

STATE OF NEW JERSEY  
DEPARTMENT OF LABOR & INDUSTRY

HARRY C. HARPER

*Commissioner*

Percy A. Miller, Jr.

Industrial Hygiene Bulletin  
OCCUPATIONAL HAZARDS

DIVISION OF  
ENGINEERING AND SAFETY  
C. GEORGE KRUEGER, *Director*

Trenton, N. J.  
June, 1946

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# **OCCUPATION HAZARDS**

With

**Symptoms, Occupations Exposed and  
Methods of Prevention**

**INDUSTRIAL HYGIENE BULLETIN**

**Trenton, N. J.**

**June, 1946**

**NEW JERSEY DEPARTMENT OF LABOR**

**HARRY C. HARPER, Commissioner**

**DIVISION OF ENGINEERING AND SAFETY**

**C. GEORGE KRUEGER, Deputy Commissioner and Director**

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## Preface

For some time past, the State of New Jersey has recognized the importance of industrial hygiene and its proper relation to the welfare of the industrial worker and the general industrial life of the state. Almost three decades ago, hygiene in factories, mills, bakeries, workshops and places where goods are manufactured was made an important function of one of the major bureaus of the department.

The past two decades have been years of tremendous expansion in the field of industrial hygiene. It has come to be recognized as an important branch of industrial management in which industrialists, physicians, engineers, chemists, laboratory technicians, statisticians, labor law administrators, workmen's compensation officials, and factory inspectors cooperate in the discovery of hazards, the nature of the injuries they cause, and in working out measures for their prevention. They have been years noteworthy for the large number of scientific investigations undertaken here and abroad to determine the causes of ill health among workmen and the effects of exposure to specific hazards.

As a result of newer findings, knowledge of the effects of many hazards, long recognized as injurious, has been enhanced, and in addition a wealth of information has been supplied on the effects of importance of new hazards, notably the volatile solvents and chemicals used in the manufacture of synthetic resins, to mention only two.

In preparing this bulletin it has been endeavored to present the most recent thought on occupational hazards expressed in this vast literature on industrial hygiene. 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 is realized. It is not presumed to attempt to settle controversial questions, nor is the attempt made 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 in which the hazard may be present, and not necessarily those in which specific cases of injury have occurred. It should be recognized that even where poisons or other hazards are present the chances of injury may be slight. Some industries today, due to the excellence of the preventive measures they have instituted, are manufacturing or handling extremely toxic materials with virtually no danger to

the workmen. There is every reason to believe that most, if not all, plants could eliminate the hazards of poisoning if management and employees worked together toward that end and this may be said of many other hazards.

The text will serve as a useful guide for safety engineers and safety inspectors of the department in carrying on their vital work of providing for the safety to life and limb of the industrial workers of New Jersey.

A word of caution should be given to the layman against the use of the material presented here for self-diagnosis or for diagnosing the illness of others. That is a practice fraught with the gravest danger. The only people competent to make a diagnosis are physicians. They should be consulted without delay whenever there are signs or symptoms of ill health. The hazards covered now include "abnormalities of air pressure"; "abnormalities of temperature"; "dampness"; "defective illumination"; "dust"; "infections"; "radiant energy"; "repeated motion, pressure, shock, etc."; the "poisons"; and "dermatoses." The number of poisonous substances considered is 128. The number of occupations listed is approximately 1,100.

The text of the bulletin is based on Bulletin No. 41 (1942 revision) published by the United States Department of Labor and according to Mr. Verue A. Zimmer, Director, Division of Labor Standards, United States Department of Labor, the original work, performed by Dublin and Vane, was intended primarily to aid the medical examiners of the Metropolitan Life Insurance Company in the discovery of impairments among applicants for insurance. The original pamphlet soon attracted the attention of others not immediately interested in insurance medical examinations. 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, expressed their approval of it. It has been reproduced either in whole or in part in a number of works by authorities on the subject of industrial hygiene.

# OCCUPATION HAZARDS AND DIAGNOSTIC SIGNS

## *A Guide To Impairments To Be Looked For In Occupations*

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### 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, and so forth, 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. This is reflected in the frequent revisions of compensation laws to include an increasing number of occupational diseases. It is now generally recognized that patients come to physicians with pains and complaints of an indefinite character, but which in many instances are the effects of their occupation. With their attention directed to occupation as a possible factor, 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.

This bulletin has been prepared to aid safety engineers, safety inspectors, industrial hygienists, physicians in general practice, 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 air pressure"; "abnormalities of temperature"; "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. To aid in detecting the hazards and their effects on the worker, two lists are presented. The first consists of the more common occupations in which hazards may be found, 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 capitol letters after each occupation, A, B, C and so forth, refer to the general hazard. The arabic numerals signify the particular hazard, as E 1, organic dust; E 2, inorganic dust containing free silica.

In this 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. Occupational disease hazards can be brought under control if management and men work together. The greater interest of medical practitioners will help materially in the campaign of prevention. 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 of 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 the text 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. Those concerned with industrial rehabilitation should find this bulletin an aid in selecting occupations for those with arrested cases of tuberculosis or other organic diseases.

## Section I.

### Alphabetical List of Occupations

#### A

Abrasives workers, B 1, E 1, 2, 3.  
Acetaldehyde workers, J 1, 70.  
Acetanilide workers, J 10.  
Acetic acid makers, J 62, 70.  
Acetone workers, J 3, 70.  
Acetylene workers, E 3, J 3, 7, 13, 26, 27, 30, 38, 97. *See also* Carbide makers and Welders.  
Acid dippers, C, J 13, 42, 62, 88, 108.  
Acid finishers (glass), J 62, 66, 108.  
Acid makers. *See* particular acid.  
Acridine workers, J 4.  
Acrolein workers, J 5.  
Actors, J 66.  
Agricultural workers. *See* Farmers.  
Air-hammer operators, H.  
Airplane-dope makers, J 3, 8, 16, 28, 57, 74, 111.  
Airplane-hangar employees, J 15, 16, 28.  
Airplane pilots, A 2, J 27.  
Airplane pilots—crop dusting, A 2, J 12, 27, 66.  
Airplane wing varnishers. *See* Varnishers.  
Alcohol-distillery workers, J 8, 9, 16, 57, 70, 72.  
Aldehyde pumpmen, J 1, 72.  
Alkali salt makers, C, J 25, 34, 62, 106, 107.  
Alloy makers, B 1, J 12, 17, 27, 38, 39, 68, 69, 81, 102, 125.  
Aluminum extractors, J 64, 69.  
Alum workers, J 108.  
Amalgam makers, J 70.  
Amber workers, J 66.  
Ammonia workers, J 7, 24, 27.  
Ammonium salt makers, B 1, J 7, 26, 42, 62, 108.  
Ammonium sulphate makers, J 108.  
Amyl-acetate workers, J 8, 9.  
Amyl alcohol workers, J 9.  
Amyl-nitrite makers, J 9.  
Aniline dye makers. *See* Dye makers.  
Aniline workers, J 10, 13, 16, 38, 62, 85, 88.  
Animal hair dressers. *See* Hair workers.  
Animal handlers, F 1, 2, 3.  
Annealers, B 1, J 7.  
Antifreeze makers, J 72.  
Antimony extractors (refiners), B 1, J 11.  
Antimony fluoride extractors, J 64.  
Antipyrine makers, J 94.  
Arsenic roasters, B 1, J 12.

Art-glass workers, J 8, 15, 64, 66, 72, 123.  
Artificial-amber makers, J 56.  
Artificial-flower makers, H, J 12, 38, 66, 70, 72.  
Artificial-gem makers, J 114.  
Artificial-ice makers, B 2, C, J 7, 106.  
Artificial-leather workers, B 1, J 3, 8, 10, 12, 16, 20, 22, 72, 88, 108.  
Artificial-manure makers. *See* Fertilizer makers.  
Artificial-pearl makers, J 3, 8, 66, 88, 111.  
Artificial-rubber makers. *See* Rubber (synthetic) makers.  
Artificial-silk makers. *See* Rayon.  
Artificial-stone makers, E 3, J 109.  
Asbestos miners. *See* Miners.  
Asbestos products workers, B 1, E 4, J 16, 56, 109.  
Ashmen, E 1, 3.  
Asphalt workers, B 1, J 109.  
Automobile mechanics. *See* Garage workers.  
Automobile painters, C, J 16, 72. *See also* Painters.  
Automobile radiator cleaners, J 89.  
Aviation personnel (flying), A 2. *See also* Airplane pilots.  
Aviators. *See* Airplane pilots.

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Babbitt metal workers, J 11, 66.  
Babbitters, J 11, 66.  
Bacteriologists, F, F 1.  
Bakers, B 2, E 1, G 2, J 25, 27.  
Baking-powder makers, J 25.  
Balloon (hydrogen) workers, J 13.  
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Barbers, F, H.  
Barium carbonate makers, J 14, 107.  
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- Beatermen (paper and pulp), C, J 34.  
 Beauty parlor operatives, F, J 16.  
 Bed rubbers (stone), E 2, 3.  
 Bench molders. *See* Molders (foundry).  
 Benzene workers. *See* Benzol workers.  
 Benzine workers, J 15.  
 Benzol purifiers, J 16, 108.  
 Benzol-stillmen, B 1, J 16.  
 Benzol workers, J 16.  
 Beryllium alloy workers, J 17.  
 Beryllium extractors, J 64.  
 Bessemer-converter workers (iron and steel), B 1, J 27.  
 Beta-still operators (beta naphthol), B 1, J 108.  
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 Bicyclists, H.  
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 Bisque-kiln workers, B 1, E 2, 3, J 27.  
 Blacksmiths, B 1, G 2, H, J 25, 27, 42, 66.  
 Blanket makers, F 1.  
 Blasters, E 2, 3, J 27, 88, 107.  
 Blast-furnace workers, B 1, J 25, 27, 42, 97, 106, 107.  
 Bleachers, B 1, 2, J 30, 34, 38, 62, 64, 88, 89, 90, 95, 99, 104, 106.  
 Bleachery driers, B 1.  
 Bleaching powder makers, J 13, 30, 34, 69.  
 Blenders (motor fuel). *See* Gasoline blenders.  
 Blockers (felt hats), B 1, J 27.  
 Blooders (tannery), J 66.  
 Blooming-mill workers (iron and steel), B 1.  
 Blowers (felt hats), E 1, J 70.  
 Blowers (glass manufacturing). *See* Glass blowers.  
 Blowers-out (zinc smelting), B 1, J 128.  
 Blue print makers, J 38.  
 Blue print paper makers, J 10, 89.  
 Bluers (revolvers), B 1.  
 Boiler cleaners and washers, C, J 27.  
 Boiler-room workers, B 1, J 25, 27.  
 Boneblack makers, J 7, 96.  
 Bone renderers, extractors, etc., E 1, F 1, J 5, 42, 106.  
 Bookbinders, J 5, 8, 12, 66, 72, 89.  
 Bottle-cap makers, J 66.  
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 Brake-lining workers, E 4, J 16.  
 Brass founders, B 1, J 11, 12, 25, 27, 40, 66, 96, 106, 128.  
 Brass polishers, J 66. *See also* Polishers and cleaners (metal).  
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 Bricklayers, E 3.  
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 Candle makers, J 5, 10, 12, 38, 108.  
 Candy makers, B 1, 2.  
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 Carbide makers, B 1, E 1, 3, J 7, 27.  
 Carbohc-acid makers, J 16, 93, 106, 108.  
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 Carbon-black workers, B 1, E 1.  
 Carbon-brush makers, E 1, E 3.  
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 Carbon-dioxide makers, J 25.  
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 Carders (textiles), E 1.  
 Card grinders (textiles), E 1, 3.  
 Carpenters, H.  
 Carpet cleaners, E 1, F 1.  
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 Catchers (iron and steel), B 1.  
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 Cellulose makers, C, J 104, 106, 107, 108.  
 Cellulose-products makers. *See* rayon, pyroxylin-plastics, lacquers.  
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 Chlorinated naphthalene workers, J 33.  
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 Chlorine compound makers, J 62.  
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 Chlorodiphenyl makers, J 16.  
 Chloroform makers, J 3, 28, 30, 75.  
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 Cloth preparers, B 1, C. *See also* Bleachers.  
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 Clutch disk impregnators, J 16.  
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 Coal passers, E 1, 3.  
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 Cobblers, E 1, F 1, H, J 16, 28.  
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 Coke-oven workers, B 1, J 7, 16, 27, 106, 107, 109. *See also* Coal-tar workers.  
 Cold-storage-plant workers. *See* Refrigerating-plant workers.  
 Collar (fused) makers, J 3, 72, 74.  
 Collodion makers, J 88.  
 Colored paper workers, J 12.  
 Colorers (marble), J 38.  
 Colorers (white) of shoes, J 66.  
 Color makers, B 1, E 3, J 7, 10, 11, 12, 15, 16, 19, 23, 34, 38, 39, 45, 66, 69, 70, 73, 75, 79, 102, 108, 111, 114.  
 Comb makers, E 1, J 3.  
 Compositors, D, E 3, H, J 10, 11, 15, 66, 123.  
 Compounders (rubber), E 3, J 10, 11, 12, 15, 16, 38, 66.  
 Compressed air (caisson) workers. *See* Caisson workers.  
 Compressed air (pneumatic tool) workers. *See* Pneumatic-tool workers.  
 Concentrating mill workers, C, E 2, 3, J 66, 69, 102. *See also* Oil flotation plant workers.  
 Coners (felt hats), E 1, J 70.  
 Confectioners. *See* Candy makers.  
 Construction workers, C, E 3.  
 Cooks, B 2, F, G 2, J 27.  
 Copper founders, J 12, 40.  
 Copper miners. *See* Miners.  
 Copper refiners and smelters, B 1, J 11, 12, 27, 40, 64, 66, 69, 102, 106, 110.  
 Coppersmiths, J 12, 40.  
 Copper (strip) roller-mill workers, J 5.  
 Cordage factory workers, F 1, J 109.  
 Core makers, B 1, E 2, 3, J 27, 28, 128.

- Cork workers, E 1.  
 Corn-products workers, B 1, 2, C.  
 Cosmetic workers, J 12, 70, 74, 85.  
 Cotton-mill workers, B 1, C, E 1, 3.  
 Cottonseed-oil workers, B 1.  
 Cotton twisters, E 1, H.  
 Cranemen (glass industry), B 1.  
 Cranemen (iron and steel), B 1.  
 Crayon (colored) makers, J 38, 66.  
 Creosoting-plant workers, C, J 109.  
 Cresol-soap makers, J 41.  
 Cresylic-acid makers, J 41.  
 Crucible mixers, E 1, 3.  
 Crucible-steel-department employees, B 1.  
 Crushermen (clay and stone), E 2, 3.  
 Crushers (asbestos), E 4.  
 Cupola men (foundries), B 1, J 25, 27.  
 Curers, vapor (rubber). *See* Vulcanizers.  
 Curriers (tannery), E 1, F 1, J 12, 15.  
 Cut-glass workers, E 3, J 12, 66.  
 Cutlery makers, E 2, 3, J 8, 66.  
 Cutters (oxy-acetylene and other gases). *See* Welders.  
 Cyanamide makers, B 1, E 3, J 24.  
 Cyanide workers, J 7, 42.  
 Cyanogen makers, J 42, 70, 107.
- D**
- Dairy workers, F 1, 4.  
 Damascening workers, J 88.  
 Dancers, H.  
 Dead animal handlers, F.  
 De-brassers, J 88.  
 Decorators (pottery), J 12, 15, 16, 66, 70, 123.  
 Degreasers, J 15, 16, 26, 28, 33, 44, 48, 52, 76, 111, 112, 119.  
 Denatured-alcohol workers. *See* particular denaturant.  
 Dental workers, J 66, 70  
 Dentists, G 1, J 70.  
 Depilatory makers, J 14, 114.  
 Detinning workers, J 34.  
 Detonator cleaners, J 70.  
 Detonator fillers, J 70.  
 Detonator packers, J 70.  
 Devil operators (felt hats), E 1, J 70.  
 Diamond cutters, E 1, 3, H.  
 Diamond polishers, J 66.  
 Dichlorethylene workers, J 43.  
 Digester-house workers (paper and pulp), B 1, 2, J 106, 107.  
 Dimethyl-sulphate makers, J 13, 45, 72, 88, 108.  
 Dinitrobenzol workers, J 85.  
 Dinitrophenol workers, J 47.  
 Dioxan makers, J 48.  
 Dippers (gun cotton), J 88.  
 Dippers (rubber), J 15, 16, 28.  
 Dippers. *See also* Acid dippers.  
 Dish-washers, F 2.  
 Disinfectant makers, J 1, 10, 12, 16, 19, 25, 30, 34, 41, 42, 56, 70, 90, 93, 98, 106, 114, 119. *See also* Insecticide makers.  
 Divers, A 1, J 25, 27.  
 Doffers (textile), B 1, C, E 1.  
 Dog-pound workers, F.  
 Dope workers. *See* Airplane dope makers.  
 Dressers (glass), B 1.  
 Dresser tenders (textile), B 1, 2, C.  
 Driers, B 2, J 25, 27.  
 Driers (felt hats), B 2, J 72.  
 Driers (lacquer), G 2.  
 Driers (rubber), J 15, 16, 26.  
 Drier workers (foundries), J 27.  
 Drillers (rock), E 2, 3.  
 Drivers. *See* Chauffeurs.  
 Drop forgers, B 1.  
 Dry-battery workers. *See* Battery (dry) makers.  
 Dry cleaners, B 2, J 8, 15, 16, 26, 28, 43, 52, 72, 89, 111, 112, 119, 123.  
 Drying room workers (miscellaneous), B 2, J 25, 27.  
 Dye makers, B 1, 2, J 1, 3, 4, 7, 10, 11, 12, 13, 14, 16, 19, 22, 25, 28, 30, 34, 38, 41, 42, 45, 47, 48, 50, 56, 57, 58, 62, 66, 69, 70, 72, 73, 74, 75, 76, 79, 85, 88, 89, 93, 94, 95, 98, 100, 104, 106, 107, 108, 114, 119, 123, 124, 125.  
 Dyers, B 2, J 3, 7, 8, 10, 11, 12, 15, 38, 52, 56, 62, 64, 66, 69, 72, 88, 89, 93, 98, 100, 105, 117, 124, 125. *See also* Mordanters, and other preparatory process workers.
- E**
- Electrical condenser makers, J 31, 33.  
 Electrical transformer makers, J 31, 33.  
 Electricians, G 2, J 90.  
 Electric induction furnace workers, J 70.  
 Electric linemen, C, G 2. *See also* Cable splicers.  
 Electrode makers, E 1, J 109.  
 Electrolytic process (copper) workers, J 13.  
 Electroplaters, C, J 11, 12, 13, 15, 16, 23, 26, 28, 33, 38, 42, 57, 62, 64, 66, 70, 81, 88, 99, 108, 111, 119.  
 Electrotypers, B 2, E 1, 3, J, 7 11, 66. *See also* Electroplaters.  
 Elevator runners, H.  
 Embalmers, J 56, 70.  
 Embalming fluid makers, J 70.  
 Embossers, J 70.  
 Embroidery workers, D, J 66.  
 Emery wheel makers, E 3, J 66.  
 Enamelers, B 1, C, E 2, H, J 8, 11, 12, 15, 16, 26, 27, 38, 66, 69, 81, 111, 123.  
 Enamel makers, J 8, 11, 12, 14, 15, 16, 26, 27, 38, 62, 64, 66, 69, 74, 88, 111, 123.

- Engineers (stationary), B 1, 2, E 3, J 27.  
 Engravers, D, E 3, H, J 16, 40, 62, 66, 70, 88, 89, 104, 108.  
 Etchers, J 13, 62, 64, 88, 93, 108.  
 Ether makers, J 108.  
 Ethyl-benzene makers, J 49.  
 Ethyl-bromide makers, J 50.  
 Ethyl-chloride makers, J 50.  
 Ethylene-dibromide makers, J 19, 51.  
 Ethylene-dichloride makers, J 52.  
 Ethylene-oxide makers, J 53.  
 Examiners using fluoroscope or X-ray, G 1.  
 Excavation workers, F 2.  
 Explosives workers, C, J 1, 3, 7, 8, 9, 10, 11, 16, 19, 25, 26, 38, 41, 47, 56, 66, 70, 72, 85, 86, 88, 93, 96, 98, 100, 108. *See also* particular occupation.  
 Exterminators and fumigators. *See* Insecticide makers.  
 Extractor operators (soap), B 2, C.  
 Extractors (gold and silver). *See* Gold and silver refiners and extractors.  
 Extractors (oils and fats), J 3, 15, 16, 26, 52, 111, 119.
- F
- Farmers, F, F 1, 2, 4, J 12, 24, 66, 83.  
 Fat renderers, B 2, F 1, J 5, 68, 90, 107, 108.  
 Feather curers, E 1, J 12.  
 Feather workers, E 1, F 3, J 10, 12, 15, 16, 72, 106, 123.  
 Felt-hat makers, B 1, 2, E 1, J 27, 70, 72, 88, 108. *See also* particular occupation.  
 Felt makers, B 1, F 1, J 107.  
 Ferrosilicon makers, E 2.  
 Ferrosilicon workers, J 12, 13, 97.  
 Fertilizer makers, C, E 1, 3, F 1, 3, J 5, 7, 12, 13, 16, 24, 25, 42, 62, 64, 68, 69, 83, 88, 106, 107, 108. *See also* Phosphate mill employees.  
 Fiberizers (asbestos), E 4.  
 Fiber workers, E 1.  
 Filament makers and finishers (incandescent lamps), J 8, 27, 72, 114.  
 File cutters, E 3, J 66.  
 Filers, E 3, J 11, 66.  
 Filling station workers, J 15, 27, 66.  
 Film makers. *See* Photographic film makers.  
 Filter press workers, C.  
 Finishers (leather), E 1.  
 Fire-extinguisher makers, J 25, 28, 50, 51, 73.  
 Firemen (city), B 1, 2, C, J 27, 95, 106.  
 Firemen (stationary), B 1, 2, E 3, G 2, J 27.  
 Fireworks makers, J 11, 12, 14, 69, 70, 96, 98, 114. *See also* Explosives workers.  
 Fishermen, B 2, C, F 3, J 109.  
 Fish market workers, F.
- Flangers (felt hats), B 2, J 27.  
 Flatteners (glass), B 1.  
 Flavoring extract makers, J 8, 9, 16, 22, 85.  
 Flax-recttery workers, J 107.  
 Flax spinners, B 1, E 1.  
 Flint workers, E 2, 3.  
 Floor molders. *See* Molders (foundry).  
 Floor polish makers. *See* Polish makers.  
 Flour mill workers, E 1, F 2.  
 Flue cleaners, E 3, J 27, 106, 109.  
 Flue dust recoverers (sulphuric acid mfr.), J 114.  
 Flush tenders (aluminum), C.  
 Fly paper makers, J 12.  
 Food irradiators, G 2.  
 Forestry workers, F.  
 Forgemmen, B 1.  
 Formaldehyde workers, J 56.  
 Formers (felt hats), E 1, J 70.  
 Formic acid workers, J 57, 89.  
 Foundry workers, B 1, E 2, 3, G 2, J 25, 27. *See also* particular metal.  
 Freight handlers, F 1.  
 Frosters (glass and pottery), J 38.  
 Fruit-essence makers. *See* Flavoring extract makers.  
 Fruit preservers, J 106.  
 Fullers (textiles), J 16, 28, 44, 111.  
 Fulminate mixers, J 42, 70.  
 Fumigant makers. *See* Insecticide makers.  
 Fumigators and exterminators. *See* Insecticide makers.  
 Fur carders, E 1, F 1.  
 Fur clippers, E 1, F 1.  
 Fur cutters, E 1, F 1.  
 Fur handlers, E 1, F 1, J 70, 107.  
 Furnace workers, B 1, E 3, G 2, J 25, 27. *See also* particular metal.  
 Furniture polishers, E 1, H, J 8, 15, 38, 72, 92, 123.  
 Fur preparers, E 1, F 1, J 56, 70, 88.  
 Fur pullers, E 1, F 1.  
 Fusel-oil workers, J 9.
- G
- Galvanizers, B 1, C, J 5, 7, 12, 13, 15, 62, 66, 88, 106, 108, 119, 128.  
 Garage workers, J 5, 15, 27, 66.  
 Garbage workers, F 3.  
 Gardeners, F 4, J 12, 24, 66, 83.  
 Gas (illuminating) workers, B 1, 2, J 7, 13, 16, 27, 42, 64, 93, 107, 109, 119.  
 Gasoline blenders, J 10, 15, 16, 49, 51, 66, 85, 113.  
 Gasoline engine workers, J 5, 15, 27.  
 Gas purifiers, J 7, 42, 93, 107.  
 Gassers (textile), J 27.  
 Gatherers (glass), B 1.  
 Gelatine makers, F 1, J 5, 106.  
 Germicide makers. *See* Disinfectant makers.

