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CONTENTS.

	Page.
Fatal accidents in coal mining, by Frederick L. Hoffman:	
Introduction.....	437-446
The fatal-accident rate.....	446-452
The causes of fatal accidents.....	453-462
Falls of coal or roof.....	455-457
Mine cars.....	457
Explosions.....	457, 458
Miscellaneous mine accidents.....	458, 459
Principal causes of fatal accidents, by coal fields.....	459-462
The fatal-accident rate due to principal causes.....	462-481
Falls of coal or roof.....	463-465
Shaft accidents.....	465, 466
Mine cars.....	466
Outside cars.....	467
Motors.....	467, 468
Explosions of gas or dust.....	468-474
Explosions of powder or dynamite.....	474-476
Asphyxiation.....	476
Mining machinery.....	476, 477
Mules.....	477
Electrocution.....	477-480
Miscellaneous mine accidents.....	480, 481
Statistical analysis of 2,660 fatal mine accidents in the United States during 1908.....	481-486
Descriptive analysis of fatal accidents in Illinois, 1904 to 1908.....	486-557
Statistical analysis of fatal accidents in West Virginia, 1899 to 1908.....	557-577
The fatal-accident rate in Pennsylvania, by occupations.....	577-609
An estimate of the total loss of life in coal mines of North America.....	609, 610
The use of explosives in mines.....	610-612
Chronological account of the principal mine disasters in North America.....	612-614
Summary.....	615-622
Appendix (29 tables).....	623-671
Bibliography.....	671-674
Recent action relating to employers' liability and workmen's compensation, by Lindley D. Clark, A. M., LL. M.:	
Nature and liability and compensation systems.....	675, 676
Federal employers' liability law.....	676, 677
Statutes providing insurance.....	677, 678
Statutes providing for compensation.....	678-680
Proposed federal legislation.....	680
United States Workmen's Compensation Commission.....	680-683
Attitude of state legislatures toward the compensation system.....	683-688
Massachusetts.....	684, 685
Illinois.....	685, 686
Connecticut.....	686
Wisconsin.....	686
Minnesota and New York.....	687
New Jersey and Ohio.....	687, 688
Conferences of commissions.....	688
Minnesota bill.....	689, 690
Wisconsin bill.....	690-692
New York statutes.....	693
Report of New York commission.....	693-698
Economic reasons for a compensation system.....	693-697
Attitude of employers and employees.....	697
Conclusions of the New York commission.....	697, 698

Recent action relating to employers' liability and workmen's compensation, by	Page.
Lindley D. Clark, A. M., LL. M.—Concluded.	
Action by employers and association of employers and of workmen.....	698-702
United States Steel Corporation.....	699
International Harvester Company.....	699, 700
National associations of employers.....	700, 701
National Civic Federation.....	701
American Federation of Labor.....	701, 702
Legal principles involved.....	702-707
Statutes.....	707-714
Essential features of a compensation law; Chicago conference of November, 1910.....	715-717
Summary of foreign workmen's compensation acts.....	719-748
Cost of employers' liability and workmen's compensation insurance, by Miles M. Dawson.....	749-831
Austria.....	752-759
Belgium.....	760
Denmark.....	760-765
Finland.....	765-768
France.....	769-773
Germany.....	774-783
Great Britain.....	784-792
Italy.....	792-794
Netherlands.....	794-797
Norway.....	797-801
Sweden.....	802-809
Switzerland.....	810-815
Canada.....	815-818
New York.....	819-823
United States.....	824-831
Decisions of courts affecting labor:	
Decisions under statute law.....	832-855
Employer and employee—interference with relation—enticement—construction of statute (<i>Abingdon Mills Co. v. Grogan</i>).....	832, 833
Employers' liability—actions for injuries causing death—rights of alien beneficiaries (<i>Cetofonte v. Camden Coke Co.</i>).....	833, 834
Employers' liability—contracts between Pullman company and railway company—waiver of employee's rights (<i>San Antonio and Aransas Pass Ry. Co. v. Tracy</i>).....	835
Employers' liability—fellow-servant law—common carriers—constitutionality of statute (<i>Chicago, Milwaukee and St. Paul Ry. Co. v. Westby</i>).....	836, 837
Employers' liability—inspection of factories—violations of statutes—defenses—construction (<i>Caspar v. Lewin</i>).....	837-848
Employers' liability—railroad companies—hazards—construction of statute—constitutionality—classification (<i>Louisville and Nashville R. R. Co. v. Melton</i>).....	848-852
Employers' liability—railroad companies—hazards—repair work—constitutionality of statute (<i>Swoboda v. Union Pacific Railroad Co.</i>).....	852-854
Laundries—registration—police regulations—constitutionality (<i>District of Columbia v. Shong Lee</i>).....	854
Payment of wages—semimonthly pay day for railroad employees—constitutionality of statute (<i>New York Central and Hudson River R. R. Co. v. Williams</i>).....	854, 855
Decisions under common law.....	855-866
Blacklisting—conspiracy—evidence (<i>Rhodes v. Granby Cotton Mills</i>).....	855-857
Employer and employee—interference with relation—conspiracy to destroy trade (<i>Globe and Rutgers Fire Insurance Co. v. Firemen's Fund Fire Insurance Co.</i>).....	857-859
Employers' liability—fellow-servants—association theory (<i>Louisville Ry. Co. v. Hibbit</i>).....	859-861
Employers' liability—safe place—low bridge over railroad track—rules—defenses (<i>West v. Chicago, Burlington and Quincy Ry. Co.</i>).....	861-863
Interference with contract of employment—procuring discharge—damages (<i>Ruddy v. United Association of Journeymen Plumbers, etc., Local No. 24</i>).....	864, 865
Labor organizations—closed-shop agreements—legality (<i>Kissam v. United States Printing Co. of Ohio et al.; Mills et al. v. Same</i>).....	865, 866

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FATAL ACCIDENTS IN COAL MINING.

BY FREDERICK L. HOFFMAN.

INTRODUCTION.

The actual dangers of coal mining have been quite fully within the understanding of mankind from the very beginning of the industry, but the accurate determination of the relative degree of occupational risk demands careful inquiry and the scientific analysis of the statistical and related facts. Explosions, causing the death of many underground employees at one time, attract world-wide attention, but they tend to emphasize only a single important aspect of the whole subject of mining casualties, the exceptional risk in gaseous mines, overshadowing by contrast the normal and considerable occupational risk inherent in all underground work. The measure of the risk to mine workers inherent or casually incidental to coal mining, is determined, as a rule and with the least chance of serious error, upon the basis of the number of men at work, but under certain conditions the relative amount of coal mined will indicate the risk exposure with at least approximate accuracy. The ratio determined by this method is limited, however, in usefulness to comparisons with mine experience in other coal fields and other coal-producing countries. In either case special caution is necessary in the use of all rates and ratios, because of the inherent variable-ness in mining operations, which arises out of essentially different methods of mining, shorter or longer hours of labor, strikes and other disturbances, curtailed production or idle times, and, finally, fundamental differences in the age, race, nativity, and occupation distribution of the mining population.

Without entering upon an extended discussion of the chance of error in the use of these statistical factors, which affect the accuracy

of all rates and ratios measuring the personal risk in mining, it may be said that they are not sufficient, as a rule, to invalidate general conclusions based upon large mining areas or periods of sufficient length. Errors and inaccuracies in statistical inquiries of this kind tend to equalize themselves, although there remains the need of great caution at all times in the advancing of conclusions or inferences from more or less insufficient statistical material. For this reason a minute analysis of the available information seems neither called for nor advisable, and the present inquiry is therefore limited to a presentation of facts and conclusions which may safely be accepted as approximately correct.

This article, in its essentials, is limited to the decade ending with 1908, except in the case of supplementary tables and the returns for a few States, for which the annual reports are for other than calendar years. The information in practically all cases is derived from the official reports of state mine inspectors, amplified by correspondence and occasional references to the reports of the United States Geological Survey on "Coal Production," for recent years. This article, for reasons of statistical accuracy, is limited to fatal accidents, since the official returns of nonfatal injuries are of extremely doubtful value. The data do not in all cases, and rarely in the totals, correspond to the annual tabulations of coal-mining accidents by the United States Geological Survey in the case of States making returns for other than calendar years. The differences, or discrepancies, are, however, not of material importance for the present purpose.

Heretofore no complete analysis has ever been made of coal-mining casualties in the United States, with a full consideration of all the essential elements of the industry, and the present inquiry is only a first, and not wholly satisfactory, attempt to present the fundamental facts in the form of a connected summary, suggestive of further investigation into matters of detail. The magnitude of the undertaking will be appreciated when it is stated that no two mining States make statistical reports exactly alike and that there are often material discrepancies in the official returns of the same States for different years. It will also be found that the reports for different mining districts vary in accuracy and completeness and that the totals are often not in conformity with the published summary for the year. It is obvious that under these circumstances no entirely accurate or complete analysis is possible, but an attempt is made here to present all the essential aspects of the fatal-accident problem in the light of the most conclusive data at present obtainable.

In 1908, according to the returns of the United States Geological Survey, the number of men employed in coal mining was 690,438, against 680,492 in 1907. Of the number at work in 1908, 516,264, or 74.8 per cent, were employed in bituminous mining and 174,174 in

the mining of anthracite coal.^a) The number employed in lignite, shale, and semibituminous or semianthracite coal mining is not accurately known. In 1907 the miners worked on an average 231 days, against only 195 days in 1908. There was, therefore, an addition of 36 days' risk exposure in 1907 compared with 1908. Differences of this kind can not be allowed for in the present state of our statistical knowledge. If it were possible to obtain for coal mining, as well as for all other dangerous industries, trustworthy returns of the aggregate number of days' labor paid for, it would be possible to reduce the same to a standard working year of 300 days of 10 hours each, for example, in the same manner as is now done by German employers' insurance institutions and by some of the employers' liability insurance companies. If, however, this method of calculation of risk exposure were employed in coal mining alone, there are no corresponding data for other industries, such as railways, navigation, iron and steel manufactures, etc. For the present purpose, therefore, the time factor must be ignored. For reasons of statistical accuracy this, of course, is a matter of regret, for, obviously, an exposure to risk during only 200 days a year may result in an actual casualty occurrence by probably one-third less than when the exposure is 300 days or more, and the difference must be approximately proportionate to the amount of employment of variable length. For these reasons mining engineers and supervising officials prefer to calculate or determine the personal risk factor in mining upon the basis of the annual production, and the differential result of the two methods is set forth in the following comparison, derived from the report of the United States Geological Survey for 1908.

COMPARATIVE FATALITY RATES AND RATIOS IN COAL MINING, 1907 AND 1908.

[Compiled from Mineral Resources of the United States, 1908, Part II, p. 55.]

Year.	Average number of employees.	Number of men killed.	Accident death rate per 1,000 employees.	Tons of coal produced.	Lives lost per 1,000,000 tons of coal mined.
1907.....	680,492	3,125	4.86	480,363,424	6.51
1908.....	690,438	2,450	3.60	415,842,698	5.89

The foregoing comparison brings out clearly the conflicting results of different methods of ascertaining the accident liability in mines. It is apparent that wide variations in the number of days worked per annum must affect the accident rate more or less in proportion

^a Mineral Resources of the United States, 1908, Pt. II, p. 39. U. S. Geological Survey, Washington, 1909.

to the time of employment, but the amount of idleness would have to be quite considerable to materially impair the accuracy of the fatality rate as determined by the usual method. In the above comparison there is a difference of 36 days, and if this is allowed for by reducing the two years to a common basis of 300 working days, the resulting rates are 5.96 and 5.46 per 1,000. The actual difference in the rates for 1907 and 1908, as determined by the usual method, is 1.26 per 1,000, or 35 per cent, while the corrected fatality rates show a difference of only 0.50 per 1,000, or 9.2 per cent. This difference corresponds quite closely to the result obtained by comparing the fatalities per million tons of coal mined. While, apparently, the corrected rates are more trustworthy than the rates determined by the usual method, it must be taken into consideration that the employment statistics have, in all probability, a very considerable degree of inaccuracy, on account of the fact that there are no uniform rules for determining the number of days worked in the different States and at different times. In view of this element of uncertainty and the limited extent to which information is available for correcting the fatality rates for variations in working time, as well as the very great amount of work involved in any attempt to make such corrections, it seems necessary at the present time to confine comparisons of coal mining fatalities to rates calculated according to the usual methods. The effect of variations in working time would be more pronounced in the case of nonfatal accidents, which, however, for reasons previously stated, have not been considered in this investigation.

Finally, there is the element of uncertainty in the returns of working time of miners working by contract and local variations in the permissible working time per day, which in the anthracite region of Pennsylvania is limited to nine hours. In the bituminous region of Pennsylvania during 1907 and 1908, according to the statistics of the United States Geological Survey, the working time was distributed as shown in the following table:

NUMBER AND PER CENT OF MEN WORKING SPECIFIED HOURS PER DAY IN BITUMINOUS COAL MINES, 1907 AND 1908.

(Compiled from Mineral Resources of the United States, 1908, Pt. II, p. 43.)

Hours per day.	Men working specified hours per day.			
	1907.		1908.	
	Number.	Per cent.	Number.	Per cent.
8.....	303,232	59.2	314,756	61.1
9.....	54,948	10.7	55,278	10.7
10.....	115,775	22.6	125,968	24.4
All other.....	38,397	7.5	19,489	3.8
Total.....	512,352	100.0	515,521	100.0

The differences in working hours from year to year are also hardly sufficient to have a really important bearing upon the degree of fatal accident occurrence, although it would be desirable, of course, to have a full statement of the actual hours of work, so that an exact comparison could be made of the true risk exposure as measured by time. Moreover, it is not to be questioned that as a general principle of human mortality and the nature of physical and mental fatigue that the shorter the hours of work in laborious employments the less will be the true accident liability, fatal or otherwise.

Possibly more serious are the actual errors which underlie the compilation of the average number of men employed. It is impossible to state by what method some of these so-called official averages are arrived at. In some cases it is quite possible that the number of employees on a given date has been taken as the average for the year; in others it would seem that the different names on the pay roll have been assumed to represent the "average" number employed, self-evident as this error obviously is. The correct "average," of course, is to add the number of persons employed each day and divide by the number of days the mines have actually been in operation, and hardly any other method would seem satisfactory as a substitute, although the addition of the number employed at the beginning or end of each month, divided by the number of months for which the returns are made, will give an average sufficiently accurate for all ordinary statistical purposes. In this case, also, the fact must not be overlooked that the number of fatal accidents in coal mining is rarely as much as 5 per 1,000 of men employed per annum, so that an error in the average number employed is of much less statistical significance than an error of even a few deaths in the number officially reported as having been killed in mining during the year. To illustrate, if the average number of men employed in 1908 had been returned as 650,000 instead of 690,000, a difference of 40,000 in number and of 5.8 in per cent, the rate per 1,000 would only have been changed from 3.60 to 3.77. Errors of this kind have a tendency to balance themselves in the course of years, but a willful omission of deaths or deliberate overstatements of the number employed, it is needless to say, can not be too seriously condemned.

Occasionally a labor trouble of state or nation wide magnitude seriously disturbs the normal conditions of mine work, so much so as to impair materially general calculations of fatal accident frequency upon the basis of the average number exposed to risk one year. The effect of such strikes is sometimes less in the case of the actual days' labor lost than in the average number of days lost per man, as illustrated by the experience of 1902, when 200,452 men went out on strike, losing 16,872,217 days' labor, or an average of 83 days per man, against 372,343 men who went on strike in 1906 with a loss

of 19,201,348 days of labor, or an average of 51.5 days per man.^(a) In 1907 the loss was 14 days and in 1908 it was 38 days per man on strike in bituminous mines, but, of course, to determine the true effect of labor disturbance on the whole mining population would require different methods of statistical calculation than are in general use in the United States or Canada. For the present purpose it has, therefore, not been feasible to take the effect of strikes upon the risk exposure into consideration in the calculation of the fatality rates which are to follow.

