemen (city)	Miners
Blast-furnace workers	Firemen (stationary)	Mold breakers (pottery)
Blockers (felt hats)	Flangers (felt hats)	Monotypers
Boiler cleaners	Flue cleaners	Motion-picture-film workers
Boiler-room workers	Foundry workers	Neon lights letter makers
Brass foundries	Fumigators	Patent-leather makers
Brick burners	Furnace workers	Phosgene makers
Cable splicers	Garage workers	Plumbers
Calico printers	Gas (illuminating) workers	Pottery (kiln) workers
Carbide makers	Gassers (textiles)	Pressers
Charcoal burners	Glost-kiln workers	Puddlers (foundries)
Chargers (foundries)	Incandescent-lamp makers	Pyroxylin-plastics workers
Chargers (zinc smelting)	Ink (printer's) makers	Refiners (metals)
Chauffeurs	Ironers	Repairers (foundries)
Chimney masons	Kiln tenders	Sealers (incandescent lamps)
Chimney sweepers	Laboratory workers	Sewer workers
Cleaners (foundries)	Laundry workers	Silver melters
Cloth singers	Lead smelters	Singers (cloth)
Coal-tar workers	Lime burners	Soda makers (Leblanc)
Coke-oven workers		Solderers
Cooks		
Copper smelters		
Core makers		
Cupola men (foundries)		

Steeple jacks	Temperers	Wood-alcohol distillers
Stokers	Top fillers (foundry)	Wood-charcoal workers
Teasers (glass)	Tubulators (incandescent lamps)	Zinc smelters
Telephone linemen (trench work)	Welders	

25. Carbon Tetrachloride

Symptom, condition, or disease to look for

Irritation of nose, eyes, and throat, headache, nausea and vomiting, loss of appetite, mental dullness, confusion and excitement, dermatitis.

Occupations which offer such exposure

Airplane-dope workers	Dry cleaners	Metal-polish makers
Carbon-tetrachloride workers	Electroplaters	Paraffin workers
Cementers (rubber)	Fire-extinguisher makers	Perfume makers
Cement mixers (rubber)	Firemen (city)	Rubber workers
Degreasers (textiles)	Lacquerers	Vulcanizers
	Lacquer makers	

26. Cellosolve (mono-ethyl ether of ethylene glycol)

This compound is used as a solvent for nitrocellulose and resins in the manufacture of lacquers.

According to the United States Bureau of Mines, animal experimentation shows inactivity, weakness, dyspnea, and death following exposure for 18 to 24 hours to air saturated with cellosolve vapor (0.6 percent by volume).

27. Chloride of Lime

Symptom, condition, or disease to look for

Irritating cough, inflammation of upper air passage, difficulty in breathing, asthma, bronchitis, conjunctivitis, lachrymation, hyperhidrosis, burning eruptions on the skin.

Occupations which offer such exposure

Acetylene workers	Chloride of lime makers	Laundry workers
Bleachers	Chloroform makers	Mordanters
Bleaching-powder makers	Disinfectant makers	Tannery workers
	Dye makers	

28. Chlorine

Symptom, condition, or disease to look for

Irritation of mucous membranes of eyes and respiratory tract, bronchitis, cough, pulmonary edema, dyspnea, pallid countenance and emaciation, gastric disturbances, decayed teeth, irritation of skin, and chloracne.

Occupations which offer such exposure

Alkali-salt makers	Detinning workers	Photographic workers
Beatermen (paper and pulp)	Disinfectant makers	Rubber-substitute makers
Bleachers	Dye makers	
Bromine makers	Extractors (gold and silver)	Shoddy makers
Broom makers	Ink makers	Soda makers
Calico printers	Iodine makers	Submarine workers
Chloride of lime makers	Laundry workers	Sulphur-chloride makers
Chlorine workers	Paper makers	Tear-gas makers
Color makers	Phosgene makers	Zinc-chloride makers

29. Chlorodinitrobenzol. See Nitrobenzol

30. Chloronitrobenzol. See Nitrobenzol

31. Chromium Compounds

Symptom, condition, or disease to look for

Pitlike phagedenic ulcers, very difficult to heal and very painful, occurring on the skin, most frequently on the hands, and on the mucous membranes; inflammation and perforation of the nasal septum at the cartilaginous portion; eczematous eruptions, irritations of the conjunctiva and of the respiratory passages with rare inflammation of small areas in the lungs.

Occupations which offer such exposure

Acetylene workers	Electroplaters	Paper hangers
Aniline-compound workers	Enamelers	Pencil (colored) makers
Artificial-flower makers	Enamel makers	Photo-engravers
Battery (dry) makers	Explosives (ammonal and pyroxylin) workers	Photographic workers
Bleachers	Frosters (glass and pottery)	Photogravure workers
Blueprint makers	Furniture polishers	Rubber workers
Calico printers	Glass colorers	Steel (chrome) makers
Candle (colored) makers	Glaze workers (pottery)	Tannery (chrome) workers
Carbon printers (photography)	Ink makers	Vulcanizers
Chrome workers	Linoleum workers	Wall-paper printers
Chromium platers	Lithographers	Waterproofers (paper and textile)
Color makers	Match-factory workers	Wax-ornament workers
Compounders (rubber)	Mixers (rubber)	Wood polishers
Crayon (colored) makers	Mordanters	Wood stainers
Dye makers	Painters	
Dyers	Paint makers	

32. Cobalt

There is little information available on the effects of cobalt. A case of poisoning with severe damage to the liver and kidneys was reported from a French tile factory. Cancer of the lungs is a recognized occupational injury among European cobalt miners, but the cause of the condition has not been definitely established. The presence of arsenic in the ore, and the fact that there are radioactive emanations in the mines, have been advanced as causes of the cancer.

33. Copper

Whether or not copper is toxic to human beings is still unestablished. The inhalation of copper dust is reported to produce "copper chills", headache, gastro-enteritis; the inhalation of fumes, to produce symptoms similar to those caused by zinc fumes. Impurities such as lead and arsenic have been advanced as possible causes of reported cases of copper poisoning.

Occupations which offer such exposure

Copper foundries	Copper refiners and smelters	Coppersmiths
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34. Cresol (cresylic acid)

Symptom, condition, or disease to look for

Toxic effects resemble those of phenol but are less severe. The chief symptoms are irritation and erosion of skin and mucous membranes, and nephritis.

Occupations which offer such exposure

Artificial-resin makers	Dye makers	Resin (synthetic) makers
Coal-tar workers	Explosives workers	Rubber (artificial) workers
Cresol-soap makers	Fumigators	Tar-distillery workers
Cresylic-acid makers	Perfume (synthetic) makers	
Disinfectant makers		

35. Cyanogen Compounds

Symptom, condition, or disease to look for

Headache and vertigo, nausea and vomiting, unsteady gait, bitter almond odor in breath, gastro-intestinal disorders, weakness, irregular pulse and respiration, irritation and inflammation of skin and mucous membranes, muscular pain and trembling, convulsions, paralysis of legs and arms, functional disturbances of nervous system.

Occupations which offer such exposure

Acid dippers	Dye makers	Mirror silverers
Ammonium-salts makers	Electroplaters	Mordanters
Artificial-silk makers	Extractors (gold and silver)	Oxalic acid makers
Art-printing workers	Fertilizer makers	Phosphoric acid makers
Blacksmiths	Fulminate mixers	Photographic workers
Blast-furnace workers	Fumigators	Picklers
Bone distillers	Gas (illuminating) workers	Polishers (metals)
Bronzers	Gas purifiers	Pyroxylin-plastics workers
Browners (gun barrels)	Gilders	Silver refiners
Calico printers	Gold refiners	Solderers
Case hardeners	Hydrocyanic-acid makers	Tannery workers
Coal-tar-distillery workers	Jewelers	Temperers
Cyanide workers		Tree sprayers
Disinfectant workers		Zincers

36. Dimethyl Sulphate

Symptom, condition, or disease to look for

Strongly corrosive effect on the skin and mucous membranes, hoarseness, lachrymation, conjunctivitis, bronchitis, pulmonary edema with hemorrhages, photophobia.

Occupations which offer such exposure

Dimethyl-sulphate makers	Dye makers	Perfume makers
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37. Dinitrobenzol. See Nitrobenzol

38. Dioxan (diethylene dioxide)

This compound may be used in the manufacture of a number of chemicals, and is a solvent for nitrocellulose, etc.

According to the United States Bureau of Mines, men exposed to air containing 0.16 percent of dioxan vapor by volume, immediately noted irritation of the eyes, nose, and throat. It is stated that "as in the case of practically all comparatively nontoxic volatile liquids, dioxan presents a hazard to life under conditions of exposure to air confined over the liquid in tanks, vats, and similar places where high concentrations would accumulate."