- Gilders, J 8, 15, 16, 42, 70, 72, 88, 100.  
 Glass blowers, B 1, E 3, G 2.  
 Glass colorers, J 23, 38, 39, 102, 110.  
 Glass cutters, C, E 3.  
 Glass etchers, J 56, 64.  
 Glass finishers, C, E 3, J 62, 64, 66, 108.  
 Glass-furnace workers, B 1, E 3, G 2, J 27. *See also* Glass mixers.  
 Glass mixers, E 2, 3, J 11, 12, 14, 62, 66, 68, 69, 102, 104, 114, 124, 125.  
 Glass polishers, J 66.  
 Glass (safety) makers, J 22, 72, 111.  
 Glaze dippers (pottery), C, J 11, 12, 38, 62, 66, 69.  
 Glaze mixers (pottery), E 2, 3, J 11, 12, 62, 66, 69.  
 Glost-kiln workers, B 2, J 27, 66.  
 Glove makers (leather preparers), C, E 1. *See also* Tannery workers.  
 Glue workers, B 2, C, E 1, F 1, 3, J 5, 7, 15, 16, 25, 26, 28, 41, 62, 85, 106, 107, 108, 119.  
 Glycerine refiners, J 89.  
 Gold beaters, E 3, H.  
 Gold and silver refiners and extractors. E 3, J 12, 13, 19, 34, 42, 56, 64, 66, 70, 105.  
 Grain-elevator workers, E 1, F 2, J 25.  
 Granite workers. *See* stonecutters.  
 Graphite workers, B 1, E 1, 3.  
 Grinders (colors). *See* Color makers.  
 Grinders (metals), C, E 2, 3, H, J 11, 66.  
 Grinders (rubber), E 1, J 11, 66.  
 Grinding wheel makers, E 2, 3.  
 Grooms, F 2.  
 Guncotton dippers, J 88, 108.  
 Guncotton pickers, E 1.  
 Guncotton washers, C.  
 Gypsum miners, J 107.  
 Gypsum workers, B 2, E 3.
- H**
- Hair workers, C, E 1, F 1, 3, J 70.  
 Hammermen, H.  
 Handlers of putrid or decomposing animal products, F 3.  
 Hardeners (felt hats), J 70, 72.  
 Hardeners. *See* Temperers.  
 Harness makers, E 1.  
 Hat makers (felt). *See* Felt-hat makers.  
 Heel makers (shoe), E 1.  
 Hemp workers, E 1.  
 Hide workers, F 2.  
 Horn workers, E 1.  
 Horse handlers, F.  
 Hospital attendants, G 1.  
 Hothouse workers, B 2. *See also* Gardeners.  
 Hot-rod rollers (iron and steel), B 1.  
 Housemaids, H.  
 House wreckers, E 3.  
 Hunters, F.
- Hydraulic construction workers, C.  
 Hydraulic miners, C.  
 Hydrochloric-acid makers, J 13, 62, 107, 108.  
 Hydrocyanic-acid makers, J 42, 108.  
 Hydrofluoric-acid makers, J 64.
- I**
- Ice (artificial) makers. *See* Artificial-ice makers.  
 Ice-cream makers, B 2, C, J 7, 25.  
 Imitation. *See* Artificial.  
 Incandescent-lamp makers, J 8, 27, 66, 70, 72, 114. *See also* particular occupation.  
 Incandescent mantle hardeners, G 1, 2, J 64, 100.  
 Ink makers, J 7, 12, 14, 15, 16, 19, 27, 28, 34, 38, 41, 56, 62, 66, 70, 72, 74, 85, 89, 99, 103, 123, 125.  
 Insecticide makers, F, J 12, 14, 15, 19, 25, 26, 27, 28, 41, 42, 43, 48, 52, 53, 56, 66, 70, 73, 77, 83, 88, 96, 105, 106, 111, 114, 119, 123. *See also* Disinfectant makers.  
 Inspectors using fluoroscope or X-ray, G 1.  
 Instrument-dial (luminous) painters, G 1.  
 Insulation (sound, heat) workers, E 3.  
 Insulators (wire), J 11, 12, 16, 28, 31, 33, 52, 109.  
 Iodine makers, J 34.  
 Iron and steel workers (all departments), B 1, E 3, G 2, J 27, 117. *See also* particular occupation and Alloy makers.  
 Ironers, B 2, H, J 27.  
 Irradiators (food), G 2.
- J**
- Japan makers, B 2, J 12, 15, 66, 72, 123.  
 Japanners, J 12, 15, 66, 72, 123.  
 Jewelers, D, E 3, H, J 8, 13, 42, 62, 66, 70, 88, 108.  
 Junk (metal) refiners, B 1, E 3, J 66, 128.  
 Jute workers, E 1, 3.
- K**
- Kiln tenders, B 1, J 27.  
 Knitters, H.  
 Knitting-mill workers, E 1.
- L**
- Labelers (paint cans), J 66.  
 Laboratory workers, J 27, 70.  
 Laboratory workers (radium research), G 1.  
 Lace makers, E 1.  
 Lacquerers, J 3, 8, 9, 12, 15, 16, 28, 49, 52, 57, 66, 72, 76, 100, 111, 119, 122, 123.

- Lacquer makers, J 1, 3, 7, 8, 9, 12, 14, 15, 16, 20, 22, 28, 29, 31, 33, 48, 52, 56, 57, 60, 61, 66, 72, 74, 76, 88, 91, 100, 111, 119, 122, 123.  
 Lampblack makers, E 1, J 92, 93.  
 Lamps (electric). *See* Incandescent lamp makers.  
 Lapidaries, E 3.  
 Lard makers, J 5.  
 Lasters (shoes), B 2, C, E 1, J 72.  
 Lathe turners, H.  
 Laundry workers, B 1, 2, C, J 27, 30, 34, 56, 90.  
 Lead arsenate makers, J 12, 66.  
 Lead burners, J 13, 66.  
 Leadfoil makers, B 1, J 66.  
 Lead miners, J 66. *See also* Miners.  
 Lead-pipe makers, J 66.  
 Lead platers (on iron), J 70.  
 Lead-salts makers, J 66.  
 Lead smelters, B 1, J 11, 12, 23, 27, 66, 102, 106, 110.  
 Leather workers, E 1, F 1, J 8, 14, 28, 62, 72, 119. *See also* Tannery workers.  
 Lehr tenders (glass), B 1.  
 Letter sorters, D, H.  
 Levermen (iron and steel), B 1.  
 Lifters-over (glass), B 1.  
 Lime burners, B 1, E 3, J 13, 25, 27, 102.  
 Lime-kiln chargers, E 3, J 25, 27.  
 Lime pullers (tannery), C, F 1.  
 Lime workers, E 3.  
 Linen workers, E 1.  
 Linoleum makers, B 1, 2, C, E 1, 3, J 5, 8, 12, 14, 15, 16, 28, 38, 66, 69, 72, 108, 123.  
 Linotypers, J 11, 27, 66.  
 Linseed-oil boilers, J 5, 25, 66.  
 Litharge workers, J 66.  
 Lithographers, E 3, H, J 10, 12, 15, 16, 38, 62, 66, 70, 72, 88, 89, 108, 111, 123.  
 Lithopone makers, J 14, 23.  
 Lithotransfer workers, J 66.  
 Locksmiths, H.  
 Longshoremen, F 1, J 69.  
 Lumbermen, B 2.  
 Luminous dial factory workers, G 1.  
 Lutens (zinc smelting), B 1, J 128.  
 Lye makers, J 99.
- M**
- Machinists, H, J 92.  
 Magnesium alloy makers, J 68.  
 Mail carriers, C, F.  
 Mail sorters, D, H.  
 Manganese-dioxide workers, J 69.  
 Manganese grinders, J 69.  
 Manganese-ore separators, J 69.  
 Manganese-steel makers, J 69.  
 Manometer makers, J 70.  
 Manure handlers, F 4.  
 Marble cutters, E 3.  
 Marblers (glass), B 1.  
 Masons, C, E 2, 3, H.  
 Masseurs, F.  
 Match-factory workers, C, E 1, 3, J 11, 26, 38, 66, 69, 96, 99, 107.  
 Mattress makers, E 1, F 1.  
 Meat inspectors, F, F 1, F 4.  
 Meat packing employees. *See* Packing house employees and slaughter-house.  
 Mechanics (gas engines), J 27, 92.  
 Melters (foundry, glass), B 1.  
 Mercerizers, J 62, 104, 108.  
 Mercury-alloy makers, J 70.  
 Mercury-boiler workers, J 70.  
 Mercury-bronzers, J 70.  
 Mercury-miners, J 70. *See also* Miners.  
 Mercury-pump workers, J 70.  
 Mercury-salt workers, J 70.  
 Mercury smelters, B 1, J 27, 70, 106.  
 Mercury-solder workers, J 70.  
 Mercury-still cleaners, J 70.  
 Mercury-switch makers, J 70.  
 Mercury-vapor-lamp makers, J 70.  
 Metallizers, J 23, 66, 102, 128.  
 Metal polishers and cleaners. *See* Polishers and cleaners (metal).  
 Metal-polish makers. *See* Polish makers.  
 Metal turners, E 3.  
 Metal workers. *See* particular occupation.  
 Metal washers, J 15.  
 Methane (synthetic) makers, J 27.  
 Methyl-alcohol workers, J 3, 27, 72.  
 Methyl-bromide makers, J 19, 72, 73.  
 Methyl-chloride makers, J 62, 72, 75.  
 Methyl-compound makers, J 72.  
 Methylene chloride workers, J 76.  
 Mica strippers or splitters, E 3.  
 Mica workers, E 3.  
 Microscopists, H.  
 Milkers, F 2, H.  
 Milk inspectors, F 4.  
 Millers, F 2.  
 Millinery workers, J 10, 15, 16, 72, 123.  
 Mineral earth workers, E 3.  
 Miners, B 1, 2, C, D, E 2, 3, H, J 25, 27, 69, 88, 103, 107.  
 Minkery workers, F 1.  
 Mirror silverers, B 2, C, J 1, 7, 16, 42, 56, 57, 66, 70, 103.  
 Mixers (felt hats), E 1, J 70.  
 Mixers (rubber), B 2, E 3, J 10, 11, 12, 15, 16, 28, 38, 66.  
 Mixing-room workers (miscellaneous), E 1, 3.  
 Mold breakers (foundry), E 2, 3.  
 Mold breakers (pottery), J 27.  
 Molders (asbestos), E 4.  
 Molders (foundry) B 1, E 2, 3, J 66, 128.  
 Monotypers, J 11, 27, 66.  
 Mordanters, J 9, 11, 12, 15, 16, 30, 38, 42, 57, 88, 125.

- Motion-picture film workers, J 8, 22, 27, 111. *See also* Pyroxylin plastics workers.
- Motion-picture-machine operators, G 2, J 88.
- Motion-picture-studio workers and actors, D, G 2.
- Motormen, B 2.
- Mottlers (leather), J 8, 72
- Muffle tenders, B 1.
- Mule handlers, F.
- Muriatic-acid makers. *See* Hydrochloric-acid makers.
- Muriatic-acid mixers. *See* Acid mixers.
- Musical-instrument makers, J 66.
- Musicians, H.
- N
- Naphthylamine workers, J 10.
- Neon lights lettermakers, J 27.
- Nickel extractors, J 81.
- Nickel platers, C. *See also* Electroplaters.
- Nickel-purification workers (Mond process), J 81, 82.
- Nitraniline workers, J 10.
- Nitrators, J 85, 88, 108.
- Nitric-acid workers, J 7, 66, 88, 108.
- Nitrobenzene workers. *See* Nitrobenzol workers.
- Nitrobenzol workers, J 16, 85, 88, 108.
- Nitrocellulose workers, J 3, 8, 9, 13, 16, 74, 88, 108. *See also* Pyroxylin plastics workers.
- Nitroglycerin makers, J 13, 66, 86, 88, 108.
- Nitrous-oxide workers, J 88.
- Nurses, G 1.
- O
- Oilcloth makers. *See* Linoleum makers.
- Oilers, J 92.
- Oil extractors. *See* Extractors (oils and fats).
- Oil-flotation-plant workers, J 92, 106, 107. *See also* Concentrating mill workers.
- Oil purifiers, J 108.
- Oil refiners. *See* Petroleum refiners.
- Oil-well workers, J 92, 107.
- Open-hearth-department workers (iron and steel), B 1, J 27.
- Ore concentrating mill workers. *See* Concentrating mill workers.
- Ore crushermen (siliceous rock), E 2.
- Oxalic-acid makers, J 42, 88, 89, 99.
- Oxy-acetylene cutters. *See* Welders.
- Ozonators, J 90.
- P
- Packing-house employees, B 1, 2, C, F, F 3, 4, J 107. *See also* Slaughterhouse workers.
- Painters, H, J 3, 8, 9, 10, 11, 12, 15, 16, 26, 28, 38, 66, 69, 70, 72, 88, 119, 123.
- Painters (luminous watch and instrument dials), G 1.
- Painters (tar), J 109.
- Paint makers, C, J 3, 8, 9, 10, 11, 12, 14, 15, 16, 23, 26, 28, 31, 33, 38, 62, 66, 68, 69, 70, 72, 93, 100, 102, 104, 108, 109, 117, 119, 123, 124.
- Paint-remover makers, J 15, 16, 20, 28, 41, 44, 48, 58, 72, 76, 93, 111, 119.
- Paint removers, E 3, J 3, 8, 15, 16, 28, 44, 66, 76, 93, 111, 119.
- Pair heaters (tin plate), B 1.
- Paper-box makers, H.
- Paper glazers, J 12.
- Paperhangers E 3, J 12, 38, 66.
- Paper makers, B 1, 2, C, F 2, J 7, 8, 13, 34, 38, 56, 62, 64, 66, 68, 99, 104, 106, 107, 108, 117. *See also* particular occupation.
- Paper-money makers, J 38.
- Paraffin workers, J 3, 16, 26, 28, 52, 92.
- Parakeet handlers, F.
- Paris-green workers, J 12.
- Parrot handlers, F.
- Patent leather makers, B 2, J 8, 27, 66, 72, 89, 90, 108, 123.
- Pavers, B 1, H, J 109.
- Pencil makers, J 3, 10, 12, 16, 38, 100.
- Perfume makers, J 3, 7, 8, 10, 15, 16, 22, 28, 41, 43, 45, 50, 57, 62, 72, 75, 76, 79, 85, 93, 99, 108, 119.
- Petroleum refiners, B 1, C, J 3, 5, 7, 10, 15, 16, 27, 44, 62, 66, 76, 85, 92, 104, 106, 107, 108, 119, 123.
- Pewter makers, J 11.
- Pharmaceutical workers, E 1, J 3, 5, 10, 11, 12, 16, 19, 24, 25, 28, 30, 47, 48, 50, 51, 52, 57, 68, 69, 70, 73, 75, 76, 79, 86, 88, 93, 94, 95, 96, 98, 99, 104, 108, 110, 111, 112, 119, 123, 124.
- Phenol makers, J 16, 93, 108.
- Phenyl-hydrazine workers, J 94.
- Phosgene makers, J 27, 34, 95.
- Phosphate extractors, J 62.
- Phosphate-mill workers, B 2, C, E 3, J 64, 96. *See also* Fertilizer makers.
- Phosphine workers, J 27, 97.
- Phosphor-bronze workers, J 96.
- Phosphoretted-hydrogen workers, J 97.
- Phosphoric-acid makers, J 42, 88, 108.
- Phosphorus-compound makers, J 96, 107.
- Phosphorus evaporating machine operators, B 2, C, J 96, 108.
- Phosphorus extractors, J 64, 96, 97.
- Phosphorus (red) makers, J 96, 97.
- Photoengravers, J 7, 8, 16, 38, 72, 88, 99.
- Photographers, D, G 2, J 72. *See also* Photographic-material workers.
- Photographic-film makers, D, J 8, 19, 22, 88, 103. *See also* Pyroxylin-plastics workers.

- Photographic-material workers, J 1, 3, 7, 10, 14, 16, 34, 38, 41, 42, 56, 62, 70, 93, 98, 108, 110, 119, 123, 124, 125. *See also* Photographic-film makers.  
 Photograph retouchers, J 66.  
 Photogravure workers, J 38, 88.  
 Physicians, G 1, J 25, 70.  
 Picklers, B 1, C, J 13, 42, 62, 64, 88, 108.  
 Picric-acid makers, J 16, 88, 93, 98, 108.  
 Pigeon fatteners, F 2.  
 Pigment makers. *See* Color makers.  
 Pile drivers, H.  
 Pilots (airplane). *See* Airplane pilots.  
 Pipe fitters, J 66. *See also* particular liquid piped.  
 Pitch workers, B 1, J 12, 41, 109.  
 Planer men (stone), E 2, 3.  
 Plasterers, C, E 3, F 1.  
 Plaster of Paris workers, E 3.  
 Platers. *See* Electroplaters and Metal-lizers.  
 Platinum extractors, J 19.  
 Plumbers, J 13, 27, 66. *See also* particular substance piped.  
 Pneumatic tool workers, E 3, H.  
 Policemen, C, J 27.  
 Polishers and cleaners (metal), D, E 1, 2, 3, H, J 15, 16, 42, 62, 66, 72, 89, 100, 103, 119, 123.  
 Polish makers, E 3, J 8, 10, 15, 16, 28, 42, 48, 72, 85, 89, 119, 123.  
 Porcelain makers. *See* Pottery work-ers.  
 Porters, H.  
 Potassium-hydroxide makers, J 99.  
 Pot fillers (glass), B 1.  
 Potlifters (iron and steel), B 1.  
 Pot pullers (foundry), B 1.  
 Pot-room workers (aluminum foundry; carbide plant), B 1.  
 Pot setters, B 1.  
 Pottery workers, B 1, C, E 2, 3, J 12, 25, 27, 38, 39, 62, 64, 66, 69, 70, 102, 106. *See also* particular occupation.  
 Pouncers (felt hats), E 1, 3.  
 Pourers (foundry), B 1.  
 Powder makers. *See* Smokeless powder makers.  
 Preparers (tannery), C, F 1, 3.  
 Preservative makers and handlers, J 56.  
 Pressers, H, J 27.  
 Pressmen (oil refining), C, J 92.  
 Pressmen (printers). *See* Printers.  
 Pressroom workers (rubber), B 2, J 10, 11, 12, 15, 16.  
 Primers (explosives), J 70.  
 Printers, E 3, J 10, 11, 12, 15, 16, 27, 28, 42, 66, 70, 72, 112, 123.  
 Printers textile. *See* Textile printers.  
 Puddlers (iron and steel), B 1, J 27, 69.  
 Pullers-out (felt hats), B 1.  
 Pull mill workers, B 1, C. *See also* Paper makers.  
 Putty makers, E 3, J 15, 26, 66.  
 Putty polishers (glass), E 3, J 66.  
 Pyridine makers, J 100.  
 Pyrites burners, B 1, E 3, J 12, 102, 106, 107.  
 Pyroxylin plastics workers, E 1, J 1, 3, 5, 8, 9, 10, 13, 15, 16, 22, 27, 28, 42, 43, 48, 51, 66, 72, 74, 88, 107, 108, 111, 122.
- Q**
- Quarrymen, E 2, 3, H.  
 Quartz workers, E 2.
- R**
- Radioactive paint makers, G 1.  
 Radioactive water makers, G 1.  
 Radiologists, G 1.  
 Radio tube makers, J 70.  
 Radium miners, G 1.  
 Radium ore reduction workers, G 1.  
 Radium specialists, G 1.  
 Rag workers, E 1, F 1, 3.  
 Rayon makers, B 1, C, J 7, 8, 13, 22, 26, 31, 34, 42, 43, 48, 56, 62, 72, 76, 88, 89, 104, 107, 108, 111.  
 Reclaimers (rubber), J 10, 16, 26, 62, 66, 93, 108.  
 Red lead workers, J 66.  
 Refiners (metals), B 1, J 12, 13, 27, 62, 66, 70, 88, 102, 106, 108. *See also* particular occupation.  
 Refiners (sugar). *See* Sugar refiners.  
 Refrigerating-plant workers, B 2, C, J 7, 25, 75, 90.  
 Refrigerator (mechanical) makers and repair-men, J 5, 50, 73, 75, 77, 106.  
 Resins (synthetic) makers, E 1, J 1, 3, 31, 33, 41, 44, 56, 58, 72, 74, 89, 93, 102, 119, 126.  
 Riveters, H, J 66.  
 Road repairers, B 1, E 3, J 109.  
 Roentgenologists, G 1.  
 Roller coverers (cotton mill), B 1, E 1.  
 Rollers (metals), B 1.  
 Roll setters (iron and steel), B 1.  
 Roll wrenchers (iron and steel), B 1.  
 Roofers, B 2, J 66, 109.  
 Roofing material workers, B 1, E 3, J 109.  
 Rope makers, E 1, J 109.  
 Rotogravure workers, J 16.  
 Roughers (iron and steel), B 1.  
 Rubber-cement makers. *See* Cement mixers (rubber).  
 Rubber glove makers, J 15.  
 Rubberized asbestos board makers, J 15.  
 Rubber (synthetic) makers, J 1, 9, 10, 34, 37, 41, 88, 105.  
 Rubber tire builders, J 15, 16.