There exists, no doubt, a fairly well-defined relation between the average coal production per man per day and the relative degree of risk to fatal accident occurrence. The probability of some such relation has been insisted upon by foreign writers on fatal accidents in American mines, and not without some conclusive evidence that the pressure and driving force back of the American miner is, in part, responsible for at least a fair proportion of the fatal accidents in our mines. The statistics of the United States Geological Survey show that the average production per man in 1908 varied from 340.8 tons per annum for Oklahoma (or 1.98 tons per day) to 793.9 for Wyoming (or 3.66 tons per day).^(b) That there is not, however, an exact relation between the average annual production and the average daily production is made clear by the returns for some of the States, as, for illustration, for West Virginia, which has the highest average daily tonnage (and, it may be said here, also the highest average fatal accident rate in 1908), but only the second highest rate of annual production per man employed (736.8 tons). Decided variations are met with in the considerable fluctuations for individual years and in both the anthracite and bituminous coal fields. There has been in the anthracite field a gradual rise in the average production of coal per man employed of from 1.85 tons in 1890 to 2.39 tons in 1908, but in some years the production has been still higher, as, for illustration, in 1899, when it attained to 2.50 tons. In the bituminous fields the average production per man has increased from 2.56 tons in 1890 to 3.34 in 1908, having attained a maximum point of 3.36 in 1906.^(c) In a measure, of course, this increased production is the result of the increasing use of coal-cutting machinery and of other labor-saving methods. The relation of work pressure to accident occurrence, particularly in falls of roof and slate, will be subsequently brought out in its proper place.

The method by which coal is mined varies widely in the different States and at different periods of time. No factor has been of

^a Mineral Resources of the United States, 1908, Pt. II, p. 47. U. S. Geological Survey, Washington, 1909.

^b *Idem*, p. 45.

^c *Idem*, p. 41.

greater significance in this respect than the introduction of coal-mining machinery. The percentage of bituminous coal mined by machinery is constantly increasing, and within five years there has been an increase from 28.80 per cent in 1904 to 37.52 per cent in 1908.^(a) In some of the States, however, the progress has been much more rapid, while in others, probably because of the opening of seams not suitable for machine mining, there has been a relative decrease in machine production. The largest relative degree of machine use is in Ohio, where 75.37 per cent of all the coal mined in the State in 1908 was mined by machines, against 57.31 per cent mined by this method in 1904. How far, if at all, there may be a direct relation between machine mining and accident occurrence it is impossible to state with accuracy at the present time. Out of 11,569 coal-mining machines in use in 1908 it is reported by the United States Geological Survey that 6,380 were pick machines, 4,992 chain-breast machines, and 197 were long-wall machines.^(b) The vast economic importance of coal-cutting machines is indicated by the fact that against 545 machines in use in 1891, cutting or "producing" 6,211,732 tons of coal, the number in use in 1908 was 11,569, cutting or producing 123,183,334 tons, or 37.52 per cent of the total bituminous product for that year.^(c)

Mining methods vary, necessarily, according to the nature and character of the coal beds, the depth of mines, and more or less according to local customs and usages. There are no statistics for the United States which give all the necessary information for a full understanding of the conditions under which coal mining is carried on at the present time, but the data for the State of Illinois are suggestive of the method in the statistical presentation of these facts which should be followed in its essentials by the different coal-producing States. Through the cooperation of the state geological survey and the state mine inspectors (there is no chief inspector of mines in Illinois) the geologic seams of coal worked in each mine have been carefully determined and tabulated, so that it is possible—with some difficulty, of course, but it can be done—to coordinate the accident risk to the different coal-bearing strata of the State.^(d) Thus, for illustration, the most important coal-bearing strata is geologic seam No. 6, which is mined in 353 out of 922 mines in the State and in 29 counties, producing 29,759,180 tons out of a total production of 49,272,452 tons. The next most important coal-bearing strata is seam

^a Mineral Resources of the United States, 1908, Pt. II, p. 50. U. S. Geological Survey, Washington, 1909.

^b *Idem*, p. 48.

^c *Idem*, p. 51.

^d Twenty-seventh Annual Coal Report of the Illinois Bureau of Labor Statistics, 1908, p. 145.

No. 5, which is mined in 255 mines in 16 counties, producing 11,473,392 tons. The third most important seam is No. 2, which is mined in 167 mines in 22 counties, producing 5,654,924 tons, so that these three seams at the present time constitute practically the entire coal-producing sources of the State. Changes in coal-producing seams, increasing depth of mines, and alterations in the physical character of the seams can be traced with admirable completeness by this method of statistical presentation from year to year.

The manner of working the coal seams of the State is also presented in complete form in the coal statistics of Illinois. In 1908, out of 922 producing mines, 862, or 93.5 per cent, were worked on the pillar-and-room plan, 51 on the long-wall plan, and 9 by stripping. Of the 51 mines worked on the long-wall plan, which, it is hardly necessary to say, presents essentially different working conditions and mining hazards than the pillar-and-room method, 43 were located in coal seam No. 2. To this interesting information it is possible to add a complete statement of the character of the openings, which vary considerably in the bituminous-coal fields, and it is shown that out of 922 producing mines 620 were entered by shafts, 105 by slopes, and 197 by drifts. All of this information is available for each individual mine, so that a thorough study of the relation of casualties to the physical and geological facts of the industry is possible, but no such extensive analysis has been feasible in the present investigation, which aims rather to present the essential facts of fatal coal-mining accidents for the coal-mining area of the United States as a whole and in certain essential details for particular mining States.

The method of coal mining and the incidence of risk in mining operations is, as has previously been pointed out, conditioned by the nature and character of the coal areas, which are briefly described by Mr. Marius R. Campbell in his report to the National Commission on the Conservation of Natural Resources, and as quoted in part in the report of the United States Geological Survey on the production of coal for 1908, as follows:^(a)

(1) The eastern province, which includes all of the bituminous areas of the Appalachian region; the Atlantic coast region, which includes the Triassic fields near Richmond and the Deep and Dan rivers fields of North Carolina, and also the anthracite region of Pennsylvania. (2) The Gulf province, which includes the lignite fields of Alabama, Mississippi, Louisiana, Arkansas, and Texas. (3) The interior province, which includes all the bituminous areas of the Mississippi Valley region and the coal fields of Michigan. This province is subdivided into the eastern region, which embraces the coal fields of Illinois, Indiana, and western Kentucky; the west-

^a Mineral Resources of the United States, 1908, Pt. II, p. 27. U. S. Geological Survey, Washington, 1909.

ern region, which includes the fields of Iowa, Missouri, Nebraska, Kansas, Arkansas, and Oklahoma; and the southwestern region, which includes the coal fields of Texas. The Michigan fields are designated as the northern region of the interior province. (4) The northern, or Great Plains, province, which includes the lignite areas of North and South Dakota and the bituminous and subbituminous areas of northeastern Wyoming and northern and eastern Montana. (5) The Rocky Mountain province, which includes the coal fields of the portions of Montana and Wyoming which are in the mountainous districts of those States, and all the coal fields of Utah, Colorado, and New Mexico. (6) The Pacific coast province, which includes all of the coal fields in California, Oregon, and Washington.

The estimated area, together with the number of persons employed, the annual production, and the estimated available coal supply, are given in the following table, which has also been abstracted from the report referred to:

AREA OF COAL FIELDS, ESTIMATED AVAILABLE SUPPLY OF COAL, NUMBER OF EMPLOYEES, AND PRODUCTION IN 1908.

[Compiled from Mineral Resources of the United States, 1908, Part II.]

Coal field.	Area (square miles).	Estimated available supply (short tons).	Production (short tons).	Average number of employes.
ANTHRACITE.				
Pennsylvania.....	480	16,970,000,000	83,268,754	174,174
Colorado and New Mexico.....	29	(a)	41,658	(c)
Total.....	509	b 16,970,000,000	83,310,412	b 174,174
BITUMINOUS.				
Eastern province—Atlantic coast region:				
Virginia.....	150	(c)	(c)	(c)
North Carolina.....	60	199,285,000	.....	.....
Total.....	210	d 199,285,000	(c)	(c)
Eastern province—Appalachian region:				
Pennsylvania.....	14,200	109,629,000,000	117,179,527	165,961
Ohio.....	12,660	85,249,000,000	26,270,639	47,407
Maryland.....	455	7,816,000,000	4,377,093	6,079
Virginia.....	1,750	e 22,408,000,000	e 4,259,042	e 6,208
West Virginia.....	17,000	149,285,000,000	41,897,843	56,861
Eastern Kentucky.....	10,270	67,703,000,000	f 4,446,433	g 16,996
Tennessee.....	4,400	25,530,000,000	6,199,171	11,812
Georgia.....	167	920,500,000	264,822	670
Alabama.....	8,430	68,639,000,000	11,604,593	19,197
Total.....	69,332	537,179,500,000	216,499,163	331,191
Interior province—Northern region: Michigan.....	11,000	11,976,500,000	1,835,019	4,247
Interior province—Eastern region:				
Indiana.....	6,500	43,911,000,000	12,314,890	18,380
Western Kentucky.....	6,400	36,126,000,000	h 5,800,120	(i)
Illinois.....	35,600	238,960,000,000	47,659,690	63,035
Total.....	48,500	318,997,000,000	65,774,700	86,415

a Included in bituminous.

b Not including Colorado and New Mexico.

c Included in Appalachian region.

d Not including estimated supply in Virginia included in Appalachian region.

e Including Atlantic coast region of Virginia.

f Reported as 4,171,131 by state inspector of mines.

g Including those in western Kentucky; reported by state inspector of mines as 8,826.

h Reported as 5,634,596 by state inspector of mines.

i Included with those in eastern Kentucky.

AREA OF COAL FIELDS, ESTIMATED AVAILABLE SUPPLY OF COAL, NUMBER OF EMPLOYEES, AND PRODUCTION IN 1908—Concluded.

Coal field.	Area (square miles).	Estimated available supply (short tons).	Production (short tons).	Average number of employees.
BITUMINOUS—concluded.				
Interior province—Western and Southwestern regions:				
Iowa.....	12,560	28,937,000,000	7,161,310	16,021
Missouri.....	16,700	39,849,000,000	3,317,315	8,988
Kansas.....	3,100	6,876,000,000	6,245,508	13,916
Arkansas.....	1,684	1,848,000,000	2,078,357	5,337
Oklahoma.....	10,000	79,213,800,000	2,948,116	8,651
Texas.....	10,200	30,975,000,000	1,895,377	4,400
Total.....	54,244	187,698,800,000	23,645,983	57,313
Rocky Mountain and northern, or Great Plains, provinces:				
Arizona.....	30	60,000,000	.....	.....
North Dakota.....	31,240	499,995,350,000	320,742	631
Montana.....	34,067	303,020,000,000	1,920,190	3,146
South Dakota.....	2,000	10,000,000,000	.....	.....
Wyoming.....	20,568	423,960,000,000	5,489,902	6,915
Utah.....	13,130	196,427,000,000	1,846,792	2,664
Colorado.....	10,105	a 371,537,000,000	9,621,153	a 14,523
New Mexico.....	13,331	a 163,743,000,000	2,440,099	a 3,448
Idaho.....	200	599,951,000	5,429	24
Total.....	124,671	1,969,392,301,000	21,644,307	31,361
Pacific coast province and Alaska:				
Washington.....	1,100	19,931,000,000	3,024,943	5,484
Oregon.....	230	997,200,000	86,259	214
California and Alaska.....	500	992,425,000	21,862	49
Total.....	1,830	21,920,625,000	3,133,064	5,747
Total production, including colliery consumption.	b 310,296	3,064,334,011,000	415,842,698	690,438

^a Including anthracite.

^b Not including 192,510 square miles of which little is known, but which may contain workable coal.

THE FATAL-ACCIDENT RATE.

The present article gives, in as full detail as the data available in the official reports of the state mine inspectors and amplified by correspondence permit, the elements of fatal coal-mining casualties in North America during the 20-year period ending with 1908. In the aggregate the investigation deals with 9,422,902 persons employed in coal mining exposed to risk of death one year, or an annual average of 471,145 employees for the 20-year period. Among this number there occurred, as far as officially reported, 29,293 fatal accidents, or an average of 1,465 per annum, resulting in a fatality rate of 3.11 per 1,000. If the decade ending with 1906 is separately considered, it appears that the average fatality rate was 3.13 per 1,000, which compares with the corresponding rates for the principal coal-mining countries of the world, as follows:

COMPARISON OF FATAL-ACCIDENT RATES IN COAL-MINING COUNTRIES FOR THE PERIOD 1897 TO 1906.

Country.	Total number of employees at work one year.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
North America.....	5,179,343	16,273	3.13
Japan (1902-1906).....	438,259	1,355	3.09
Russia, Finland (1901-1903).....	330,147	805	2.44
Victoria.....	7,902	18	2.28
New South Wales.....	124,940	267	2.14
Prussia.....	4,389,174	9,327	2.13
France.....	1,629,177	2,944	1.81
New Zealand.....	27,268	37	1.36
Austria.....	1,186,510	1,599	1.35
United Kingdom.....	7,973,031	10,319	1.29
Queensland.....	11,714	14	1.20
Belgium.....	1,322,516	1,401	1.06
India (1898-1906).....	793,070	676	.86

According to this comparison, which, of course, is subject to the criticism of possible defects in the statistical information, the risk of fatal accident in the coal mines of North America is decidedly more serious than in any other important coal field of the world. Considering the constant growth of the mining industry on this continent, an increase measured by an enhanced output in the United States alone, from 253,741,192 tons in 1899 to 415,842,698 tons in 1908,^(a) or 64 per cent, the excess in the mining fatality rate is plainly a matter of most serious national concern.^(b)

As shown in the following table, the accident rate for the North American coal mines has gradually increased from an average of 2.66 per 1,000 during the first 5 years of the 20-year period to 3.58 per 1,000 during the last.

^a Mineral Resources of the United States, 1908, Pt. II, p. 25. U. S. Geological Survey, Washington, 1909.

^b For an extended discussion of the comparative fatality rate in American and foreign coal mines, see the Engineering and Mining Journal, December 19, 1908, which contains in detail the fatality rates for all of the principal coal-producing countries of the world. It is shown that the fatality rate in the five-year period ending with 1901, as compared with the five years ending with 1906, decreased in the coal mines of the United Kingdom from 1.81 to 1.28, in Prussia from 2.41 to 1.91, and in Belgium from 1.12 to 1.00 per 1,000 men employed. In contrast, the corresponding rates for the United States increased from 2.91 to 3.31.

SUMMARY OF THE FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA,
1889 TO 1908.

Year.	Average number of employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
1889.....	278,361	681	2.45
1890.....	300,044	852	2.84
1891.....	325,565	952	2.92
1892.....	342,406	880	2.57
1893.....	382,948	969	2.53
1894.....	392,364	956	2.44
1895.....	402,369	1,053	2.62
1896.....	409,320	1,123	2.74
1897.....	407,493	947	2.32
1898.....	405,177	1,049	2.59
1899.....	420,111	1,249	2.97
1900.....	461,859	1,501	3.25
1901.....	492,129	1,579	3.21
1902.....	528,686	1,837	3.47
1903.....	574,210	1,815	3.16
1904.....	606,496	2,018	3.33
1905.....	641,044	2,178	3.40
1906.....	656,486	2,093	3.19
1907.....	683,725	2,838	4.15
1908.....	712,209	2,723	3.82
1889-1908.....	9,422,902	29,293	3.11

The fluctuations in the rates from year to year are shown to have been considerable. The maximum was attained in 1907, when the rate reached 4.15 per 1,000, against a minimum of 2.32 in 1897. Rates above the average for the whole period prevailed during each of the last 9 years. During the first 11 years the rate never attained to 3 per 1,000 per annum; during the last 9 years it has never fallen below this point. There is no parallel for this anomaly in the coal-mining history of any other country in the world. In occasional years the rate, because of a particularly disastrous accident, has been excessive in other lands, but in none of the principal coal-producing countries of the world does the fatality rate tend persistently upward, and in not one does the rate persistently exceed 3 per 1,000 per annum. Whatever may be the cause of this condition in American coal mining, the fact can not be controverted that by every test of statistical analysis the fatality rate in the North American coal fields is decidedly above the corresponding average for the other principal coal-producing countries of the world.^(a)

The true elements of risk in coal mining in North America are not, however, fully disclosed by the returns for the coal field as a whole. When the facts are considered by particular coal areas, still more startling contrasts are brought to light. In view of the consid-

^a For an instructive comparison of the fatal-accident rates in the United States and Belgium during a period of years, indicating the upward tendency of the accident rate in the United States and the downward tendency of the rate in Belgium, see *Engineering and Mining Journal*, September 10, 1910.

erable employment of negro labor in southern coal-mining areas, which may possibly have a bearing upon the fatality rate, it has seemed advisable for the present purpose to subdivide the Appalachian coal fields into north and south. Nova Scotia also has been considered separately from the remainder of the eastern area, on account of possible material differences in the physical character of the coal seams, etc. To avoid too many subdivisions it has seemed unnecessary to consider the anthracite regions separately from the bituminous of Pennsylvania, but the facts are given in full detail in Table XXIV of the appendix.