39. Ethyl Benzene

This compound is used as an "antiknock", as a lacquer diluent, general solvent, etc.

According to the United States Bureau of Mines, animal experimentation shows irritation of eyes and nose, apparent vertigo, static and motor ataxia, apparent unconsciousness, tremor of extremities, rapid jerky respiration, then shallow respiration, and finally slow, gasping respiration, followed by death. All these symptoms and death resulted from 1 percent exposure in from 2 to 3 hours.

40. Ethyl Bromide and Ethyl Chloride

Symptom, condition, or disease to look for

See note under Methyl Chloride

Occupations which offer such exposure

Anesthetic makers

Ethyl-bromide makers

Ethyl-chloride makers

Refrigerator (mechanical) makers and
repair men

41. Ethylene Dibromide

Symptom, condition, or disease to look for

Irritation of eyes and respiratory tract, vomiting, pallor, weakness, vertigo.

Occupations which offer exposure

Ethylene dibromide makers.

42. Ethylene Dichloride

This compound is used as a solvent, particularly in the extraction of oil and fats.

According to the United States Bureau of Mines, animal experimentation shows irritation of eyes and nose, vertigo, static and motor ataxia, retching movements, semiconsciousness and unconsciousness accompanied by uncoordinated movements of the extremities, and death if exposure is continued. Exposure to 8 percent vapors caused all these symptoms, excepting death, to occur in less than 10 minutes, and death in about 30 minutes.

43. Ethylene Oxide

This compound is principally used as an intermediate in the synthesis of other compounds as ethyl, methyl, and butyl cellosolve, and as a fumigant.

According to the United States Bureau of Mines, animal experimentation shows irritation of the eyes and nose; blood-tinged, frothy, serous exudate from nostrils; unsteadiness on feet and staggering inability to stand; respiratory disturbances; dyspnea and gasping; and death. Most of these symptoms occurred with exposure to concentrations of 8.5 to 0.3 percent by volume.

44. Formaldehyde

Symptom, condition, or disease to look for

Irritation of mucous membranes, conjunctivitis, bronchitis, dyspnea, severe dermatitis, destruction of finger nails. Systemic effects, including degeneration of the liver, have been reported.

Occupations which offer such exposure

Artificial-amber makers

Artificial-silk makers

Bakelite makers

Brewery workers

Broom makers

Brush makers

Calico printers

Disinfectant workers

Dye makers

Embalmers

Explosives workers

Formaldehyde workers

Germicide makers

Glass etchers

Ink makers

Insecticide makers

Mirror silverers

Paper makers

Photographic workers

Preservative makers and

handlers

Resin (synthetic) makers

Recoverers (gold and
silver)

Rubber workers

Soap makers

Straw-hat makers

Tannery workers

Textile printers

Waterproofers (paper)

45. Formic Acid. *See also* Formaldehyde

Symptom, condition, or disease to look for

Dermatitis (blisters, ulcerations, necrosis), irritation of mucous membranes of eyes, nose, and throat.

Occupations which offer such exposure

Alcohol fermenters	Lacquerers	Rubber workers
Cellulose-formate makers	Lacquer makers	Soap makers
Dye makers	Mirror silverers	Tannery workers
Electroplaters	Mordanters	Varnishers
Formic-acid workers	Perfume makers	Varnish makers

46. Gasoline. *See* Benzine

47. Hydrochloric Acid

Symptom, condition, or disease to look for

Caustic and irritating action on skin and mucous membranes, conjunctivitis, coryza, pharyngeal and bronchial catarrh, dental caries, pulmonary hemorrhages.

Occupations which offer such exposure

Acetic-acid makers	Dye makers	Paper-mill workers
Acid dippers	Dyers	Petroleum refiners
Acid finishers (glass)	Electroplaters	Phosphate extractors
Acid mixers	Enamel makers	Photographic workers
Acid recoverers	Engravers	Picklers (metals)
Acid transporters	Etchers	Pottery workers
Alkali-salt makers	Fertilizer makers	Reclaimers (rubber)
Ammonium-salts makers	Galvanizers	Shoddy workers
Aniline makers	Glass finishers	Soap makers
Artificial-silk makers	Glass mixers	Solderers
Battery (dry) makers	Glaze mixers (pottery)	Sugar refiners
Bleachers	Glazers (pottery)	Sulphur-chloride makers
Bronzers	Glue makers	Tannery workers
Calico printers	Hydrochloric-acid makers	Tinners
Camphor makers	Ink makers	Transparent - wrapping-material workers
Carbonizers (shoddy)	Jewelers	Vignettters
Cartridge dippers	Leather workers	Wire makers
Cement makers	Lithographers	Zinc chloride makers
Chlorine-compound makers	Metal cleaners	
Chlorine makers	Metal refiners	
	Paint makers	

48. Hydrocyanic Acid. *See* Cyanogen Compounds

49. Hydrofluoric Acid

Symptom, condition, or disease to look for

Intense irritation of eyelids and conjunctiva, coryza, bronchial catarrh with spasmodic cough, ulceration of the nostrils, gums, and oral mucous membranes, painful ulcers of the cuticle, erosion and formation of vesicles, suppuration under the finger nails.

Occupations which offer such exposure

Aluminum extractors	Brewers	Gold refiners
Antimony-fluoride extractors	Dyers	Hydrofluoric-acid makers
Art-glass workers	Etchers	Phosphorus extractors
Bleachers	Fertilizer makers	Silicate extractors
	Glass finishers	

50. Iron Carbonyl. *See* Nickel Carbonyl

51. Lead and Its Compounds

Symptom, condition, or disease to look for

Ashen pallor, metallic taste, gastrointestinal disturbances, constipation, abdominal pains, lead line on gums, asthenia, lassitude, headache, backache, pain about joints, weakness of grip, tremors of fingers and tongue, lead paralysis, especially of muscles used most, stippling of red blood cells, ocular disturbances, mental symptoms (lead encephalopathy).

Occupations which offer such exposure

Acid finishers (glass)	Galvanizers	Printers
Amber workers	Garage workers	Putty makers
Art-glass workers	Gardeners	Putty polishers (glass)
Artificial-flower makers	Gasoline blenders	Pyroxylin-plastics workers
Balbutters	Glass finishers	
Battery (dry) makers	Glass mixers	Reclaimers (rubber)
Bench molders (foundry)	Glass polishers	Red-lead workers
Blacksmiths	Glaze dippers (pottery)	Refiners (metals)
Blooders (tannery)	Glaze mixers (pottery)	Riveters
Bookbinders	Glost-kiln workers	Roofers
Bottle-cap makers	Gold refiners	Rubber workers
Brass foundry	Grinders (metals)	Sagger makers
Brass polishers	Grinders (rubber)	Sandpaperers (enameling and painting auto bodies, etc.)
Braziers	Heater boys (riveters)	Screen workers (lead and zinc smelting)
Brick burners	Imitation-pearl makers	Sheet-metal workers
Brick makers	Incandescent-lamp makers	Shellackers
Bronzers	Insecticide makers	Shellac makers
Browners (gun barrels)	Japan makers	Shot makers
Brush makers	Japanners	Slip makers (pottery)
Buffers (rubber)	Jewelers	Slushers (porcelain enameling)
Burners (enameling)	Junk-metal refiners	Solderers
Cable makers	Labelers (paint cans)	Solder makers
Cable splicers	Lacquerers	Stainers (shoes)
Calico printers	Lacquer makers	Steel engravers
Canners	Lead burners	Stereotypers
Cartridge makers	Lead-foil makers	Storage-battery makers
Chargers (zinc smelting)	Lead miners	Sulphuric-acid workers
Chippers	Lead-pipe makers	Table turners (enameling)
Colorers (white) of shoes	Lead-salts makers	Tannery workers
Color makers	Lead smelters	Temperers
Compositors	Linoleum makers	Tetraethyl lead makers
Compounders (rubber)	Linotypers	Tile makers
Concentrating-mill workers (lead and zinc)	Linseed-oil boilers	Tin-foil makers
Copper refiners	Lithographers	Tinners
Cut-glass workers	Lithotransfer workers	Toy makers
Cutlery makers	Match-factory workers	Transfer workers (pottery)
Cutters (oxyacetylene and other gases)	Mirror silverers	Tree sprayers
Decorators (pottery)	Mixers (rubber)	Type foundry
Dental workers	Monotypers	Typesetters
Diamond polishers	Musical-instrument makers	Varnishers
Dye makers	Nitric-acid workers	Varnish makers
Dyers	Nitroglycerin makers	Wall-paper printers
Electroplaters	Painters	Welders
Electrotypers	Paint makers	White-lead workers
Embroidery workers	Paint removers	Wood stainers
Emery-wheel makers	Paper hangers	Zinc miners
Enamelers	Patent-leather makers	Zinc smelters
Enamel makers	Petroleum refiners	
Farmers	Photograph retouchers	
File cutters	Pipe fitters	
Filers	Plumbers	
Filling-station workers	Polishers	
Floor molders (foundry)	Pottery workers	

52. Lead Arsenate. See Arsenic; Lead

53. Manganese

Symptom, condition, or disease to look for

Languor and sleepiness, stolid mask-like facial expression, low monotonous voice, muscular twitching, cramps and stiffness of muscles in legs, increase in tendon reflexes, ankle and patellar clonus, retropulsion and propulsion, slapping gait, uncontrollable laughter.