- Rubber workers**, B 2, E 1, 2, 3, J 3, 10, 11, 12, 14, 15, 16, 26, 28, 38, 52, 56, 57, 66, 68, 72, 88, 93, 100, 104, 110, 111, 119, 123. *See also* particular occupation.
- S**
- Sagger makers**, C, E 3, J 66.  
**Sailors**, B 2, H, J 27.  
**Salt extractors** (coke-oven byproducts), J 7, 108.  
**Salt preparers**, B 1, 2, E 3.  
**Sand blasters**, E 2, 3.  
**Sand cutters**, E 2.  
**Sanders**, E 2, 3.  
**Sanding machine operators**, E 2, 3.  
**Sandpaperers** (enameling and painting auto bodies, etc.), E 3, J 66.  
**Sandpaper makers**, E 2, 3.  
**Sand pulverizers**, E 2.  
**Sandstone quarriers, crushers, dressers**, E 2.  
**Saw filers**, E 3.  
**Sawmill workers**, E 1.  
**Sawyers**, H.  
**Sawyers (stone)**, E 2, 3.  
**Scissors sharpeners**, E 3, H.  
**Scourers (belts)**, J 16.  
**Scourers (metals)**, J 15, 28, 88, 108, 119.  
**Scourers, wood lasts (shoes)**, E 1.  
**Scouring powder makers**, E 2, 3.  
**Scrapers (foundry)**, E 2, 3.  
**Screen tenders (pulp mill)**, C.  
**Screen workers** (lead and zinc smelting), E 3, J 66.  
**Scrubwomen**, H.  
**Sealers** (incandescent lamps), J 27.  
**Sealing-wax makers**, J 12, 123.  
**Seamstresses**, H.  
**Selenium refiners**, J 102.  
**Sewage purification workers**, J 34.  
**Sewer workers**, C, J 7, 15, 25, 27, 107.  
**Sewing machine operators**, H.  
**Shade cloth makers**, J 15, 16.  
**Shale oil workers.** *See* Petroleum refiners.  
**Shavers** (felt hats; fur; tannery), C, E 1, F 1, 3.  
**Shearers**, F, F 4.  
**Sheep dip makers**, J 12.  
**Sheet metal workers**, J 66.  
**Shellackers**, J 8, 15, 16, 22, 66, 72, 123.  
**Shellac makers**, J 7, 8, 15, 16, 22, 66, 72, 123.  
**Shell fillers**, J 47, 85, 86, 98.  
**Shepherds**, F, F 1.  
**Sherardizers**, J 128.  
**Shingle stainers**, J 15.  
**Shipyard workers**, J 109.  
**Shoddy workers**, E 1, F 1, 3, J 13, 34, 62, 108.  
**Shoe dyers**, J 66, 85.  
**Shoe factory operatives**, E 1, F 1, J 3, 8, 15, 16, 28, 72, 111, 119, 123. *See also* particular occupation.  
**Shoe finishers**, B 2, J 7, 8, 9, 15, 16, 72.  
**Shoe-heel (wood) coverers**, J 3, 8, 15, 16, 72.  
**Shoemakers.** *See* Cobblers.  
**Shooting gallery workers**, J 70.  
**Shot makers**, J 11, 12, 66.  
**Shove-in boys (glass)**, B 1.  
**Shifters**, E 1, 3.  
**Silicon alloy makers**, E 2.  
**Silk weighters**, J 66, 116.  
**Silk workers**, E 1, F 3.  
**Silo workers**, J 25.  
**Silverers (mirror).** *See* Mirror silverers.  
**Silver-foil makers**, J 103.  
**Silver melters**, B 2, J 27, 42, 103.  
**Silver miners**, J 12.  
**Silver nitrate makers**, J 103.  
**Silver platers**, J 103. *See also* Electroplaters.  
**Silversmiths**, J 103.  
**Singers (cloth)**, J 27.  
**Sintering plant workers**, E 3.  
**Sizers (felt hats)**, B 1, J 70.  
**Skimmers (glass)**, B 1, G 2.  
**Slag workers**, B 1, E 3.  
**Slate grinders**, E 2, 3.  
**Slaughter-house workers**, C, F, F 1, 3, 4. *See also* Packing-house workers.  
**Slip makers (pottery)**, C, E 3, J 66.  
**Slushers (porcelain enameling)**, J 66.  
**Smelters**, B 1, E 2, 3, J 106. *See also* particular metal.  
**Smokeless-powder makers**, J 3, 8, 9, 16, 26, 85, 86, 88, 93, 98.  
**Smoothers (glass)**, C, E 3.  
**Soap (abrasive) workers**, E 2, 3.  
**Soap makers**, B 2, C, E 1, F 3, J 5, 8, 12, 15, 16, 28, 44, 52, 56, 57, 62, 69, 72, 85, 99, 104, 107, 108, 109, 111, 112, 119.  
**Soda makers**, C, J 7, 13, 25, 27, 34, 88, 107, 108.  
**Sodium hydroxide makers**, C, J 34, 104.  
**Sodium silicate makers**, E 2.  
**Sodium sulphide makers**, J 107.  
**Softeners (tannery)**, E 1.  
**Solderers**, G 2, J 13, 23, 27, 42, 62, 66.  
**Solder makers**, J 11, 23, 66.  
**Sole stitchers (Blake machine)**, J 70.  
**Soot packers**, E 1, J 12.  
**Spice makers**, E 1.  
**Spinners (asbestos)**, E 4.  
**Spinners (textiles)**, E 1, H.  
**Spongers**, B 1, C.  
**Sprayers (metals).** *See* Metallizers.  
**Sprayers (paint).** *See* Painters.  
**Sprayers (trees)**, J 12, 42, 66.  
**Spreaders (rubber works)**, B 2, J 28.  
**Stablemen**, F 1, 2, 4, J 7.  
**Stamp-mill workers**, B 1, C, E 2, 3.  
**Starch makers**, E 1, J 25, 107.  
**Starters (felt hats)**, B 1, J 70.

Statuary workers, E 2, 3.  
 Steam fitters. *See* Pipe fitters.  
 Stearic acid makers, B 2, J 5.  
 Steel alloy makers. *See* Alloy makers.  
 Steel (chrome) makers, J 38.  
 Steel (corrosion resistant) makers, J 12.  
 Steel engravers. *See* Engravers.  
 Steeple jacks, J 27.  
 Stereotypers, B 2, J 11, 66.  
 Stiffeners (felt hats), J 70, 72.  
 Still (coal tar) cleaners, B 1, J 16, 109.  
 Stillmen (carbolic acid), B 1, J 93.  
 Stillmen, operating, B 1. *See also* particular chemical.  
 Stitchers (shoes), J 72.  
 Stockmen, F 4.  
 Stockyard workers. *See* Slaughterhouse workers.  
 Stokers, B 1, 2, E 3, G 2, J 27.  
 Stone (artificial) makers, E 3, J 109.  
 Stone cleaners, J 64, 89.  
 Stonecutters, C, E 2, 3, H.  
 Stone masons. *See* Masons.  
 Stone workers, E 2, 3.  
 Storage-battery makers, J 8, 11, 13, 23, 27, 66, 70, 81, 106, 108.  
 Straw cutters, F 2.  
 Straw-hat makers, B 2, E 1, J 5, 8, 30, 56, 72, 111.  
 Street cleaners, E 1, 3, F 3.  
 Street repairers, B 1, E 3, J 109.  
 Submarine workers, J 13, 25, 34.  
 Subway construction workers, E 2.  
 Sugar refiners, B 1, 2, C, E 1, 3, J 7, 14, 25, 34, 62, 106, 107, 108.  
 Sulphates makers, J 108.  
 Sulphides makers, J 107.  
 Sulphite cooks (pulp mill), B 1, 2, J 106.  
 Sulphur burners, B 1, E 3, J 12, 106.  
 Sulphur chloride makers, J 34, 62, 105, 107.  
 Sulphur dioxide makers, J 27, 106.  
 Sulphurors (malt and hops), J 106.  
 Sulphur extractors, J 26.  
 Sulphuric acid workers, J 7, 12, 13, 66, 88, 102, 106, 107, 108, 125.  
 Sulphur miners, J 106, 107.  
 Sumackers (tannery), C, F 1.  
 Surgical dressing makers, J 93.

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Tablehands (tannery), C, F 1.  
 Table operatives (iron and steel), B 1.  
 Table turners (enameling), B 2, E 3, J 66.  
 Tailors, H, J 27.  
 Takers-down (glass), B 1.  
 Talc workers, E 3.  
 Tallow refiners, F 3, J 5, 26, 108.  
 Tank cleaners, J 13, 15, 16, 64, 109, 113. *See also* particular chemical.  
 Tank men, B 1, C.

Tannery workers, C, F 1, 3, J 7, 8, 10, 12, 15, 25, 30, 38, 42, 56, 57, 62, 66, 70, 89, 98, 104, 106, 107, 108.  
 Tapers (airplanes), J 111.  
 Tappers (smelting), B 1. *See also* particular metal.  
 Tar (distillery) workers, B 1, J 12, 41, 109. *See also* Coal tar workers.  
 Taxidermists, E 1, F 1, 3, J 12, 70.  
 Tear gas makers. *See* War gas makers.  
 Teazers (glass), B 1, J 27.  
 Telegraphers, H.  
 Telephone linemen (trench work), C, J 27. *See also* Cable splicers.  
 Temperers, B 1, J 24, 27, 42, 66, 70, 92, 108.  
 Tetraethyl lead makers, J 19, 66, 113.  
 Textile (asbestos) workers, E 4.  
 Textile comb makers, E 3.  
 Textile finishers. *See* particular occupation.  
 Textile printers, B 1, 2, J 8, 10, 11, 12, 23, 27, 34, 38, 42, 56, 62, 66, 69, 70, 72, 88, 93, 108, 123, 125.  
 Textile workers, B 1, 2, C, E 1. *See also* particular occupation.  
 Thallium workers, J 114.  
 Thermometer makers, J 70, 75, 114.  
 Thread glazers, B 1, 2.  
 Tile makers, B 1, 2, C, E 2, 3, J 66, 124. *See also* Pottery workers.  
 Tin-foil makers, B 1, J 66.  
 Tanners, B 1, C, J 5, 7, 12, 13, 62, 66.  
 Tin plate mill workers. *See* Iron and steel workers.  
 Tin recovery workers, J 34.  
 Tire builders. *See* Rubber tire builders.  
 Tobacco denicotinizers, J 52, 119.  
 Tobacco moisteners, C, J 25.  
 Tobacco seedling treaters, J 16.  
 Tobacco workers, E 1, J 83.  
 Tongsman (iron and steel), B 1.  
 Toolmakers, E 3.  
 Top fillers (foundry), B 1, E 3, J 27.  
 Towermen (sulphuric acid), J 13, 88, 106, 108. *See also* Sulphuric acid workers.  
 Toy makers, J 8, 12, 66.  
 Train dispatchers, D.  
 Transfer workers (pottery), J 66, 123.  
 Transparent wrapping materials workers, B 2, J 3, 26, 62, 104, 107, 108.  
 Trappers, F.  
 Treaders (rubber), J 15, 16.  
 Tree sprayers. *See* Sprayers (trees).  
 Trichlorethylene workers, J 119.  
 Trinitrotoluol makers, J 16, 85.  
 Tube makers (glass), B 1.  
 Tubulators (incandescent lamps), J 27.  
 Tumbling-barrel workers, E 2, 3.  
 Tunnel workers, A 1, D, E 2, 3, J 25, 88, 107.  
 Turners-out (glass), B 1.  
 Turpentine extractors, B 1, J 123.

Type cleaners, J 15, 72.  
 Type founders, J 11, 66.  
 Type melters, J 5, 66.  
 Typesetters. *See* Compositors.  
 Typists, H.

## U

Ultramarine blue makers, J 106.  
 Upholsterers, E 1, F 1, J 72.  
 Uranium miners, G 1, J 124.  
 Uranium workers, G 1, J 124.

## V

Vanadium steel workers, B 1, J 125.  
 Vapor curers. *See* Vulcanizers.  
 Varnishers, J 1, 3, 8, 9, 10, 15, 16, 22, 28, 43, 52, 57, 66, 69, 72, 111, 119, 123.  
 Varnish makers, B 2, J 1, 3, 5, 7, 8, 9, 10, 12, 14, 15, 16, 22, 26, 28, 31, 33, 43, 52, 57, 58, 61, 66, 69, 72, 74, 90, 93, 104, 105, 111, 119, 123.  
 Varnish remover makers, J 15, 16, 44, 60, 91, 111.  
 Varnish removers, J 15, 16, 44, 60, 91, 111.  
 Vatmen, B 1, C, J 25.  
 Vat varnishers. *See* Varnishers.  
 Vault workers, J 25.  
 Velvet makers, B 1, J 12.  
 Veterinarians, F, F 1, 3, 4.  
 Vignettors, J 62.  
 Vinegar workers, J 1, 25.  
 Vintners, J 25.  
 Vinyl chloride makers, J 126.  
 Vulcanizers, B 2, J 7, 10, 11, 15, 16, 25, 26, 28, 38, 72, 102, 105, 106, 107.  
 Vulcanizers (steam), B 1, C.

## W

Wallpaper printers, B 1, 2, J 12, 38, 66.  
 Warehouse workers, F 1.  
 War gas makers, J 13, 16, 19, 34, 42, 45, 95, 98, 105.  
 Warming-house employees (gun-cotton), B 2.  
 Washers, C.  
 Washers (metal), J 15, *See also* Degreasers.  
 Washwomen, C, H.  
 Watch dial (luminous) painters, G 1.  
 Watchmakers, D, H.

Water gilders, J 70.  
 Waterproofers (paper and textile), J 15, 16, 28, 38, 56, 109.  
 Water purifiers, J 14, 30, 34, 90.  
 Wax makers, J 16, 31, 33, 90, 108, 111, 123. *See also* Petroleum.  
 Wax-ornament makers, J 5, 12, 38.  
 Weavers, E 1, H.  
 Weavers (asbestos), E 4.  
 Weighers, E 1, 3.  
 Welders, B 1, G 2, J 12, 16, 23, 27, 38, 40, 64, 66, 69, 70, 88, 90, 96, 97, 102, 128.  
 Well workers, J 25.  
 White lead workers, J 25, 66.  
 Window-shade makers, J 15, 16.  
 Wire drawers, J 12, 62, 108.  
 Wirers (incandescent lamps), J 8.  
 Wood-alcohol distillers, J 3, 27, 72.  
 Wooden heel workers, F 1.  
 Wood-last scourers (shoes), E 1.  
 Wood polishers. *See* Furniture polishers.  
 Wood preservers, J 12, 47, 70, 93, 108, 109.  
 Wood stainers, J 38, 66.  
 Woodworkers, E 1, J 15, 72.  
 Wool carders, E 1, F 1.  
 Wool scourers, B 2, C, F 1, J 3, 7.  
 Wool spinners, E 1, F 1.  
 Wool workers, E 1, F 1. *See also* Particular occupation.  
 Wringers (guncotton), J 88.

## X

X-ray machine makers, G 1.  
 X-ray photographers, G 1.  
 X-ray technicians, G 1.  
 X-ray tube makers, G 1.

## Y

Yeast makers, J 1, 25, 64, 108.

## Z

Zinc chloride makers, J 13, 34, 62.  
 Zinc electrode makers, J 70.  
 Zincers, J 42.  
 Zinc miners, J 12, 66, 69. *See also* Miners.  
 Zinc smelters and refiners, B 1, E 2, 3, J 11, 12, 23, 27, 66, 69, 102, 106, 110, 128.  
 Zoological technicians, F 4.

## Section II.

### List of Hazards, Symptoms, Occupations Exposed, and Methods of Prevention

#### A. Abnormalities of Air Pressure

##### 1. Compressed Air (Increased Atmospheric Pressure)

IN building tunnels, laying deep foundations for large buildings, and so forth, it is often necessary for the work to be carried on under increased air pressure in order to prevent the entrance of water into the excavations. After the workers enter the compression chamber or "lock" the pressure of the air in the compartment is increased gradually and at short intervals. 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 laws and 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.

##### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Pruritis and rash; excruciating pain in abdomen and extremities, joints and muscles; painful pressure in chest; aphasia and asphyxia; monoplegia and paraplegia; dyspnea; vertigo; Meniere's syndrome.

##### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Caisson workers

Divers

Tunnel workers

##### 2. Altitude; Rarefied Air (Decreased Atmospheric Pressure)

In contrast to working under compressed air, rising to an altitude of 10,000 feet as in aviation is accompanied by a reduction in the barometric pressure from 760 mm. at sea level, to 520 mm., and at 18,000 feet, the normal pressure is approximately halved. Exposure to decreased atmospheric pressure has a profound effect on health. The physiological changes which occur are chiefly due to oxygen want (anoxia), and the term used for the resulting condition is "altitude sickness." It may be acute, due to rapid ascent or

prolonged stay at high altitude, or chronic, due to the cumulative effect of repeated prolonged exposures to minor degrees of oxygen want.

Furthermore, as the external air pressure on the body decreases, the internal pressure must decrease correspondingly if the body is not to burst; so, given sufficiently extreme conditions of decreased pressure and rapid ascent, the internal gases of the body will expand and eventually, at altitudes of 30,000 feet or over, dissolved air bubbles will form in the blood vessels and tissues as in compressed air illness ("the bends"). "Aeroembolism" is the term given to this condition in aviation medicine, and normal individuals vary greatly in susceptibility, so that it may occur at lower altitudes.

Disturbances of the middle ear are common among flying personnel due to rapid changes in altitude and pressure. A rapid dive with negative pressure on the eustachian tube prohibiting its opening may cause the drum to rupture.

The lowered partial pressure of oxygen in the inhaled air at high altitudes has also a dangerous indirect effect in that it renders the individual more susceptible to carbon-monoxide gas should this be present in the pilot or passenger compartment. Low concentrations which would be considered safe at normal atmospheric pressure are capable of causing anoxemia and asphyxia at high altitudes due to the progressively decreasing oxygen saturation of the blood under these conditions.

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

*Acute altitude sickness (anoxia).*—Sleepiness, headache, altered respiration, fatigue, psychological impairments, unconsciousness, and respiratory failure. Warning symptoms preceding unconsciousness are not always present. There may be even a feeling of freedom from care because of the dulling effect on the sensory nervous system.

The effects of anoxia after a flight may be more severe than the subjective symptoms noticed while flying. There may be persistent fatigue, severe headache, nausea, vomiting, dizziness, abnormal behavior, mental confusion, and muscular weakness.

*Chronic altitude sickness.*—Repeated exposure to anoxia (even without symptoms of acute altitude sickness) results in bodily and mental fatigue, irritability, insomnia, marked deterioration in efficiency, and disregard for danger in the air.

*Aeroembolism.*—The symptoms depend on the location and volume of the air bubbles, and may manifest themselves as joint pains, itching, formication, pulmonary pain and edema, neuritis, paralysis, convulsions, and coma.

*Middle-ear disturbances.*

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Airplane pilots  
Aviation personnel (flying)  
Pilots (airplane)

## B. 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, from extreme heat to cooler temperatures or vice versa, are of frequent occurrence, and are a contributory cause of 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, heat stroke, or in heat cramps; 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 and throat, 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 disease of the respiratory passages, and to neuralgia and rheumatic affections. With the above data in mind, abnormalities of temperature have been classified under two headings, namely, "Sudden variations of temperature," and "Heat." "Extreme cold" has not been listed as a distinct hazard, because the factor of occupational exposure is readily recognized and the effects well known. It is evident that the occupations listed in the division "Heat" 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 in the avoidance or mitigation of such exposure as far as practicable. In recent years, ventilation, refrigeration, and air-conditioning have received much attention, and installations of machinery to control atmospheric conditions are becoming more and more common. Protective clothing and insulating methods can mitigate hazards of abnormal temperatures. The use of salt as a preventive of heat cramps has become a standardized procedure.

## 1. Heat

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

#### Common acute effects.

*Heat stroke.*—Dizziness, nausea, acute pain in the head, skin dry and hot, face red or purple, breathing difficult, high temperature, unconsciousness.

*Heat exhaustion.*—Pallor, cold moist skin, rapid shallow breathing, weak pulse body temperature subnormal or slightly elevated.

*Heat cramps.*—Spasms of muscles of the extremities or of the abdominal wall.