In brief, the average fatality rates of the different coal areas of North America as arranged for the present purpose have been as follows:

FATAL-ACCIDENT RATE IN COAL MINES OF NORTH AMERICA, BY GEOGRAPHICAL SECTIONS FOR THE PERIOD 1889 TO 1908.

Geographical section.	Total number of employees at work one year.	Fatal accidents.	
		Number.	Per 1,000 employees.
Pacific coast (a).....	137,343	961	7.00
Western (b).....	228,734	1,451	6.40
Southern (c).....	1,037,553	4,563	4.40
North central (d).....	23,356	68	2.91
West central (e).....	667,223	1,662	2.49
East central (f).....	1,220,341	2,745	2.25
Northeastern (g).....	153,453	447	2.91
Eastern (h).....	5,956,399	17,396	2.92
Total.....	9,422,902	29,293	3.11

a Washington and British Columbia.

b Colorado, New Mexico, and Utah.

c Alabama, Eastern Kentucky, Tennessee, and West Virginia.

d Michigan.

e Oklahoma, Iowa, Kansas, and Missouri.

f Western Kentucky, Illinois, and Indiana.

g Nova Scotia.

h Maryland, Ohio, and Pennsylvania.

Against an average fatality rate of 3.11 per 1,000 for the entire coal field of North America, it is here shown that the rate varied between 2.25 as a minimum for the east central coal fields (western Kentucky, Illinois, and Indiana) and 7 per 1,000 for the far western coal area (Washington and British Columbia). The returns are not entirely complete for some of the smaller mining States for the earlier years, when no trustworthy records were kept, probably on account of very limited production. The next two tables will show the fatality rate in detail for each of the eight coal fields and for each of the 20 years ending with 1908 except for the States for which complete returns are not available. Additional details of the number employed and the number of deaths each year are given in full in Table XXIV of the appendix.

FATAL-ACCIDENT RATES IN THE COAL MINES OF NORTH AMERICA, BY GEOGRAPHICAL SECTIONS, 1889 TO 1908.

Year.	Fatal accident rates per 1,000 employees—								Total.
	East- ern section. (a)	North- eastern section. (b)	East central section. (c)	West central section. (d)	North central section. (e)	South- ern section. (f)	West- ern section. (g)	Pacific coast section. (h)	
1889.....	2.61	1.55	1.52	2.78	(f)	1.44	4.04	(f)	2.45
1890.....	2.69	25.17	1.63	1.57	(f)	2.35	2.27	(f)	2.84
1891.....	3.17	.52	1.77	2.25	(f)	3.52	4.40	4.85	2.92
1892.....	2.50	1.89	1.76	2.59	(f)	2.38	4.49	10.49	2.57
1893.....	2.48	.34	1.97	2.51	(f)	3.10	6.11	4.41	2.53
1894.....	2.37	2.41	1.82	2.43	(f)	2.46	2.91	8.56	2.44
1895.....	2.44	1.55	2.02	1.59	(f)	4.22	4.96	7.82	2.62
1896.....	2.74	1.33	2.22	2.13	(f)	2.69	8.82	3.13	2.74
1897.....	2.30	1.35	1.93	1.87	(f)	2.79	4.94	2.47	2.32
1898.....	2.53	1.56	2.10	2.33	(f)	3.52	3.40	2.53	2.59
1899.....	2.96	3.39	2.10	2.27	4.88	3.07	5.52	7.90	2.97
1900.....	2.59	1.87	2.25	2.70	6.11	3.57	23.45	6.05	3.25
1901.....	2.95	3.13	2.16	2.58	3.26	3.85	6.27	14.66	3.21
1902.....	2.59	2.36	1.98	4.11	4.24	6.00	7.45	20.71	3.47
1903.....	3.02	2.79	3.09	2.78	2.54	3.40	4.32	7.33	3.16
1904.....	3.42	1.63	2.52	2.21	2.58	3.26	7.56	7.48	3.33
1905.....	3.27	1.86	3.02	2.41	2.16	5.03	4.50	2.66	3.40
1906.....	2.99	2.31	2.29	2.72	2.83	4.92	6.39	3.62	3.19
1907.....	4.12	2.89	2.42	3.07	2.43	6.18	7.43	5.59	4.15
1908.....	3.33	3.02	2.47	2.34	1.94	8.49	4.97	3.76	3.82
1889-1908.....	2.92	2.91	2.25	2.49	2.91	4.40	6.40	7.09	3.11

a Maryland, Ohio, and Pennsylvania.

b Nova Scotia.

c Western Kentucky, Illinois, and Indiana.

d Oklahoma, Iowa, Kansas, and Missouri.

e Michigan.

f Alabama, Eastern Kentucky, Tennessee, and West Virginia.

g Colorado, New Mexico, and Utah.

h Washington and British Columbia.

i Data not available.

The foregoing table requires no extended comment. It brings out the startling fact that in some of the coal fields of North America the fatality rate due to mining casualties is almost as high as the general death rate from all causes among males of corresponding age at work under normal conditions of industry. The death rate of occupied males insured with workmen's benefit insurance institutions, as reported in the Twenty-third Annual Report of the Commissioner of Labor for 1908, was only 6.7 per 1,000.^(a) The death rate of workers insured with the Leipzig (Germany) Local Sick Fund, including all classes of labor of both sexes, was 8.2 per 1,000.^(b) The United States census data for 1900^(c) show that the average mortality rate for all occupied males aged 15 to 64 was only 10.6 per 1,000, while for miners and quarrymen the death rate was 8.05 per 1,000; but this latter rate is chiefly for the miners in the eastern coal fields and for a year when the fatality rate was 3.25 per 1,000 against 4.15 in 1907 and 3.82 in 1908. A fatality rate of from 6 to 7 per 1,000 is extremely high, so high, indeed, that it challenges public attention as one of the most extraordinary evidences of life waste in a particu-

^a Twenty-third Annual Report of the Commissioner of Labor, 1908, p. 424.

^b Krankheits- und Sterblichkeitsverhältnisse in der Ortskrankenkasse für Leipzig und Umgegend.

^c Report on Vital Statistics, Pt. I, Twelfth Census of the United States, 1900.

lar branch of industry. But it may be laid down as a fundamental principle of industrial hygiene that all fatality rates above 1.5 per 1,000 must be considered excessive, since under normal conditions of industry the fatal accident rate, including casualties of all kinds, rarely exceeds 1 per 1,000.^(a) Averages for a period of years are more conclusive for the purpose of determining the accident risk than rates for single years, but it is decidedly significant that in some years the rate in some of the coal fields of North America should have reached 23.45 and 25.17 per 1,000.

How far these variations in coal-mining fatality rates are the result of geological or other inherent factors and conditions can not be discussed here.^(b) No doubt some such relation exists, and particularly in the case of very gaseous or dusty mines, in which the coal dust itself is the cause of disastrous explosions, as, for illustration, in the State of West Virginia, but a discussion of these underlying causes falls more properly within the scope of applied geology, industrial chemistry, and mining engineering. Nor does it seem necessary for the present purpose to discuss at length the returns in detail for the different States, since the fluctuations from year to year would be required to be explained by a full discussion of individual accident occurrences of more than ordinary significance. Such a discussion would be a most interesting and valuable contribution to our knowledge, but to enlarge upon this class of facts would preclude more adequate consideration of the more determining elements of mining experience throughout the country as a whole. For an intelligent annual discussion of fatal accidents in American coal mines the most useful would be a full descriptive account of each death from accident reported, with a full explanation of all the circumstances, including maps and diagrams of the working place, which may have a bearing upon the underlying causes or conditions responsible for its occurrence. The material now available is especially defective on account of the diversity in the official reports and the indifference on the part of many mine inspectors to some of the most significant labor factors, such as mining experience, age, nativity, or race, etc.

^a Mortality Statistics, 1908, U. S. Census, p. 75.

^b The geologic formation of the various coal fields of the United States is fully discussed in a number of descriptive geologic folios published by the United States Geological Survey. Typical folios are for the Brownsville-Connellsville area of Pennsylvania (No. 94), the Raleigh area of West Virginia (No. 77), and the Atoka area of the Indian Territory [Oklahoma] (No. 79). Part II of the annual "Contributions to Economic Geology," issued by the same authority, contains a large amount of information useful to the student of mine accidents in their relation to the geology of particular coal fields.

In brief, however, the result of the present inquiry, with reference to several States, may be summarized as follows:

FATAL-ACCIDENT RATES IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, FOR THE PERIOD 1889 TO 1908.

State or Province.	Fatal-accident rate per 1,000 employees.	State or Province.	Fatal-accident rate per 1,000 employees.
Western Kentucky.....	1.60	Michigan.....	2.91
Missouri.....	1.72	Pennsylvania (anthracite).....	3.30
Maryland.....	1.77	Tennessee.....	4.38
Eastern Kentucky.....	1.89	Alabama.....	4.55
Ohio.....	2.14	West Virginia.....	4.64
Iowa.....	2.15	Oklahoma.....	5.07
Kansas.....	2.31	Colorado.....	5.51
Indiana.....	2.32	Washington.....	6.76
Illinois.....	2.33	British Columbia.....	7.23
Pennsylvania (bituminous).....	2.71	New Mexico.....	7.23
Nova Scotia.....	2.91	Utah.....	11.67

This table is extremely suggestive. The fluctuations in rates of accident frequency range from an average of 1.60 for western Kentucky to 11.67 for Utah. A careful examination of Table XXIV of the appendix brings out the fact that some of the extremely high rates are primarily due to accidents of exceptional seriousness, but, on the whole, it may be said that the States with low averages have generally had a favorable experience from year to year, while the States with high averages have frequently had a disastrous experience. The States may be grouped into two divisions—first, all those having an average rate of less than 3 per 1,000 per annum, and, second, those which experienced a rate of 3 or more per annum, and it will be found on careful examination of the detailed tables that only occasionally have the rates in the former exceeded 3 per 1,000 in any one year, while the rates in the 10 States with an average above 3 per 1,000 have rarely gone below this rate, which, by every standard of mining experience throughout the world, must be considered extremely high. Or, to be specific, out of 219 individual years contained in the collective mine experience of States with an average of less than 3 per 1,000, the rate for individual years exceeded this average in 24 years, and the excess occurred chiefly in those States which include the more dangerous mining areas—that is, Pennsylvania (bituminous), Nova Scotia, and Michigan. In the case of the States with an average rate of 3 or more per 1,000 it is shown that there were only 46 individual instances when the rate was less than 3 per 1,000, out of a total of 174 years of coal-mining activity.

THE CAUSES OF FATAL ACCIDENTS.

The causes of fatal accidents in coal mining are almost as varied as the circumstances which give rise to them. Many fatal accidents arise, without doubt, from negligence, indifference, or extraneous accidental circumstances, not inherent in the nature of coal mining as such. The large majority of accidents, however, are properly to be called such, in the general acceptance of the term, and while the underlying cause may (as is often the case) be the so-called carelessness of the miners or other mine employees, it is a great injustice to bring a charge of willful indifference to life and safety of limb against those working under the most trying conditions which can possibly surround the industrial activity of mankind. Crude as the classification of causes, or so-called causes, of coal mining accidents is, the facts in the mass indicate, at least with approximate accuracy, the probable underlying conditions responsible for the occurrence of calamities of this kind. Every death of a mine worker represents a most serious economic and social loss to the community, measured financially by the dependence of survivors, widows, orphans, and other relatives, on the one hand, and the destruction of slowly acquired labor efficiency on the other. In full recognition of the seriousness of the whole labor problem in coal mining, as implied by the risk of the occupation, it is difficult to understand how lightly some mine inspectors regard their duty and how superficially in some States the whole subject is considered from the standpoint of public interest and public policy.

No full account is rendered of the fatal accidents and their occurrence in many of the States. No full inquiry is made into all the surroundings and antecedent causation of many of the ordinary everyday casualties, which end in death, or serious injury often worse than death. It has not been possible, after a most painstaking effort extending over many years, to secure a full account of all the fatal accidents which have occurred in the different mining States. Some mining States, like California, have not even a mining bureau charged with the duty of collecting accident statistics, and in others the publication of the required statistics is often delayed so long that when finally made available the best opportunity for their practical use has passed. The analysis of fatal accidents, according to causes, is, therefore, limited to a 10-year period for all the States from which the information could be obtained, but for some the data are not for an uninterrupted 10-year period, since the data could not be secured either by correspondence or otherwise. For the present purpose this defect is not a serious obstacle to the attainment of a reasonable degree of statistical accuracy and completeness, and in the aggregate the analysis by causes includes 18,346 deaths

out of the 29,293 deaths included in the 20-year table for the different coal-producing States, Territories, and Provinces of North America.

A discussion of the causes of coal-mining fatalities proceeds, as a rule, upon the basis of the percentage distribution of the deaths due to casualties of different kinds. Obviously, such a method is open to serious criticism, since the presence, or absence, of special causes may result in an abnormal distribution of casualties from specified causes without inherent evidence that such casualties from particular causes are really of rare or common occurrence. However, this method has the advantage of simplicity, and when used in connection with the known fatality rate from all causes it is often sufficiently accurate for the end in view. For, it may be held that it is, after all, of the greatest practical importance to determine the most common cause of accident occurrence, and this fact, of course, is more clearly brought out by the percentage distribution of casualties by causes than by the ratio from specified causes to coal production, or upon the basis of the number of men exposed to risk of death one year. Both methods have their value, though for different purposes, in inquiries of this kind and they will both be made use of in the present effort to determine the approximate fatal accident risk in coal mining in North America.

The 18,346 fatal accidents for which the information is available were distributed, by principal causes, as follows:

PER CENT OF FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA DUE TO EACH CAUSE DURING A 10-YEAR PERIOD.

Cause.	Fatal accidents.	
	Number.	Per cent of total.
Fall of coal.....	2,722	14.8
Fall of roof, slate, etc.....	5,823	31.8
Falling into shafts.....	369	2.0
Falling into slopes, manways, etc.....	125	.7
Mine cars.....	2,294	12.0
Outside cars.....	470	2.6
Motors.....	39	.2
Explosions:		
Dust or gas.....	2,571	14.0
Powder or dynamite.....	968	5.3
Blast.....	793	4.3
Other, not specified.....	292	1.6
Mining machinery.....	332	1.8
Mules.....	73	.4
Asphyxiation.....	271	1.5
Electrocution.....	193	1.0
Miscellaneous.....	1,105	6.0
Total.....	18,346	100.0

It must be admitted that an analysis of this kind is not free from error in matters of detail. The method of classification by causes differs in the various coal-mining States and often in the several

mining districts of a single State. The descriptive accounts of accidents, when reexamined and retabulated, often yield results which differ more or less from the tabular presentations in the annual reports of the mine inspectors of the several States. The terms used in mining are not of precisely the same meaning in different coal fields, and often, no doubt, the reports are made by mine officials who fill out the required forms in a perfunctory manner. This criticism, however, applies more to the minor causes than to the leading causes, which are of such a nature that the liability to serious error is small.

FALLS OF COAL OR ROOF.

In the present analysis out of 18,346 fatal accidents, 2,722 were due to fall of coal and 5,828 were due to fall of roof, rock, or slate, etc. For general purposes it is rather immaterial whether the accident is due to one or the other of these causes, or to both combined; but when the facts are stated in their relation to the probable degree of safety in working different kinds of coal fields, seams of varying degrees of thickness, etc., accuracy in the descriptive account of the fatal accidents is of considerable practical importance. Combining the two classes of casualties, as being more or less equivalent terms, it appears that of all the fatalities 46.6 per cent were the result of conditions inherent in all coal-mining operations. This average is for the coal fields of North America as a whole, and wide divergencies from the average will presently be pointed out in the case of the several coal fields and the separate States. The average is the result of accumulated experience both in time and area, and while for some of the States the returns are for shorter periods than a 10-year period, the available facts for each State are fully indicated in Table XXIII of the appendix.