Occupations which offer such exposure

Battery (dry) makers	Fireworks makers	Manganese-steel makers
Bleaching-powder makers	Glass mixers	Match-factory workers
Calico printers	Glaze dippers (pottery)	Painters
Chlorine makers	Glaze mixers (pottery)	Paint makers
Dye makers	Linoleum makers	Pottery workers
Dyers	Manganese dioxide workers	Soap makers
Enamelers	Manganese grinders	Varnishers
Enamel makers	Manganese-ore-separators	Varnish makers
Fertilizer makers		Zinc miners

54. Mercury and Its Compounds

Symptom, condition, or disease to look for

Stomatitis and gingivitis, salivation, blue line on gums, gastro-intestinal disorders, metallic or fetid breath, tremor, mercurial erethism, loss of memory, insomnia and depression, anxiety and irritability, mercurial eczema.

Occupations which offer such exposure

Acetaldehyde makers	Disinfectant makers	Mercury-solder workers
Acetic-acid (synthetic) makers	Dye makers	Mercury-still cleaners
Acetone (synthetic) makers	Electric induction furnace workers	Mercury-switch makers
Alcohol (synthetic) makers	Electroplaters	Mercury-vapor-lamp makers
Amalgam makers	Embalmers	Mirror silverers
Artificial-flower makers	Embossers	Mixers (felt hats)
Barometer makers	Explosives workers	Painters
Battery (dry) makers	Extractors (gold and silver)	Paint makers
Blowers (felt hats)	Felt-hat makers	Photographic workers
Bronzers	Fireworks makers	Porcelain makers
Browners (gun barrels)	Fulminate mixers	Primers (explosives)
Brushers (felt hats)	Fur handlers	Refiners (metals)
Calico printers	Fur preparers	Sizers (felt hats)
Cap loaders	Gilders	Sole stitchers (Blake machine)
Carroters (felt hats)	Gold refiners	Starters (felt hats)
Cartridge makers	Hardeners (felt hats)	Steel engravers
Chlorine makers (electrolytic)	Incandescent-lamp makers	Stiffeners (felt hats)
Color makers	Jewelers	Storage-battery makers
Coners (felt hats)	Laboratory workers	Tannery workers
Cosmetic workers	Lithographers	Taxidermists
Cyanogen gas makers	Manometer makers	Thermometer makers
Dentists	Mercury-alloy makers	Water gilders
Detonator cleaners	Mercury-boller workers	Welders
Detonator fillers	Mercury bronzers	Wood preservers
Detonator packers	Mercury miners	Zinc-electrode makers
Devil operators (felt hats)	Mercury-pump workers	
	Mercury-salt workers	
	Mercury smelters	

55. Methanol (methyl alcohol)

Symptom, condition, or disease to look for

Headache, nausea and vomiting, vertigo, irritation of mucous membranes, severe colic, convulsions, paralysis, chilliness and cold sweats, cyanosis, loss of reflexes and of sensation, irregular and intermittent heart action, rapid breathing followed by retardation, rapid and marked drop in temperature, affections of sight including amblyopia, optic neuritis, conjunctivitis, mydriasis, nystagmus, visual hallucinations, blindness.

Occupations which offer such exposure

Aldehyde pumpmen	Fitters (shoes)	Photographers
Aniline-dye makers	Furniture polishers	Polishers (wood)
Antifreeze makers	Gilders	Polish makers
Art-glass workers	Hardeners (felt hats)	Pyroxylin-plastics workers
Artificial-flower makers	Incandescent-lamp makers	Rubber workers
Artificial-silk makers	Ink makers	Shellackers
Automobile painters	Japan makers	Shellac makers
Bookbinders	Japanners	Shoe-factory operatives
Bronzers	Lacquerers	Shoe finishers
Brush makers	Lacquer makers	Soap makers
Calico printers	Lasters (shoes)	Stiffeners (felt hats)
Cementers (rubber shoes)	Linoleum makers	Stitchers (shoes)
Dimethyl-sulphate makers	Methyl-alcohol workers	Type cleaners
Driers (felt hats)	Methyl-compound makers	Upholsterers
Dry cleaners	Millinery workers	Varnishers
Dye makers	Mottlers (leather)	Varnish makers
Explosives workers	Painters	Vulcanizers
Feather workers	Paint makers	Wood-alcohol distillers
Felt-hat makers	Patent-leather makers	Woodworkers
Filament makers (incandescent lamps)	Perfume makers	
	Photo-engravers	

56. Methyl Bromide

Symptom, condition, or disease to look for

See note under Methyl chloride.

Occupations which offer such exposure

Methyl bromide makers	Refrigerator (mechanical) makers and repair men
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57. Methyl Chloride

Symptom, condition, or disease to look for

Progressive drowsiness, vertigo, nausea, staggering gait, mental confusion, weakness, visual disturbances, tremors, presence of formates and acetone in urine, insomnia.

NOTE.—Experiments conducted by the United States Bureau of Mines on guinea pigs showed that air containing methyl chloride, methyl bromide, ethyl bromide, and ethyl chloride produced similar symptoms, including excitement, loss of equilibrium, inability to walk, rapid pulse, convulsive rapid respiration with râles, frothy (often blood-tinged) exudate from nostrils. The signs of lung irritation were not as pronounced for exposure to ethyl chloride as for the other compounds.

Occupations which offer such exposure

Chloroform makers	Dye makers	Refrigerator (mechanical) makers and repair men
Color makers	Methyl chloride makers	

58. Naphtha. *See* Benzine

59. Nickel Carbonyl

Symptom, condition, or disease to look for

Headache, giddiness, nausea, dyspnea, cough, cyanosis, edema, pain in the loins.

Occupations which offer such exposure

Nickel-purification workers (Mond process)

60. Nitraniline. *See* Aniline

61. Nitrobenzol and Other Nitro Compounds of Benzol and Its Homologues

Symptom, condition, or disease to look for

Cyanotic face and lips, nausea and vomiting, odor of bitter almonds in breath, irritation of skin, icterical skin, visual disturbances, anemia, dark-brown blood, methemoglobin formation, presence of hematoporphyrin, albumin, and sometimes free poison in urine, tremors, muscular twitching, and other manifestations of nerve injury.

Occupations which offer such exposure

Aniline makers	Ink makers	Smokeless-powdermakers
Dye makers	Nitrobenzol workers	Soap makers
Explosives workers	Perfume makers	Trinitrotoluol makers
Floor-polish makers	Shoe dyers	

62. Nitroglycerin

Symptom, condition, or disease to look for

Intense headache, nausea and vomiting, flushing of face, gastro-intestinal disturbances, tachycardia, skin eruptions (characterized by dryness and the formation of rhagades).

Occupations which offer such exposure

Explosives workers | Nitroglycerin workers | Shell fillers

63. Nitronaphthalene. *See* Nitrobenzol

64. Nitrous Gases and Nitric Acid

Symptom, condition, or disease to look for

Irritation of air passages, spasmodic cough, dyspnea, pulmonary edema, bronchitis, feeling of suffocation, pain in chest, digestive disturbances, corrosion of teeth, severe burns on the skin.

Occupations which offer such exposure

Acid dippers	Electroplaters	Phosphoric-acid makers
Acid mixers	Enamel makers	Photo-engravers
Acid recoverers	Etchers	Picklers (metals)
Acid transporters	Explosives workers	Picric-acid makers
Aniline makers	Fertilizer makers	Pyroxylin-plastics workers
Artificial-leather makers	Fur preparers	
Artificial-pearl makers	Galvanizers	Refiners (metals)
Bleachers	Gilders	Scourers (metals)
Calico printers	Guncotton workers	Smokeless-powder makers
Carroters (felt hats)	Jewelers	Soda makers
Cartridge dippers	Lithographers	Sulphuric-acid makers
Collodion makers	Mordanters	Tower men (sulphuric acid)
Damascening workers	Nitrators	Wringers (guncotton)
Dimethyl-sulphate makers	Nitric-acid workers	
Dippers (guncotton)	Nitrocellulose makers	
Dye makers	Nitroglycerin makers	
	Nitrous-oxide workers	

65. Oxalic Acid

Symptom, condition, or disease to look for

Local caustic action on skin and mucous membranes, bluish discoloration and brittleness of nails. Irritation of mucous membranes of esophagus, stomach and intestines, peripheral circulatory trouble, cardiac weakness, convulsions.