**Other effects of exposure.**

Anemia, general debility, respiratory and rheumatic affections, skin eruptions.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Abrasives (artificial) makers	Cupola men (foundries)	Pot setters
Alloy makers	Cyanamid makers	Potters workers
Ammonium-salts makers	Digester house workers (paper and pulp)	Pourers (foundry)
Annealers	Doffers (textile)	Puddlers (iron and steel)
Antimony extractors (refiners)	Dressers (glass)	Pullers-out (felt hats)
Arsenic roasters	Dresser tenders (textile)	Pulp-mill workers
Artificial-leather workers	Drop forgers	Pyrites burners
Asbestos-roofing makers	Dye makers	Rayon makers
Asphalt workers	Enamellers	Refiners (metals)
Bar-mill workers (iron and steel)	Engineers (stationary)	Road repairers
Benzol-still men	Felt-hat makers	Roller coverers (cotton mill)
Bessemer converter workers (iron and steel)	Felt makers	Rollers (metals)
Beta-still operators (iron and steel)	Firemen (city)	Roll setters (iron and steel)
Billet-mill workers (iron and steel)	Firemen (stationary)	Roll wrenchers (iron and steel)
Bisque-kiln workers	Flatteners (glass)	Roofing-material workers
Blacksmiths	Flax spinners	Roughers (iron and steel)
Blast-furnace workers	Forgemen	Salt preparers
Bleachers	Foundry workers	Shove-in boys (glass)
Bleachery driers	Furnace workers	Sizers (felt hats)
Blockers (felt hats)	Galvanizers	Skimmers (glass)
Blooming-mill workers (iron and steel)	Gas (illuminating) workers	Slag-machine tenders (iron and steel)
Blowers-out (zinc smelting)	Gatherers (glass)	Smelters
Bjuers (revolvers)	Glass blowers	Spongers
Boiler-room workers	Glass-furnace workers	Stamp-mill workers
Brass founders	Graphite workers	Starters (felt hats)
Braziers	Hot-rod rollers (iron and steel)	Still (coal tar) cleaners
Brewers	Iron and steel workers (all departments)	Stillmen (carbolic acid)
Brick burners	Junk (metal) refiners	Stillmen (operating)
Brick makers	Kiln tenders	Stokers
Burners (enameling)	Laundry workers	Street repairers
Candy makers	Lead-foil makers	Sugar refiners
Canners	Lead smelters	Sulphite cooks (pulp mill)
Cappers (window glass)	Lehr tenders (glass)	Sulphur burners
Carbide makers	Levermen (iron and steel)	Table operators (iron and steel)
Carbon-black workers	Lifters-over (glass)	Takers-down (glass)
Case hardeners	Lime burners	Tank men
Casters (iron and steel)	Linoleum makers	Tappers (smelting)
Catchers (iron and steel)	Luters (zinc smelting)	Tar-distillery workers
Cement (Portland) workers	Marblers (glass)	Teazers (glass)
Charcoal workers (sugar refinery)	Melters (foundry; glass)	Temperers
Cloth preparers	Mercury smelters	Textile printers
Coal-tar workers	Miners	Textile workers
Coke-oven workers	Molders (foundry)	Thread glazers
Color makers	Muffle tenders	Tile makers
Copper smelters	Open-hearth-department workers (iron and steel)	Tin-foil makers
Core makers	Packing-house employees	Tinners
Corn-products workers	Pair heaters (tin plate)	Tongsmen (iron and steel)
Cotton-mill workers	Paper makers	Top fillers (foundry)
Cottonseed-oil workers	Pavers	Tube makers (glass)
Cranemen (glass industry)	Petroleum refiners	Turners-out (glass)
Cranemen (iron and steel)	Picklers	Turpentine extractors
Crucible-steel-department employees	Pitch workers	Vanadium-steel workers
	Pot fillers (glass)	Vatmen
	Pot lifters (iron and steel)	Velvet makers
	Pot pullers (foundry)	Vulcanizers (steam)
	Pot-room workers (aluminum foundry; carbide plant)	Wall-paper printers
		Welders
		Zinc smelters

**2. Sudden Variations of Temperature****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Respiratory infections, neuralgic and rheumatic affections.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

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

**C. Dampness**

Aside from high atmospheric humidities which have been dealt with under "Abnormalities of temperature" there remains to be considered exposure to constant wetting. Tankmen, vatmen, and washers, for example, may be required to carry on their duties constantly in wet clothes. Such exposures are brought together under the heading "Dampness." Rheumatic and neuralgic affections may result from exposure to dampness, which also may be a contributing factor to respiratory infections.

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, such as rubber boots, rubberized aprons, and so forth, should be supplied.

**SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Respiratory, neuralgic, and rheumatic affections.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Acid dippers	Beamhouse workers	Boiler washers
Alkali-salt makers	(tannery)	Brewers
Artificial-ice makers	Beatermen (paper and pulp)	Brickmakers
Auto painters		Cable splicers

Caisson workers	Glass finishers	Pulp-mill employees
Canners	Glaze dippers (pottery)	Rayon makers
Cartridge-cup washers	Glove makers (leather preparers)	Refrigerating-plant workers
Cartridge felt and wad makers	Glue workers	Sagger makers
Cartridge shot shell paraffin dippers	Grinders (metals)	Screen tenders (pulp mill)
Cellulose makers	Guncotton washers	Sewer workers
Chauffeurs	Hair workers	Shavers (felt hats; fur; tannery)
Clay and bisque makers (pottery)	Hydraulic construction workers	Slaughterhouse workers
Clay-plug makers (pottery)	Hydraulic miners	Slip makers (pottery)
Cloth preparers	Ice-cream makers	Smoothers (glass)
Concentrating-mill workers	Lasters (shoes)	Soap makers
Construction workers	Laundry workers	Soda makers
Corn products workers	Lime pullers (tannery)	Sodium hydroxide makers
Cotton-mill workers	Linoleum makers	Spongers
Creosoting-plant workers	Mail carriers	Stamp-mill workers
Doffers (textile)	Masons	Stonecutters (wet process)
Dresser tenders (textile)	Match-factory workers	Sugar refiners
Electroplaters	Miners	Sumackers (tannery)
Enamellers	Mirror silverers	Tablehands (tannery)
Explosives workers	Nickel platers	Tank men
Extractor operators (soap)	Packing-house employees	Tannery workers
Fertilizer makers	Paint makers	Telephone linemen (trench work)
Filter-press workers	Paper makers	Textile workers
Firemen (city)	Petroleum refiners	Tile makers
Fishermen	Phosphate-mill workers	Tinners
Flush tenders (aluminum)	Phosphorus evaporating machine operators	Tobacco moisteners
Galvanizers	Picklers	Vatmen
Glass cutters	Plasterers	Vulcanizers (steam)
	Policemen	Washers
	Pottery workers	Wool scourers
	Preparers (tannery)	
	Pressmen (oil refining)	

### D. Defective Illumination

Defective illumination, characterized by insufficient quantity of light, glare (light out of place), 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 involuntary oscillatory movement, is attributed to 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 likely 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.

## 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	Jewelers	Photographic film makers
Burnishers (iron and steel)	Letter sorters	Polishers (metal)
Caisson workers	Mail sorters	Steel engravers
Clerks	Miners	Train dispatchers
Compositors	Motion-picture studio workers	Tunnel workers
Embroidery workers	Photographers	Watchmakers

## E. Dust

Dust arising from industrial processes is produced by mechanical action, such as grinding, crushing, cutting, drilling, and so forth. Its composition is similar to the substance or substances from which it is derived, and in this respect it differs from fume, which is the result of chemical action and which does differ from the substance of its origin. The size of dust particles is important because this influences their ability to be inhaled into the finer air passages and reach the pulmonary parenchyma.

Poisonous dusts are not considered in this section but under their appropriate headings relating to their composition. For practical purposes industrial dusts are divided into two classes, organic and inorganic.

### Organic Dust

Organic dusts contain carbon and are largely derived from substances of animal and plant origin. Examples of these are textile dusts, flour, sugar, wood, leather, and feathers. Organic dusts may irritate the skin, causing an occupational dermatitis or may irritate the conjunctiva. Many, if not most, organic dusts may cause an allergic reaction in some persons. When present in very large quantity, any organic dust may cause irritation of the upper air passages. Some woods may also cause skin irritation, notably Brazil wood, satinwood, teak, some mahoganies, cocobolo, California redwood.

Organic dusts do not cause pneumoconiosis or pulmonary fibrosis of a specific disabling nature. The particles of many types of organic dusts are not of the size or shape to permit them to penetrate to the lung tissue and those which do gain entrance into the body are absorbed. Coal is an organic dust, but on account of its origin is sometimes classed with the mineral dusts. Coal dust does get into the lungs, causes pigmentation, and may stimulate the production of fibrous tissue but will not produce a disabling pneumoconiosis. The "miners' asthma" of anhracite miners has been shown to be in fact a silicosis, modified by the presence of coal dust along with the silica, and is properly termed anthracosilicosis.

### Inorganic Dust

Inorganic industrial dusts are mostly metallic and mineral. Of all the various types of such dust, only those containing "free" or *uncombined silica* of respirable size will produce the specific pneumoconiosis known as silicosis. Other inorganic dusts may cause some pulmonary fibrosis of a benign or nondisabling character. The action of silica dust upon the lungs is probably chemical, and the dust particles producing the reaction are mostly those from one-half to three microns in diameter. The reaction of silica is the production of nodules, distributed throughout both lungs, producing a characteristic appearance on the X-ray film. Another effect of silica is to stimulate tubercle infection and severe cases of silicosis frequently die with tuberculosis.

Dusts containing silica in *combined form* do not cause silicosis. However, one such dust, asbestos, a magnesium silicate, will produce a characteristic fibrosis. This is quite different in its pathology from silicosis, and has a characteristic "ground glass" appearance on X-ray film. Animal experimentation indicates that the action of asbestos is probably mechanical, since it cannot be produced in other than the pulmonary tissue. Asbestosis may cause disability, and a few fatal cases have been recorded, but in those cases showing marked disability, other organic disease is usually also present.

The control and prevention of silicosis and asbestosis depends on both medical and engineering supervision. Periodic X-ray examination of workmen exposed to these dusts is essential. Engineering methods for the control of dust comprise:

- (1) The use of exhaust systems or suction devices which entrap the dust at its point of origin.
- (2) The use of water, and occasionally oil, to lay the dust and keep it out of the atmosphere. Both these methods may be combined.
- (3) The use of enclosed systems for dust-causing procedures, properly exhausted.
- (4) Increased ventilation, thus diluting the amount of dust in the air and decreasing its concentration.
- (5) The use of helmets or respirators, of a type approved by the United States Bureau of Mines, where intermittent exposures, not otherwise controllable, are involved.

### 1. Organic Dust

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of the skin and upper air passages, allergic effects, asthma.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Abrasives makers	Carbonizers (shoddy)	Crucible mixers
Ashmen	Carbon-paper makers	Curriers (tannery)
Bakers	Carders (textiles)	Devil operators (felt hats)
Battery (dry) makers	Card grinders (textiles)	Diamond cutters
Beamers (textiles)	Carpet cleaners	Doffers (textiles)
Blowers (felt hats)	Carpet makers	Electrode makers
Boneworkers	Charcoal workers	Electrotypers
Broom makers	Cigar makers	Feather curers
Brushers (felt hats)	Coal passers	Feather workers
Brush makers	Cobblers	Felt-hat makers
Buffers	Comb makers	Fertilizer makers
Button makers	Coners (felt hats)	Fiber workers
Carbide makers	Cork workers	Finishers (leather)
Carbon-black workers	Cotton-mill workers	Flax spinners
Carbon-brush makers	Cotton twistors	

Flour-mill workers	Leather workers	Shoe-factory operatives
Formers (felt hats)	Linen workers	Sifters
Fur carders	Linoleum makers	Silk workers
Fur clippers	Match-factory workers	Soap makers
Fur cutters	Mattress makers	Softeners (tannery)
Fur handlers	Mixers (felt hats)	Soot packers
Fur preparers	Mixing-room workers	Spice makers
Fur pullers	(miscellaneous)	Spinners (textiles)
Furniture polishers	Pharmaceutical workers	Starch makers
Glove makers (leather preparers)	Polishers (metal)	Straw-hat makers
Glue workers	Pouncers (felt hats)	Street cleaners
Grain-elevator workers	Pyroxylin-plastics workers	Sugar refiners
Graphite workers	Rag workers	Taxidermists
Grinders (rubber)	Resins (synthetic) makers	Textile workers
Guncotton pickers	Roller coverers (cotton mills)	Tobacco workers
Hair workers	Rope makers	Upholsterers
Harnessmakers	Rubber workers	Weavers
Heel makers (shoe)	Sawmill workers	Weighers
Hemp workers	Scourers, wood lasts (shoes)	Wood-last scourers (shoes)
Horn workers	Shavers (felt hats; fur; tannery)	Woodworkers
Jute workers	Shoddy workers	Wool carders
Knitting-mill workers		Wool spinners
Lace makers		Wool workers
Lampblack makers		
Lasters (shoes)		

## 2. Inorganic Dust Containing Free Silica

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Cough, dyspnea, pleuritic pains, deficient chest expansion, dullness, diminished resonance, colds, pleurisy, tuberculosis, hemoptysis.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Abrasives makers	Flint workers	Sandpaper makers (quartz varieties)
Abrasives workers	Foundry workers	Sand pulverizers
Bedrubbers (siliceous stone)	Glass mixers	Sandstone quarriers, crushers, dressers
Bisque-kiln workers	Glaze mixers (pottery)	Sawyers (siliceous stone)
Blasters—underground (siliceous rock)	Grinders, metal (sandstone wheels)	Scouring powder makers
Brickmakers (refractories)	Grinding wheel (sandstone) dressers	Scrapers (foundry)
Burrers—needles (sandstone wheels)	Granite cutters	Silicon alloys makers
Casting cleaners (foundry)	Masons (refractory materials)	Slate grinders
Chippers (foundry)	Miners in siliceous rock	Smelter workers
Clay and bisque makers (pottery)	Molders (foundry)	Soap (abrasive) makers and packers
Concentrating mill—ore crushermen (siliceous rock)	Ore crushermen (siliceous rock)	Sodium silicate makers
Coremakers	Planer men (siliceous rock)	Stampmill workers
Crushermen (siliceous rock)	Polishers (metal)	Statuary (granite or sandstone) makers
Cutlery grinders (sandstone wheels)	Pottery workers	Stonecutters (granite or sandstone)
Drillers (siliceous rock)	Quarrymen (siliceous rock)	Stone workers (granite or sandstone)
Enamelers (free silica frits)	Quartz workers	Subway construction workers (in siliceous rock)
Ferrosilicon makers	Rubber workers (filling)	Tile makers
	Sandblasters	Tumbling barrel workers
	Sand cutters	Tunnel construction workers (in siliceous rock)
	Sanders (quartz paper)	
	Sanding machine operators (quartz paper)	

### 3. Inorganic Dust (except Asbestos) Containing no Free Silica

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Exposure to inorganic dusts containing no free silica has been found in some instances to be associated with simple linear fibrosis (nonspecific benign fibrosis-Gardner) not associated with disability. The exact relationship of various dusts to this type of fibrotic reaction is not entirely clear.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Abrasives makers	File cutters	Polish makers
Abrasives workers	Fillers	Pottery workers
Acetylene makers	Firemen (stationary)	Pouncers (felt hats)
Ashmen	Flint workers	Printers
Basic slag (artificial manure) workers	Flue cleaners	Putty makers
Battery (dry) makers	Foundry workers	Putty polishers (glass)
Bed rubbers (stone)	Furnace workers	Pyrites burners
Bevelers	Glass blowers	Quarrymen
Bisque-kiln workers	Glass cutters	Road repairers
Blasters	Glass finishers	Roofing-material workers
Bricklayers	Glass-furnace workers	Rubber workers
Brickmakers	Glass mixers	Sagger makers
Bronzers	Glaze mixers (pottery)	Salt preparers
Buffers	Gold beaters	Sand blasters
Burrers (needles)	Gold refiners	Sanders
Burr filers	Graphite workers	Sanding-machine operators
Button makers	Grinders (metals)	Sandpaperers (enameling and painting auto bodies, etc)
Calenderers (rubber)	Grinding wheel makers	Sandpaper makers
Carbide makers	Gypsum workers	Saw filers
Carbon-brush makers	House wreckers	Sawyers (stone)
Card grinders (textiles)	Insulation (sound, heat) workers	Scissors sharpeners
Casting cleaners (foundry)	Iron and steel mill workers	Scouring-powder makers
Cement (portland) workers	Jewelers	Scrapers (foundry)
Chasers (steel)	Junk (metal) refiners	Screen workers (lead and zinc smelting)
Chimney sweepers	Jute workers	Sifters
Chippers	Lapidaries	Sintering-plant workers
Clay and bisque makers (pottery)	Lime burners	Slag workers
Clay-plug makers (pottery)	Lime-kiln chargers	Slate grinders
Coal passers	Lime workers	Slip makers (pottery)
Color makers	Linoleum makers	Smelter workers
Compositors	Lithographers	Smoothers (glass)
Compounders (rubber)	Marble cutters	Soap (abrasive) workers
Concentrating-mill workers	Masons	Stamp-mill workers
Construction workers	Match-factory workers	Statuary workers
Core makers	Metal turners	Stokers
Cotton-mill openers	Mica strippers or splitters	Stone (artificial) makers
Crucible mixers	Mica workers	Stonecutters
Crushermen (clay and stone)	Mineral-earth workers	Stone workers
Cut-glass workers	Miners	Street cleaners
Cutlery makers	Mixers (rubber)	Street repairers
Cyanamid makers	Mixing-room workers (miscellaneous)	Sugar refiners
Diamond cutters	Mold breakers (foundry)	Sulphur burners
Drillers (rock)	Molders (foundry)	Table turners (enameling)
Electrotypers	Paint removers	Talc workers
Emery-wheel makers	Paper hangers	Textile comb makers
Engineers (stationary)	Phosphate-mill workers	Tile makers
Engravers	Planermen (stone; metal)	Toolmakers
Fertilizer makers	Plasterers	Top fillers (foundry)
	Plaster of Paris workers	Tumbling-barrel workers
	Pneumatic-tool workers	Tunnel workers
	Polishers (metal)	Weighers

### 4. Asbestos

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Cough, dyspnea, pallor, clubbing of fingers, diminished chest expansion.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Asbestos-products workers	Crushers (asbestos)	Textile (asbestos) workers
Brake-lining workers	Iberizers (asbestos)	ers
Carders (asbestos)	Molders (asbestos)	Weavers (asbestos)
	Spinners (asbestos)	

**F. Infections**

Infections, both localized and systemic, are frequently of occupational origin. Anthrax, fungus infections, undulant fever, and "septic infections" are typical examples. A brief summary of the symptoms of these diseases and the principal occupations in which infection is likely to occur are given in this section. Other infectious diseases especially worthy of mention are listed below:

Butcher's pemphigus	Butchers, dead-animal handlers.
Erysipeloid	Butchers, button makers, cooks, fish handlers, meat inspectors.
Glanders	Horse and mule handlers.
Psittacosis	Bacteriologists, parrot, and parakeet handlers.
Rabies	Dog-pound workers, mail carriers, veterinarians.
Ringworm	Barbers, bathhouse attendants, beauty-parlor operatives, chambermaids, masseurs.
Rocky Mountain spotted fever	Foresters, hunters, sheep herders, trappers.
Tetanus	Farmers, slaughterhouse and packing-house workers.
Tularemia	Bacteriologists, butchers, cooks, farmers, forestry workers, hunters, shearers.
Weill's disease	Dog-pound workers, insecticide makers, fishmarket workers, veterinarians.

Cases have also been found among British butchers, canal workers, coal miners, farmers, gardeners, street cleaners.

**I. Anthrax**

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Anthrax (external).—Begins as small red spot or papule in the skin, with no pain but an itching, burning sensation. This later has a blister indented in the center and is surrounded by severe swelling. Next, the center becomes black and the blister may break and discharge a bloody fluid. The black depressed area has an elevated border of small vesicles. Regional lymph nodes become enlarged and tender and often suppurate. High fever, headache, restlessness, insomnia, have also been noted.

Anthrax (internal).—Pulmonary anthrax, of which there has been almost none in America, has no external lesions and is always rapidly fatal.

Intestinal anthrax is not an industrial hazard.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Animal handlers	Cordage-factory workers	Gelatine makers
Bacteriologists	Curriers	Glue makers
Baters (tannery)	Dairy workers	Hair workers
Beamhouse workers (tannery)	Farmers	Leather workers
Blanket makers	Fat renderers	Lime pullers (tannery)
Bonemeal workers	Felt makers	Longshoremen
Broom makers	Fertilizer makers	Mattress makers
Brush makers	Freight handlers	Meat inspectors
Butchers	Fur carders	Minkery workers
Carpet cleaners	Fur clippers	Plasterers
Carpet makers	Fur cutters	Preparers (tannery)
Cattle salesmen	Fur handlers	Rag workers
Cobblers	Fur preparers	Shavers (felt hats, fur, tannery)
	Fur pullers	

Shepherds	Table hands (tannery)	Wooden-heel workers
Shoddy workers	Tannery workers	Wool carders
Shoe-factory workers	Taxidermists	Wool scourers
Slaughterhouse workers	Upholsterers	Wool spinners
Stablemen	Veterinarians	Wool workers
Sumackers (tannery)	Warehouse workers	

## 2. Fungus Infections

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Fungus infections may be due to a wide variety of fungi. They may be local or systemic. Many of them are of mild clinical importance, others may produce marked disability and death.

Skin diseases are caused by monilia, yeasts, dermatophytes, sporotrichum, blastomycetes, as well as a great many other fungi.

Fungus disease of the lungs may be due to blastomycetes, actinomyces, monilia, coccidioides immitis, cryptococcus, and aspergillus. The symptoms are largely those of tuberculosis, from which it is often most difficult to differentiate. The X-ray film may also closely resemble tuberculosis. The sputum usually reveals large numbers of fungi of predominantly one type.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Animal handlers	Flour- and grain-mill workers	Paper makers
Brewery workers	Grooms	Pigeon fatteners
Cigar makers	Hide workers	Stablemen
Dishwashers	Milkers	Straw cutters
Excavation workers	Millers	
Farmers		

## 3. Septic Infections

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Boils, carbuncles, folliculitis, cellulitis, localized lymphangitis, erysipelas.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

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

## 4. Undulant Fever (Brucellosis)

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Weakness, profuse sweating, chills, fever, headache, usually bilateral and frontal, constipation, loss of weight, hacking nonproductive cough, general aching. Reddish, widely separated skin lesions accompanied by intense itching and burning among veterinarians have been attributed to Brucella infection.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Butchers	Manure handlers	Slaughterhouse workers
Cattle salesmen	Meat inspectors	Stablemen
Dairy workers	Milk inspectors	Stockmen
Farmers	Packing-house workers	Veterinarians
Gardeners	Shearers	Zoological technicians

## 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-ray in

industry as an aid in detecting hidden defects in metals have greatly added to their importance as potential sources of occupational disease. Radioactive substances (radium, radiothorium, mesothorium) have been added to the list of occupational hazards found in various manufacturing industries. 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.

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Severe dermatitis usually on hands and arms, loss of nails, burns, destruction of skin, injury to joints, necrosis of bones, cancer, anemia, leukemia, leukopenia, sterility.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Chemists and laboratory workers (radium research)	ers of instrument dials, and other workers in plants manufacturing luminous dials.	Radium ore reduction workers
Dentists	Physicians, nurses, and hospital attendants	Radium specialists
Incandescent mantle makers	Radioactive-paint makers	Roentgenologists
Inspectors and examiners using fluoroscope or X-ray	Radioactive-water makers	Uranium miners
Painters of luminous watch dials and paint-	Radiologists	Uranium workers
	Radium miners	X-ray machine makers
		X-ray technicians and photographers
		X-ray tube makers

## 2. Ultraviolet and Infrared Rays

Ultraviolet and infrared rays are an industrial hazard in a number of occupations where there is exposure to excessive radiance. Welders and cutters especially are exposed to ultraviolet rays; furnacemen and other workers around molten metal and glass, to infrared rays. 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 (cataract). There is little definite evidence that welding has caused cataract, similar to glassblower's cataract, but it is probable that prolonged exposure to infrared rays may cause haziness of the cornea.

The injuries 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.

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Bakers	Foundry workers	Motion-picture-machine operators
Blacksmiths	Furnace workers	Motion-picture-studio workers and actors
Braziers	Glass blowers	Photographers
Cooks	Glass-furnace workers	Skimmers (glass)
Driers (lacquer)	Incandescent-mantle hardeners	Solderers
Electricians	Iron and steel mill workers	Stokers
Electric linemen	ers	Welders
Firemen (stationary)	Irradiators (food)	
Food irradiators		

## H. Repeated Motion, Pressure, Shock, etc.

Under this heading are included those 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, and so forth. 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. When the body is subjected to constant pressure or repeated shocks such as are encountered in working with pneumatic tools or when muscles are used for a long period under conditions of severe strain, there may result tenosynovitis or bursitis. In the use of pneumatic tools, due to the repeated shocks or vibration, there may occur also marked vasomotor changes with a characteristic condition known as "dead fingers." Exposure to vibrations may also cause changes in bone structure.