Accidents due to fall of coal or roof are, therefore, by far the most important single and well-defined group of fatal accidents in coal mining, and this is true not only for the United States, but for most of the other coal fields throughout the world. Exceptional disasters, due to gas or dust explosion, causing a great loss of life in a single year, must necessarily disturb the percentage distribution of the several causes responsible for coal-mining fatalities, but normally the percentage of deaths from fall of coal or roof will not vary much from year to year. The occurrence of a very disastrous accident in West Virginia in 1907, for illustration, resulted in a marked decrease in the percentage of deaths from falls of coal, roof, etc., although the number and proportion of deaths from this cause remained about the same as in the previous year. According to the reports of the United

States Geological Survey for 1907 and 1908, fatal accidents due to falls of coal or roof were distributed as follows:(^a)

FATAL ACCIDENTS IN COAL MINING IN THE UNITED STATES DUE TO FALLS OF COAL OR ROOF, 1907 AND 1908.

Year.	All fatalities.	Falls of coal or roof.	Percent.	Rate per 1,000 employees.
1907.....	3,125	1,122	35.9	1.65
1908.....	2,450	1,060	44.1	1.56

This table illustrates and emphasizes the very serious statistical error which may invalidate conclusions based upon percentages alone. The table shows an increase in the proportion of deaths from falls of coal or roof to have taken place in 1908 compared with 1907; but, in fact, in proportion to the average number of men exposed to risk of death the fatality rate for deaths from fall of coal or roof decreased from 1.65 in 1907 to 1.56 in 1908.

As has previously been said, both methods of statistical analysis have their use, provided they are employed with due caution and a full knowledge of all the facts which have a bearing upon the question under consideration. The liability to error is diminished in proportion as the subject is considered from the broadest possible standpoint and rather as an approximation to the truth than as a statement entitled to the claim of scientific accuracy. No such claim can rightfully be made for any of the statistical information relating to coal mining in North America at the present day, but, on the whole, it may safely be assumed that the available data for this country conform favorably in accuracy and detail to the corresponding information for the other coal-producing countries of the world. The table of principal causes may therefore be relied upon as a trustworthy presentation of the true facts for the coal fields of North America, as far as these facts are known at the present time, and the conclusion is fully warranted that the most important and determining cause in coal-mining fatalities is fall of coal or of roof, rock, and slate, as the case may be, singly or in combination with each other. This cause, or group of causes, then, is by far the most important element in coal mining as regards the safety of mine laborers. The deaths do not occur in the mass, but they take place from day to day, singly, or, at most, a few at a time,^(b) but in the aggregate they mount up to from one-third to one-half of all the coal-mining fatalities during the year. Occasionally a fearful calamity will cause a

^a Mineral Resources of the United States, 1908, Pt. II, p. 56. U. S. Geological Survey, Washington, 1909.

^b This, of course, does not apply to "cave-in" accidents, which may cause a large loss of life at one time. See Report of the Department of Mines of Pennsylvania, 1896, p. 79.

great loss of life by a single accident, but when the casualties are considered in the mass and with a due regard to length of time in mine experience it will invariably be found that no other single cause or combination of causes is responsible for as great a loss of life in coal mining as falls of coal and roof or slate and rock, as the case may be.

MINE CARS.

In the preceding tabular summary of causes (p. 454) one of the most important causes of coal-mine fatalities is mine cars. In the aggregate of casualties at present under consideration there were 2,204 deaths from this cause, or 12 per cent of the total. The proportion must naturally vary according to the motive power employed, and the degrees of variation in this respect will be fully brought out in subsequent tables in which the facts are given in detail for the different coal areas and the separate coal-mining States. Combining the deaths from mine cars and the deaths from falls of coal or roof, it is shown that out of the total number of fatal accidents from all causes, given as 18,346, as many as 10,754, or 58.6 per cent, were due to these two particular groups of causes. In some of the coal fields and in some of the States this proportion will be found to be much greater, so that it may be stated as a broad conclusion, sustained by a whole decade of American coal-mining experience, that primarily and chiefly the causes responsible for fatal accidents in coal mining are falls of coal, rock, and roof and fatal injuries caused by mine cars.

EXPLOSIONS.

Explosions due to gas or dust, or both, caused 2,571 deaths, or 14 per cent of the whole. There is the possibility of error in a return of this kind in that the closely related mortality from explosions of powder, dynamite, and blasts, or explosions "other" and "not specified" may include deaths which should properly be charged to explosions due to gas or dust or both. When these are considered together, it appears that out of the total of 18,346, in addition to the 2,571 deaths resulting from gas and dust explosion, there were 968 deaths from explosions of powder and dynamite, 793 from explosions of blasts (which, of course, is practically the same thing), and 292 from other explosions not specified, a total of 4,624, or 25.2 per cent. Comparing this total with the aggregate of deaths due to falls of coal, roof, and rock, it appears that the result is as follows:

COMPARATIVE MORTALITY FROM PRINCIPAL CAUSES IN COAL MINING IN NORTH AMERICA.

Cause.	Deaths.	Per cent.
Fall of coal, roof, and rock	8,550	46.6
Gas and dust explosions and the handling or use of explosives.....	4,624	25.2
All other causes	5,172	28.2
Total	18,346	100.0

When, therefore, all proper allowance is made for a possible erroneous classification, it appears that fatalities due to falls of coal, roof, and rock far outnumber the corresponding fatalities caused by explosions due to gas or dust, or the use, handling, transportation, and storage of explosives of all kinds.

MISCELLANEOUS MINE ACCIDENTS.

The foregoing three principal causes, or groups of causes, account in the aggregate mortality experience for 83.8 per cent of the fatal accidents from all causes. Among the most important of the minor causes come, first, the accidents due to falling into shafts, slopes, manways, etc. Accidents of this kind are due to a large variety of causes, the exact nature of which can be fully understood only after a careful study of a large number of individual cases. Badly guarded shafts and openings are probably responsible for the majority, but many of the deaths are due to falling out of the hoisting cages, or to falls while climbing in or out of the shaft when the hoisting apparatus is not working or while climbing in and out of mine shafts not provided with hoisting apparatus, etc. Falls into shafts separately account for 2 per cent of the total number of accidents, and falls into slopes, manways, etc., account for 0.7 per cent additional.

Outside car accidents caused 470 deaths, or 2.6 per cent of the total. This is the principal cause of accidents outside of mines, or overground, as separate and distinct from accidents underground. Many, if not most, of the other overground accidents are included under "miscellaneous" causes, which comprehend a total mortality of 1,105, or 6 per cent of the total. For some of the States returns in more detail are available and these will be considered later. Manifestly specific details are of particular importance in an inquiry of this kind, for large aggregates tend rather to obscure the true underlying conditions responsible for the occurrence of fatal accidents in coal-mining operations. However, when the statistical analysis is carried too far the actual numbers often become so small as not to warrant safe conclusions. "Mining machinery" is a rather indefinite term, but largely inclusive of coal-cutting machines causing fatal accidents due to mechanical causes. There is otherwise no considerable amount of working machinery, generally so called, underground. Boiler explosions occur occasionally, but in the present analysis deaths resulting from these are not separately accounted for. Perhaps the deaths from "motors" should have been included in the total of deaths from machinery, since the motors may be such as operate the coal punchers, or coal-cutting machines, or electric motors employed in underground haulage. Deaths from this group of causes numbered 30, or 0.2 per cent of the total. While electric haulage is gradually replacing mules used for haulage pur-

poses underground, a large number of mules are still employed, but the deaths caused by the kicks of these animals, or otherwise in connection with the handling, driving, etc., of the same, number only 73, or 0.4 per cent. The two remaining specific causes are asphyxiation and electrocution. The former caused 271 deaths, or 1.5 per cent of the total, and the latter 193, or 1 per cent. Both of these are important causes, which for their full understanding require to be considered in detail, as disclosed by a careful consideration of a sufficient number of individual cases.

PRINCIPAL CAUSES OF FATAL ACCIDENTS BY COAL FIELDS.

The relative proportion of principal causes naturally varies widely, according to the geological character of the coal fields, the method of mining, the presence of dust or dangerous gases, the use of coal-cutting machinery, compressed air and electricity, etc. In the table which follows a comparison is made of the distribution of principal causes in the different coal fields, amplified in the appendix by tables for the several coal-mining States. It would carry the present analysis too far to discuss the variations in causes, as determined by the percentage basis in detail, since they will be further considered on the basis of the exposed to risk of death one year for the several States. (See Table XXIII of the appendix.)

PER CENT OF FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA DUE TO EACH CAUSE DURING A TEN-YEAR PERIOD, BY GEOGRAPHICAL SECTIONS.

Cause.	Per cent of fatal accidents due to each specified cause in—							
	East- ern section.	North- eastern section.	East central section.	West central section.	South- ern section.	West- ern section.	Pacific coast section.	North Amer- ica.
Falling of coal.....	10.6	21.2	36.9	27.6	12.0	11.3	9.4	14.8
Falling of roof, slate, etc.....	38.8	20.8	8.9	16.9	29.7	37.7	18.3	31.8
Falling into shafts.....	2.0	2.4	3.9	3.2	1.0	.9	.7	2.0
Falling into slopes, manways, etc.....	1.0	2.9	.....	.....	.....	.4	1.0	.7
Mine cars.....	12.9	20.4	12.3	7.9	10.7	11.0	10.5	12.0
Outside cars.....	3.8	2.1	1.7	.6	.7	.3	.3	2.6
Motors.....	.2	.4	.3	.....	.....	.2	.1	.2
Explosions:								
Dust or gas.....	11.2	11.0	4.9	7.3	33.2	8.9	15.5	14.0
Dynamite or powder.....	2.6	2.4	11.1	11.1	5.3	20.5	1.5	5.3
Blast.....	4.3	2.1	9.0	11.1	.8	3.3	1.7	4.3
Other, not specified.....	.2	.....	.2	4.2	.2	.3	28.4	1.6
Mining machinery.....	2.4	6.1	1.2	.7	1.0	.5	.6	1.8
Mules.....	.5	.....	.3	.3	.3	.2	.....	.4
Asphyxiation.....	1.9	.....	1.0	2.2	1	1.9	.....	1.5
Electrocution.....	1.2	.....	.5	.6	1.4	.9	.....	1.0
Miscellaneous.....	6.4	3.2	7.8	6.3	3.6	1.7	10.5	6.0
SUMMARY.								
Falling of coal, roof, etc.....	49.4	42.0	45.8	44.5	41.7	49.0	27.7	46.6
Falling into openings.....	3.0	5.3	3.9	3.2	1.0	1.3	1.7	2.7
Mine cars, railroad, and other trans- portation agencies.....	16.9	22.9	14.3	8.5	11.4	11.5	10.9	14.8
Explosions.....	18.3	15.5	25.2	33.7	39.5	33.0	47.1	25.2
All causes.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The table is self-explanatory and requires no extended analysis. It is shown, for illustration, that in the eastern section (Maryland, Ohio, and Pennsylvania) falls of coal caused 10.6 per cent and falls of roof, rock, slate, etc., 38.8 per cent, a total of 49.4 per cent, against 21.2 per cent of deaths from fall of coal and 20.8 per cent of deaths from fall of roof, slate, etc., in the northeastern section (Nova Scotia). The highest percentage proportion of deaths caused by fall of coal occurred in the east central section, or 36.9 per cent, while the lowest occurred in the Pacific coast section, or 9.4 per cent. The highest percentage of deaths caused by falls of roof, slate, etc., occurred in the eastern section (Maryland, Ohio, and Pennsylvania), or 38.8 per cent, while the lowest occurred in the east central section, or 8.9 per cent. Unquestionably, some of these differences are the result of variations in the method of reporting the causes, but the differences are too pronounced to be solely due to this possible source of error. When combined the results, in order of relative importance, are as follows:

PER CENT OF DEATHS FROM FALLS OF COAL AND OF ROOF, SLATE, ROCK, ETC., IN COAL MINES OF NORTH AMERICA, BY GEOGRAPHICAL SECTIONS.

Section.	Per cent of deaths due to—		Total.
	Falls of coal.	Falls of roof, etc.	
Eastern.....	10.6	38.8	49.4
Western.....	11.3	37.7	49.0
East central.....	36.9	8.9	45.8
West central.....	27.6	16.9	44.5
Northeastern.....	21.2	20.8	42.0
Southern.....	12.0	29.7	41.7
Pacific coast.....	9.4	18.3	27.7
Total.....	14.8	31.8	46.6

There is evidently no very definite or even approximately well-defined relation between the degree of frequency of occurrence of these two closely allied and often identical causes. The most marked opposite conditions are shown to have prevailed in two coal fields not greatly different in geological characteristics or general mining methods; that is, the eastern (Maryland, Ohio, and Pennsylvania) and the east central section (Illinois and Indiana). In the former, fall of coal caused 10.6 per cent, against 36.9 per cent in the latter, so that the combined totals of 49.4 and 45.8 per cent do not vary materially. It may therefore be assumed as a reasonable probability that the two causes are often inclusive of each other, and that for statistical purposes they should be considered as a group, more or less similar in the underlying causes, conditions, and methods of mining responsible for their occurrence.

The summary table (p. 459) brings out the local significance of other causes, which in some cases even exceed in importance the fatality rate from fall of coal, roof, etc. Explosions due to gas or dust or the use, storage, etc., of explosives caused the largest proportionate mortality on the Pacific coast section, or 47.1 per cent. Arranged in the order of importance, the fatality percentage due to this group of causes was 39.5 per cent in the southern coal fields, 33.7 per cent in the west central section, 33 per cent in the western section, 25.2 per cent in the east central section, 18.3 per cent in the eastern section, and only 15.5 per cent in the northeastern section. The extremes in the casual occurrence of fatalities due to explosions, as would naturally be expected, were therefore of a wider range, or from 47.1 per cent to 15.5 per cent, against a range of from 49.4 per cent to 27.7 per cent for fatalities caused by falling of coal, roof, etc.

“Falling into openings” considered as a group caused 2.7 per cent of all the fatal accidents in the whole coal area, but the proportion varied between only 1 per cent in the southern section to 5.3 per cent in the northeastern. The differences are chiefly due to the fact that there are few deep mines or vertical mine openings in the southern coal fields, where most of the coal is mined by horizontal slopes, tunnels, etc., while in the central coal fields of Pennsylvania, for illustration, practically all the mining is by shaft. The liability to death on account of falling into openings is therefore largely governed by the methods of mining, which vary widely, according to the nature of the coal beds of the several States.

Fatal accidents caused by mine cars, railroad, and other transportation or hauling agencies varied from an average of 14.8 per cent for the North American coal fields as a whole to 22.9 per cent for the northeastern coal fields and 8.5 per cent for the west central section. These proportions are also governed largely by local conditions, mining methods, etc., which require to be determined by special inquiry and a thorough analysis of a large number of individual cases. The summary table gives the available information in detail, but, as previously explained, the facts must be considered with great caution and always with a due regard to the geological characteristics of the different coal fields and local variations in methods of mining, labor supply, use of coal-cutting machinery, electricity, etc.

A further consideration of the causes of fatal accidents in coal mining is made possible, at least for some of the States for which the facts are made public in more detail. As far as practicable, in the tables for the several States, all the essential facts contained in the annual reports of the state mine inspectors have been considered, which explains why for some States much more detailed returns are available than for others. The practical value of this analysis will

be better understood when it is stated that heretofore the United States Geological Survey has given the details of causes of fatal accidents in only 3 specific groups, while in some of the tables in the appendix to this study the facts are given in detail in 21 groups. The practical value of the tabular analysis of coal-mining accidents, provided the facts by causes are sufficiently numerous, is, of course, in exact proportion to the detailed grouping of individual but well-defined specific causes responsible for coal-mining casualties. Much would be gained by uniformity in the method of tabulation by causes, but efforts in this direction should insist rather upon a comprehensive tabular analysis than upon condensation.^(a)

The importance of details is best illustrated by specific causes of modern significance, such as deaths due to mining machinery, electricity, boiler explosions, etc. (For further details of the causes of accidents by States, see Table XXIII of the appendix.)

THE FATAL-ACCIDENT RATE DUE TO PRINCIPAL CAUSES.