Occupations which offer such exposure

Dry cleaners	Ink makers	Polishers (metal)
Dye makers	Lithographers	Straw bleachers
Engravers	Metal-polish makers	Tannery workers
Glycerin refiners	Oxalic-acid workers	

66. Ozone

Symptom, condition, or disease to look for

Irritation of eyes and respiratory tract.

Occupations which offer such exposure

Bleachers	Electrical workers	Laundry workers
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67. Petroleum. *See also* Benzine*Symptom, condition, or disease to look for*

Inflammation of the skin, acne, suppurating ulcers, papilloma, numbness and irritation of the Schneiderian membrane, headache and sensory disturbances, affections of the respiratory organs.

Occupations which offer such exposure

Browners (gun barrels)	Millinery workers	Paraffin workers
Feather workers	Oil-floatation-plant workers	Petroleum refiners
Furniture polishers		Temperers
Lampblack makers	Oil-well workers	

68. Phenol

Symptom, condition, or disease to look for

Erosion of the skin, eczema, irritation of respiratory organs, digestive disturbances, symptoms of degeneration of blood, emaciation, nephritis, gangrene, jaundice.

Occupations which offer such exposure

Bakelite makers	Explosives workers	Phenol workers
Brewers	Gas (illuminating) workers	Picric-acid makers
Calico printers	Gas purifiers	Powder (smokeless) makers
Carbolic-acid makers	Lampblack makers	Reclaimers (rubber)
Coal-tar workers	Paint makers	Resin (synthetic) makers
Disinfectant workers	Paint-remover makers	Stillmen (carbolic acid)
Dye makers	Paint removers	Surgical-dressing makers
Dyers	Perfume makers	Wood preservers
Etchers		

69. Phenyl Hydrazine

Symptom, condition, or disease to look for

Vesicular eruptions of the skin with itching and burning, diarrhea, anorexia, granular degeneration of blood corpuscles, formation of methemoglobin, a sense of general malaise.

Occupations which offer such exposure

Antipyrin makers	Dye makers	Phenyl-hydrazine workers
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70. Phosgene

Symptom, condition, or disease to look for

Violent lung inflammation with edema, necrosis of lung tissue, emphysema, bronchitis, bronchiectasis, dysfunction of the heart, dyspnea.

Occupations which offer such exposure

Carbon-tetrachloride workers	Dye makers	Phosgene makers
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71. Phosphorus

Symptom, condition, or disease to look for

Increasingly severe toothache, inflammation and sclerosis of the bones and of the periosteum, swelling and ulceration of the gums and buccal membrane, loosening and falling out of the teeth, suppuration and destruction of jawbone with fistulous channels burrowing through the cheek, meningeal inflammation, brittleness of bones, digestive disturbances, emaciation.

Occupations which offer such exposure

Bone-black makers	Insecticide makers	Phosphorus-compound makers
Brass foundries	Match-factory workers	Phosphorus extractors
Fertilizer makers	Phosphate-mill workers	
Fireworks makers	Phosphor-bronze workers	

72. Phosphuretted Hydrogen (phosphine)

Symptom, condition, or disease to look for

Oppression in chest, headache and vertigo, gastro-intestinal irritation, dyspnea, general debility, tinnitus aurium, tremors and convulsions.

Occupations which offer such exposure

Acetylene workers	Phosphorus extractors	Phosphuretted hydrogen workers
Ferrosilicon workers	Phosphorus (red) makers	
Phosphine workers		

73. Picric Acid

Symptom, condition, or disease to look for

Irritation and inflammation of the skin and mucous membranes, yellow coloring of skin, headache, vertigo, digestive disorders, gastric pain, nephritis.

Occupations which offer such exposure

Dye makers	Germicide makers	Smokeless-powder makers
Dyers	Photography workers	Tear-gas (chloropicrin) makers
Explosives workers	Picric-acid workers	
Fireworks makers	Shell fillers	

74. Potassium Hydroxide

Symptom, condition, or disease to look for

Severe chemical burning of the skin and mucous membranes, formation of deep-seated and persistent ulcers, loss of nails.

Occupations which offer such exposure

Bleachers	Oxalic-acid makers	Soap makers
Match-factory workers		

75. Pyridine

Symptom, condition, or disease to look for

Irritation of respiratory tract and of eyes, cough, dermatitis. Symptoms following ingestion include headache, vertigo, trembling of extremities.

Occupations which offer such exposure

Denatured - a l c o h o l	Lacquerers	Pyridine makers
workers	Lacquer makers	
Gilders	Pencil makers	

76. Silver

Symptom, condition, or disease to look for

Argyrosis, a grayish blue or black discoloration of the skin and mucous membranes, is the chief effect reported in industry.

Symptoms of intoxication are reported from ingestion of soluble silver salts.

Occupations which offer such exposure

Photographic-film makers	Silver melters and re-	Silver platers
Silverers (mirrors)	finers	Silversmiths
Silver-foil makers	Silver-nitrate makers	

77. Sodium Hydroxide

Symptom, condition, or disease to look for

Severe chemical burning of the skin and mucous membranes. Formation of deep-seated and persistent ulcers, loss of nails.

Occupations which offer such exposure

Artificial-silk workers	Paper makers	Tannery workers
Bleachers	Soap makers	Transparent - wrapping-
Mercerizers	Sodium-hydroxide	material workers
Oil refiners	makers	

78. Sulphur Dioxide

Symptom, condition, or disease to look for

Irritation and inflammation of mucous membranes of eyes and respiratory tract, spasmodic cough, bronchial catarrh, digestive disturbances, blood-tinged mucus, inflammation of lungs.

Occupations which offer such exposure

Alkali salt makers	Disinfectant workers	Refiners (metals)
Artificial-ice makers	Dye makers	Refrigerator (mechanical) makers and repairmen
Blast-furnace workers	Feather workers	Smelters
Bleachers	Fertilizer makers	Storage-battery chargers
Bone extractors	Flue cleaners	Sugar refiners
Brass foundries	Fruit preservers	Sulphite cooks
Brick makers	Fumigators	Sulphur burners
Broom makers	Galvanizers	Sulphururs (malt and hops)
Carbolic-acid makers	Gelatine makers	Sulphuric-acid workers
Cellulose workers	Glass makers	Tannery workers
Ceramic workers	Glue makers	Tower men (sulphuric acid)
Chambermen (sulphuric acid)	Lead smelters	Ultramarine blue makers
Chargers (zinc smelting)	Mercury smelters	Vulcanizers (rubber)
Coke-oven workers	Oil-fotation-plant workers	Zinc smelters
Copper smelters	Paper-mill workers	
Digester-house workers (paper and pulp)	Petroleum refiners	
	Pottery workers	
	Pyrites burners	

79. Sulphuretted Hydrogen

Symptom, condition, or disease to look for

Irritation of mucous membranes of eyes and respiratory tract, conjunctivitis, bronchitis, rhinitis pharyngitis and laryngitis, pulmonary edema, headache and vertigo, hyperpnea, gastro-intestinal disturbances, bradycardia.

Occupations which offer such exposure

Alkali-salt makers	Flax-rettery workers	Pyrites burners
Artificial-silk makers	Gas (illuminating) workers	Pyroxylin-plastics workers
Barium-carbonate makers	Gas purifiers	Sewer workers
Blast-furnace workers	Glue workers	Soap makers
Bottlers (mineral water)	Gypsum workers	Soda (Leblanc) makers
Bronzers	Hydrochloric-acid makers	Sodium-sulphide makers
Cable splicers	Hydrogen - sulphide workers	Starch makers
Caisson workers	Match-factory workers	Sugar refiners
Carbon-disulphide makers	Miners	Sulphides makers
Cellulose extractors	Oil-flotation-plant workers	Sulphur-chloride makers
Coke-oven workers	Oil-well workers	Sulphuric-acid makers
Cyanogen makers	Petroleum refiners	Sulphur miners
Digester-house workers (paper and pulp)	Phosphorus-compound makers	Tannery workers
Dye makers	Pulp-mill workers	Transparent-wrapping-material workers
Fat renderers		Tunnel workers
Fertilizer makers		Vulcanizers

80. Sulphuric Acid

Symptom, condition, or disease to look for

Corrosive action on the skin, severe inflammation of the mucous membranes of the eyes and respiratory tract, injury to the teeth through softening of the dentine, chronic catarrh.