After long-continued repetitive motion in which small groups of muscles are used excessively, the muscles involved may not function when called upon to perform the accustomed task, although their function is unimpaired for other activities. This condition, of which a typical example is writers' cramp, is referred to as occupational or professional neurosis.

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.

**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, cramp. Among pneumatic-tool workers also vasomotor disturbances: local anemia of hand followed by hyperemia, cyanosis, and burning sensation.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

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

## J. Poisons

Industry today produces or employs a far greater number of poisonous compounds than ever before. Extensive chemical research, particularly in the field of the volatile solvents, is adding to the number every year. The production of new synthetic materials finding industrial uses as substitutes for wood, textile, and other natural products, has also added to the list. It would be impracticable to cover all or even the greater number of these industrial poisons in a work of this kind. Only the more important ones concerning which we know something of the toxicity have been included. Some poisons, long used in industry, on the other hand, are being displaced.

In the list of industrial poisons 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 whose effects 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 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.

The occupations and industries listed under the various poisons are those in which the hazard may be present. They are not necessarily those where actual cases of poisoning have been reported. Adequate preventive measures, vigilantly carried out, may make the chance of poisoning from even an extremely toxic compound virtually impossible. That fact has been fully established

by the splendid record of many American companies which have manufactured some of the most toxic compounds for years without having a single case of poisoning develop in their plants.

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 wash-room 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.

If complete removal of the poison is not possible, men who are required to work in an atmosphere polluted by poisonous fumes and gases should wear approved respiratory protective devices constructed for the specific poison with which they work.

### 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	Mirror silverers	Rubber (synthetic) makers
Aldehyde pumpmen	Photographic workers	ers
Disinfectant makers	Pyroxylin-plastics workers	Varnishers
Dye makers	ers	Varnish makers
Explosive workers	Resin (synthetic) makers	Vinegar workers
Lacquer workers		Yeast makers

### 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	Extractors (oils and fats)	Rayon workers
Acetylene workers	Lacquerers	Resin makers
Airplane-dope makers	Lacquer makers	Rubber workers
Artificial-leather makers	Methyl-alcohol makers	Shoe-factory operatives
Artificial-pearl makers	Nitrocellulose workers	Shoe-heel (wood) coverers
Artificial-silk workers	Painters	Smokeless-powder makers
Bronze-powder makers	Paint makers	ers
Button makers	Paint removers	Transparent-wrapping-material workers
Cement (rubber, plastic, etc.) mixers	Paraffin workers	Varnishers
Chloroform makers	Pencil makers	Varnish makers
Collar (fused) makers	Perfume makers	Wood-alcohol distillers
Comb makers	Petroleum refiners	Wool scourers
Dye makers	Pharmaceutical workers	
Dyers	Photographic workers	
Explosive workers	Pyroxylin-plastics workers	
	ers	

#### 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

#### 5. Acrolein

##### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of skin and mucous membranes of eyes and respiratory tract, dyspnea, bronchitis.

##### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Acrolein is formed whenever fatty substances are heated to dryness and decomposed.

Acrolein workers	Gasoline engine workers	Refrigerator (mechanical) makers and repair men
Bone renderers	Gelatine makers	Soap makers
Bookbinders	Glue makers	Stearic-acid makers
Candle makers	Lard makers	Straw-hat makers
Copper (strip) roller mill workers	Linoleum makers	Tallow refiners
Fat renderers	Linseed-oil boilers	Tinners
Fertilizer makers	Petroleum refiners	Type melters
Galvanizers	Pharmaceutical workers	Varnish makers
Garage workers	Pyroxylin-plastics workers	Wax ornament makers

#### 6. Aluminum

Not generally regarded as an industrial poison.

#### 7. Ammonia

##### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

##### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Acetylene-workers	Fertilizer makers	Rayon makers
Ammonia workers	Galvanizers	Refrigerating-plant workers
Ammonium-salts makers	Gas (illuminating) workers	Salt extractors (coke-oven byproducts)
Annealers	Gas purifiers	Sewer workers
Artificial-ice makers	Glue makers	Shellac makers
Boneblack makers	Ice-cream makers	Shoe finishers
Bronzers	Ink makers	Soda (Solvay) makers
Calcium carbide makers	Lacquer makers	Stablemen
Cement (rubber plastic, etc.) mixers	Mirror silverers	Sugar refiners
Coke-oven workers	Nitric-acid makers	Sulphuric-acid workers
Color makers	Paper makers	Tannery workers
Cyanide makers	Perfume makers	Tinners
Dye makers	Petroleum refiners	Varnish makers
Dyers	Photoengravers	Vulcanizers
Electrotypers	Photographic materials workers	Wool scourers
Explosive workers		

#### 8. Amyl Acetate

##### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

##### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Airplane-dope makers	Artificial-leather workers	Buffers (rubber)
Alcohol-distillery workers	Artificial-pearl makers	Camphor makers
Amyl acetate workers	Battery (dry) makers	Cement (rubber, plastic, etc.) mixers
Art-glass workers	Bookbinders	Cutlery makers
	Bronzers	

Dry cleaners	Mottlers (leather)	Shoe-factory workers
Dyers	Nitrocellulose workers	Shoe finishers
Enamellers	Painters	Shoe-heel (wood) cover- ers
Enamel makers	Paint makers	Smokeless-powder mak- ers
Explosive workers	Paint removers	Soap makers
Fruit-essence makers	Paper (coated) makers	Storage-battery makers
Furniture polishers	Patent-leather makers	Straw hat makers
Gilders	Perfume makers	Tannery workers
Incandescent lamp mak- ers	Photoengravers	Textile printers
Jewelers	Photographic-film mak- ers	Toy makers
Lacquerers	Polish makers	Varnishers
Lacquer makers	Pyroxylin-plastic work- ers	Varnish makers
Leather workers	Rayon makers	Wirers (incandescent lamps)
Linoleum makers	Shellackers	
Motion-picture film work- ers	Shellac makers	

## 9. Amyl Alcohol

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of eyes and respiratory tract, headache and vertigo, nausea, vomit-  
ing, diarrhea.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Alcohol-distillery work- ers	Fusel-oil workers	Rubber (synthetic) mak- ers
Amyl-acetate makers	Lacquerers	Shoe finishers
Amyl-alcohol workers	Lacquer makers	Smokeless-powder mak- ers
Amyl-nitrite makers	Mordanters	Varnish makers
Brewers	Nitrocellulose workers	Varnishers
Explosive workers	Painters	
Fruit-essence makers	Paint makers	
	Pyroxylin-plastic workers	

## 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, somnolence,  
irritability, mental confusion, headache and vertigo, nausea and vomiting, un-  
steady gait, weakness, muscular tremor and convulsions, anemia, weak pulse,  
visual disturbances, brownish discoloration of the blood and urine, disorders  
(tumors, etc.) of the bladder, eczematous eruptions.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Acetanilide workers	Feather workers	Polish makers
Aniline workers	Gasoline blenders	Pressroom workers (rubber)
Artificial-leather makers	Lithographers	Printers
Blueprint paper makers	Millinery workers	Pyroxylin-plastics workers
Bromine makers	Mixers (rubber)	Reclaimers (rubber)
Camphor makers	Naphthylamine workers	Rubber (synthetic) makers
Candle (colored) makers	Nitraniline workers	Rubber workers
Coal-tar workers	Painters	Tannery workers
Color makers	Paint makers	Textile printers
Compositors	Pencil (colored) makers	Varnishers
Compounds (rubber)	Perfume makers	Varnish makers
Disinfectant makers	Petroleum refiners	Vulcanizers
Dye makers	Pharmaceutical workers	
Dyers	Photographic materials workers	
Explosives 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, sores in mouth, metallic taste, gastro-  
intestinal disorders with vomiting, diarrhea, colic.

A clear picture of symptomatology of industrial antimony poisoning is diffi-  
cult to obtain. Antimony utilized in industry almost always contains arsenic  
and, furthermore, it is associated with lead compounds in most of its industrial

uses. Both of these substances are poisons which produce many of the symptoms ascribed to antimony poisoning.

Metal fume fever. (See Zinc.)

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Antimony extractors (refiners)	Enamel makers	Paint makers
Babbitt-metal workers	Explosives makers	Painters
Babblers	Filers	Pewter makers
Brass foundries	Fireworks makers	Pharmaceutical workers
Burnishers (iron and steel)	Glass mixers	Pressroom workers (rubber)
Color makers	Glaze dippers (pottery)	Printers
Compositors	Glaze mixers (pottery)	Rubber (red) workers
Compounders (rubber)	Grinders (metals)	Shot makers
Copper refiners	Grinders (rubber)	Solder makers
Dye makers	Insulators (wire)	Stereotypers
Dyers	Lead smelters	Storage-battery workers
Electroplaters	Linotypers	Textile printers
Electrotypers	Match-factory workers	Typefounders
Enamellers	Mixers (rubber)	Vulcanizers
	Monotypers	Zinc refiners
	Mordanters	

## 12. Arsenic and Its Compounds (Except Arseniuretted Hydrogen)

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Eruptions and bronzing of skin, loss of nails and hair, keratosis, epithelioma, inflammation of eye, nose, mouth, and respiratory tract, perforation of nasal septum, headache, gastro-intestinal disturbances with nausea, vomiting, and severe diarrhea and abdominal pains, peripheral polyneuritis, muscular weakness, and paralysis. Metal fume fever (see Zinc).

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Arsenic roasters	Feather workers	Pressroom workers (rubber)
Arsenic workers	Ferrosilicon workers	Printers
Artificial-flower makers	Fertilizer makers	Pyrites burners
Artificial-leather makers	Fireworks makers	Refiners (metals)
Aviators—crop dusting	Fly-paper makers	Rubber workers
Bookbinders	Galvanizers	Sealing-wax makers
Brass foundries	Gardeners	Sheep-dip makers
Briquet makers	Glass mixers	Shot makers
Bronzers	Glaze dippers (pottery)	Silver miners
Candle (colored) makers	Glaze mixers (pottery)	Soap makers
Canners	Gold refiners	Soot packers
Carpet makers	Ink makers	Sprayers (trees)
Carroters (felt hats)	Insecticide makers	Steel (corrosion resistant) makers
Chimney sweepers	Insulators (wire)	Sulphur burners
Colored-paper workers	Japan makers	Sulphuric-acid workers
Color makers	Japanners	Tannery workers
Compounders (rubber)	Lacquerers	Tar workers
Copper foundries	Lacquer makers	Taxidermists
Copper smelters	Lead-arsenate makers	Textile printers
Coppersmiths	Lead smelters	Tinners
Cosmetic workers	Linoleum colorers	Toy makers
Curriers (tannery)	Lithographers	Varnish makers
Cut-glass workers	Mixers (rubber)	Velvet makers
Decorators (pottery)	Mordanters	Wallpaper printers
Disinfectant makers	Painters	Wax-ornament makers
Dye makers	Paint makers	Welders
Dyers	Paper glazers	Wire drawers
Electroplaters	Paperhangers	Wood preservers
Enamellers	Paris-green workers	Zinc miners
Enamel makers	Pencil (colored) makers	Zinc refiners
Exterminators	Pharmaceutical workers	
Farmers	Pitch workers	
Feather curers	Pottery workers	

## 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, anemia, suppression of urine, shivering and chills, gastric disorders.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

NOTE.—Arsine is formed when a metal and an acid react to produce nascent hydrogen which unites with arsenic present in either the acid or metal, to give the toxic gas.

Acetylene workers	Ferrosilicon workers	Pyroxylin-plastics workers
Acid dippers	Fertilizer makers	Rayon makers
Aniline workers	Galvanizers	Refiners (metals)
Balloon (hydrogen) workers	Gas (illuminating) workers	Shoddy workers
Bleaching-powder makers	Hydrochloric acid workers	Soda makers
Bronzers	Jewelers	Solderers
Cadmium workers	Lead burners	Storage-battery makers
Carbonizers (shoddy)	Lime burners	Submarine workers
Dimethyl-sulphate makers	Nitrocellulose makers	Sulphuric-acid workers
Dye makers	Nitroglycerine makers	Tank cleaners
Electrolytic-process (copper) workers	Paper makers	Tinners
Electroplaters	Picklers	Towermen (sulphuric acid)
Etchers	Plumbers	War-gas makers
Extractors (gold)		Zinc-chloride makers

## 14. Barium

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

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Barium carbonate makers	Ink (printing) makers	Paint makers
Depilatory makers	Insecticide makers	Photographic workers
Dye makers	Lacquer makers	Rubber workers
Enamel makers	Leather workers	Sugar refiners
Fireworks makers	Linoleum makers	Varnish makers
Glass mixers	Lithopone makers	Water purifiers

## 15. Benzine (naphtha-gasoline)

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Headache and vertigo, nausea and vomiting, abdominal pain, irregular respiration, pneumonia, 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

Airplane hangar employees	Galvanizers	Putty makers
Art-glass workers	Garage workers	Pyroxylin-plastics workers
Benzine workers	Gasoline blenders	Rubber-glove makers
Bronzers	Gasoline-engine workers	Rubberized asbestos board makers
Buffers (rubber)	Gilders	Rubber-tire builders
Burnishers (metals)	Glue workers	Rubber workers
Cast scrubbers (electroplaters)	Ink makers	Scourers (metals)
Cementers (rubber shoes)	Insecticide makers	Sewer workers
Cement mixers (rubber)	Japan makers	Shade-cloth makers
Chauffeurs	Japanners	Shellackers
Color makers	Lacquerers	Shellac makers
Compositors	Lacquer makers	Shingle stainers
Compounders (rubber)	Linoleum makers	Shoe-factory workers
Curriers (tannery)	Lithographers	Shoe finishers
Decorators (pottery)	Metal-polish makers	Shoe-heel (wood) coverers
Degreasers (fertilizer; leather; metals; textile)	Metal washers	Soap makers
Dippers (rubber)	Millinery workers	Tank cleaners
Driers (rubber)	Mixers (rubber)	Tannery workers
Dry cleaners	Mordanters	Type cleaners
Dyers	Painters	Varnishers
Electroplaters	Paint makers	Varnish makers
Enamelers	Paint-remover makers	Varnish-remover makers
Enamel makers	Paint removers	Varnish removers
Extractors (oils and fats)	Perfume makers	Vulcanizers
Feather workers	Petroleum refiners	Washers (metal)
Filling station workers	Polishers	Waterproof-cloth makers
Furniture polishers	Polish makers	Window-shade makers
	Pressroom workers (rubber)	Woodworkers
	Printers	

**16. Benzol (benzene) and Its Homologues (toluol and xylol)****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Headache and vertigo, gastrointestinal disturbances, hemorrhages, purpura, injury to blood-forming organs with marked but varied changes in the blood picture—slight polycythemia followed by leukopenia, erythropenia, anemia, and so forth, injury to blood vessels, heart, liver, kidneys, and nervous system, marked susceptibility to infection, local irritation (bronchitis, conjunctivitis, gingivitis, and so forth). In acute poisoning; inebriation, staggering gait, twitchings, convulsions, and loss of consciousness.

Note.—The effects of toluol and xylol differ from those of benzol particularly as regards their effects on the blood and blood-forming organs. Neither of these compounds produces the changes in the blood characteristic of benzol. It is important to note however that the toluol and xylol used in industry are frequently mixed with benzol.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Airplane-dope workers	Enamel makers	Polish makers
Airplane hangar employees	Engravers	Polishers
Alcohol (denatured) workers	Explosive workers	Pressroom workers (rubber)
Aniline workers	Extractors (oils and fats)	Printers
Artificial-leather makers	Feather workers	Pyroxylin-plastics workers
Asbestos-products impregnators	Fertilizer makers	Reclaimers (rubber)
Auto painters	Flavoring-extract makers	Rotogravure workers
Battery (dry) makers	Fullers (textiles)	Rubber-tire builders
Beauty-parlor operatives	Gas (illuminating) workers	Rubber workers
Benzol purifiers	Gasoline blenders	Scourers (belts)
Benzol-stillmen	Gilders	Shade-cloth makers
Benzol workers	Glue workers	Shellackers
Brake-lining makers	Ink makers	Shellac makers
Bronzers	Insulators (wire)	Shoe-factory workers
Can sealers	Lacquerers	Shoe finishers
Carbolic-acid makers	Lacquer makers	Shoe-heel (wood) coverers
Cast scrubbbers (electroplaters)	Linoleum workers	Smokeless powder makers
Cementers (rubber)	Lithographers	Soap makers
Cement mixers (rubber)	Millinery workers	Still (coal tar) cleaners
Chlorodiphenyl makers	Mirror silverers	Tank cleaners
Clutch-disk impregnators	Mixers (rubber)	Tobacco seedling treaters
Coal-tar workers	Mordanters	Treaders (rubber)
Cobblers	Nitrobenzol makers	Trinitrotoluol makers
Coke-oven workers*	Nitrocellulose workers	Varnishers
Color makers	Painters	Varnish makers
Compounders (rubber)	Paint makers	Varnish-remover makers
Decorators (pottery)	Paint-remover makers	Varnish removers
Degreasers	Paint removers	Vulcanizers
Dippers (rubber)	Paraffin makers	War gas makers
Disinfectant makers	Pencil makers	Waterproof-fabric makers
Driers (rubber)	Perfume makers	Wax makers
Dry cleaners	Petroleum refiners	Welders
Dye makers	Pharmaceutical workers	Window-shade makers
Electroplaters	Phenol makers	
Enamelers	Photoengravers	
	Photographic materials workers	
	Picric-acid makers	

**17. Beryllium****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

*Metal fume fever* (see zinc). Severe lung injury has been reported from the extraction of beryllium, but this is thought to be due to the fluorine compounds used in the process of extraction.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Beryllium alloy workers

**18. Brass. See Zinc**

## 19. Bromine

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Bromine extractors	Explosive workers	Pharmaceutical workers
Bromine-salts makers	Extractors (gold)	Photographic-film makers
Color makers	Ink makers	Platinum extractors
Disinfectant makers	Insecticide makers	Tetraethyl-lead makers
Dye makers	Methyl bromide makers	War-gas makers
Ethylene dibromide makers		

## 20. Butanone (Methyl Ethyl Ketone)

Butanone is at present employed in the manufacture of pyroxylin solutions, chiefly in the artificial leather and lacquer industries, and is also used in paint removers. Although at present limited largely to these uses, butanone has possibilities as a solvent in other fields.

The United States Bureau of Mines studied the acute response of guinea pigs to a single exposure to vapors of butanone. According to this Bureau the symptoms are principally those of eye and nose irritation, and narcosis, the latter being apparently the most significant. Animals that did not die during exposure recovered. The principal gross pathological findings immediately after exposure were congestion, edema, and hemorrhage of vital organs, death being due to a narcosis terminating in death.

Butanone, according to the same authority, has a distinct odor and is markedly irritating to the nose and eyes of man in concentrations found to be harmful to guinea pigs. It also has moderate warning properties (odor, and eye and nose irritation) in concentrations apparently harmless to guinea pigs after several hours' exposure.

## 21. Butyl Acetate. See Amyl Acetate

## 22. Butyl Alcohol

No case of industrial poisoning has been reported, but it has been considered a contributing cause in a number of cases of poisoning. Animal experimentation showed marked dermatitis, early liver degeneration, a definite decrease in red-blood cells, with an absolute and relative lymphocytosis.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Artificial-leather workers	Glass (safety) makers	Pyroxylin-plastics workers
Butyl acetate makers	Lacquer makers	Rayon makers
Butyl alcohol makers	Motion-picture-film makers	Shellackers
Cementers (rubber)		Shellac makers
Dye makers	Perfume makers	Varnishers
Fruit-essence makers	Photographic-film makers	Varnish makers

## 23. Cadmium

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Dryness of throat, coughing, tightness, and soreness in chest, dyspnea, severe inflammation of lungs, weakness, loss of appetite, diarrhea, nausea, vomiting, headache, shivering, rapid pulse, brown urine, inflammation of kidneys, fatty degeneration of kidneys and liver.

Metal fume fever (See Zinc).