The rate of fatal accidents by principal causes determines with scientific accuracy the degree of risk exposure to particular hazard in mining experience. The following table is identical with the table on page 454, previously discussed, except that for each cause the rate per 10,000 exposed to risk has been calculated, instead of the percentage distribution of causes, as in the former table. Since the number of some of the causes is small, it has seemed best to use 10,000 employees exposed to risk one year, instead of the usual basis of 1,000. The table is based upon a risk exposure of 5,459,436 mine workers for one year and 18,346 fatal accidents occurring in the coal fields of North America during the decade ending with 1908, or a part thereof, since the returns for some of the States are not complete. The rates for individual coal-mining States and the details for the different coal areas, by number of casualties and the rate per 10,000, will be found in Table XXIII of the appendix.

^a For suggestions for improving coal-mining accident statistics, see *Engineering and Mining Journal*, June 2, 1900, and subsequent issues. Among the more important works on the causes of coal mining accidents are *Mining Accidents and their Prevention*, by Sir Frederick Augustus Abel, New York, 1839; *Explosions in Coal Mines*, by W. N. and J. B. Atkinson, London, 1886; *Essays on the Prevention of Explosions and Accidents in Coal Mines*, by Creswick, Galloway, and Hopton, London, 1874; *Elements of Mining and Quarrying*, by C. Le Neve Foster, London, 1903; and *Practical Coal Mining*, by T. H. Cockin, New York, 1909.

FATAL-ACCIDENT RATE IN THE COAL MINES OF NORTH AMERICA DURING A TEN-YEAR PERIOD, BY CAUSES.

Cause.	Fatal accidents.	
	Number.	Rate per 10,000 employ-ees.
Fall of coal.....	2,722	4.99
Fall of roof, slate, etc.....	5,828	10.68
Falling into shafts.....	369	.68
Falling into slopes, manways, etc.....	125	.23
Mine cars.....	2,204	4.04
Outside cars.....	470	.86
Motors.....	30	.05
Explosions:		
Dust or gas.....	2,571	4.71
Powder or dynamite.....	968	1.77
Blast.....	793	1.45
Other, not specified.....	292	.53
Mining machinery.....	332	.61
Mules.....	73	.13
Asphyxiation.....	271	.50
Electrocution.....	193	.35
Miscellaneous.....	1,105	2.02
Total.....	18,346	33.60

The average fatality rate for the North American coal field, according to this table, was 33.6 per 10,000, or 3.36 per 1,000 of persons employed one year.

FALLS OF COAL OR ROOF.

The average fatality rates by principal causes during the ten-year period 1899 to 1908, as given in the above table, may be considered the standard by which the relative frequency of accident occurrence in the different coal fields and coal-mining States can be measured. The standard rate of accident occurrence due to fall of coal and roof, slate, etc., combined was 15.67 per 10,000, but, as brought out by the following comparison, the degree of risk varies considerably in the different coal fields.

FATAL-ACCIDENT RATES IN COAL MINING DUE TO FALLS OF COAL, ROOF, SLATE, ETC., DURING A TEN-YEAR PERIOD.

Section.	Rate per 10,000 employ-ees.
Western.....	34.08
Southern.....	21.57
Pacific coast.....	21.13
Standard or average rate	15.67
Eastern.....	15.33
East central.....	11.68
West central.....	11.06
Northeastern.....	10.44

This comparison is of very considerable practical significance. For the first time, the true rate of risk from a particular cause in mining

operations is here precisely determined by a method which has the sanction of statistical science, and the result is startling, indeed.

The table brings out the fact that in some of the coal fields the fatality rate due to a single group of related causes; that is, fall of coal and roof, slate, etc., is as high, or higher, than the normal fatality rate due to all causes in most of the coal-mining States and Provinces of North America. Even the standard rate, of 15.67 per 10,000, or 1.57 per 1,000, is extremely high, higher, in fact, than the normal fatality rate due to all causes in the United Kingdom, Austria, and Belgium. In the far western coal area the rate has been 34.08 per 10,000, or higher than the fatality rate due to all causes for the whole American coal field. The southern, Pacific coast, and western coal areas all have decidedly higher average rates for this group of causes than the North American coal fields as a whole, while the northeastern, the east central, west central, and eastern sections experienced fatality rates due to fall of coal and roof below the standard, but in the last-named area the rate was very close to the average, so that with the exception of the northeastern and the central sections the fatality rate due to fall of coal and roof, slate, etc., must be considered high, and in some cases extremely high for the entire coal field of North America.

The variations in fatality rates due to fall of coal and roof for the different coal-mining States are, of course, much greater, but they can not be fully discussed here. By reference to Table XXIII of the appendix the facts for each State are made available in the most convenient manner, but the extremely high rates for some of the States may be briefly referred to. In Colorado the rate reached 35.15 per 10,000 out of a total rate, from all causes of accidents, of 55.99, or 62.8 per cent. In New Mexico the fatality rate due to fall of coal and roof was still higher, attaining to 40.48 per 10,000 out of a total rate for all causes of 72.69, or 55.7 per cent. In Utah more favorable conditions prevailed, but the rate reached 21.56 per 10,000 out of a total of 133.25, or 16.2 per cent. These rates admirably illustrate the danger of reasoning exclusively from a percentage distribution of causes; for, while the fatality rate due to fall of coal and roof in Utah is considerably above the standard (15.67), it is only 16.2 per cent of the deaths from all causes, and thus apparently lower. This apparent contradiction is due to the fact that a very disastrous explosion occurred in Utah in 1900, which increased the proportion of deaths due to this cause to 73.5 per cent of the whole number. It is evident that for an accurate understanding of the causes of coal-mining casualties, the rate of accidents by cause is required in place of the percentage distribution, but it is equally true that for many practical reasons, particularly such as govern in considerations of pre-

ventive measures, the percentage distribution, as emphasizing the actually most important cause, is very useful; in fact, quite indispensable.

SHAFT ACCIDENTS.

The standard fatality rate for the coal fields of North America from shaft accidents or falls into shafts, manways, slopes, etc., was 0.91 per 10,000 employed. This cause is, therefore, apparently not of great numerical significance, as only 494 deaths were caused in this manner, although it is safe to assume that a considerable number of these accidents were preventable. The variations in rates in the different coal fields is shown in the following table:

FATAL-ACCIDENT RATES IN COAL MINING IN NORTH AMERICA DUE TO **SHAFT ACCIDENTS**, FOR THE PERIOD 1899 TO 1908.

Section.	Rate per 10,000 employees.
Southern.....	0.53
West central.....	.83
Western.....	.90
Standard or average rate.....	.91
Eastern.....	.95
East central.....	1.00
Pacific coast.....	1.28
Northeastern.....	1.32

The range in rates is from 0.53 in the southern coal fields to 1.32 per 10,000 in the northeastern coal area. Of course, the liability to falls into shafts, as has previously been said, is in proportion to the number of employees in mines with vertical shaft entrance, and the proportion of such accidents is naturally lowest in coal fields with flat seams above sea level entered by tunnels, drifts, or slopes. The term "shaft accidents," it should be explained, is not one of precise meaning in some of the mine inspectors' reports, and it is not clear whether deaths due to objects falling into shafts have always been included (as they should have been) or whether they have been grouped under miscellaneous. The importance of this suggestion is made clear by reference to Table XXIII of the appendix, in which the details are given for the State of Illinois. In that table it is shown that there were 46 deaths due to employees falling into shafts, equivalent to a rate of 0.87 per 10,000; 53 deaths due to objects falling into shafts, equivalent to a rate of 1 per 10,000; 13 deaths due to falling of other miscellaneous objects, or 0.25 per 10,000; and, finally, 47 deaths due to cage accidents, or 0.89 per 10,000. When these four groups are combined, it is brought out that shaft accidents proper caused 159 fatalities, or nearly as many as mine cars, which caused 175 deaths. Calculated upon the basis of every 10,000 persons employed, the fatality rate for Illinois due to all shaft accidents was 3.01 per 10,000,

which contrasts with an average for the coal fields of North America of 0.91. But the excessive shaft accident rate for Illinois is by no means an exception. In Indiana the combined rate was 2.87, for Oklahoma 3.11, for Iowa 2.18, for Nova Scotia 2.64, and for Washington 3.99 per 10,000. Accidents of this kind constitute, therefore, quite an important factor in the fatality rates of certain States, and it may be assumed that if the returns were everywhere accurate and complete the true fatality rates due to shaft and cage accidents of all kinds would be higher than the rates as officially returned and given in the above table and in Table XXIII of the appendix.^(a)

MINE CARS.

Mine cars caused 2,204 fatal accidents in the North American coal fields during the decade ending with 1908, out of a total of 18,346 accidents from all causes. The standard or average fatality rate due to mine cars was 4.04 per 10,000 employees, but the rates vary considerably in the different coal areas, as shown by the following table:

FATAL-ACCIDENT RATES IN COAL MINING IN NORTH AMERICA DUE TO MINE CARS, FOR THE PERIOD 1899 TO 1908.

Section.	Rate per 10,000 employees.
West central.....	2.05
East central.....	3.13
Eastern.....	3.99
Standard or average rate	4.04
Northeastern.....	5.07
Southern.....	5.52
Western.....	7.67
Pacific coast.....	8.01

The mine car fatality rate ranges from a minimum of 2.05 per 10,000 for the west-central section to 8.01 per 10,000 for the Pacific coast section. Mine equipment, of course, has a bearing upon the degree of accident occurrence, but how far this is the case can not be determined by the brief account rendered in most of the official reports on accidents of this class. Riding on loaded cars contrary to orders is probably one of the chief reasons for the difference, and another probable reason is in the better discipline and control of mine labor in the Eastern States compared with the South and West.

Among the States and Provinces, with rates of mine car fatalities much above the average, reference may be made to British Columbia with a rate of 7.63; Colorado, 7.01; Oklahoma, 7.26; Utah, 8.33; Washington, 8.37; and West Virginia, 6.18 per 10,000.

^a See also the Report of the Committee appointed by the Royal Commission on Mines to Inquire into the Causes of and Means of Preventing Accidents from Falls of Ground, Underground Haulage and in Shafts; Parliamentary paper Cd. 4821, London, 1909.

OUTSIDE CARS.

Outside car accidents caused 470 deaths in coal-mining operations in North America during the period under consideration, or 2.6 per cent of the fatalities due to all causes. In proportion to the number employed the standard or average fatality rate due to this cause was 0.86 per 10,000. Since practically all of these accidents occur to outside employees they should perhaps have been calculated with reference to outside employments only, but the necessary information as to the number of outside employees is not available for the North American coal fields as a whole. The statistics for Pennsylvania prove conclusively that most of the fatalities due to outside cars have occurred to outside employees. As brought out in the subsequent discussion of the fatal accident rate by occupations, the rate of outside car accidents to underground employees in Pennsylvania was 6.3 per 10,000 for the anthracite coal field and 3.9 per 10,000 for the bituminous coal field. In the anthracite coal fields 38.2 per cent of outside accidents were due to outside cars, and in the bituminous coal field 45.9 per cent.

The term "outside cars," as used in mining statistics, is, however, of a rather indefinite meaning, at least for some of the coal areas, and there are strong reasons to believe that in some of the States this class of accidents is combined with "mine car" accidents, which have been previously discussed. Most of the outside car accidents in the consolidated table have been reported from Pennsylvania and the east-central section, and it is, therefore, very doubtful whether the rates for other coal fields and coal-mining States can be accepted as accurate. For some of the States no outside accidents at all have been separately returned, although it is a practical certainty that such accidents have occurred. For this reason a discussion of the fatality rates by States would obviously be of no practical value. It may be emphasized here, however, that the risk factor due to outside cars is, undoubtedly, one which demands serious consideration.

MOTORS.

Motors caused a total of 30 fatal accidents in the coal fields of North America during the period under consideration, or 0.2 per cent of the casualties due to all causes. The standard or average fatality rate due to motors was 0.05 per 10,000 employed, the rate having been highest in the western section, where it reached 0.14 per 10,000, and zero in the west central section, for which no fatalities of this kind were officially reported. It is very doubtful whether all the fatal accidents due to motors used in mines have been properly classified as such, and it may reasonably be supposed, considering the rapid increase in the use of electric motor power in mining, that more deaths have occurred than have been officially reported, or properly

classified. Granting probable defects in the returns, it is surprising to find that the fatality rate due to motors should be as low as 0.06 per 10,000 in the eastern coal field, which comprehends the States of Maryland, Pennsylvania, and Ohio. In Illinois, for illustration, out of 1,391 fatal accidents only 4, or 0.08 per 10,000 employed, were officially ascribed to motors, while in Ohio 19 out of 1,027, or 0.47 per 10,000 employed, were attributed to this cause. No deaths due to motors were officially reported as having occurred in the coal mines of Pennsylvania, which, no doubt, is partly due to errors in classification. For these reasons, it would serve no practical purpose to discuss the fatality rates due to motors in the different coal areas and coal mining States, but the self-evident defect in coal mining statistics clearly brings out the necessity of a uniform classification of causes to be agreed upon by the mining officials of the different States.

EXPLOSIONS OF GAS OR DUST.

Statistical defects are inherent in all classification, but they can be materially reduced by a critical examination of individual returns. Of no group of causes is this more true than of gas and dust explosions, explosions of dynamite and powder, blasts, etc. There are practical difficulties to be overcome which at times will baffle even the most skilled, for cause and effect will often be confused, and it will occasionally occur that the true but insignificant cause of a coal-mining accident is overshadowed by the disastrous effect. A can of powder explodes and results in a subsequent gas and dust explosion with a considerable loss of life. Should such an explosion be classified under explosives or explosions? Or, a naked light ignites fire damp and causes a small gas explosion, which results in the explosion of an underground powder magazine, with disastrous results to life. Should such an accident be classified as gas explosion, or as a powder explosion? A compromise is necessary in such cases, but it would be of great value if definite rules governed in the statistical classification. It is due to these differences in the determination of the true cause that so many apparent errors and contradictions occur in coal-mining accident statistics and without a definite understanding among the different mine officials, a decided improvement can not be expected for many years to come.

As classified in Table XXIII of the appendix, there have been 2,571 fatal accidents due to gas and dust explosions in the coal fields of North America during the period under consideration, or 14 per cent of the fatalities due to all causes. The standard or average rate of accident frequency was 4.71 per 10,000, against 4.04 for mine cars and 1.77 for deaths due to explosions of powder or dynamite. Gas and dust explosions, therefore, are among the most important causes of mining

fatalities and their geographical distribution is a matter of particular importance.

The variations in rates in the different coal fields are shown in the following table:

FATAL-ACCIDENT RATES IN COAL MINING IN NORTH AMERICA DUE TO GAS OR DUST EXPLOSION, FOR THE PERIOD 1899 TO 1908.