Occupations which offer such exposure

Acid dippers	Explosives workers	Photographic workers
Acid finishers (glass)	Fat purifiers	Picklers (metals)
Acid mixers	Felt-hat makers	Picric-acid makers
Acid recoverers	Fertilizer makers	Pyroxylin-plastics workers
Acid transporters	Galvanizers	Rayon makers
Alum workers	Glass finishers	Reclaimers (rubber)
Ammonium salts makers	Glue makers	Refiners (metals)
Ammonium sulphate makers	Guncotton dippers	Salt extractors (coke-oven byproducts)
Artificial leather makers	Hydrochloric-acid makers	Scourers (metals)
Artificial silk makers	Hydrocyanic-acid makers	Shoddy workers
Benzene purifiers	Jewelers	Soap makers
Beta still operators (beta naphthol)	Linoleum makers	Soda (Leblanc) makers
Burnishers (iron and steel)	Lithographers	Storage-battery workers
Calico printers	Mercerizers	Sugar refiners
Carbolic-acid makers	Nitrators	Sulphates makers
Carbonizers (shoddy)	Nitric-acid makers	Sulphuric-acid makers
Cartridge dippers	Nitrobenzene makers	Tallow refiners
Chambermen (sulphuric acid)	Nitrocellulose makers	Tannery workers
Color makers	Nitroglycerine makers	Temperers
Dimethyl sulphate makers	Oil purifiers	Towermen (sulphuric acid)
Dye makers	Paper makers	Transparent-wrapping-material workers
Electroplaters	Patent-leather makers	Wax refiners
Engravers	Perfume makers	Wire drawers
Etchers	Petroleum refiners	Yeast makers
Ether makers	Phenol makers	
	Phosphoric-acid makers	
	Phosphorus evaporating machine workers	

81. Sulphur Monochloride

Symptom, condition, or disease to look for

Compound of questionable toxicity. In contact with water it decomposes, forming hydrochloric acid, sulphurous, and sulphuric acid. Injury may result from the presence of these compounds.

Occupations which offer such exposure

Carbon-tetrachloride makers	Gold extractors	Sulphur monochloride workers
Cement mixers (rubber)	Insecticide makers	Vulcanizers
Dyers	Rubber substitute makers	

82. Tar

Symptom, condition, or disease to look for

Tar itch, acne, eczema or psoriasis, ulcers of the skin and cornea, epitheliomatous cancer, loss of appetite, nausea, diarrhea, headache, vertigo, irritation of the respiratory tract, conjunctivitis, albuminuria, edema, ischuria.

Occupations which offer such exposure

Artificial-stone makers	Creosoting-plant workers	Pavers
Asphalt workers	Electrode makers	Petroleum refiners
Battery (dry) makers	Flue cleaners	Pitch workers
Briquet makers	Gas (illuminating) workers	Roofers
Brush makers	Insulators	Roofing-paper workers
Chimney sweepers	Painters (tar)	Still (coal tar) cleaners
Coal-tar workers	Paint makers	Tar workers
Coke-oven workers	Paraffin workers	Wood preservers
Cord makers		

83. Tellurium

Symptom, condition, or disease to look for

Garlic-like odor of breath and of secretions and excretions, suppression of sweat, dryness of the mouth.

Dry itching skin, metallic taste, anorexia, nausea, vomiting, indigestion, constipation, and somnolence.

Occupations which offer such exposure

Copper refiners	Glass colorers	Lead refiners
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84. Tetrachlorethane (acetylene tetrachloride)

Symptom, condition, or disease to look for

Abnormal fatigue, profuse perspiration, general discontent and nervousness, headache and vertigo, insomnia, anorexia, gastro-intestinal disorders, abdominal pains, jaundice, increase of immature large mononuclear cells in blood, elevation of white cell count, slight anemia, slight increase in number of platelets in blood, petechiae, polyneuritis.

Occupations which offer such exposure

Airplane-dope makers	Enamelers	Paint-remover makers
Airplane-wing varnishers	Enamel makers	Paint removers
Artificial-pearl makers	Lacquerers	Rubber workers
Artificial-silk makers	Lacquer makers	Tapers (airplanes)
Cellulose acetate workers	Lithographers	Varnishers
Color makers	Moving-picture-film makers	Varnish makers
"Dope" workers	Oil extractors	

85. Tetraethyl Lead. See also Lead and Its Compounds

Symptom, condition, or disease to look for

Insomnia, nausea and vomiting, anorexia, vertigo and headache, muscular weakness, pallor, subnormal blood pressure, subnormal temperature, loss of weight, abdominal cramps, tremors, lead in feces and urine, lead encephalopathy.

Occupations which offer such exposure

Filling-station workers	Gasoline blenders	Tetraethyl lead makers
Garage workers		

86. Thallium

Symptom, condition, or disease to look for

Reddish discoloration and falling out of the hair, pains in the limbs, severe eye affections, inflammation of the kidneys.

Occupations which offer such exposure

Artificial-gem makers	Dye makers	Thallium workers
Color makers	Filament makers (incandescent lamps)	Thermometer makers
Depilatory makers	Glass workers	
Disinfectant makers		

87. Tin

Not generally regarded as an industrial poison.

88. Titanium Oxide

This compound is used as a substitute for white lead in the manufacture of paint. No ill effects have been reported as a result of its use in industry.

89. Trinitrotoluol. See Nitrobenzol

90. Turpentine

Symptom, condition, or disease to look for

Irritation of mucous membranes of eyes, nose, and upper air passages, cough, bronchial inflammation, salivation, headache and vertigo, irritation of kidneys and bladder, strangury, odor of violets in urine, severe irritation of skin, hardening of the epidermis.

Occupations which offer such exposure

Art-glass workers	Japan makers	Printers
Cable splicers	Japanners	Rubber workers
Calico printers	Lacquerers	Sealing-wax makers
Camphor makers	Lacquer makers	Shellackers
Cementers (rubber)	Linoleum makers	Shellac makers
Decorators (pottery)	Lithographers	Transfer workers
Dry cleaners	Millinery workers	(pottery)
Dye makers	Painters	Turpentine extractors
Enamelers	Paint makers	Varnishers
Enamel makers	Patent-leather makers	Varnish makers
Feather workers	Polishers	
Furniture polishers	Polish makers	

91. Uranium

Uranium is a source of radiant energy. It is reported to be the most toxic of metals. Symptoms following ingestion or injection of the soluble salts of uranium are reported to be nephritis, glycosuria, gastro-intestinal disorders, degeneration of the liver, affections of the nervous system, respiratory paralysis. No cases of industrial poisoning have been reported upon.

92. Vanadium

Symptom, condition, or disease to look for

Anemia, cachexia, irritation of respiratory tract, dry cough resulting in hemorrhages, diarrhea or constipation, emaciation, hysterical manifestations, melancholia.

Occupations which offer such exposure

Mordanters

93. Vinyl Chloride

This compound is used in the synthesis of organic compounds, principally resins.

According to the United States Bureau of Mines, animal experimentation shows unsteadiness and motor ataxia, incomplete and finally complete narcosis. Men exposed to 2.5 percent for approximately 3 minutes soon began to feel dizzy and disoriented as to space and size of surrounding objects and complained of a burning sensation in the soles of the feet. They immediately recovered on leaving the chamber, and complained only of a slight headache which lasted about 30 minutes.

94. Zinc. See Brass

Section III.—Dermatoses

Skin affections resulting from exposure to the hazards discussed in the foregoing section have been recorded with the symptoms, conditions, or diseases to be looked for in men employed in occupations where such hazards are present. Because the dermatoses form so large a proportion of all disabling occupational diseases, the more important occupations exposed to agencies producing skin affections have been listed separately. A complete enumeration of such occupations would be impracticable. Almost any foreign substance can become a skin irritant if it is in continuous contact with the skin. Thus, soap and water, which ordinarily do not irritate the skin, may cause severe dermatitis in laundresses. Under the dermatoses are included the effects on the skin of such causative agencies as poisonous and irritating chemicals, heat and cold, dust, radiant energy, friction, plants and woods, proteins, and vegetable and animal parasites.

Occupational dermatoses are frequently distinguished by their grouping, situation, mode of appearance, spread, and evolution. They crop up in series, retaining their initial type throughout, unless they are secondarily infected. They are most often local, except when they are a differentiating sign of the toxemias. The onset and development are usually sudden. The inflammation is sharply outlined. Exudation is excessive, and there is a deep-seated edema. The eruption usually predominates on the right side. Skin affections caused by different external irritants often, however, may show the same clinical picture. A number of occupational skin eruptions have no specific lesions or special pathology, which makes their differential diagnosis very difficult. For these reasons, the symptoms for each irritating substance have not been listed as has been done for the other hazards.