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Cadmium-alloy makers	Electroplaters	Solder makers
Cadmium and cadmium-compound makers	Glass colorers	Storage-battery makers
Cadmium platers	Lead smelters	Textile printers
Cadmium-vapor-lamp makers	Lithopone makers	Welders
Color makers	Metallizers	Zinc smelters and refiners
	Paint makers	
	Solderers	

**24. Calcium Cyanamide (Cyanamide)****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Severe irritation of nose, throat, and skin. Flushing of skin, headache, shortness of breath, rapid pulse, vasodilation with lowered blood pressure have been reported among workers who have consumed alcohol.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Ammonia workers	Cyanamide makers	Gardeners
Calcium cyanamide makers	Farmers	Pharmaceutical workers
	Fertilizer makers	Temperers

**25. Carbon Dioxide****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

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

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Alkali-salt makers	Disinfectant makers	Refrigerating-plant workers
Bakers	Divers	Sewer workers
Baking-powder makers	Drying-room workers	Silo workers
Blacksmiths	Dye makers	Soda makers
Blast-furnace workers	Explosives (safety) makers	Starch makers
Boiler-room workers	Fertilizer workers	Submarine workers
Bottlers (mineral waters)	Fire-extinguisher makers	Sugar refiners
Brass foundries	Foundry workers	Tannery pit men
Brewers	Furnace workers	Tobacco moisteners (storehouse)
Brick burners	Glue makers	Tunnel workers
Caisson workers	Grain-elevator workers	Vatmen
Canners	Ice-cream makers	Vault workers
Carbonated-water makers	Insecticide makers	Vinegar makers
Carbon-dioxide-ice workers	Lime burners	Vintners
Carbon-dioxide makers	Lime-kiln workers	Vulcanizers
Carbonic-acid makers	Linseed-oil boilers	Well workers
Charcoal burners	Miners	White-lead makers
Clothes pressers	Pharmaceutical workers	Yeast makers
Cupola men (foundries)	Physicians	
	Pottery workers	

**26. Carbon Disulphide****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Headache, vertigo, weakness, physical effects (hilarity, agitation, irritability, hallucinations, mania), disturbances of sensation, particularly of sight, polyneuritis, digestive disturbances. Irritation of the skin.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Acetylene workers	Electroplaters	Putty makers
Ammonium-salts makers	Enamellers	Rayon makers
Carbanilide makers	Enamel makers	Reclaimers (rubber)
Carbon-disulphide makers	Explosives workers	Rubber workers
Carbon tetrachloride workers	Extractors (oils & fats)	Smokeless-powder makers
Cementers (rubber shoes)	Glue workers	Sulphur extractors
Cement mixers (rubber)	Insecticide makers	Tallow refiners
Degreasers	Match-factory workers	Transparent-wrapping-material workers
Driers (rubber)	Painters	Varnish makers
Dry cleaners	Paint makers	Vulcanizers
	Paraffin workers	

**27. 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	Filament makers and finishers (incandescent lamps)	Patent-leather makers
Airplane pilots	Filling-station workers	Petroleum refinery workers
Alloy makers	Firemen (city)	Phosgene makers
Ammonia makers	Firemen (stationary)	Phosphine workers
Bakers	Flangers (felt hats)	Pilots (airplane)
Balloon inflaters	Flue cleaners	Plumbers
Bisque-kiln workers	Foundry workers	Police-men
Blacksmiths	Furnace workers	Pottery (kiln) workers
Blasters	Garage workers	Pressers
Blast-furnace workers	Gas (illuminating) workers	Printers
Blockers (felt hats)	Gasoline-engine workers	Puddlers (foundries)
Boiler cleaners	Gassers (textiles)	Pyroxylin-plastics workers
Boiler-room workers	Glass-furnace workers	Refiners (metals)
Brass foundries	Glost-kiln workers	Sailors
Brewery workers	Incandescent-lamp makers	Sealers (incandescent lamps)
Brick burners	Ink (printer's) makers	Sewer workers
Cable splicers	Insecticide makers	Silver melters
Carbide makers	Iron and steel workers	Singers (cloth)
Cement (portland) makers	Ironers	Soda makers (Leblanc)
Charcoal burners	Kiln tenders	Solderers
Chargers (furnaces)	Laboratory workers	Steeple jacks
Chauffeurs	Laundry workers	Stokers
Chimney masons	Lead smelters	Storage-battery makers
Chimney sweepers	Lime burners	Sulphur-dioxide makers
Cloth singers	Lime-kiln chargers	Tailors
Coal-tar workers	Linotypers	Teazers (glass)
Coke-oven workers	Mechanics (gas engines)	Telephone linemen (trench work)
Compressed air (caisson) workers	Mercury smelters	Temperers
Cooks	Methane (synthetic) makers	Textile printers
Copper smelters	Methyl-alcohol (synthetic) makers	Top fillers (foundry)
Core makers	Miners	Tubulators (incandescent lamps)
Cupola men (foundries)	Mold breakers (pottery)	Welders
Divers	Monotypers	Wood-alcohol distillers
Drier workers (foundries)	Motion-picture-film workers	Zinc smelters
Drying-room workers (miscellaneous)	Neon-lights letter makers	
Enamelers		
Enamel makers		
Engineers (stationary)		
Felt-hat makers		

## 28. Carbon Tetrachloride

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of nose, eyes, and throat, headache, visual disturbances, vertigo, nausea and vomiting, diarrhea, loss of appetite, mental dullness, confusion and excitement, nervousness, injury to liver, jaundice, nephritis, dermatitis, narcosis.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Airplane-dope workers	Dye makers	Paint removers
Airplane-hangar employees	Electroplaters	Paraffin workers
Burnishers (metals)	Fire-extinguisher makers	Perfume makers
Carbon-tetrachloride workers	Fullers (textiles)	Pharmaceutical workers
Cementers (rubber)	Glue workers	Polish makers
Cement mixers (rubber)	Ink makers	Printers
Chlorinated rubber makers	Insecticide makers	Pyroxylin-plastics workers
Chloroform makers	Insulators (wire)	Rubber workers
Cobblers	Lacquerers	Scourers (metals)
Core makers	Lacquer makers	Shoe-factory workers
Degreasers (metals)	Leather workers	Soapmakers
Degreasers (textiles)	Linoleum makers	Spreaders (rubber)
Dippers (rubber)	Metal-polish makers	Varnishers
Dry cleaners	Mixers (rubber)	Varnish makers
	Painters	Vulcanizers
	Paint makers	Waterproof-fabric makers
	Paint-remover makers	

### 29. Cellosolve (mono-ethyl ether of ethylene glycol)

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

The United States Bureau of Mines studied the acute response of guinea pigs to a single exposure to vapors of cellosolve. According to this Bureau, the animals showed inactivity, weakness, dyspnea, and death following exposure for 18 to 24 hours to air saturated with cellosolve vapor (0.6 percent by volume). The principal gross pathological findings were congestion and edema of the lungs; distention of the stomach, with numerous reddish-brown petechiae scattered over the mucous membrane; and congestion of the kidney. The contents of the stomach were also discolored reddish brown. All these occurred in the animals that died during or soon after exposure. The congestion and edema were the principal findings in the animals that died 24 hours following exposure and broncho-pneumonia in the animals that died 3 days following.

They also determined that men exposed to 0.6 percent for a few seconds reported the atmosphere to be irritating to the eyes and to have a very disagreeable odor. They thought that the odor and the irritation was sufficiently disagreeable to make one desire to avoid a like exposure.

Actual examinations of workers in lacquer and paint manufacture by the British Factory Department in 1934 revealed very little evidence of any injury to health from the use of cellosolve.

### 30. 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	Mordanters
Bleachers	Chloroform makers	Pharmaceutical workers
Bleaching-powder makers	Disinfectant makers	Straw-hat-makers
Button (shell, pearl) makers	Dye makers	Tannery workers
	Laundry workers	Water purifiers

### 31. Chlorinated Diphenyls

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Acneform skin eruptions, jaundice, and atrophy of liver.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Chlorinated-diphenyl makers	Insulators (wire)	Resin (synthetic) workers
Electrical-condenser makers	Lacquer makers	Varnish makers
Electrical-transformer makers	Paint makers	Wax makers
	Rayon makers	

### 32. Chlorinated Hydrocarbons

See the following: Carbon tetrachloride, chlorinated diphenyl, chlorinated naphthalenes, chloroprene, dichlorethylene, ethyl chloride, theylene dichloride, methyl chloride, methylene chloride, tetrachlorethane, tetrachlorethylene, trichlorethylene, and vinyl chloride.

### 33. Chlorinated Naphthalenes

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Acneform skin eruptions, jaundice, and atrophy of liver.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Chlorinated naphthalene workers	Electrical-transformer makers	Paint makers
Degreasers (metals)	Electroplaters	Resin (synthetic) workers
Electrical-condenser makers	Insulators (wire)	Varnish makers
	Lacquer makers	Wax makers

### 34. Chlorine

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Alkali-salt makers	Extractors (gold and silver)	Soda makers
Beatermen (paper and pulp)	Ink makers	Sodium-hydroxide makers
Bleachers	Iodine makers	Submarine workers
Bleaching-powder makers	Laundry workers	Sugar refiners
Bromine makers	Paper makers	Sulphur-chloride maker
Broom makers	Phosgene makers	Textile printers
Chloride of lime makers	Photographic workers	Tin-recovery workers
Chlorine makers	Rayon makers	War-gas makers
Color makers	Rubber-substitute makers	Water purifiers
Detinning workers	Sewage-purification workers	Zinc-chloride makers
Disinfectant makers	Shoddy makers	
Dye makers		

### 35. Chlorodinitrobenzol. See Nitrobenzol

### 36. Chloronitrobenzol. See Nitrobenzol

### 37. Chloroprene (2-Chloro-Butadiene)

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

This compound is the starting material for the manufacture of a synthetic rubber.

According to Von Oettingen and Sayers, it has narcotic properties but is mainly characterized by its injurious effect on the liver and in addition it has also a toxic effect on the kidneys and the circulation. Von Oettingen and others have shown that vapors of chloroprene mixed with air cause a primary irritation of the respiratory tract.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Rubber (synthetic) makers.

### 38. Chromium Compounds

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Pitlike ulcers, or so-called chrome holes, very difficult to heal, 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, irritation of the conjunctiva and of the respiratory passages.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Acetylene workers	Enamel makers	Pencil (colored) makers
Aniline workers	Explosives (ammonal and pyroxylin) workers	Photoengravers
Artificial-flower makers	Frosters (glass and pottery)	Photographic workers
Battery (dry) makers	Furniture polishers	Photogravure workers
Bleachers	Glass colorers	Pottery workers
Blueprint makers	Glaze workers (pottery)	Rubber workers
Candle (colored) makers	Ink makers	Steel (chrome) makers
Carbon printers (photography)	Linoleum workers	Tannery (chrome) workers
Chrome workers	Lithographers	Textile printers
Chromium platers	Match-factory workers	Vulcanizers
Colorers (marble)	Mixers (rubber)	Wallpaper printers
Color makers	Mordanters	Waterproofers (paper and textile)
Compounders (rubber)	Painters	Wax-ornament workers
Crayon (colored) makers	Paint makers	Welders
Dye makers	Paperhangers	Wood stainers
Dyers	Paper makers	
Electroplaters	Paper-money makers	
Enamellers		

**39. 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. Animal experimentation reveals polycythemia. Metal-fume fever (*see* Zinc) has been reported.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Alloy makers	Glass colorers	Steel-alloy makers
Color makers	Pottery workers	

**40. Copper**

Metal fume fever (*see* Zinc). Chronic poisoning from inhaling or ingesting copper dust has been reported to cause hemochromatosis or bronzed diabetes. Other authorities doubt the existence of a chronic form of copper poisoning of industrial origin. Few cases have been reported upon.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Brass founders	Copper refiners and smelters	Engravers
Copper founders	Coppersmiths	Welders

**41. 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**

Coal-tar workers	Glue workers	Photographic workers
Cresol-soap makers	Ink makers	Pitch workers
Cresylic-acid makers	Insecticide makers	Resin (synthetic) makers
Disinfectant makers	Paint-remover makers	Rubber (artificial) workers
Dye makers	Perfume (synthetic) makers	Tar-distillery workers
Explosives workers		

**42. Cyanogen Compounds****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

*Acute poisoning.*—Exposure to large amounts of hydrogen cyanide causes death from asphyxia almost immediately. Exposure to lesser amounts causes irritation of eyes and mucous membranes, headache, dizziness, nausea, vomiting, diarrhea, shortness of breath, palpitation of the heart, trembling, muscle cramps, shallow breathing, convulsions, unconsciousness. Hydrogen cyanide and cyanide solutions also cause skin eruptions.

*Chronic poisoning.*—Exposure to small amounts of cyanide compounds over a long period of time is reported to cause loss of appetite, weakness, nausea, muscle cramps, unsteady gait, paralysis of arms and legs, psychoses.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

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

**43. Dichlorethylene****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

This substance has irritant and narcotic properties. Post mortem findings of men overcome by the vapors of dichlorethylene show an excess of fat in the blood suggesting death from embolism rather than asphyxiation.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Cementers (rubber)	Perfume makers	Varnishers
Dichloroethylene workers	Pyroxylin (plastics) workers	
Dry cleaners		
Insecticide makers	Rayon makers	

## 44. Dichloroethyl Ether

Dichloroethyl ether is an active solvent for fats, tars, waxes, resins, and similar materials.

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

The United States Bureau of Mines studied the acute response of guinea pigs to a single exposure to vapors of dichloroethyl ether. According to this Bureau, the physiological action among these animals is primarily irritation of the respiratory passages and the lungs. In order of their appearance the symptoms produced were: nasal irritation, eye irritation, lacrimation, disturbances in respiration, dyspnea, gasping, and death. All of these appeared in concentrations of 0.026 to 0.10 percent vapor in air by volume. All except lacrimation were attained with 0.01 percent, while an exposure of 810 minutes to 0.0035 percent caused no symptoms other than signs of slight nasal irritation. The principal gross pathological findings were congestion, emphysema, edema, and hemorrhage of the lungs. These occurred in all animals that died during or after exposure, the severity increasing with length of exposure, and also during 1 to 4 days after exposure.

The same Bureau found that concentrations of 0.055 and 0.10 percent dichloroethyl ether vapor in air on brief exposure of men, were very irritating to the eyes and nasal passages.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Degreasers	Paint removers	Soap makers
Fullers (textils)	Petroleum refiners	Varnish-remover makers
Paint-remover makers	Resin (synthetic) makers	Varnish removers

## 45. Dimethyl Sulphate

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Color makers	Dyemakers	War gas makers
Dimethyl-sulphate makers	Perfume makers	

## 46. Dinitrobenzol. See Nitrobenzol

## 47. Dinitrophenol (1-2-4)

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Burning thirst, sweating, panting, excitement, high fever, patchy yellow skin, and convulsions. After ingestion, evidence of liver and blood damage have been observed. Bilateral cataracts have also occurred as a sequella.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Dinitrophenol workers	Explosives workers	Shell fillers
Dye makers	Pharmaceutical workers	Wood preservers

## 48. Dioxan (Diethylene Dioxide)

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Headache, vertigo, drowsiness, irritation of eyes, nose, throat, and lungs, gastric disturbances, injury to liver and kidneys.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Cement (rubber, plastic, etc.) mixers	Insecticide makers	Pyroxylin-plastics workers
Degreasers	Lacquer makers	Rayon makers
Dioxan makers	Paint-remover makers	Varnish makers
Dye makers	Pharmaceutical workers	
	Polish makers	

**49. Ethyl Benzene**

This compound is used as an "antiknock," as a lacquer diluent, general solvent, and so forth.

The United States Bureau of Mines studied the acute response of guinea pigs to a single exposure to vapors of ethyl benzene. According to this Bureau these animals showed in the order of occurrence, eye and nose irritation, and 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. Exposure to 1 percent caused all these symptoms and death in from 2 to 3 hours; 0.5 percent caused all the symptoms up to and including tremor of extremities, but not respiratory disturbances and death during or after exposure of 8 hours; 0.2 percent caused all the symptoms up to and including ataxia in 8 hours; 0.1 percent did not cause symptoms other than eye irritation during 8 hours. The gross pathological findings were congestion of the brain and congestion and edema of the lungs. These were most severe for the exposures to 1 percent concentration of vapor until death ensued.

Men exposed, according to the same authority, were of the opinion that a 0.2 percent concentration of vapor would give ample warning and would not be tolerated; and that 0.5 percent would have sufficient irritating properties to render working in this atmosphere impossible.

**50. Ethyl Bromide and Ethyl Chloride****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

See note under Methyl Chloride.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Dye makers	Fire-extinguisher makers	Refrigerator (mechanical)
Ethyl-bromide makers	Perfume makers	makers and repair men
Ethyl-chloride makers	Pharmaceutical workers	

**51. Ethylene Dibromide****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

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

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Ethylene dibromide makers	Fire-extinguisher makers	Pyroxylin-plastics workers
	Gasoline blenders	
	Pharmaceutical workers	

**52. Ethylene Dichloride (Dichlorethane)**

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

**SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Acute poisonings in industry have been reported with the following symptoms: Dizziness, nausea, and vomiting followed by weakness, trembling and epigastric cramps. Evidence of liver damage was shown by presence of extremely low-blood sugar levels. Leukocytosis and dermatitis also appeared.

The United States Bureau of Mines studied the acute response of guinea pigs to a single exposure to vapors of ethylene dichloride. According to this Bureau, these animals showed 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 6 percent vapors caused all these symptoms, excepting death, to occur in less than 10 minutes, and death in about 30 minutes. Exposure to 1 percent caused all the symptoms to appear in 25 minutes with the possibility of death occurring a day or more following an exposure of about 15 to 20 minutes. The gross pathological findings were hyperemia, congestion, and edema of the lungs with secondary degenerative changes in the kidneys. The severity of the pathology increased with the concentration of vapor and duration of exposure. The lung lesion was the most prominent and probably the greatest causative factor in death.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Degreasers (textile)	Extractors (oils and fats)	Pharmaceutical workers
Dry cleaners	Insecticide makers	Rubber workers
Dyers	Insulators (wire)	Soap makers
Ethylene-dichloride makers	Lacquerers	Tobacco denicotinizers
Exterminators	Lacquer makers	Varnishers
	Paraffin workers	Varnish makers

**53. Ethylene Oxide****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Headache, vomiting, dyspnea, diarrhea, irritation of mucous membranes of nose and eyes, vertigo, nausea, lymphocytosis, dullness, disturbances of respiration and of heart action, pulmonary edema.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Butyl cellosolve makers      Exterminators      Insecticide makers  
Ethylene oxide makers

**54. Ethyl Silicates. Tetraethyl-ortho-silicate; Tetramethyl-ortho-silicate**

Animal experimentation shows these compounds to be toxic, but no cases have been reported from industrial exposure.

**55. Fluorine and Its Compounds. See Hydrofluoric Acid****56. Formaldehyde****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Irritation of eyes and respiratory tract, cough, bronchitis, dyspnea, severe dermatitis, destruction of finger nails.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Artificial-amber makers	Formaldehyde workers	Rayon makers
Asbestos (goods) makers	Fur preparers	Recoverers (gold and silver)
Brewery workers	Glass etchers	Resin (synthetic) makers
Broom-makers	Ink makers	Rubber workers
Brush makers	Insecticide makers	Soap makers
Button makers	Lacquer makers	Straw-hat makers
Disinfectant makers	Laundry workers	Tannery workers
Dye makers	Mirror silverers	Textile printers
Dyers	Paper makers	Waterproofers (paper and textile)
Embalmers	Photographic workers	
Explosives workers	Preservative makers and handlers	

**57. 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**

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

**58. Furfural****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Vapors are irritating and may be dangerous to eyesight.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Dye makers	Resin makers	Varnish makers
Paint-remover makers		

**59. Gasoline. See Benzine****60. Hexanone (Methyl Butyl Ketone)**

Hexanone is an organic solvent. It is reported to be a good solvent for nitro-cellulose and has possibilities of use in making lacquers and also varnish and lacquer removers.

The United States Bureau of Mines studied the acute response of guinea pigs to a single exposure to vapors of hexanone. According to this Bureau, hexanone produces in these animals narcosis, terminating in death in the higher concentrations. Symptoms are principally eye and nasal irritation, followed by narcosis. Animals that did not die during exposure recovered. The principal gross pathological findings were congestion and hemorrhage of the lungs, slight congestion of the brain, and moderate congestion of the liver and kidneys, as observed in the autopsies performed immediately after exposure.

Men exposed to 0.23, 0.65, and 2.0 percent vapor in air, according to this same authority, pronounced the atmosphere extremely disagreeable even for a short time (one-fourth to 1 minute) because of strong odor and irritation to eyes and nasal passages. One-tenth of 1 percent was found to have a strong odor and moderate eye and nasal irritation. Concentrations producing no marked symptoms and apparently harmless to guinea pigs after one exposure of several hours have distinct warning properties of both odor and irritation that are very disagreeable to human beings.

**61. Hexone (Methyl Isobutyl Ketone)**

Methyl isobutyl ketone, commercially known as hexone, has been proposed as a diluent and denaturant of ethyl alcohol for external use, and is used industrially in making varnishes and lacquers.

The United States Public Health Service studied the acute response of guinea pigs to inhalation of methyl isobutyl ketone. They found that: "Methyl isobutyl ketone vapor inhalation causes irritation of conjunctival and nasal mucosa in man at concentrations below 0.1 volume percent, although this concentration is well tolerated by guinea pigs. This indicates good warning qualities. At higher concentrations marked irritation is exhibited by guinea pigs as evidenced by lacrimation and salivation. A progressive narcosis occurs, causing lowering of body temperature, respiratory rate, and heart rate. A loss of static control, consciousness, and the deeper reflexes follows. Death finally ensues at 1.0 volum percent in about 4 hours and in progressively shorter periods at higher concentrations. Complete recovery can be effected by removal at any but the terminal stages. Gross and microscopic pathology is slight and resembles that of most acute reactions to solvent exposures."

**62. Hydrochloric Acid****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Irritation and ulceration of skin and mucous membranes, conjunctivitis, coryza, pharyngitis and bronchitis, dental caries, pulmonary hemorrhages.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

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

**63. Hydrocyanic Acid. See Cyanogen Compounds****64. Hydrofluoric Acid****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Redness and burning of skin, intense irritation of eyelids and conjunctiva, coryza, bronchitis 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.

Chronic poisoning (fluorosis) is characterized by gastro-intestinal disturbances, cachexia, stiffness of limbs, disturbances of calcium metabolism, nervous symptoms.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Aluminum extractors	Electroplaters	Incandescent-mantle hardeners
Antimony-fluoride extractors	Enamel makers	Paper (filter) makers
Art-glass workers	Etchers	Phosphate-mill workers
Beryllium extractors	Fertilizer makers	Phosphorus extractors
Bleachers	Gas (illuminating) workers	Picklers (metals)
Brewers	Glass etchers	Pottery workers
Brick makers	Glass finishers	Stone cleaners
Copper refiners and smelters	Gold refiners	Tank cleaners (brewery)
Dyers	Hydrofluoric-acid makers	Welders
		Yeast makers

**65. Iron Carbonyl. See Nickel Carbonyl****66. Lead and Its Compounds****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Ashen pallor, jaundice, metallic taste, gastrointestinal disturbances, constipation, abdominal pains, lead line on gums, asthenia, lassitude, irritability, 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, anemia, ocular disturbances, mental symptoms (lead encephalopathy). Abnormal amount of lead in urine or feces. Lead in blood stream and spinal fluid. Metal-fume fever (*see* Zinc).