Section.	Rate per 10,000 employees.
Southern.....	17.17
Pacific coast.....	11.85
Western.....	6.22
Standard or average rate.....	4.71
Eastern.....	3.48
Northeastern.....	2.73
West central.....	1.92
East central.....	1.25

The variation in rates ranges from a minimum of 1.25 per 10,000 for the east-central section to 17.17 for the southern section. The wide range is due primarily and largely to fundamental differences in the character and depth of the coal beds in the several coal areas, which are brought out in a striking manner by reference to the tables for the different coal-mining States. Gas and dust explosions have been combined, because of the fact that dust explosions per se are probably extremely rare in coal mines, while dust explosions caused by previous gas explosions are quite common, and particularly so in some of the States of the southern and Pacific coast fields. Coal dust, as a factor in mine explosions, has only been regarded as such within very recent years, after a number of particularly serious disasters, in which there could be no doubt that what had been a gas explosion in its inception had subsequently become an explosion of coal dust. There is probably no more serious question to-day in many of our mining States than the increasing danger of dust explosions, due possibly to the use of coal-mining machinery and to other causes which, as yet, are not fully understood. The subject of dust explosion is too complex to be discussed in this place,^(a) but it may be pointed out that measures of prevention in-

^aThe most important recent contribution to the subject is Bulletin 425 of the United States Geological Survey, on "The Explosibility of Coal-dust," Washington, D. C., 1910. This bulletin includes a very complete bibliography. Reference should also be had to Bulletin 383 of the United States Geological Survey, on "Notes on Explosive Mine Gases and Dust," by R. T. Chamberlin, 1909. Among other important recent contributions reference should be had to an article on "The Dust Problem in Coal Mines," by Joseph Virgin, Engineering and Mining Journal, October 9, 1909; "Coal-dust as a Factor in Mine Explosions," by Henry M. Penn, Engineering and Mining Journal, July 4, 1908; "Equipment for the Prevention of Mine Explosions, with Special Reference to

clude the sprinkling of dry mines previous to the setting off of blasts, as perhaps the only effective method of precaution. It has been objected to this method, however, that sprinkling favors the spread of ankylostomiasis, with its well-known serious consequences to the miner's health. The sprinkling or spraying of dry mines is made obligatory in most European countries, and it can only be a question of time when this preventive will be insisted upon in the United States; but strong objections are made to the practice, which must be overcome by education and the perfection of sprinkling or spraying methods, as yet quite crude and often ineffective.^(a)

The dust factor is clearly recognized in Alabama, where the accident rate due to gas explosions, officially returned as such, was only 1.98 per 10,000, while the rate for dust explosions was 8.67, or a combined rate of 10.65. No dust explosions have been officially reported as such from British Columbia, but the rate for explosions of gas alone was 7.85 per 10,000, or nearly twice the standard or average rate for the coal fields of North America. For Colorado the rate has not been particularly excessive, or 2.96 for gas explosions and 1.38 for dust. For Illinois dust explosions have not been separately returned, and the rate for gas explosions was only 1.34. Since 1909, however, the disastrous explosion at Cherry, Ill., has furnished lamentable evidence of the inherent uncertainty in all calculations of this kind. Normally, however, the risk of gas or dust explosion in Illinois is below the standard. The fatality rate due to gas explosions in Indiana has also been very low, while for Oklahoma it has been extremely high, or 10.02 per 10,000. The rates have been low in Iowa and Kansas, Kentucky, Maryland, and Missouri. In New Mexico the gas-explosion rate was 2.18 per 10,000 and the dust-explosion rate 6.53, or a combined rate of 8.71 against a standard rate of 4.71. The rate was below the average in Nova Scotia, Ohio, and Pennsylvania anthracite, but above the average in Pennsylvania bituminous mines. In the Pennsylvania anthracite coal field the rate from gas and dust explosions combined was 2.13 per 10,000, while for the bituminous coal field the comparative rate was 5.23. These rates are insignificant compared with the rate for Tennessee, which was 0.21 for gas explo-

Dust," by Wilber F. Meyers, *Engineering and Mining Journal*, February 22, 1908; "Coal-dust as a Dangerous Element in Mining," article by H. C. Hovey, *American Journal of Science*, volume 122, page 18; "The Dust Danger," by W. H. Pickering, *Engineering and Mining Journal*, May 12, 1906; "English Experiments in Coal-dust Explosions," *Scientific American Supplement* No. 1450, October 17, 1903; Argument that coal-dust is not explosive, by Wm. M. Page, an open letter to the mine operators of West Virginia, *Engineering and Mining Journal*, December 5, 1908.

^a For a full discussion of the whole problem of coal-dust explosions, the prevention of coal dust and its removal, methods and cost of watering or sprinkling, etc., see Second Report of the Royal Commission on Mines, p. 82. London, 1909.

sion and 22.45 for dust explosion, or 22.66 per 10,000 for the two causes combined.

For Utah the recorded fatality rate due to gas explosion was only 0.49 and for dust explosion 0.98 per 10,000, but this very low rate would be changed into an extremely high rate if the great disaster of May 1, 1900, at the Winter Quarters mine, officially classified as due to a powder explosion,^(a) had been classified as a gas and dust explosion, which under a given interpretation of the evidence was probably the true cause. The fatality rate due to gas explosions has been very high in Washington, or 10.25 for gas explosion, 4.60 for explosions due to "afterdamp" and 0.84 for explosions due to white damp, a combined total of 15.69 per 10,000. For West Virginia the returns do not separate dust explosions from fatalities due to the use of explosives, but when the known facts of the most serious explosion which has occurred in that State are taken into consideration, it may safely be asserted that the risk of gas and dust explosions in West Virginia is decidedly above the average for the North American coal fields as a whole.

The cause and prevention of gas and dust explosions involve so many complex technical considerations that they can not be discussed here, but the following extract from the Thirteenth Biennial Report of the Chief Mine Inspector of Colorado is of practical interest in connection with the preceding discussion :

All coal beds are more or less charged with occluded gases of various kinds, which are injurious to health if breathed in certain quantities and for any length of time. As soon as the air enters a mine, it begins to take up these gases as they issue forth from the pores in the coal, and the percentage of impregnation of the air naturally increases all along its course until the outlet is reached. The air is further contaminated by noxious gases generated by the breathing of men and mules, by the burning of lights, by the combustion of powder, and the decomposition of matter through various sources. It is then very obvious how necessary it is to keep a copious supply of fresh air continuously traveling through a mine.^(b)

The danger of gas explosion is largely increased by poor or defective methods of ventilation. An adequate air supply is not only required as a safeguard against the accumulation of dangerous gases, but is a prerequisite to the maintenance of the health of miners and animals employed underground. The economic aspects of proper

^a Report of the state coal mine inspector of Utah for 1900, p. 65 et seq.

^b For a full discussion of the whole subject of mine air in its relation to mine explosions and health in mines, see the Investigation of Mine Air, by Foster & Haldane, London, 1905. This work includes as an appendix a discussion of the effects of carbonic oxide in connection with an underground fire at Snaefell mine, which occurred in May, 1897, also Statements Concerning the Sensations, Symptoms, and After-Effects of Carbon Monoxide Poisoning, by Dr. C. Le Neve Foster.

mine ventilation have been discussed in the same report of the chief mine inspector of Colorado, as follows:

From many years of practical experience in the various branches of underground work and under different conditions of sanitation, I feel safe in stating that the strength, speed, and durability of men working under extremely unfavorable conditions of ventilation are impaired to an extent that their normal working capacities are reduced on an average of at least 20 per cent. For example, assuming a mine, operating under extremely adverse circumstances and having a daily output of 1,000 tons and requiring an average of 50 company men, including drivers, timbermen, track layers, and laborers, at \$3 per day, to haul coal and keep the mine in working order. Then if the output is kept up when 20 per cent of the efficiency of the employees is lost, due to poor ventilation, it can readily be seen that by transforming such a mine into one with first-class ventilation, the change would be accompanied by a reduction in the expense of operating equal to the advantages gained by the improvement.

Par. 1. By raising the normal capacity of the men from 80 to 100 per cent by virtue of an improvement in the air, then evidently the total amount of work done by the 50 company men in handling 1,000 tons per day could be performed with equal ease and greater comfort by 40 men. The reduction alone of 10 men at \$3 each would be a clear gain of \$30 per day to the operator.

Par. 2. This same rule applies also to the miners. With an increase of working power at a ratio of 8 to 10, the earning capacity of the miners would be correspondingly raised and the working area of the mine would be proportionately reduced, and still the same daily output could be maintained. Therefore, with the limitation of the working territory and increased efficiency, the amount of trackage and timbering to keep up would be cut down, the rooms would be driven and the pillars extracted in shorter time and before the roof reached an advanced stage of deterioration as well as the decay of timber. The air courses would be shortened, and consequently fewer stoppings to construct, and the friction against the air and leakages lessened, further diminishing the number of company men needed for the maintenance of the workings. This, together with the increased preservation of materials resulting from the concentration of area, would be followed by a marked reduction in the cost of operating.

Par. 3. Moreover, the lives of mules would be prolonged and the number required to do the work lessened, and, as stated before, the crumbling and falling of roof and sides would be checked and the life of the timber lengthened throughout the mine. These are important features of economy, as the amount of repairing would be curtailed and the number of company men could be further lowered, besides the danger of accidents due to the unavoidable deteriorating condition of roof and the decay of timber would be largely eliminated.

Par. 4. In a misty mine atmosphere the men can not see or hear warnings of danger as quickly, and they are not as lively to get out of the way when it approaches; therefore accidents are more frequent under such conditions than when the air is clear and good. Then, inasmuch as poor ventilation is a factor productive of accidents in this manner, it inevitably adds to the cost of production, regardless whether the accidents are unavoidable or are caused through the negli-

gence of the officials, and thereby subject to indemnity. When a man is injured the output suffers a setback; besides, the company is deprived for a time of one man's services until he recovers. If an employee is killed the mine is usually idle two or three days, which fact incurs a loss to the mine of the fixed charges or regular running expenses paid in wages for engineers, pumpmen, timbermen, clerical force, and the cost of operating steam plants, feed for stock, etc., all of which have to be kept up just the same as when the mine is running.

Inadequate ventilation and defective conduction of the air currents are the causes which bring about gas explosions. Of course it is possible for a part, or parts of even a well-ventilated mine to be invaded by dangerous accumulations of explosive gas through unforeseen occurrences which would impede or cut off the air current and an explosion ensues. The additional expense thrown upon the mine owners through explosions is sometimes enormous and often exceeds the cost of equipment and maintaining a first-class system of ventilation through the whole life of a property. The extent of the extra cost thus incurred, and not considering the indemnities companies are liable to in case of neglect, is dependent upon the degree of damage to the mine, the time the daily tonnage is cut off, the extra force of company men and the amount of material needed to reopen and restore it to normal condition. It is very often under such circumstances that many of the best men leave camp and months and sometimes years elapse before the mine is restored to its former standard.

Poor ventilation breeds contempt and a general dissatisfaction among the men. It creates hard feelings between the employees and the officials and invites agitation and strikes.

Summing up the various items and discarding the heavy expenses under paragraph 4, we find the following difference in the cost of operating, when a mine is changed from the poorest condition of sanitation to the best:

(1) Due to the first reduction in number of company men-----	\$30
(2) Due to saving material and reduction of company men through concentration of work-----	4
(3) Due to limitation of work in attending roof and timber and using fewer mules-----	6
Total saving per day-----	40

A property containing 640 acres with a 5-foot bed of coal, if properly mined, would yield 4,680,000 tons. To mine this at the rate of 1,000 tons per day would require 4,680 days, or about 15 years working full time, excepting Sundays and holidays. Therefore, a careless mode of operating, as illustrated in the foregoing statement, would incur an extra expenditure upon the company of \$12,480 per year, or a total loss of \$187,200 during the life of the mine.

The above figures show the difference in results between the two extreme limits, but I want it further understood that a mine conducted upon any of the various grades of sanitation below the first class is economically affected in its percentage under par. For instance, mines having a sanitary condition 50 and 75 per cent below the perfect mark would suffer to the extent of \$20 to \$30 per day, respectively, etc. Therefore, admitting that the above figures and statements are correct and which any practical mining man must

concede, it is conclusive that a mine official who permits such unhealthy conditions to prevail on the plea of economy is grossly ignorant and robs his master of legitimate profits at the expense of the health and life of the employees under him as well as neglecting the preservation of the property.

These observations fully confirm the conclusion arrived at after an analysis of the statistical evidence, that the whole subject of mine explosions due to gas or dust requires to be dealt with in a thoroughly scientific manner.^a The tendency, fortunately, is in this direction and at no time has expert judgment been as generally applied to mine management as to-day. What is true in this respect of gas and dust explosions is equally true of fatalities resulting from the accidental explosion of powder, dynamite, premature blasts, missed shots, etc. Perhaps no class of accidents illustrates more forcibly the want of discipline, training, and successful mine experience than safety in the use of explosives, and it may be laid down as a first principle in all mine management that accidents due to this group of causes will be in almost exact proportion to the skill and intelligence of the labor employed.

EXPLOSIONS OF POWDER OR DYNAMITE.

Explosions of dynamite, or powder and blasts, including miscellaneous accidents of this nature, caused a fatality rate in the North American coal fields of 3.75 per 10,000 employed, or 11.2 per cent of the deaths from all causes. Accidents due to powder or dynamite only caused a standard or average fatality rate of 1.77, of blasts (chiefly premature explosions) 1.45, and miscellaneous causes of this nature 0.53 per 10,000 employed. Accidents due to powder and dynamite explosions are not separated in the returns and it is quite probable that common blasting powder is not always clearly distinguished from high explosives, which probably are, sometimes at least, classified as "powder" explosions. The fatality rate from these causes is high and naturally there are wide variations in the rates for the different coal fields. The table which follows shows the fatality rate due to explosives for the different coal fields in the order of their importance, compared with the standard average of 3.75 for the North American coal fields as a whole.

^a See the special report of the Chief Inspector of Mines on the Explosion at Washington "Glebe" Colliery, February 20, 1908; Parliamentary Paper Cd., 4183, London, 1908. See also Bulletin 425 of the United States Geological Survey on Explosibility of Coal Dust, by George S. Rice, Washington, 1910, which includes a bibliography on coal dust as a cause of colliery explosions.

FATAL-ACCIDENT RATES IN COAL MINING IN NORTH AMERICA DUE TO EXPLOSIVES, FOR THE PERIOD 1899 TO 1908.

Section.	Rates per 10,000 em- ployed.
Pacific coast.....	24.55
Western.....	16.52
West central.....	6.91
East central.....	5.17
Standard or average rate.....	3.75
Southern.....	3.27
Eastern.....	2.19
Northeastern.....	1.11

As has been pointed out in the discussion of fatalities due to gas and dust explosion, the classification of accidents by causes is often of doubtful accuracy, and it is quite probable that this in part explains the extremely high rate for the Pacific coast section. In a general way, however, the rates conform to mining experience and well-known differences in methods and usage. The rate of consumption of explosives in mining in the Western States is undoubtedly higher than in the more conservative and economical mining methods of the Eastern States. The range in the fatality rates is from 1.11 in the northeastern section (Nova Scotia) to 24.55 per 10,000 for the Pacific coast States. The rates for the several States emphasize the importance of the suggestion that all returns of accidents due to "explosives" require to be used with great caution. In British Columbia, for illustration, "explosions due to causes unknown" caused a fatality rate of 44.25 per 10,000, or of 47.9 per cent of the fatalities due to all causes, while explosions of powder and dynamite, specified as such, caused a rate of only 1.09. In Colorado the combined fatality rate due to explosions was 4.64, but of these 2.27 was ascribed to fire damp, 1.38 to premature shots, 0.59 to delayed shots, 0.30 to explosions of powder, and 0.10 to explosions of lamps. In Illinois the combined rate was 5.08, but of this 2.09 was due to explosions of blasts, 1.21 to explosions of powder, 1.08 to flying coal after blasts or explosions, 0.62 to blown-out shots, and 0.02 to explosions of dynamite, and the same rate due to explosion of gasoline torch. Still more varied have been the reported causes of explosions in Indiana, where the combined rate was 6.40 per 10,000, of which 1.47 was due to the explosion of powder, 1.40 to delayed shots, 0.87 to premature shots, 0.60 to "windy shots," 0.53 to "explosions of smoke" (?), 0.40 to explosion of shots through pillars, 0.33 to fire damp, and the remainder of 0.80 to miscellaneous causes. In Oklahoma the combined rate was 21.42, of which 8.81 was due to shot firing, 3.63 to windy shots, 3.28 to explosions of dynamite, 2.25 to explosions not specified, 2.07 to explosions of powder, and 1.21 to

"returning too soon," to shots, etc. These illustrations bring out the varied causes of mine fatalities resulting from the use of explosives.^(a) The details for the several States are given in full in Table XXIII of the appendix.

ASPHYXIATION.

Deaths from asphyxiation are separately returned in many States, aside from the deaths due to gas asphyxiation, as the result of gas and dust explosions. Deaths of this nature are quite common, as the result of careless exposure to powder and dynamite fumes, as well as to mine gases, and in the aggregate 271 such deaths have been reported in a total of 18,346 deaths from all causes in the coal fields of North America. The standard or average fatality rate has been 0.50 per 10,000, while the proportion of these accidents to the deaths from all causes was 1.5 per cent. The rate has been highest in the western section, or 1.31, in the Pacific coast section 0.64, in the eastern section and in the west-central section 0.59. Practically no accidents of this nature were specifically reported for the southern coal fields and none for the northeastern (Nova Scotia). In the east-central section the rate was only 0.26. It is practically certain that the rates for this cause for some of the States at least are untrustworthy. With few exceptions the fatalities are the result of reckless exposure, but no definite conclusion will be possible until the returns discriminate between asphyxiation due to gas and deaths from this cause due to asphyxiation by powder or dynamite, smoke, drowning, etc.

MINING MACHINERY.