The excellent work of Dr. R. Prosser White entitled "The Dermatoses, or Occupational Affections of the Skin", admirably covers the entire subject of causative agencies and differential diagnosis. It should be consulted by anyone who has a need for an extensive treatment of the subject. The data presented in this section are based largely on Dr. White's compilation.

The following is a list of the more common occupations exposed to agencies causing dermatoses. It is a partial list only. Reference should also be made to the specific hazards listed for the occupation under consideration in section I.

Occupations Exposed to Specified Skin Irritants

Occupation exposed	Skin irritants
Acetylene makers.....	Calcium carbide.
Acid workers.....	Acids.
Alkali salt makers.....	Caustic alkali.
Artificial-flower makers.....	Caustic alkali, dyes.
Bakelite makers.....	Formaldehyde, phenol.
Bakers.....	Dough, potassium persulphate, heat.
Barbers.....	Soap, hair tonics.
Battery (dry) makers.....	Acids, zinc chloride, ammonium salts, charcoal.
Beatermen (paper and pulp).....	Caustic alkali, dyes.
Bleachers (cloth).....	Acids, bleaching powder, caustic alkali, hydrogen peroxide, sodium silicate.
Blooders (tannery).....	Dyes.
Bobbin carriers.....	Nitrobenzol, aluminum salts, formaldehyde, magnesium salts, sodium fluosilicate.
Bricklayers.....	Lime.
Bronzers.....	Dyes.
Broom makers.....	Dyes, vegetable dust.
Calico printers.....	Dyes.
Candy makers.....	Sugar.
Canners.....	Fruit acids, lacquer, organisms.
Cap loaders.....	Mercury compounds.
Carbide makers.....	Calcium carbide.
Carbolic-acid makers.....	Caustic alkali, phenol.
Cardboard stickers.....	Sodium silicate.
Carroters (felt hats).....	Acids, mercury compounds.
Cartridge dippers.....	Acids, soap.
Celluloid makers.....	Dyes.
Cementers (rubber shoes).....	Benzine, coal-tar products, naphtha, methyl alcohol.
Cement workers.....	Lime.
Chemical workers.....	See specific chemical in section II J.
Chromium platers.....	Chromium compounds.
Cloth preparers.....	Acids, caustic alkali, lime, soap, potassium salts, sodium salts, sodium silicate.
Confectioners.....	Sugar.
Cotton sifers.....	Acids, zinc chloride, arsenic salts, phenol.
Curriers (tannery).....	Paraffin, benzine.
Dampers (conditioning cotton).....	Nitrobenzol, aluminum salts, formaldehyde, magnesium salts, sodium fluosilicate.
Dentists.....	Procam.
Detonator cleaners.....	Mercury compounds.
Detonator fillers.....	Mercury compounds.
Detonator packers.....	Mercury compounds.
Disinfectant makers.....	Formaldehyde.
Druggists.....	Bleaching powder, soap, iodoform, sodium salts, sugar.
Dye makers.....	Acids, benzine, caustic alkali, coal-tar products, dye intermediates, dyes, turpentine, antimony compounds, barium salts, calcium salts, cresol, dextrins, ferrocyanides, formaldehyde, gums, hydroquinone, lead salts, phenol, potassium chlorate.
Dyers.....	Dyes.
Electroplaters.....	Acids, benzine, caustic alkali, lime, potassium cyanide, soap, nickel sulphate.
Embalmers.....	Formaldehyde.
Engravers.....	Acids, caustic alkali, ferric chloride, potassium cyanide.
Etchers.....	Acids, caustic alkali.
Explosives workers.....	Dye intermediates, explosives (TNT, etc.), ammonium salts, bromine, mercury compounds.
Farmers.....	Ivy and other plants, fertilizers, insecticides.
Felt-hat makers.....	Acids, mercuric nitrate, dyes.
Fertilizer makers.....	Calcium cyanamide.
Fish dressers.....	Brine.
Flax spinners.....	Lime, brine.
Furnacemen.....	Heat.
Furniture polishers.....	Benzine, caustic alkali, naphtha, turpentine, methyl alcohol, pyridine, rosin.
Fur workers.....	Dyes.
Galvanizers.....	Ammonium chloride.
Gardeners.....	Ivy and other plants, fertilizers, insecticides.
Gas-mantle impregnators.....	Thorium compounds.
Glass blowers.....	Charcoal, pitch, rosin.
Glass mixers.....	Caustic alkali.
Ink makers.....	Dyes.
Insecticide makers.....	Arsenic.

Occupations Exposed to Specified Skin Irritants—Continued

Occupation exposed	Skin irritants
Lampblack makers.....	Soot.
Laundry workers.....	Caustic alkali, soap.
Lime burners.....	Lime.
Lime pullers (tannery).....	Lime.
Linoleum makers.....	Dyes.
Machinists.....	Cutting compounds, lubricants, oils.
Masons.....	Lime.
Match-factory workers.....	Dyes, dextrins, gums.
Marcellizers.....	Acids, caustic alkali.
Mixers (rubber).....	Accelerators (hexamethylenetetramine).
Mordanters.....	Acids, caustic alkali, chromates, zinc chloride, aluminum salts, antimony compounds, arsenates, chromium salts, copper salts, iron salts, lead salts, phosphates, silicates, tin salts.
Mottlers (leather).....	Dyes.
Nickel platers.....	Zinc chloride, nickel sulphate.
Nitroglycerin makers.....	Acids, explosives.
Packing-house employees.....	Brine.
Painters.....	Acids, caustic alkali, paints, zinc chloride.
Paint makers.....	Paints.
Paper-box makers.....	Glue.
Paraffin workers.....	Paraffin.
Parchment makers.....	Zinc chloride.
Pencil (colored) makers.....	Dyes.
Petroleum refiners.....	Caustic alkali, paraffin.
Photographers.....	Acids, caustic alkali, chromates, metol, pyrogallol acid, turpentine, amido, bronzing powder, hydroquinone, rodinal.
Photographic-plate cleaners.....	Caustic alkali.
Pitch workers.....	Pitch.
Plasterers.....	Lime.
Polishers.....	Caustic alkali, naphtha.
Polishers (silver and brass).....	Potassium cyanide.
Printers.....	Ink, benzine.
Radium workers.....	Radiant energy.
Rock-salt workers.....	Brine.
Ropemakers.....	Oil, tar.
Rubber workers.....	Accelerators (hexamethylenetetramine).
Salt preparers.....	Brine.
Scratch brushes (electroplating).....	Acids, benzine, lime, oils.
Shell fillers.....	Explosives (TNT, etc.).
Shoe finishers.....	Benzine, coal-tar products, naphtha, methyl alcohol.
Sizers (cotton).....	Zinc chloride, aluminum salts, calcium salts, magnesium salts.
Smelters.....	Arsenic.
Soap makers.....	Caustic alkali, soap, vegetable oils, sodium silicate.
Sodium hydroxide makers.....	Caustic alkali.
Solderers.....	Acids, zinc chloride.
Sugar refiners.....	Sugar.
Tannery workers.....	Acids, lime, sodium sulphide, arsenic salts, brine, calcium hydrosulphide, chromium salts.
Tar workers.....	Tar.
Temperers.....	Oil, brine.
Tinners.....	Zinc chloride.
Tobacco rollers.....	Vegetable dust, vegetable oils.
Tube layers (cotton conditioning).....	Nitrobenzol, aluminum salts, formaldehyde, magnesium salts, sodium fluosilicate.
Typists.....	Carbon paper.
Vulcanizers.....	Accelerators (hexamethylenetetramine).
Washers.....	Caustic alkali.
Washwomen.....	Caustic alkali, soap, sodium salts.
Watchmakers.....	Potassium cyanide.
Waterproofers (paper).....	Paraffin.
Wax-ornament makers.....	Dye intermediates, potassium cyanide.
Wax-bobbin winders.....	Lime, aluminum salts, formaldehyde, magnesium salts, sodium fluosilicate.
Wood preservers.....	Tar, zinc chloride.
X-ray workers.....	Radiant energy.
Zinc-chloride makers.....	Acids, zinc chloride.

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 strikes. [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. 265. 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. 322. Kansas Court of Industrial Relations. [1923.]
- 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. 312. Consumers' cooperative societies in the United States in 1920.
- *No. 316. Cooperative credit societies (credit unions) in America and in foreign countries. [1923.]
- No. 437. Cooperative movement in the United States in 1925 (other than agricultural).
- No. 531. Consumers', credit, and productive cooperative societies, 1929.

Employment and unemployment.