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Acid finishers (glass)	Compounders (rubber)	Grinders (metals)
Actors	Concentrating-mill workers (lead and zinc)	Grinders (rubber)
Airplane pilots—crop dusting	Copper refiners	Incandescent-lamp makers
Amber workers	Crayon (colored) makers	Ink makers
Art-glass workers	Cut-glass workers	Insecticide makers
Artificial-flower makers	Cutlery makers	Japan makers
Artificial-pearl makers	Decorators (pottery)	Japanners
Babbitt-metal workers	Dental workers	Jewelers
Babbitters	Diamond polishers	Junk-metal refiners
Battery (dry) makers	Dye makers	Labelers (paint cans)
Blacksmiths	Dyers	Lacquerers
Blooders (tannery)	Electroplaters	Lacquer makers
Bookbinders	Electrotypers	Lead burners
Bottle-cap makers	Embroidery workers	Lead-foil makers
Brass founders	Emery-wheel makers	Lead miners
Brass polishers	Enamelers	Lead-pipe makers
Braziers	Enamel makers	Lead-salts makers
Brick burners	Engravers (steel)	Lead smelters
Brickmakers	Explosives workers	Linoleum makers
Bronzers	Farmers	Linotypers
Browners (gun barrels)	File cutters	Linseed-oil boilers
Brush makers	Fillers	Litharge workers
Buffers (rubber)	Filling-station workers	Lithographers
Burners (enameling)	Galvanizers	Lithotransfer workers
Cable makers	Garage workers	Match-factory workers
Cable splicers	Gardeners	Metallizers
Canners	Gasoline blenders	Mirror silverers
Cartridge makers	Glass finishers	Mixers (rubber)
Cement workers (ceramic)	Glass mixers	Molders (foundry)
Chippers	Glass polishers	Monotypers
Cigar makers	Glaze dippers (pottery)	Musical-instrument makers
Colorers (white) of shoes	Glaze mixers (pottery)	Nitric-acid workers
Color makers	Glost-kiln workers	Nitroglycerin makers
Compositors	Gold refiners	Painters

Paint makers	Sagger makers	Tannery workers
Paint removers	Sandpaperers (enameling and painting auto bodies, etc.)	Temperers
Paperhangers	Screen workers (lead and zinc smelting)	Tetraethyl lead makers
Paper makers	Sheet-metal workers	Textile printers
Patent-leather makers	Shellackers	Tile makers
Petroleum refiners	Shellac makers	Tin-foil makers
Photograph retouchers	Shot makers	Tinners
Pipe fitters	Silk weighters	Toy makers
Plumbers	Slip makers (pottery)	Transfer workers (pottery)
Polishers	Slushers (porcelain enameling)	Type founders
Pottery workers	Solderers	Type melters
Printers	Solder makers	Varnishers
Putty makers	Sprayers (trees)	Varnish makers
Putty polishers (glass)	Stainers (shoes)	Wall-paper printers
Pyroxylin-plastics workers	Stereotypers	Welders
Reclaimers (rubber)	Storage-battery makers	White-lead workers
Red-lead workers	Sulphuric-acid workers	Wood stainers
Refiners (metals)	Table turners (enameling)	Zinc miners
Riveters		Zinc smelters
Roofers		
Rubber workers		

### 67. Lead Arsenate. *See* Arsenic; Lead

### 68. Magnesium

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Metal-fume fever (*see* Zinc). Toxic effects have been suspected but have not been demonstrated as due to industrial exposure.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Alloy makers	Glass mixers	Pharmaceutical workers
Brick makers	Magnesium alloy makers	Rubber workers
Fat renderers	Paint makers	
Fertilizer workers	Paper makers	

### 69. Manganese

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Languor and sleepiness, stolid mask-like facial expression, low monotonous voice, muscular twitching, varying from a fine tremor of hands to gross rhythmical movements of arms, legs, trunk, and head, cramps and stiffness of muscles in legs, increase in tendon reflexes, ankle and patellar clonus, retro-pulsion and propulsion, slapping gait, uncontrollable laughter and crying. Metal-fume fever (*see* Zinc).

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Alloy makers	Fertilizer makers	Open-hearth-department workers
Aluminum extractors	Fireworks makers	Painters
Battery (dry) makers	Glass mixers	Paint makers
Bleaching-powder makers	Glaze dippers (pottery)	Pharmaceutical workers
Brick makers	Glaze mixers (pottery)	Pottery workers
Bronzers	Linoleum makers	Puddlers (iron and steel)
Chlorine makers	Longshoremen	Soap makers
Color makers	Manganese-dioxide workers	Steel-alloy makers
Concentrating-mill workers	Manganese grinders	Textile printers
Copper smelters	Manganese-ore separators	Varnishers
Dye makers	Manganese-steel makers	Varnish makers
Dyers	Match-factory workers	Welders
Enamelers	Miners (Manganese)	Zinc miners
Enamel makers		Zinc smelters

### 70. 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, fine intention tremor, exaggerated knee jerk, scanning speech, mercurial erethism, loss of memory, insomnia and depression, anxiety and irritability, mercurial eczema. Metal-fume fever (*see* Zinc).

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Acetaldehyde makers	Electroplaters	Mercury-still cleaners
Acetic-acid (synthetic) makers	Embalmers	Mercury-switch makers
Acetone (synthetic) makers	Embalming fluid makers	Mercury-vapor lamp makers
Alcohol (synthetic) makers	Embossers	Mirror silverers
Amalgam makers	Engravers (steel)	Mixers (felt hats)
Artificial-flower makers	Explosives workers	Painters
Barometer makers	Extractors (gold and silver)	Paint (antifouling) makers
Battery (dry) makers	Felt-hat makers	Pharmaceutical workers
Blowers (felt hats)	Fireworks makers	Photographic workers
Bronzers	Formers (felt hats)	Physicians
Browners (gun barrels)	Fulminate mixers	Pottery decorators
Brushers (felt hats)	Fur (hatters) handlers	Primers (explosives)
Bulb (mercury) makers	Fur handlers	Printers
Cap loaders	Fur preparers	Radio-tube makers
Carroters (felt hats)	Gilders	Refiners (metals)
Cartridge makers	Gold refiners	Shooting-gallery workers
Chlorine makers	Hair workers	Sizers (felt hats)
Color makers	Hardeners (felt hats)	Sole stitchers (Blake machine)
Coners (felt hats)	Incandescent-lamp makers	Starters (felt hats)
Cosmetic workers	Ink (vermillion) makers	Stiffeners (felt hats)
Cyanogen gas makers	Insecticide makers	Storage-battery makers
Decorators (pottery)	Jewelers	Tannery workers
Dental workers	Laboratory workers	Taxidermists
Dentists	Lead platers (on iron)	Temperers
Detonator cleaners	Lithographers	Textile printers
Detonator fillers	Manometer makers	Thermometer makers
Detonator packers	Mercury boiler workers	Water gilders
Devil operators (felt hats)	Mercury-alloy makers	Welders
Disinfectant makers	Mercury bronzers	Wood preservers
Dye makers	Mercury miners	Zinc-electrode makers
Electric-induction furnace workers	Mercury-pump workers	
	Mercury-salt workers	
	Mercury smelters	
	Mercury-solder workers	

71. Metal Fume Fever. *See Zinc*

## 72. Methanol (Methyl Alcohol)

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Burning and irritation of eyes, respiratory tract, and skin; headache, nausea and vomiting, vertigo, severe colic, convulsions, 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. Has a specific effect on the optic nerve and may cause optic atrophy and blindness.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Alcohol (denatured) workers	Filament makers (incandescent lamps)	Millinery workers
Aldehyde pumpmen	Furniture polishers	Mottlers (leather)
Antifreeze makers	Gilders	Painters
Art-glass workers	Glass (safety) makers	Paint makers
Artificial-flower makers	Hardeners (felt hats)	Paint-remover makers
Artificial-leather workers	Incandescent-lamp makers	Patent-leather makers
Automobile painters	Ink makers	Perfume makers
Bookbinders	Japan makers	Photoengravers
Bronzers	Japanners	Photographers
Brush makers	Lacquerers	Polishers (metals)
Cementers (rubber shoes)	Lacquer makers	Polish makers
Collar (fused) makers	Lasters (shoes)	Printers
Dimethyl-sulphate makers	Leather workers	Pyroxylin-plastics workers
Driers (felt hats)	Linoleum makers	Rayon makers
Dry cleaners	Lithographers	Resin makers
Dye makers	Methyl-alcohol workers	Rubber workers
Dyers	Methyl-bromide makers	Shellackers
Explosives workers	Methyl-chloride makers	Shellac makers
Featherworkers	Methyl-compound makers	Shoe-factory operatives
Felt-hat makers		

Shoe finishers	Stitchers (shoes)	Varnishers
Shoe-heel (wood) covers	Straw-hat makers	Varnish makers
Soap makers	Textile printers	Vulcanizers
Stiffeners (felt hats)	Type cleaners	Wood-alcohol distillers
	Upholsterers	Woodworkers

### 73. Methyl Bromide

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of respiratory passages, muscular twitchings, cramps, convulsions, disturbance of sight, fever, delirium, coma. Nervous symptoms—unsure gait, heightened reflexes, loss of visual acuity, loss of memory, irritable temper—may persist for a long time.

See note under Methyl chloride.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Color makers	Fire extinguisher makers	Pharmaceutical workers
Dye makers	Insecticide makers	Refrigerator (mechanical) makers and repair men
Exterminators	Methyl-bromide makers	

### 74. Methyl Cellosolve (Ethylene Glycol Monomethyl Ether)

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

While it is not positively established, recent studies suggest that methyl cellosolve may affect the blood and blood-forming organs and the nervous system.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Airplane dope makers	Enamel makers	Pyroxylin-plastics workers
Collar (fused) makers	Ink (printing) makers	Resin makers
Cosmetic workers	Lacquer makers	Varnish makers
Dye makers	Nitrocellulose workers	

### 75. Methyl Chloride

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

NOTE.—The United States Bureau of Mines studied the acute response of guinea pigs to a single exposure to vapors of methyl chloride, methyl bromide, ethyl bromide, and ethyl chloride. According to this Bureau all four produced similar symptoms, including excitement, loss of equilibrium, inability to walk, rapid pulse, convulsive rapid respiration with rales, 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. The gross pathology was quite similar for all four of these alkyl halides and was characterized by congestion, hemorrhage, and edema of the lungs, and by injury to the vascular system, as shown by the tendency toward hemorrhage. Congestion was present in the organs of all groups, but parenchymal degeneration was most marked in those exposed to methyl-bromide vapors. A distinct delayed effect of exposure was noted with methyl bromide and methyl chloride, to a lesser extent with ethyl bromide, but was not observed with ethyl chloride.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Air-conditioning workers	Methyl-chloride makers	Refrigerator (mechanical) makers and repair men
Chloroform makers	Perfume makers	Thermometer makers
Color makers	Pharmaceutical workers	
Dye makers		

### 76. Methylene Chloride (Dichloromethane)

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Generally considered practically harmless if free from other products and under conditions of good ventilation. But one authority reports the effects from industrial exposure to be headache, giddiness, stupor-irritability, numbness and tingling in the limbs, and possibly some degree of chronic anemia.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Degreasers	Methylene-chloride workers	Perfume makers
Dye makers	Perfume makers	Petroleum refiners
Lacquerers	Paint removers	Pharmaceutical workers
Lacquer makers		Rayon makers

### 77. Methyl Formate

Methyl formate is used in fumigants. It has also been considered for use as a high boiling refrigerant for household appliances.

The United States Bureau of Mines studied the acute responses of guinea pigs to a single exposure to vapors of methyl formate. According to this Bureau, the animals showed, in their order of occurrence, nose and eye irritation, retching movement, uncoordination, narcosis accompanied by uncoordinated movements of the extremities, and death. Methyl formate vapor was found to be irritating to the lungs. Congestion and edema were the most constant and prominent findings after exposure which resulted in death. A hyperemia of the liver and kidneys and congestion of the surface vessels of the brain and adrenals usually accompanied the lung changes. Lung irritation was frequently found immediately after exposure which did not cause death, but was absent in animals examined 4 to 10 days following exposure.

Men exposed for 1 minute to 0.15 percent vapor in air, according to the same authority, noticed the pleasant ethereal odor of methyl formate, but experienced no nasal or eye irritation or other signs or symptoms. While the odor of methyl formate is distinct and noticeable in concentrations which are relatively safe from the standpoint of producing acute poisoning, owing to its pleasant nature and the occurrence of olfactory fatigue it is doubtful whether the odor of methyl formate will serve as an effective warning of harmful conditions of exposure.

### 78. Naphtha. *See Benzine*

### 79. Naphthols

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of skin and kidneys. Injury to cornea and lens.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Color makers	Dye makers	Pharmaceutical workers
	Perfume makers	

### 80. Naphthylamines. *See Aniline and Other Amino Compounds of Benzol and Its Homologues*

### 81. Nickel

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

The only lesion reported to be caused by nickel, apart from the toxic effects of nickel carbonyl, is nickel eczema. This condition is reported mostly among nickel platers who are exposed to many dermatitis-producing substances. Some authorities question whether nickel is the responsible agent.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Alloy makers	Nickel extractors	Storage-battery makers
Coin makers (nickel)	Nickel-purifications workers (Mond process)	
Electroplaters	Steel-alloy makers	
Enamellers		

### 82. Nickel Carbonyl

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Giddiness, headache, nausea, constipation, dyspnea, cough, retrosternal soreness and epigastric pain, sleeplessness, cyanosis, edema of lungs, pain in the loins, hemorrhages—especially in the brain and the adrenals. Metal-fume fever. (*see Zinc*)

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Nickel-purification workers (Mond process)

### 83. Nicotine

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Industrial poisoning usually occurs through skin absorption. Acute cases may be fatal. In less severe cases there may be severe prostration, gastric upsets,

cardio-vascular collapse, precordial distress, dyspnea. Toxic amblyopia has been reported by some authorities to be a chronic effect of nicotine poisoning.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Cigar makers	Fertilizer makers	Insecticide makers
Farmers	Gardeners	Tobacco workers

**84. Nitraniline. See Aniline**

**85. Nitrobenzol and Other Nitro Compounds of Benzol and Its Homologues**

**SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Cyanotic face and lips, somnolence, headache, vertigo, nausea and vomiting, odor of bitter almonds in breath, unsteady gait, tremors, muscular twitching, and other manifestations of nerve injury, anemia, visual disturbances, methemoglobin formation, presence of hematoporphyrin, albumin, and sometimes free poison in urine, eczematous eruptions.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Aniline workers	Gasoline blenders	Polish makers
Cosmetic workers	Glue workers	Shell fillers
Dinitrobenzol workers	Ink makers	Shoe dyers
Dye makers	Nitrators	Smokeless-powder makers
Explosives workers	Nitrobenzol workers	Soap makers
Flavoring-extract makers	Perfume makers	Trinitrotoluol makers
Floor-polish makers	Petroleum refiners	

**86. 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), marked vasodilation, and low blood pressure.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Explosives workers	Pharmaceutical workers	Smokeless-powder makers
Nitroglycerin workers	Shell fillers	

**87. Nitronaphthalene. See Nitrobenzol**

**88. Nitrous Fumes 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, peripheral vasodilatation, methemoglobinemia and its sequelae, and depression of the central nervous system, corrosion of teeth, severe burns on the skin.

Continued exposure to diluted fumes is said to cause chronic inflammation of the respiratory tract and a general disability characterized by headache, sleeplessness, anorexia, gradual loss of strength, dyspepsia, constipation, and ulcers on the lips and mucous membranes of the mouth and pharynx.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Nitrous fumes may be present whenever nitric acid comes in contact with a metal, an organic material or with air. They are also present when nitrated materials such as photographic film are burned, when explosives are incompletely detonated and when an electric arc or an explosion causes extreme heat in the air.

Acid dippers	Collodion makers	Enamel makers
Aniline workers	Damascening workers	Engravers
Artificial-leather makers	De-brassers	Etchers
Artificial-pearl makers	Dimethyl-sulphate makers	Explosives workers
Blasters	Dippers (guncotton)	Felt-hat makers
Bleachers	Dye makers	Fertilizer makers
Carroters (felt hats)	Dyers	Fur preparers
Cartridge dippers	Electroplaters	Galvanizers

Gilders	Nitroglycerin makers	Refiners (metals)
Guncotton workers	Nitrous-oxide workers	Rubber-substitute makers
Insecticide makers	Oxalic-acid makers	Rubber workers
Jewelers	Painters	Scourers (metals)
Lacquer makers	Pharmaceutical workers	Smokeless-powder makers
Lithographers	Phosphoric-acid makers	Soda makers
Miners (blasting)	Photoengravers	Sulphuric-acid makers
Mordanters	Photographic film makers	Textile printers
Motion-picture machine operators	Photogravure workers	Towermen (sulphuric acid)
Nitrators	Picklers (metals)	Tunnel workers (blasting)
Nitric-acid workers	Picric-acid makers	Welders
Nitrobenzol workers	Pyroxylin-plastics workers	Wringers (guncotton)
Nitrocellulose makers	Rayon makers	

## 89. Oxalic Acid

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Auto-radiator cleaners	Engravers	Patent-leather makers
Bleachers (straw)	Formic-acid workers	Polishers (metals)
Blueprint-paper makers	Glycerin refiners	Rayon makers
Bookbinders	Ink makers	Resin makers
Dry cleaners	Lithographers	Stone cleaners
Dye makers	Metal-polish makers	Tannery workers
Dyers	Oxalic-acid makers	

## 90. Ozone

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of eyes and respiratory tract.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Bleachers	Ozonators	Water purifiers
Disinfectant makers	Patent-leather makers	Wax refiners
Electrical workers	Refrigerating-plant workers	Welders
Fat renderers		
Laundry workers	Varnish makers	

## 91. Pentanone (Methyl Propyl Ketone)

Pentanone is an organic solvent. It is reported to be a good solvent for intracellular and vinyl resin products and has possibilities of use in making lacquers and also varnish and lacquer removers.

The United States Bureau of Mines studied the acute response of guinea pigs to a single exposure to vapors of pentanone. According to this Bureau, pentanone produces in these animals narcosis, terminating in death in the higher concentrations. Symptoms are principally eye and nasal irritation, followed by narcosis. Animals that did not die during exposure, recovered. The principal gross pathological findings were congestions, edema, and hemorrhage of lungs, liver, and kidneys, as observed in the autopsies performed immediately after exposure.

Men momentarily exposed to 1.3 and approximately 5.0 percent pentanone vapor, according to the same authority, pronounced the atmosphere extremely disagreeable because of irritation to the eyes and nasal passages. One-half percent was found to be very disagreeable, and 0.15 percent vapor was found to have a strong odor and to produce a moderate to marked sense of irritation to the eyes and nasal passages.

## 92. Petroleum. See also Benzine

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Petroleum and its volatile products are irritating to the skin and respiratory organs, and may cause acute inflammation of the lungs and headache, sensory disturbances, and so forth. (See Benzine.)

Workers in petroleum refineries are subject to acne, keratosis, epithelioma, and melanosis from petroleum, paraffin, and petroleum residue. Workers exposed to petroleum oils and greases in a number of industries are subject to folliculitis, boils, and papillomas.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Browners (gun barrels)	Oilers	Petroleum refiners
Furniture polishers	Oil-flotation-plant workers	Pressmen (oil refinery)
Lampblack makers	Oil-well workers	Temperers
Machinists	Paraffin workers	
Mechanics		

### 93. Phenol

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Erosion of the skin, eczema, gangrene, irritation of the respiratory organs and eyes.

Symptoms of acute poisoning following splashing with phenol or inhaling its vapors include: Headache, vertigo, nausea, tinnitus, fainting, dyspnea, excitement, convulsions, respiratory paralysis.

Symptoms of chronic exposure include: Emaciation, vomiting, diarrhea, anorexia, headache, vertigo, nephritis, degeneration of liver, circulatory disturbances.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Brewers	Gas purifiers	Picric-acid makers
Carbolic-acid makers	Lampblack makers	Reclaimers (rubber)
Coal-tar workers	Paint makers	Resin (synthetic) makers
Disinfectant makers	Paint-remover makers	Rubber workers
Dye makers	Paint removers	Smokeless-powder makers
Dyers	Perfume makers	Stillmen (carbolic acid)
Etchers	Pharmaceutical workers	Surgical-dressing makers
Explosives workers	Phenol workers	Textile printers
Gas (illuminating) workers	Photographic materials workers	Varnish makers
		Wood preservers

### 94. 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

Antipyrine makers	Pharmaceutical workers	Phenyl-hydrazine workers
Dye makers		

### 95. Phosgene

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Phosgene is given off when certain chlorinated hydrocarbons come in contact with hot metals or an open flame.

Bleachers	Dye makers	Phosgene makers
Carbon-tetrachloride workers	Firemen (city)	War-gas makers
	Pharmaceutical workers	

### 96. Phosphorus

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Increasingly severe toothache, digestive disturbances, swelling and ulceration of the gums and buccal membrane, loosening and falling out of the teeth, supuration and destruction of jawbone with fistulous channels burrowing through the cheek, meningeal inflammation, emaciation. Necrosis of the bones, other than the jawbone, has also been reported.

A different type of poisoning marked by generalized systemic effects is also recognized.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Bone-black makers	Insecticide makers	Phosphor-bronze workers
Brass founders	Match-factory workers	Phosphorus-compound makers
Explosives workers	Pharmaceutical workers	Phosphorus extractors
Exterminators	Phosphate-mill workers	Welders
Fireworks makers	(phosphorous manufac- ture)	

**97. 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, pain in the region of the diaphragm and feeling of chill. Symptoms similar to those of phosphorous poisoning are said to have resulted from prolonged exposure to low concentration of phosphine.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Acetylene workers	Phosphine workers	Phosphuretted hydrogen workers
Blast-furnace workers	Phosphorus extractors	Welders
Buoy makers	Phosphorus (red) makers	
Ferrosilicon worker		

**98. Picric Acid (Trinitrophenol)**

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Disinfectant makers	Fireworks makers	Shell fillers
Dye makers	Pharmaceutical workers	Smokeless-powder makers
Dyers	Photographic workers	Tannery workers
Explosives workers	Picric-acid makers	War-gas makers

**99. Potassium Hydroxide**

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Bleachers	Oxalic-acid makers	Potassium hydroxide makers
Electroplaters	Paper makers	Soap makers
Ink makers	Perfume makers	
Lye makers	Pharmaceutical workers	
Match-factory workers	Photo-engravers	

**100. Pyridine**

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of respiratory tract and of eyes, dyspnea, cough, dermatitis, headache, vertigo, gastro-intestinal and nervous disorders, trembling of extremities.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Cement mixers (rubber)	Incandescent-mantle hardeners	Pencil makers
Dye makers	Lacquerers	Polishers
Dyers	Lacquer makers	Pyridine makers
Explosives workers	Paint makers	Rubber workers
Gilders		

**101. Radium. See Radiant energy****102. Selenium Compounds**

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

The effects of industrial exposure are: Dermatitis, pallor, gastrointestinal disturbances, garlicky odor of breath and perspiration, irritation of nose and throat, coating of tongue, metallic taste in mouth, and nervousness.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Alloy makers	Glass mixers	Resin (synthetic) makers
Cement (Portland) makers (certain areas)	Lead smelters and refiners	Selenium refiners
Color makers	Lime burners (certain areas)	Steel-alloy makers
Concentrating-mill workers	Metallizers	Sulphuric-acid workers
Copper smelters and refiners	Paint makers	Vulcanizers
Glass colorers	Pottery workers	Welders
	Pyrites burners	Zinc smelters and refiners

## 103. 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.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Coin makers (silver)	Photographic-film makers	Silver-nitrate makers
Ink (indelible) makers	Polishers (silver)	Silver platers
Miners (silver)	Silver-foil makers	Silversmiths
Mirror silverers	Silver melters and refiners	

## 104. Sodium Hydroxide

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Bleachers	Paint makers	Soap makers
Cellulose makers	Paper makers	Sodium-hydroxide makers
Dye makers	Petroleum refiners	Tannery workers
Engravers	Pharmaceutical workers	Transparent wrapping-material workers
Glass makers	Rayon makers	Rubber workers
Mercerizers		

## 105. Sulphur Chloride

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of mucous membranes of eye and respiratory tract.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Carbon-tetrachloride makers	Extractors (gold)	Varnish makers
Cement mixers (rubber)	Insecticide makers	Vulcanizers
Dyers	Rubber-substitute makers	War-gas makers
	Sulphur-chloride workers	