Mining machinery caused 332 deaths in the coal fields of North America, out of a total mortality of 18,346 from all causes, or 1.8 per cent. The standard or average fatality rate due to this cause was 0.61 per 10,000, having been highest in the northeastern section, or 1.52, and lowest in the west-central section, or 0.19. The term "accidents by mining machinery" is indefinite, but probably includes deaths caused by coal-cutting machines, screens, in breakers, by shafting or gearing, etc. Definite conclusions would not be warranted until the returns are made in more detail, as is now the case in some of the States. Most of the deaths due to machinery are due to exposure to unguarded machines, particularly at conveyors, screens, gearings, etc. Proper safeguards, which have been in use in European countries for many years, would make many such

^a In this connection reference may be made to a very useful publication by the United States Geological Survey, entitled *A Primer on Explosives for Coal Miners*, Washington, D. C., 1910, and to the *List of Permissible Explosives*, published by the same authority.

accidents impossible. As yet the requirements in the several States for protective devices on machinery in motion are very defective, and the laws are often not complied with.

MULES.

The use of mules in underground mining is still very common, although mechanical haulage is gradually taking the place of animal traction. There were 73 deaths caused by mules, but it is quite probable that the number was larger, if deaths indirectly caused by mules, such as squeezes against mine walls, car accidents due to cantankerous animals, etc., had been included, as seems not to have been the case. The fatality rate due to this cause was 0.13 per 10,000, the rate having been highest in the eastern section, or 0.16, where relatively the largest number of mules are employed. Outside of the eastern section this cause is not of material importance. Deaths of this nature are due chiefly to mule kicks, run-over accidents, boys being accidentally crushed between mules and mine walls, or cars, etc. Except for the employment of experienced drivers and passageways of sufficient width, there are few safety precautions which experience can suggest that are likely to be effective.

ELECTROCUTION.

The introduction of electricity into mining operations underground has considerably increased the liability to fatal accidents.^(a) The uses of electricity in mining include all the essentials of mine operations, from coal cutting, rock drilling, hoisting and haulage, to lighting, pumping, and the driving of ventilating fans. Electricity has replaced a large number of mules and horses, with a corresponding decrease in the number of boys employed as drivers. Electricity has gradually replaced compressed air as a motive power for operating coal-cutting machines, with a resulting increase in the accident liability of the workmen. Accidents due to electricity have been of common occurrence, although relatively the proportion of officially reported fatal accidents due to electricity has not been large. An electric spark may be the cause of a serious explosion, which, however, would be recorded as due to gas or dust, since most if not all of the deaths would be due to gas asphyxiation or the resulting fall

^aThe subject is fully discussed in a Special Report of the Census Office; Mines and Quarries 1902, Chap III, which deals with electricity in mines. In this connection reference may also be had to "The Safe Use of Electricity in Coal Mining," by Sydney F. Walker, Engineering and Mining Journal, October 30, 1909; "Electricity in Modern Coal Mining," by Harvey J. Nelms, same publication, December 5, 1908; "Is the Electric Current Safe in Coal Mines?" by Rush N. Hosler, *idem*, July 4, 1908; "The German Investigations to Determine the Dangers from Electric Appliances in Coal Mines," *idem*, April 9, 1898.

of roof, or otherwise, but rarely to the direct effect of electricity itself. It needs no extended knowledge of the dangers of electricity and the ever-present possibility of defective insulation to contradict the returns for the last 10 years, according to which there have only been 193 deaths due to "electrocution," which, of course, means the direct effect of electric shock. The most serious danger is not from electric shock, but electric sparks igniting dangerous gases or dust, and this risk may materially increase if electric shot firing comes into common use. The standard or average fatality rate due to "electrocution" has been 0.35 per 10,000, but this rate does not accurately measure the accident risk due to electricity in mining operations. The fatality rate has been highest in the southern section, or 0.72, in the western section 0.62, and 0.53 in the Pacific Coast section, while it has been only 0.12 in the east-central section, 0.16 in the west-central section, and 0.36 in the eastern section. The rate, however, has been considerably higher in some of the States, and, among others, 1.22 in Alabama, 0.79 in Colorado, 1.04 in Oklahoma, 0.98 in Ohio, 0.56 in the Pennsylvania bituminous mines, 0.83 in Tennessee, and 1.05 in Washington. No deaths due to electricity were specifically reported in the summary of causes in British Columbia, nor in Iowa, Kansas, and a few other States. For the anthracite coal field of Pennsylvania the rate was only 0.03, and for Illinois 0.09 per 10,000 employed. These rates must therefore be accepted with great caution, for they are obviously an understatement of the facts, which can only be fully determined by a complete analysis of the individual returns for all the States for a period of years. Electrical accidents are no doubt occasionally classified with miscellaneous causes, which is unavoidable in the absence of a uniform classification of the causes of mine accidents in the different States. As conclusive evidence of the serious risk involved in the extensive use of electricity in underground mining the following is quoted from the report of the chief inspector of coal mines for Pennsylvania, who in his report for 1901 said:

Electricity is one cause of fatalities in the bituminous mines (7 having lost their lives through it during 1901) that so far has not proved fatal to any person in the anthracite mines. Electricity in various forms has been the cause of many deaths in the soft-coal mines, either from the men coming in contact with the electric trolley wire, or with the electric wire that carries the power to the electric cutting machines. In my opinion, separate traveling ways should be provided for the workmen when the haulage is done by electricity, unless the wires can be raised to a distance of at least 6 feet from the rail, and even then there should be sufficient room for passing on the main haulage roads at all points, as men can not always reach the "safety holes" in time. In every case where electric machines are used for cutting coal, the wires should be made absolutely safe, as men in the hurry of their work forget about the "deadly wire," touch

it, and all is over, and the report follows, "Killed by an electric shock." Humanity demands protection for the workingmen from this most deadly agent recently introduced and employed in coal mines. I hope the time will come when "compressed air," "liquid air," or some other agent will supplant electricity in coal mines.

In gaseous mines, electric cutting machines or other electric motors should never be permitted in use, as otherwise sooner or later they will be the cause of a great catastrophe.

It is impossible to say how far electricity has been the responsible cause for some of the great mining calamities of recent years, but it is an entirely safe assumption that some of the disastrous gas explosions have been due to gas or dust ignited by electric sparks. At least the same question has been raised in England, and according to an extended discussion of this subject in the *Engineering and Mining Journal* of May 21, 1910, on "The use of electricity in British coal mines," it was said that—

During the last 12 months or more the use of electricity in mines has attracted a great deal of attention in the United Kingdom. In the present circumstances, it may be said there is a feeling of apprehension in many quarters, and the suspicion that this power has played an important part in some recent disasters is gaining ground. It is not so much that electricity in itself as a power has been blamed, although among some of the miners' organizations there has been a mild agitation in favor of Parliament being called upon to enforce the removal of electricity from dry and dusty mines. The outcome of such a procedure would simply be the strengthening of legislation in such a manner as to insure that the electrical apparatus installed in the mines would be of a greatly improved quality, which would insure greater safety.

The same article contains a quotation from an address by Mr. Robert Nelson before the Institute of Mining Engineers, which reads in part as follows:

A coal mine is the last place in the world where ill-designed electrical apparatus should be used. The risk of employing inferior material is too great to be run. The best advice should, therefore, be obtained on the design of an installation and on the purchase of apparatus. Later the most careful and competent supervision is required during progress of the work, but given due attention to these important matters successful operation in the future is much simplified. A daily test of the operation of all automatically opened circuits is advisable; but a complete test as regards the proper working and insulation of all parts should be made at least every three months, and the results recorded for future reference. It is also advisable that the danger of touching current-carrying apparatus, such as cables and motors, should be pointed out from time to time to all the workmen employed in the mine, or in some way kept constantly before them.

It is made evident by these warnings on the part of competent mining engineers that the risk resulting from the introduction of

electricity into mines has materially increased the underground hazard, and that the true risk is unquestionably greater than the apparent risk, is measured by the recorded fatality rate due to "electrocution." The increasing importance of electrical risk in mining is made evident by the declared purpose and object of the recently established Institute of Electrical Mining Engineers in England, which sets forth that—

The purposes for which the institute is established, are:

1. To consider means for minimizing the risk attending the application of electricity to the industry of mining and to promote the adoption of approved methods and devices tending to increase safety.

2. To promote the general advancement of electrical science in its applications to the industry of mining; to facilitate the exchange of information and ideas on this subject among the members of the institute and otherwise; and generally, to extend the experience, increase the efficiency, and elevate the status of those engaged in such applications.

In briefly commenting upon these principles of the new organization, the president, Mr. William Maurice, an experienced mine manager, said:

Who is there among you who can not recall accidents and narrow escapes from accidents by the dozen, almost every one of which had its origin in some form of neglect or carelessness? In fact (and it is an indisputable fact, lying at the root of the whole problem of the safe use of electricity in mines) accidents do not happen at all on account of some mysterious and incalculable property of electricity, but simply and solely for want of order, cleanliness, and common care. Merely a little elementary technical knowledge, if associated with intelligent application, would work wonders in the prevention of accidents. At many collieries there are dynamo attendants, motor drivers, wiremen, and others associated with electrical plants who have had no technical training. They have, in fact, picked up all they know in course of the performance of their work.

Thus, in its final analysis, it is largely a question of efficient labor and adequate skilled supervision, by means of which the risk due to electricity in mining can be reduced, but not done away with. The whole subject will be further inquired into by a special departmental committee, which will consider the working of existing rules for the use of electricity in British mines and what amendments are necessary to reduce the risk to a minimum. In view of what has been said by the chief mine inspector of Pennsylvania, the subject evidently demands similar public consideration in this country.

MISCELLANEOUS MINE ACCIDENTS.

Miscellaneous accidents in coal mines constitute 6 per cent of the 18,346 fatalities included in these statistics. The standard or average fatality rate for this group was 2.02 per 10,000, an item sufficiently

large to demand a more explicit statement of the facts. It is often the case that the so-called miscellaneous accidents are largely of the kind that fall within the preventable class, but the mining statistics at present afford no opportunity to deal with this group in sufficient detail to determine the exact causes responsible for their occurrence. In some of the States the proportion is much larger than the average, and among others, in Alabama, 17.4 per cent were classed as miscellaneous, or 8.67 per 10,000. In British Columbia the proportion was 7.1 per cent, but in Colorado only 0.5 per cent, and in Illinois 0.2 per cent, so that it may safely be asserted that the difficulties of exact classification are not insuperable. The facts regarding miscellaneous accidents for each State are given in Table XXIII of the appendix.

STATISTICAL ANALYSIS OF 2,660 FATAL MINE ACCIDENTS IN THE UNITED STATES DURING 1908.

During 1908 there occurred 2,660 fatal accidents in coal mining in the United States for which more or less complete information is available regarding the cause, age, race or nativity, conjugal condition, dependence, and length of mine service, which constitute the elements of every statistical inquiry into the subject of coal-mining casualties. Not all of this information is available for each accident on account of the regrettable dissimilarity in the returns, but all the facts officially returned are condensed in the analysis which follows and the statistical tables included in the appendix. The ages of the killed, for illustration, are given in only 2,269 accidents out of the 2,660 included in the present investigation, but the difference in numbers, of course, does not impair the value of the age distribution as given below:

PERSONS KILLED IN COAL MINING IN THE UNITED STATES, BY AGE AT DEATH, 1908.

Age at death.	Persons killed.		Age at death.	Persons killed.	
	Number.	Per cent of total.		Number.	Per cent of total.
13 and 14 years.....	10	0.4	50 to 54 years.....	92	4.1
15 to 19 years.....	232	10.2	55 to 59 years.....	52	2.3
20 to 24 years.....	415	18.3	60 to 64 years.....	19	.8
25 to 29 years.....	447	19.7	65 to 69 years.....	12	.5
30 to 34 years.....	331	14.6	70 to 74 years.....	4	.2
35 to 39 years.....	300	13.2	75 years and over.....	1	.1
40 to 44 years.....	209	9.2			
45 to 49 years.....	145	6.4	Total.....	2,269	100.0

It is extremely significant that there should have been 10 deaths at ages under 15 and 232 deaths at so early an age as 15 to 19 during the course of a single year. Similar information has not

heretofore been made public and the table is therefore a most useful contribution to the problem of child labor in its relation to child life.^(a) The details of age distribution, by single years, are given in Table I of the appendix, but it may here be stated that of the age group 15 to 19 there were 13 deaths at age 15, 34 at age 16, 38 at age 17, 58 at age 18, and 89 at age 19. Unfortunately the number employed at these ages is not known, but the facts stated suggest the necessity of a full return of persons employed in coal mining by single years of life at ages under 21. Such a return is called for by the highest considerations of public policy as a necessary basis for the calculation of the true fatality rate among young persons employed in a decidedly dangerous industry. Errors in age returns are common, but they tend to equalize themselves in the age groups adopted for the present purpose, so that the preceding table may be safely accepted as an approximation to the truth. The table brings out the fact that coal-mining fatalities occur most frequently in the age period when life has its highest economic value and when the resulting loss to the community is most serious in the form of dependent widows and orphans, on the one hand, and the absolute loss of slowly acquired labor efficiency on the other. Of the 2,269 deaths at specified ages, 56.7 per cent occurred between the ages 25 and 44, while 13.6 per cent of the deaths occurred at ages 45 to 64, inclusive, and 0.8 per cent at ages 65 and over.

The age distribution of the killed naturally varies considerably in the different employments. The average age at death for all occupations was 31.8 years, but the average has been as low as 18.1 years for trappers, and as high as 33.6 years for miners. The details, by occupations, are given in Table II of the appendix. The table is of considerable interest, in that it brings out the many-sided character of coal mining as carried on under varying conditions throughout the nation, and while some of the names of occupa-

^a The following account is from the Annual Report of the Mine Inspector for Maryland, for the year ending May 1, 1910, p. 16:

"John Hogan, a miner, aged 14 years, residing with his parents at Frostburg, was killed instantly by a fall of roof composed of rock and coal at mine No. 10, Tyson, of the Consolidation Coal Company, near Eckhart, on November 22, 1909. This boy was working with his father in a room where the roof had to be shot down for height on the roadside. The system generally practiced in this kind of work is the miner puts up what is called breakers before he shoots; in this case this was not done and from the effects of the powder from the last shot, which loosened the roof all over the place, which was 21 feet wide and 16 feet from the last prop to the face, made the place unsafe and in no condition to work under. They were working near the face when the roof fell, injuring the father and killing the son. It was very sad to see such a bright little life crushed out in such a manner. John was well liked by all his little friends."

tions are probably the equivalents of other occupation titles, they are given as returned in the official reports to avoid a possible erroneous interpretation. For the more important occupations the number of deaths, the years of life, and the average ages at death are summarized in the table below :

FATAL ACCIDENTS IN COAL MINING IN THE UNITED STATES, BY PRINCIPAL OCCUPATIONS AND AVERAGE AGE AT DEATH, 1908.

Occupation.	Number killed.	Total years of life.	Average age at death (years).
Drivers.....	139	3,271	23.5
Loaders.....	134	4,239	31.6
Machine runners.....	52	1,650	31.7
Miners.....	1,133	38,039	33.6
Mine laborers.....	228	6,888	30.2
Shot firers.....	28	1,032	36.9
Trappers.....	20	471	18.1
All occupations.....	2,269	72,254	31.8

According to this table the 2,269 men killed whose ages were known had lived a total of 72,254 years, or an average of 31.8 years. Since the termination of life was caused by accident instead of by natural causes, it is a reasonable supposition that but for the accidents the duration of life would not have fallen materially below the normal. At 32 years of age the normal expectation by the most recent English life tables (there being no corresponding life tables for the United States) is 31.51 years. If this number of years is multiplied by the number of accidents (2,660), which includes the 391 accidents to persons whose ages were not stated, but who were presumably of the same average age, the net loss in years of life as the result of fatal accidents in coal mining occurring during the year 1908 may be conservatively estimated at 84,000. Assuming that the average age at commencing work was 15, the men killed lived on an average not quite 17 years subsequent to their entry into the mining industry. At age 15 the normal expectation of life by the most recent English life tables is 45.21 years, so that the amount of not realized lifetime is represented by 28.41 years for the individual and 75,500 years for the 2,660 deaths reported during 1908. In other words, the curtailed average lifetime as the result of coal-mining fatalities is of most serious economic and social significance. If the facts were clearly realized, it would be difficult, indeed, to induce young men to enter so perilous a vocation, except as an inevitable alternative as a matter of self-support. The waste as measured in years of human life implies a very material destruction of national wealth. Although it is not possible to assign a definite monetary value to a human life, it requires no discussion to sustain the view that the loss involved in the destruction of human life as the result of coal-mining casualties is absolute

and represents a destruction of national wealth of the highest potential value in the form of trained human energy.