- *No. 109. Statistics of unemployment and the work of employment offices in the United States. [1913.]
- *No. 173. Unemployment in New York City, N.Y. [1915.]
- *No. 183. Regularity of employment in the women's ready-to-wear garment industries. [1915.]
- *No. 193. Unemployment in the United States. [1916.]
- *No. 196. Proceedings of 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 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. [1921.]
- No. 409. Unemployment in Columbus, Ohio, 1921 to 1925.
- No. 542. Report of the Advisory Committee on Employment Statistics. [1931.]
- No. 544. Unemployment-benefit plans in the United States and unemployment insurance in foreign countries. [1931.]
- *No. 553. Fluctuation in employment in Ohio, 1914 to 1929.
- No. 555. Social and economic character of unemployment in Philadelphia, April 1930.

Foreign labor laws.

- *No. 142. Administration of labor laws and factory inspection in certain European countries. [1916.]
- No. 494. Labor legislation of Uruguay. [1929.]
- No. 510. Labor legislation of Argentina. [1930.]
- No. 529. Workmen's compensation legislation of the Latin American countries. [1930.]
- No. 549. Labor legislation of Venezuela. [1931.]
- No. 554. Labor legislation of Paraguay. [1931.]
- No. 559. Labor legislation of Ecuador. [1931.]
- No. 569. Labor legislation of Mexico. [1932.]

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. 548. Building operations in the principal cities of the United States in [1921 to] 1929.

Industrial accidents and hygiene.

- *No. 104. Lead poisoning in potteries, tile works, and porcelain-enamelled sanitary ware factories. [1912.]
- No. 120. Hygiene of the painters' trade. [1912.]
- *No. 127. Dangers to workers from dusts and fumes, and methods of protection. [1912.]

Industrial accidents and hygiene—Continued.

- *No. 141. Lead poisoning in the smelting and refining of lead. [1914.]
- *No. 157. Industrial accident statistics. [1915.]
- *No. 155. 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 the committee on statistics and compensation insurance cost of the International Association of Industrial Accident Boards and Commissions. [1916.]
- 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. The 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. 302. Survey of hygienic conditions in the printing trades. [1923.]
- No. 405. Phosphorus necrosis in the manufacture of fireworks and in the preparation of phosphorus. [1924.]
- 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 tax for industrial lead poisoning. [1928.]
- *No. 466. Settlement for accidents to American seamen. [1928.]
- *No. 488. Deaths from lead poisoning, 1925-1927.
- No. 490. Statistics of industrial accidents in the United States to the end of 1927.
- No. 507. Causes of death, by occupation. [1929.]

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.]
- *No. 483. Conditions in the shoe industry in Haverhill, Mass., 1928.
- No. 534. Labor conditions in the Territory of Hawaii, 1929-1930.

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. 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. 406. Laws relating to payment of wages. [1926.]
- *No. 448. Decisions of courts and opinions affecting labor, 1929-1930.
- *No. 552. Labor legislation, 1930.
- *No. 581. Laws relating to employment agencies in the United States, as of January 1, 1933.

Proceedings of annual conventions of the Association of Governmental Officials in Industry of the United States and Canada. (Name changed in 1928 from Association of Governmental Labor Officials of the United States and Canada.)

- *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.
- *No. 429. Thirteenth, Columbus, Ohio, June 7-10, 1926.
- *No. 455. Fourteenth, Paterson, N.J., May 31 to June 3, 1927.
- *No. 490. Fifteenth, New Orleans, La., May 21-24, 1928.
- *No. 508. Sixteenth, Toronto, Canada, June 4-7, 1929.
- *No. 530. Seventeenth, Louisville, Ky., May 20-23, 1930.
- *No. 563. Eighteenth, Boston, Mass., May 18-22, 1931.

Proceedings of annual meetings of the International Association of Industrial Accident Boards and Commissions.

- No. 210. Third, Columbus, Ohio, April 25-28, 1916.
- No. 248. Fourth, Boston, Mass., August 21-25, 1917.
- No. 264. Fifth, Madison, Wis., September 24-27, 1918.
- *No. 273. Sixth, Toronto, Canada, September 22-26, 1919.
- *No. 281. Seventh, San Francisco, Calif., September 20-24, 1920.
- *No. 304. Eighth, Chicago, Ill., September 12-23, 1921.
- *No. 333. Ninth, Baltimore, Md., October 8-13, 1922.
- *No. 369. Tenth, St. Paul, Minn., September 24-26, 1923.

Proceedings of annual meetings of the International Association of Industrial Accident Boards and Commissions—Continued.

- No. 333. Eleventh, Halifax, Nova Scotia, August 26-28, 1924.
- No. 395. Index to proceedings, 1914-1924.
- No. 408. Twelfth, Salt Lake City, Utah, August 17-20, 1925.
- No. 432. Thirteenth, Hartford, Conn., September 14-17, 1926.
- No. 456. Fourteenth, Atlanta, Ga., September 27-29, 1927.
- No. 485. Fifteenth, Paterson, N.J., September 11-14, 1928.
- No. 511. Sixteenth, Buffalo, N.Y., October 8-11, 1929.
- No. 536. Seventeenth, Wilmington, Del., September 22-26, 1930.
- No. 564. Eighteenth, Richmond, Va., October 5-8, 1931.
- No. 677. Nineteenth, Columbus, Ohio, September 26-29, 1932.

Proceedings of annual meetings of the International Association of Public Employment Services.

- No. 192. First, Chicago, December 19 and 20, 1913; second, Indianapolis, September 24 and 25, 1914; third, Detroit, July 1 and 2, 1915.
- *No. 220. Fourth, Buffalo, N.Y., July 20 and 21, 1916.
- No. 311. Ninth, Buffalo, N.Y., September 7-9, 1921.
- No. 337. Tenth, Washington, D.C., September 11-13, 1922.
- No. 355. Eleventh, Toronto, Canada, September 4-7, 1923.
- No. 400. Twelfth, Chicago, Ill., May 19-23, 1924.
- No. 414. Thirteenth, Rochester, N.Y., September 15-17, 1925.
- No. 478. Fifteenth, Detroit, Mich., October 25-28, 1927.
- No. 501. Sixteenth, Cleveland, Ohio, September 18-21, 1928.
- No. 538. Seventeenth, Philadelphia, Pa., September 24-27, 1929; eighteenth, Toronto, Canada, September 9-12, 1930.

Productivity of labor and technological unemployment.

- No. 356. Productivity costs in the common-brick industry. [1924.]
- No. 360. Time and labor costs in manufacturing 100 pairs of shoes, 1923.
- No. 407. Labor cost of production and wages and hours of labor in the paper box-board industry [1926.]
- *No. 412. Wages, hours, and productivity in the pottery industry, 1925.
- No. 441. Productivity of labor in the glass industry. [1927.]
- No. 474. Productivity of labor in merchant blast furnaces. [1928.]
- No. 475. Productivity of labor in newspaper printing. [1929.]
- No. 550. Cargo handling and longshore labor conditions. [1932.]
- No. 574. Technological changes and employment in the United States Postal Service. [1932.]

Retail prices and cost of living.

- *No. 121. Sugar prices, from refiner to consumer. [1913.]
- No. 130. Wheat and flour prices, from farmer to consumer. [1913.]
- No. 184. Butter prices, from producer to consumer. [1914.]
- *No. 170. Foreign food prices as affected by the war. [1918.]
- No. 287. Cost of living in the United States. [1924.]
- No. 369. The use of cost-of-living figures in wage adjustments. [1925.]
- No. 498. Retail prices, 1890 to 1924.

Safety codes.

- *No. 328. Safety code for the protection of industrial workers in foundries.
- No. 350. Rules governing the approval of headlighting devices for motor vehicles.
- *No. 351. Safety code for the construction, care, and use of ladders.
- No. 376. Safety code for laundry machinery and operations.
- *No. 382. Code of lighting school buildings.
- No. 410. Safety code for paper and pulp mills.
- *No. 430. Safety code for power presses and foot and hand presses.
- No. 447. Safety code for rubber mills and calendars.
- No. 451. Safety code for forging and hot-metal stamping.
- No. 463. Safety code for mechanical power-transmission apparatus—first revision.
- No. 509. Textile safety code.
- No. 512. Code for identification of gas-mask canisters.
- No. 519. Safety code for woodworking plants, as revised 1930.
- No. 527. Safety code for the use, care, and protection of abrasive wheels, as revised 1930.
- No. 556. Code of lighting: Factories, mills, and other work places. (Revision of 1930.)
- No. 562. Safety codes for the prevention of dust explosions.

Vocational and workers' education.

- *No. 159. Short-unit courses for wage earners, and a factory school experiment. [1918.]
- *No. 182. Vocational education survey of Richmond, Va. [1915.]
- *No. 199. Vocational education survey of Minneapolis, Minn. [1917.]
- No. 271. Adult working-class education in Great Britain and the United States. [1920.]
- No. 459. Apprenticeship in building construction. [1928.]

Wages and hours of labor.