## 106. Sulphur Dioxide

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation and inflammation of mucous membranes of eyes and respiratory tract, spasmodic cough, bronchitis, digestive disturbances, blood-tinged mucus, inflammation of lungs. Physical examination of a group of workers with prolonged exposure to sulphur dioxide and a control group from the same plant showed a higher incidence among the exposed workers of naso-pharyngitis, altered sense of smell and sense of taste, increased sensitivity to other irritants, abnormal urinary acidity, increased fatigability, shortness of breath on exertion, abnormal reflexes.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Alkali-salt makers	Carbolic-acid makers	Disinfectant makers
Artificial-ice makers	Cellulose makers	Dye makers
Blast-furnace workers	Chambermen (sulphuric acid)	Exterminators
Bleachers	Coke-oven workers	Feather workers
Bone extractors	Copper smelters	Fertilizer makers
Brass founders	Digester-house workers (paper and pulp)	Firemen (city)
Brickmakers		Flue cleaners
Broommakers		Fruit preservers

Galvanizers	Pyrites burners	Sulphurers (malt and hops)
Gelatine makers	Refiners (metals)	Sulphuric-acid workers
Gluemakers	Refrigerator (mechanical) makers and repairmen	Sulphur miners
Insecticide makers	Smelters	Tannery workers
Lead smelters	Storage-battery chargers	Towermen (sulphuric acid)
Mercury smelters	Sugar refiners	Ultramarine-blue makers
Oil-flotation-plant workers	Sulphite cooks	Vulcanizers (rubber)
Paper-mill workers	Sulphur burners	Zinc smelters
Petroleum refiners	Sulphur-dioxide workers	
Pottory workers		

### 107. Sulphuretted Hydrogen (Hydrogen Sulphide)

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of mucous membranes of eyes and respiratory tract, conjunctivitis, keratitis, photophobia, bronchitis, rhinitis, pharyngitis and laryngitis, pulmonary edema, headache and vertigo, hyperpnea, gastro-intestinal disturbances, depression of the nervous system, bradycardia, psychic disorders.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

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

### 108. 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	Etchers	Perfume makers
Acid finishers (glass)	Ether makers	Petroleum refiners
Alum workers	Explosives workers	Pharmaceutical workers
Ammonium-salts makers	Fat purifiers	Phenol makers
Ammonium-sulphate makers	Felt-hat makers	Phosphoric-acid makers
Artificial-leather makers	Fertilizer makers	Phosphorus-evaporating-machine workers
Benzol purifiers	Galvanizers	Photographic workers
Beta-still operators (beta naphthol)	Glass finishers	Picklers (metals)
Brewery workers	Glue makers	Picric-acid makers
Burnishers (iron and steel)	Guncotton dippers	Pyroxylin-plastics workers
Candle makers	Hydrochloric-acid makers	Rayon makers
Carbolic-acid makers	Hydrocyanic-acid makers	Reclaimers (rubber)
Carbonizers (shoddy)	Jewelers	Refiners (metals)
Cartridge dippers	Linoleum makers	Salt extractors (Coke-oven byproducts)
Cellulose makers	Lithographers	Scourers (metals)
Chambermen (sulphuric acid)	Mercerizers	Shoddy workers
Color makers	Nitrators	Soap makers
Dimethyl-sulphate makers	Nitric-acid makers	Soda (Leblanc) makers
Dye makers	Nitroglycerin makers	Storage-battery workers
Electroplaters	Nitrocellulose makers	Sugar refiners
Engravers	Oil purifiers	Sulphates makers
	Paint makers	Sulphuric-acid makers
	Paper makers	
	Patent-leather makers	

Tallow refiners	Towermen (sulphuric acid)	Wax refiners
Tannery workers	Transparent-wrapping-material workers	Wire drawers
Temperers		Wood preservers
Textile printers		Yeast makers

### 109. Tar and Pitch

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Melanosis, tar itch, acne, eczema, or psoriasis, ulcers of the skin and cornea, warts, 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	Roofers
Asbestos goods workers	Electrode makers	Roofing-paper workers
Asphalt workers	Fishermen	Rope makers
Battery (dry) makers	Flue cleaners	Shipyards workers
Briquet makers	Gas (illuminating) workers	Soap makers
Brush makers	Insulators	Still (coal tar) cleaners
Cement workers (plastic)	Painters (tar)	Street repairers
Chimney sweepers	Paint makers	Tank cleaners
Coal-tar workers	Pavers	Tar workers
Coke-oven workers	Pitch workers	Waterproofers
Cordage-factory workers	Road repairers	Wood preservers

### 110. Tellurium Compounds

#### 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	Pharmaceutical workers	Zinc refiners
Glass colorers	Photographic workers	
Lead refiners	Rubber makers	

### 111. Tetrachlorethane (Acetylene Tetrachloride)

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Airplane-dope makers	Glass (safety) workers	Rubber workers
Artificial-pearl makers	Insecticide makers	Shoe-factory operatives
Cementers (rubber)	Lacquerers	Soap makers
Cement mixers (rubber)	Lacquer makers	Straw-hat makers
Color makers	Lithographers	Tapers (airplanes)
Degreasers (metals, textiles)	Motion-picture-film workers	Varnishers
Dry cleaners	Paint-remover makers	Varnish makers
Electroplaters	Paint-removers	Varnish-remover makers
Enamelers	Pharmaceutical workers	Varnish removers
Enamel makers	Pyroxylin-plastics workers	Wax makers
Extractors (oils and fats)	Rayon makers	
Fullers (textiles)		

### 112. Tetrachlorethylene (Perchloroethylene)

#### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of eyes, tightness in frontal sinuses, increased perspiration of hands and increased secretion of mucous from nasal passages, nausea, elation, faintness, dizziness, dyspnea, retarded mental activity, headache, and visual disturbances.

#### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Degreasers (metals)	Pharmaceutical workers	Soap makers
Dry cleaners	Printers	

**113. 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, excessive quantities of lead in feces and urine, lead encephalopathy.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Gasoline blenders                      Tank cleaners                      Tetraethyl-lead makers

**114. Thallium****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

Loss of appetite, fatigue, reddish discoloration and falling out of the hair, pains in the limbs, severe eye affections, inflammation of the kidneys, albuminuria, polyneuritis, lymphocytosis, eosinophilia.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Artificial-gem makers	Filament makers	Insecticide makers
Color makers	(incandescent lamps)	Thallium workers
Depilatory makers	Fireworks makers	Thermometer makers
Disinfectant makers	Flue-dust recoverers	
Dye makers	(sulphuric acid mfr.)	
Exterminators	Glass mixers	

**115. Thorium. See Radiant Energy****116. Tin**

Not generally regarded as an industrial poison.

There is a case on record which suggests that tin tetrachloride used in weighing silk may have toxic effects. The symptoms noted included feeling of chilliness in the chest, pain in the throat, and heaviness in the stomach, anemia, and traces of tin in urine and feces.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Silk weighers

**117. 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.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Dyers	Paint makers	Paper makers
Iron and steel workers		

**118. Toluol. See Benzol****119. Trichlorethylene****SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR**

The effects of trichlorethylene are not fully established.

Symptoms of acute poisoning include excitement, drunkenness, dullness, nausea, vomiting, unconsciousness; sequelae include headache, vertigo, anorexia, disturbed heart action. Severe irritation of the respiratory passages has also been reported, but this effect is ascribed by some authorities to the action of its decomposition products, phosgene, and hydrochloric acid.

Chronic exposure is said to result in injury to the trigeminal and optic nerves. Impurities in trichlorethylene, it has been suggested, may be the cause of these injuries. Other effects are addiction and skin irritation.

**OCCUPATIONS WHICH OFFER SUCH EXPOSURE**

Burnishers (metals)	Electroplaters	Insecticide makers
Cementers (rubber)	Extractors (oils and fats)	Lacquerers
Degreasers	Galvanizers	Lacquer makers
Disinfectant makers	Gas (illuminating)	Leather workers
Dry cleaners	workers	Painters
Dye makers	Glue workers	Paint makers

Paint-remover makers	Polishers (metals)	Soap makers
Paint removers	Polish makers	Tobacco denicotinizers
Perfume makers	Resin (synthetic) workers	Trichlorethylene workers
Petroleum refiners	Rubber workers	Varnishers
Pharmaceutical workers	Scourers (metals)	Varnish makers
Photographic workers	Shoe-factory operatives	

## 120. Trinitrophenol. See Picric Acid

## 121. Trinitrotoluol. See Nitrobenzol

## 122. Triorthocresyl Phosphate

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

No clear-cut cases have been reported from industry. It is not highly volatile, but if absorbed it may cause paralysis of extremities.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Lacquerers	Lacquer makers	Pyroxylin plastics workers
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## 123. Turpentine

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Irritation of mucous membranes of eyes, nose, and upper air passages, bronchial inflammation, salivation, headache, vomiting, abdominal pain and vertigo, state of excitement resembling drunkenness, irritation of kidneys and bladder, strangury, odor of violets in urine, severe irritation of skin.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Art-glass workers	Japanners	Printers
Cable splicers	Lacquerers	Rubber workers
Camphor makers	Lacquer makers	Sealing-wax makers
Cementers (rubber)	Linoleum makers	Shellackers
Compositors	Lithographers	Shellac makers
Decorators (pottery)	Millinery workers	Shoe factory operatives
Dry cleaners	Painters	Textile printers
Dye makers	Paint makers	Transfer workers
Enamelers	Patent-leather makers	(pottery)
Enamel makers	Petroleum-refinery workers	Turpentine extractors
Feather workers	Pharmaceutical workers	Varnishers
Furniture polishers	Photographic workers	Varnish makers
Ink (printing) makers	Polishers	Wax makers
Insecticide makers	Polish makers	
Japan makers		

## 124. Uranium

Uranium, reported to be one of the most toxic of metals, is a source of radiant energy. A high frequency of cancer of the lungs in Czechoslovakian miners of uranium is believed to be due to the radioactivity of the ore. Very little has been published on the effects on man of exposure to uranium salts. The conditions reported include purpura of the legs, reduction of leukocytes, as well as diminution of red corpuscles, a reduction in urinary elimination of nitrated salts, and an increase in the chlorides.

Experiments on animals with uranium nitrate are reported to show nephritis, glycosuria, albuminuria, gastro-intestinal disorders, degeneration of liver, affections of nervous system.

### OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Dye makers	Paint makers	Tile makers
Dyers	Pharmaceutical workers	Uranium miners
Glass mixers	Photographic workers	Uranium workers

## 125. Vanadium

### SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

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

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Alloy makers	Ink (blue) makers	Textile printers
Dye makers	Mordanters	Vanadium-steel workers
Dyers	Photographic workers	
Glass mixers	Sulphuric-acid workers	

**126. Vinyl Chloride**

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

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

The United States Bureau of Mines studied the acute response of guinea pigs to a single exposure to the vapors of vinyl chloride. According to this Bureau, vinyl chloride produces in these animals unsteadiness and motor ataxia, incomplete and finally complete narcosis. The principal gross pathological findings were congestion and edema of the lungs with hyperemia of the kidneys and liver.

This same Bureau determined that 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.

**127. Xylol. See Benzol****128. Zinc**

## SYMPTOM, CONDITION, OR DISEASE TO LOOK FOR

Metal-fume fever characterized by: Irritation of respiratory tract, dryness of throat, dry cough, malaise, headache, nausea, severe chills with fever, pains in limbs, shaking in limbs, sweating, leukocytosis.

Metal-fume fever may also be caused by fumes of lead, mercury, manganese, cadmium, arsenic, antimony, and many other metals. Metal-fume fever resulting from metals which may cause systemic poisoning should be regarded as a warning that continued exposure may have more serious effects.

## OCCUPATIONS WHICH OFFER SUCH EXPOSURE

Blowers-out (zinc smelting)	Core makers	Pourers (brass foundry)
Brass foundry	Galvanizers	Sherardizers
Brasiers	Junk-metal refiners	Welders
Bronze-powder makers	Luters (zinc smelting)	Zinc smelters
Bronzers	Metallizers	
	Molders (foundry)	

## Section III.

### Dermatoses

**S**KIN 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 wood, proteins, and vegetable and animal parasites.

Occupational dermatoses are frequently distinguished by their grouping, situation, mode of appearance, spread, and evolution. They are most often local and predominate on the right side of right-handed people. The onset and development are usually sudden. The association between occupational exposure and the dermatoses produced by some substances, particularly those which are primary irritants, such as caustic soda, chromic acid, and gasoline, is quite obvious. Many other substances, however, have no specific lesions or special pathology, and some are selective in the people in whom they cause injury, thus making it more difficult to associate the condition with occupational exposure.

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.

### DERMATOSES

#### Occupations Exposed to Specified Skin Irritants

<i>Occupation exposed</i>	<i>Skin irritants</i>
Acetylene makers	Calcium carbide.
Acid workers	Acids.
Alkali-salt makers	Caustic alkali.
Artificial-flower makers	Caustic alkali, dyes, solvents.
Auto washers and cleaners	Solvents, potassium cyanide.
Bakers	Dough, potassium persulphate, heat, dust.
Barbers	Soap, hair tonics, dyes.
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.
Bricklayers	Lime.
Bronzers	Dyes.
Broom and brush makers	Dyes, vegetable dust, tar, bacteria, fungi, parasites.

## Occupations Exposed to Specified Skin Irritants—Continued

<i>Occupation exposed</i>	<i>Skin irritants</i>
Calico printers	Dyes.
Candy makers	Sugar, tartaric acid.
Canners	Fruit acids, lacquer, fungi, parasites, dyes, bacteria.
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.
Cementers (rubber shoes)	Benzine, coal-tar products, naphtha, methyl alcohol.
Cement workers	Lime, pitch, rosin.
Chemical workers	See specific chemical in section II J.
Chromium platers	Chromium compounds, sulphuric acid.
Cloth preparers	Acids, caustic alkali, lime, soap, potassium salts, sodium salts, sodium silicate.
Confectioners	Sugar.
Cooks	Fruit acids, glucose.
Cotton sizers	Acids, zinc chloride, arsenic salts, phenol, aluminum salts, calcium salts, magnesium salts.
Courriers (tannery)	Paraffin, benzine.
Degreasers	Solvents.
Dentists	Procain, mercury, cocaine.
Detonator cleaners	Mercury compounds.
Detonator fillers	Mercury compounds.
Detonator packers	Mercury compounds.
Dishwashers	Caustic soaps, grease, bacteria, fungi.
Disinfectant makers	Formaldehyde, cresol.
Druggists	Bleaching powder, soap, iodoform, sodium salts, sugar.
Dry cleaners	Dirt, benzine, carbon tetrachloride.
Dye makers	Acids, benzine, caustic alkali, coal-tar products, dye intermediates, dyes, turpentine, antimony compounds, barium salts, calcium salts, cresol, dextrins, ferrocyanides, formaldehyde, gums, hydro-quinone, lead salts, phenol, potassium chlorate.
Dyers	Dyes.
Electroplaters	Acids, benzine, caustic alkali, lime, potassium cyanide, soap, nickel, sulphate, chromic acid.
Embalmers	Formaldehyde, mercury.
Enamelers	Alkalis, acids, arsenic, chromium.
Engravers	Acids, caustic alkali, ferric chloride, potassium cyanide.
Etchers	Acids, caustic alkali.
<b>Explosives workers</b>	<b>Dye intermediates, explosives (TNT, etc.), ammonium salts, bromine, mercury compounds.</b>
Farmers	Ivy and other plants, fertilizers, insecticides, bacteria, fungi parasites.
Felt-hat makers	Acids, mercuric nitrate, dyes.
Fertilizer makers	Calcium cyanamide, fluorides.
Fish dressers	Brine.
Flax spinners	Lime, brine.
Flour-mill workers	Dust, fungi, parasites.
Furnacemen	Heat.
Furniture polishers	Benzine, caustic alkali, naphtha, turpentine, methyl alcohol, pyridine, rosin.
Fur workers	Dyes, lime, formaldehyde.
Galvanizers	Ammonium chloride.
Garage workers	Oils, grease, solvents.
Gardeners	Ivy and other plants, fertilizers, insecticides.
Gas-mantle impregnators	Thorium compounds.
Glass blowers	Charcoal, pitch, rosin.
Glass mixers	Caustic alkali.
Hair dressers	Cosmetics, dyes, tonics, perfumes, bacteria, fungi.
Ink makers	Dyes, turpentine, chromates.
Insecticide makers	Arsenic.
Lampblack makers	Soot.
Laundry workers	Caustic alkali, soap, bleaching powder.
Lime burners	Lime.
Lime pullers (tannery)	Lime.
Linoleum makers	Dyes.
Machinists	Cutting compounds, lubricants, oils.
Masons	Lime.
Match-factory workers	Dyes, dextrins, gums, chrome salts.

## Occupations Exposed to Specified Skin Irritants—Continued

<i>Occupation exposed</i>	<i>Skin irritants</i>
Mercerizers .....	Acids, caustic alkali.
Mixers (rubber) .....	Accelerators (hexamethylenetetramine).
Mordanters .....	Acids, caustic alkali, chromates, zinc chloride, aluminum salts, antimony compounds, arsenates, copper salts, iron salts, lead salts, phosphates, silicates, tin salts.
Mottlers (leather) .....	Dyes.
Nickelplaters .....	Zinc chloride, nickel sulphate.
Nitroglycerin makers .....	Acids, explosives.
Painters .....	Acids, caustic alkali, paints, zinc chloride, benzene, chrome pigments.
Paint makers .....	Paints.
Paper-box makers .....	Glue, dyes.
Paraffin workers .....	Paraffin.
Parchment makers .....	Zinc chlorides.
Pencil (colored) makers .....	Dyes.
Petroleum refiners .....	Caustic alkali, paraffin.
Photographers .....	Acids, caustic alkali, chromates, metol, pyrogallol acid, turpentine, amidol, bronzing powder, hydroquinone, rodinal.
Photographic-plate cleaners .....	Caustic alkali.
Pitch workers .....	Pitch, tar.
Plasterers .....	Lime.
Plumbers .....	Caustic soaps, hydrochloric acid, zinc chloride.
Pollishers .....	Caustic alkali, naphtha, acid, cyanogen compounds.
Pollishers (silver and brass) .....	Potassium cyanide.
Printers .....	Ink, benzene, chromates, alkalis.
Pyroxylin-plastics makers .....	Dyes.
Radium workers .....	Radiant energy.
Rayon workers .....	Alkalis, carbon disulphide, acids, solvents, bleaches.
Rock-salt workers .....	Brine.
Ropemakers .....	Oil, tar, dyes, potassium hydroxide.
Rubber workers .....	Accelerators (hexamethylenetetramine), solvents.
Salt preparers .....	Brine.
Shell fillers .....	Explosives (TNT, etc.).
Shoe finishers .....	Benzene, coal-tar products, naphtha, methyl alcohol.
Silk workers .....	Alkalis, acids, dyes.
Sizers (cotton) .....	Zinc chloride, aluminum salts, calcium salts, magnesium salts, acids, phenol, arsenic salts.
Slaughter and packing-house workers .....	Bacteria, fungi, parasites, brine.
Smelters .....	Arsenic.
Soap makers .....	Caustic alkali, soap, vegetable oils, sodium silicate.
Sodium-hydroxide makers .....	Caustic alkali.
Solderers .....	Acids, zinc chloride.
Stockyard workers .....	Bacteria, fungi, parasites.
Sugar refiners .....	Sugar.
Tannery workers .....	Acids, lime, sodium sulphide, arsenic salts, brine, calcium hydrosulphide, chromium salts.
Tar workers .....	Tar, pitch.
Taxidermists .....	Arsenic, mercuric chloride, calcined alum, tannin.
Temperers .....	Oil, brine, cyanide.
Tinners .....	Zinc chloride.
Tobacco rollers .....	Vegetable dust, vegetable oils, glue.
Typists .....	Carbon paper, typewriter ribbons.
Upholsterers .....	Lacquer, glue, bacteria, fungi, parasites.
Veterinarians .....	Bacteria, fungi, parasites.
Vulcanizers .....	Accelerators (hexamethylenetetramine).
Washers .....	Caustic alkali, soap, bleaching powder.
Washwomen .....	Caustic alkali, soap, bleaching powder.
Watchmakers .....	Potassium cyanide, trichlorethylene.
Waterproofers (paper) .....	Paraffin.
Wax-ornament makers .....	Dye intermediates, potassium cyanide.
Wood preservers .....	Tar, zinc chloride, bichloride of mercury.
X-ray workers .....	Radiant energy.
Zinc-chloride makers .....	Acids, zinc chloride.

## Section IV.

### Selected Sources of Information on Industrial Hygiene

#### BOOKS

- Chenowith, Lawrence B., and Willard Machle.** Industrial hygiene; a handbook of hygiene and toxicology for engineers and plant managers. F. S. Crofts & Co. New York, 1938. 235 pp.
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- Hamilton, Alice.** Industrial poisons in the United States. Harper & Bros. New York, 1925. 590 pp.
- Industrial toxicology.** Harper & Bros. New York, 1934. 352 pp.
- Henderson, Yandell, and Howard W. Haggard.** Noxious gases and the principles of respiration influencing their action. Chemical Catalog Co. Inc. New York, 1927. 220 pp.
- Kessler, Henry H.** Accidental injuries; the medico-legal aspects of workmen's compensation and public liability. Lea & Febiger. Philadelphia, 1931. 718 pp.
- Kober, George M., and Emery R. Hayhurst.** Industrial health. P. Blakiston's Son & Co. Philadelphia, 1924. 1184 pp.
- Lanza, A. J.** Silicosis and asbestosis, by various authors. Oxford University Press. New York, 1938. 439 pp.
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- Leschke, Erich.** Clinical toxicology; modern methods in the diagnosis and treatment of poisoning translated by C. P. Stewart and O. Dorrer. William Wood & Co. Baltimore, 1934. 346 pp.
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- Sappington, C. O.** Medico-legal phases of occupational diseases; an outline of theory and practice. Industrial Health Book Co. Chicago, 1939. 405 pp.
- Schwartz, Louis, and Louis Tulipan.** A text-book of occupational diseases of the skin. Lea & Febiger. Philadelphia, 1939. 755 pp.

#### REPORTS AND MISCELLANEOUS PERIODICALS

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- International Labor Office.** Occupation and Health; Encyclopedia of Hygiene, Pathology, and Social Welfare, studied from the point of view of labor, industry, and trades. Brochure edition. Brochures Nos. 1-353. Geneva, 1925-1934.
- Occupation and Health; Encyclopedia of Hygiene, Pathology, and Social Welfare, studied from the point of view of labor, industry, and trades. Supplement. Geneva, 1938-1939.
- The Journal of Industrial Hygiene and Toxicology.** Williams & Wilkins Co. Baltimore, Md. Published monthly.

#### UNITED STATES GOVERNMENT BUREAUS

- United States Department of Labor, Bureau of Labor Statistics.  
United States Department of Labor, Division of Labor Standards.  
United States Bureau of Mines.  
United States Public Health Service.