- *No. 144. Wages and regularity of employment and standardization of piece rates in the dress and waist industry of New York City. [1914.]
- *No. 147. Wages and regularity of employment in the cloak, suit, and skirt industry. [1914.]
- No. 161. Wages and hours of labor in the clothing and cigar industries, 1911 to 1913.
- *No. 183. Wages and hours of labor in the building and repairing of steam-railroad cars, 1907 to 1912.
- No. 190. Wages and hours of labor in the cotton, woolen, and silk industries, 1907 to 1914.
- No. 204. Street railway employment in the United States. [1917.]
- *No. 218. Wages and hours of labor in the iron and steel industry, 1907 to 1913: With a glossary of occupations.
- *No. 225. Wages and hours of labor in the lumber, millwork, and furniture industries, 1914.
- No. 245. Industrial survey in selected industries in the United States, 1918.
- No. 297. Wages and hours of labor in the petroleum industry, 1928.
- No. 356. Productivity costs in the common-brick industry. [1924.]
- No. 358. Wages and hours of labor in the automobile-tire industry, 1928.
- No. 360. Time and labor costs in manufacturing 100 pairs of shoes, 1923.
- No. 365. Wages and hours of labor in the paper and pulp industry, 1928.
- No. 407. Labor cost of production and wages and hours of labor in the paper box-board industry. [1926.]

Wages and hours of labor—Continued.

- *No. 412. Wages, hours, and productivity in the pottery industry, 1926.
- No. 418. Hours and earnings in anthracite and bituminous coal mining, 1922 and 1924.
- No. 484. Wages and hours of labor of common street laborers, 1928.
- No. 499. History of wages in the United States from colonial times to 1928.
- No. 502. Wages and hours of labor in the motor-vehicle industry, 1928.
- No. 504. Wages and hours of labor in the hosiery and underwear industries, 1907 to 1928.
- No. 514. Pennsylvania Railroad wage data. From Report of Joint Fact Finding Committee in the wage negotiations in 1927.
- No. 516. Hours and earnings in bituminous-coal mining, 1929.
- No. 523. Wages and hours in the manufacture of airplanes and aircraft engines, 1929.
- No. 525. Wages and hours of labor in the Portland cement industry, 1929.
- No. 532. Wages and hours of labor in the cigarette manufacturing industry, 1930.
- No. 533. Wages and hours of labor in woolen and worsted goods manufacturing, 1910 to 1930.
- No. 534. Labor conditions in the Territory of Hawaii, 1929-1930.
- No. 535. Wages and hours of labor in the slaughtering and meat-packing industry, 1929.
- No. 537. Wages and hours of labor in the dyeing and finishing of textiles, 1930.
- No. 539. Wages and hours of labor in cotton goods manufacturing, 1910 to 1930.
- No. 546. Wages and hours in rayon and other synthetic yarn manufacturing, 1930.
- No. 547. Wages and hours in cane sugar refining industry, 1930.
- No. 557. Wages and hours of labor in the men's clothing industry, 1911 to 1930.
- No. 560. Wages and hours of labor in the lumber industry in the United States, 1930.
- No. 564. Union scales of wages and hours of labor, May 15, 1931.
- No. 567. Wages and hours of labor in the iron and steel industry, 1931.
- No. 568. Wages and hours of labor in the manufacture of silk and rayon goods, 1931.
- No. 570. Wages and hours of labor in foundry and machine shops, 1931.
- No. 571. Wages and hours of labor in the furniture industry, 1910 to 1931.
- No. 573. Wages and hours of labor in metalliferous mines, 1924 to 1931.
- No. 575. Wages and hours of labor in air transportation, 1931.
- No. 576. Wages and hours of labor in the slaughtering and meat-packing industry, 1931.
- No. 578. Wages and hours of labor in gasoline filling stations and motor-vehicle repair garages, 1931.
- No. 579. Wages and hours of labor in the boot and shoe industry, 1910 to 1932.
- No. 580. Wages and hours of labor in the bakery industry—bread and cake departments, 1931.

Welfare work.

- *No. 123. Employers' welfare work. [1913.]
- *No. 222. Welfare work in British munition factories. [1917.]
- *No. 250. Welfare work for employees in industrial establishments in the United States. [1919.]
- No. 458. Health and recreation activities in industrial establishments, 1926.

Wholesale prices.

- *No. 284. Index numbers of wholesale prices in the United States and foreign countries. [1921.]
- *No. 453. Revised index numbers of wholesale prices, 1922 to July, 1927.
- No. 572. Wholesale prices, 1931.

Women and children in industry.

- *No. 116. Hours, earnings, and duration of employment of wage-earning women in selected industries in the District of Columbia. [1913.]
- *No. 117. Prohibition of night work of young persons. [1913.]
- No. 118. Ten-hour maximum working day for women and young persons. [1913.]
- *No. 119. Working hours of women in the pea canneries of Wisconsin. [1913.]
- No. 122. Employment of women in power laundries in Milwaukee. [1913.]
- *No. 160. Hours, earnings, and conditions of labor of women in Indiana mercantile establishments and garment factories. [1914.]
- *No. 167. Minimum-wage legislation in the United States and foreign countries. [1915.]
- *No. 175. Summary of the report on conditions of woman and child wage earners in the United States. [1915.]
- *No. 176. Effect of minimum-wage determinations in Oregon. [1915.]
- *No. 180. The boot and shoe industry in Massachusetts as a vocation for women. [1915.]
- No. 182. Unemployment among women in department and other retail stores of Boston, Mass. [1915.]
- No. 193. Dressmaking as a trade for women in Massachusetts. [1915.]
- No. 215. Industrial experience of trade-school girls in Massachusetts. [1917.]
- *No. 217. Effect of workmen's compensation laws in diminishing the necessity of industrial employment of women and children. [1918.]
- *No. 223. Employment of women and juveniles in Great Britain during the war. [1917.]
- No. 253. Women in the lead industries. [1919.]
- No. 467. Minimum-wage legislation in various countries. [1928.]
- No. 558. Labor conditions of women and children in Japan. [1931.]

Workmen's insurance and compensation (including laws relating thereto).

- *No. 101. Care of tuberculous wage earners in Germany. [1912.]
- *No. 102. British national insurance act, 1911.
- No. 103. Sickness and accident insurance law in Switzerland. [1912.]
- No. 107. Law relating to insurance of married employees in Germany. [1913.]
- *No. 155. Compensation for accidents to employees of the United States. [1914.]
- *No. 211. Proceedings of the conference on social insurance called by the International Association of Industrial Accident Boards and Commissions, Washington, D.C., December 5-9, 1918.
- *No. 243. Workmen's compensation legislation in the United States and foreign countries, 1917 and 1918.
- No. 301. Comparison of workmen's compensation insurance and administration. [1922.]
- No. 312. National health insurance in Great Britain, 1911 to 1921.
- No. 376. Comparison of workmen's compensation laws of the United States as of January 1, 1925.
- No. 477. Public-service retirement systems, United States and Europe. [1929.]
- No. 496. Workmen's compensation legislation of the United States and Canada as of January 1, 1929. (With text of legislation enacted in 1927 and 1928.)
- No. 522. Workmen's compensation legislation of the Latin American countries. [1930.]

Miscellaneous series.

- *No. 174. Subject index of the publications of the United States Bureau of Labor Statistics up to May 1, 1915.
- No. 208. Profit sharing in the United States. [1916.]
- No. 242. Food situation in central Europe, 1917.
- No. 254. International labor legislation and the society of nations. [1919.]
- *No. 258. Historical survey of international action affecting labor. [1920.]
- No. 282. Mutual relief associations among Government employees in Washington, D.C. [1921.]
- No. 319. The Bureau of Labor Statistics: Its history, activities, and organization. [1922.]
- No. 328. Methods of procuring and computing statistical information of the Bureau of Labor Statistics. [1922.]
- No. 342. International Seamen's Union of America: A study of its history and problems. [1922.]
- No. 346. Humanity in government. [1922.]
- No. 372. Convict labor in 1922.
- No. 386. Cost of American almshouses. [1925.]
- No. 398. Growth of legal-aid work in the United States. [1928.]
- No. 401. Family allowances in foreign countries. [1928.]
- No. 461. Labor organizations in Chile. [1928.]
- *No. 465. Beneficial activities of American trade-unions. [1928.]
- No. 479. Activities and functions of a State department of labor. [1928.]
- No. 489. Care of aged persons in United States. [1929.]
- No. 506. Directory of homes for the aged in the United States. [1929.]
- No. 506. Handbook of American trade-unions, 1929 edition.
- No. 518. Personnel research agencies, 1930 edition.
- No. 541. Handbook of labor statistics, 1931 edition.
- No. 561. Public old-age pensions and insurance in the United States and in foreign countries. [1932.]
- No. 566. Park recreation areas in the United States, 1930.