The causes of accidents by occupation in detail are given in Table III of the appendix. Of the 2,660 fatal accidents 229, or 8.6 per cent, were due to falls of coal and 906, or 34.1 per cent, to falls of roof, rock, or slate. When these two causes are combined, it appears that nearly one-half the entire number of fatalities were the result of a single group of clearly defined causes and conditions. The facts are summarized in the table below, which is self-explanatory and requires no extended consideration:

CAUSES OF FATAL ACCIDENTS IN COAL MINING IN THE UNITED STATES, 1908.

Cause.	Fatal accidents.	
	Number.	Per cent of total.
Falls of coal.....	229	8.6
Falls of roof, rock, and slate.....	906	34.1
Falls into shafts.....	70	2.6
Falls into slope.....	5	.2
Mine cars.....	326	12.2
Outside cars.....	60	2.3
Explosions:		
Gas and dust.....	636	23.9
Powder and dynamite.....	61	2.3
Blast.....	133	5.0
Bollers.....	7	.3
Machinery.....	58	2.2
Mules.....	9	.3
Asphyxiation.....	32	1.2
Electricity.....	55	2.1
Miscellaneous.....	73	2.7
Total.....	2,660	100.0

The length of mining experience, using that term as inclusive of any employment in connection with mining operations, is not specifically returned in most of the official reports, but only for West Virginia and Tennessee. The information is, therefore, limited to 588 fatal accidents occurring during 1908 in the two States named, and the facts are set forth in convenient form in the table below, while details for individual occupations are given in Table IV of the appendix:

FATAL ACCIDENTS IN COAL MINING IN WEST VIRGINIA AND TENNESSEE, BY DURATION OF MINE EXPERIENCE, 1908.

Duration of mine experience.	Fatal accidents.	
	Number.	Per cent of total.
Under 3 months.....	33	5.6
3 and under 6 months.....	28	4.8
6 and under 12 months.....	51	8.7
1 and under 5 years.....	255	43.3
5 and under 10 years.....	154	26.2
10 and under 15 years.....	43	7.3
15 and under 20 years.....	13	2.2
20 years and over.....	11	1.9
Total.....	588	100.0

According to the foregoing table there were 33 deaths out of the 588, or 5.6 per cent, of men who had been less than 3 months at work. The number of men killed with less than 1 year of mine experience was 112, or 19.1 per cent of the total, which it is safe to assume is rather out of proportion to the corresponding number employed. It is significant that there should have been 43 deaths of men who had been at work from 10 to 14 years, and 13 deaths of men with from 15 to 19 years of mine experience, and 11 deaths of men with 20 or more years' experience. It is therefore clearly proven that mine experience, even of considerable length, is not necessarily a protective factor, although it is quite probable that in proportion to the number employed the fatality rate is relatively less among men with long experience than among those with short experience. The difference naturally results from successful adaptation to conditions of life involving unusual hazards and fatal consequences of negligence not common to those who work under conditions with which they are more or less familiar. It is a matter of regret that the duration of mine experience should not be stated in the returns of the mine inspectors of other States than West Virginia and Tennessee.

The social aspects of coal-mining fatalities are emphasized in the conjugal condition of the persons killed and the number of children left fatherless. The returns are not entirely explicit or conclusive, for it is not clear whether the widowed are included among the single or the married, nor whether the children were of a dependent age or not. In the case of many miners of mature age it is obvious that the children are no longer dependent upon the family, and it would, therefore, be a hazardous guess to estimate the resulting social burden involved in the support of all the children reported in the official returns. It would be of material value if the ages of the children were required to be stated, for it would then be possible to calculate the social burden implied in their support. According to German data the average age of children made dependent through coal-mining casualties was 8 years, so that the average duration of their dependence to an age of complete self-support may be placed at 10 years. There is, unfortunately, no corresponding information for this country. According to the official returns as given in detail in Table V of the appendix, there were 1,233 wives made widows and 2,421 children were made fatherless. If allowance is made for defective returns, it is quite probable that the actual number of wives made widows through coal-mining accident fatalities was not less than 1,300, and that the number of orphans or fatherless children was not less than 2,500 during the year 1908. Of this number it is safe to assume that 2,000 were under 15 years of age, in view of the fact that the average age of miners killed was about 32 years. There are no data by which it is possible to calculate the social de-

pendence resulting from coal-mining accidents, but it is self-evident that in probably the large majority of cases the wives made widows were compelled to seek their own support, mostly in an humble capacity, while the support of the children was partly at least shared by others, to their own social or economic disadvantage. A fixed family income, be it what it may, can not be suddenly terminated without serious social and economic consequences, and it is a safe inference that in many cases these consequences are deplorable from the moral, physical, and economic points of view.

DESCRIPTIVE ANALYSIS OF FATAL ACCIDENTS IN ILLINOIS, 1904 TO 1908.

Even the most complete tabular analysis of coal-mining accidents can not possibly disclose the many and varied circumstances under which such accidents take place. The brief descriptive accounts of fatalities which are usually included in the annual reports of mine inspectors rarely do more than emphasize the general features of such occurrences. No complete account of fatal mine accidents in North America in any one year has been rendered, although the utility of such an analysis can not be questioned. For the present purpose it has only been possible to make such an analysis of the deaths occurring in the coal mines of Illinois during the 5 years ending with June 30, 1908. It has been customary for a number of years to include in the coal statistics of that State, as published by the bureau of labor statistics, a reasonably full account of each death, and in the following discussion the facts are presented in exactly the same form as they have been officially made public, except that the occupations, or causes, have been grouped and that only the more significant and suggestive cases are dealt with in detail. It would, manifestly, serve no practical purpose to give separately all of the many deaths due to fall of coal or slate, etc., most of which are reported in identical language, and rarely with a full account of the surrounding circumstances. There is, indeed, much that is suggestive of neglect to inquire into all the facts and conditions, more or less contributing to these numerous occurrences, which are disposed of with the simple official statement that "John Smith, miner, age 40, married, was killed instantly by falling rock." Considering that casualties of this kind constituted 47.1 per cent of the coal-mining fatalities in the State of Illinois during 1908, it would seem a matter of the utmost importance that all the facts having a direct or remote bearing upon the occurrence should be inquired into and given in full in the annual report.

During the 5 years ending with June 30, 1908, there occurred in the State of Illinois 859 fatal accidents in coal mining, distributed by principal causes, as follows:

FATAL ACCIDENTS IN COAL MINING IN ILLINOIS, BY CAUSES, FOR THE PERIOD
1904 TO 1908.

Cause.	Fatal accidents.		
	Number.	Per cent of total.	Per 10,000 employees.
Falling coal.....	209	24.3	6.66
Falling roof, slate, etc.....	196	22.8	6.25
Falling down shaft.....	57	6.6	1.82
Mine cars.....	116	13.5	3.70
Outside cars.....	19	2.2	.61
Explosions:			
Gas or dust.....	64	7.5	2.04
Powder or dynamite.....	47	5.5	1.50
Blast.....	105	12.2	3.35
Boiler.....	2	.2	.06
Machinery.....	16	1.9	.51
Asphyxiation.....	9	1.1	.29
Electrocution.....	4	.5	.13
Miscellaneous.....	15	1.7	.43
Total.....	859	100.0	27.37

The deaths have been classified primarily with reference to the causes responsible for their occurrence, but these do not always correspond, it would seem, to the final classification adopted by the labor bureau, which may have been based upon a more complete knowledge, as is indicated in the brief summary account to which such a report must necessarily be limited. The accounts vary in value, chiefly according to the several mining districts, and while they are admirable in concise presentation of essential facts in some cases, they are woefully lacking in material detail in others. The facts as set forth in the illustrative cases cited throw much light upon the causes as well as the economic and social aspects of coal-mining casualties, including the problem of individual or corporation responsibility and the related ones of employers' liability, workmen's compensation, community responsibility, and social dependence.

FATAL ACCIDENTS TO MINERS.

During the 5 years ending with 1908, according to the annual reports of the mine inspector of Illinois, there were 859 fatal accidents, of which 518, or 60.3 per cent, were deaths of miners. The descriptive returns of industrial casualties do not exactly conform to this number, but quite possibly the number reported in the statistical tables was increased by subsequent returns aside from the accidents described in more or less detail. Out of 423 fatal accidents to miners described in detail, 246, or 58.2 per cent, were due to fall of rock, clod, or slate, and of these the following are more or less typical of the conditions under which these accidents take place in the coal-mining industry of the State of Illinois.

FATAL ACCIDENTS TO MINERS DUE TO GENERAL CAUSES.

December 31, 1904. John Wendel, miner, aged 24 years, single, was severely injured by a fall of rock on his roadway, 45 feet from the face of his working place in the No. 5 mine of the Braceville Coal Company, Braceville, Grundy County. Deceased had quit work about 3 o'clock p. m., and was going out when a large rock fell on him. He was conveyed to his home, where he died about 6 o'clock the same day.

August 31, 1905. Frank Hellstrom, miner, aged 42 years, married, was killed instantly by falling roof at the face of his working place in the Coal Valley Mining Company's shaft No. 2, Sherrard, Mercer County. Deceased was working alone in the mine and was in the act of mining out the heel of a shot when a large mass of the roof fell from between mud slips in the roof, crushing him through the body, with the result as stated. The rock that fell on him would weigh about $1\frac{1}{2}$ tons. He leaves a widow and 6 children.

November 1, 1905. Konstantine Andreyewski, miner, aged 55 years, employed at the Gallatin Coal Company's mine, Nashville, was killed by falling rock at the face of his room while loading a car of coal. He leaves a widow and 6 children. All the children except one can provide for themselves.

November 2, 1905. George Moss, miner, aged 26 years, married, had his spine broken in the Spangler & Jones mine, Danville, Vermillion County. A piece of rock had slipped through between two bars; the bars not being properly propped were spread apart, letting the rock fall on him. He died in St. Elizabeth Hospital, Danville, November 24, 1905, leaving a widow and 2 children.

March 28, 1908. Charles Condon, miner, aged 38 years, married, employed at the mine of the Willis Coal and Mining Company, Percy. Deceased was loading coal in a cross cut when a piece of white top slate broke loose, falling and crushing him. The slate was next to the last cross bar. The fall was caused by a slip running on the rib, which did not show until after the fall had occurred. He leaves a widow and 6 children.

Accidents of this character are apparently the direct result of dangers inherent in the industry, which it will always be more or less difficult to guard against, but it is self-evident that in most, if not all, of these cases, no special precautions were adopted to protect the men against the inherent risk in the employment, as well as against their own carelessness, indifference, ignorance, or foolhardiness. No such precautions as are in general use in the Courrières mines of France, as the most effective safeguards against fall of roof, are in use in the mines of Illinois, although there would seem to be no valid reason against their adoption.^a

The next group, of eight fatalities, furnishes definite evidence of a deliberate disregard of warnings or orders on the part of the miners, but it must be taken into consideration that the miners themselves could not be heard in their own defense, and since the warnings or orders were not in written form and preserved as a matter of proof and record, it is at least an open question as to how far the men were really aware of the actual risk or danger inherent in the work which was required to be done and which they were not prevented from

^a For a full discussion of the method employed by the Courrières Coal Mining Company to bring about a reduction in the fatalities due to fall of roof, see Mines and Quarries: General Report and Statistics for 1899, Pt. II. Home Office, London, 1900.

doing, regardless of the risk, or danger, known to the supervising officer, foreman, etc.

FATAL ACCIDENTS TO MINERS, INVOLVING VOLUNTARY ASSUMPTION OF SPECIAL RISK, OR DISREGARD OF WARNINGS AND ORDERS SUGGESTIVE OF PARTICULAR PRECAUTIONS.

August 11, 1905. Charles Leby, miner, aged 32 years, married, employed at the mine of the Chicago and Marion Coal Company, Marion, Williamson County, was loading coal under a piece of slate that had been marked "danger" by the mine examiner. Deceased had been trying to get it down, but failed, and went on loading his car, when the piece of slate fell on him, killing him instantly. Props were in the room and he could have put them under the slate, but failed to do so. He leaves a widow and 4 children.

November 10, 1905. Adrin Rodgers, miner, aged 40 years, single, a native of Belgium, was killed by falling rock at the face of his room in the Dering Coal Company's mine No. 2, Westville, Vermillion County. I inspected this mine November 2, and found it in a dangerous condition, needing additional props set to support the roof. I called the attention of this man at that time to the dangerous condition, and stopped him from loading any more coal until he had set timbers opposite in the side room and also at the working face. I also called the attention of the mine manager to the condition of this room, and gave him orders not to allow the men to load any more coal until the props were set. I was called back to the mine on the 10th of November and found the props had been set opposite the side room, but only three props had been set in the room since my previous visit.

May 25, 1906. Howard Hunter, miner, aged 61 years, single, employed at the St. Louis and Big Muddy Coal Company, Dewmaine, Williamson County, was killed by falling slate while loading his car. He had been notified to keep out until the place had been timbered, but paid no attention and went to work. He was injured internally and died the same day.

July 14, 1906. Harvey Dunning, miner, aged 24 years, single, employed at the O'Gara Coal Company's mine No. 6, located 2 miles south of Harrisburg, was killed by falling rock in room No. 4, third east entry off of the north. The rock was 20 feet long, 12 feet wide, and about 5 feet thick at the thickest place. Instructions had been given by the mine manager about 1 hour before the accident to set props under the roof; deceased promised to do so, but failed to do as instructed.

January 31, 1907. Joseph W. Zeigler, miner and operator, aged 27 years, single, was killed instantly by falling roof at the face of his working room in Zeigler Brothers' local mine, about 3 miles from Coal Valley, Rock Island County. Deceased and his brother operated a local mine. They employed no help whatever, mining, hoisting, and selling the coal themselves. This brother was at work in his room. He knew the roof was dangerous and had evidently, as he supposed, thoroughly secured the same by propping. A large slab, 12 feet long, 3 feet wide, and an average thickness of fully 3 inches, suddenly fell, crushing him underneath. He was dead when found by his brother, about 10 minutes after the roof fell.

May 27, 1907. Richard D. Lewis, miner, aged 46 years, single, and employed by the Carterville and Big Muddy Coal Company, was working in room No. 2, east entry on the north side of the shaft. About 3.30 p. m. he was supposed to be preparing a shot, when a piece of slate fell from the roof, striking him on the back of the head, killing him instantly; the piece of slate was about 3 by 4 feet in size and 2 inches thick. This was a draw piece of slate, and the deceased was warned about it in the morning and told to take it down, and said he would, but neglected to do so, when it fell upon him.

December 21, 1907. Charles Morton, miner, aged 42 years, married, working in the mine of the Vivian Collieries Company, Greenridge, Macoupin County, was engaged, and had been for some time, trying to pull a rock down at the face of his room; failing to bring it down, he went to work under the rock, after being repeatedly told not to do so; the result was that the rock fell on him, killing him instantly. He leaves a widow and 1 child.

June 23, 1908. Thomas White, miner, aged 28 years, married, was killed instantly by being struck on the head by a heavy fall of roof at the face of his

working place in the No. 2 mine operated by the St. Paul Coal Company, at Cherry, Bureau County. Deceased was an experienced miner. He was employed in driving the eighth south entry in the mine, and was in the act of building up a loaded car with lumps of coal when suddenly a large mass of roof fell, striking him on the head and crushing him against the side of the pit car. He had been notified of the dangerous condition of the roof by the assistant mine manager about an hour previous to the accident, but had evidently neglected to make it safe at the proper time. He leaves a widow and 3 children.

The voluntary assumption of known risk does not necessarily imply foolhardy indifference to danger or ignorance of the danger itself. One of the killed was a man 61 years of age, who had been notified to keep out of his working place, but the warning may have been given in a perfunctory manner, and the man assumed the risk as a matter of course, which the employing company permitted him to do.

In mining operations employing a large number of foreigners it is a matter of common occurrence that the miner does not understand the orders or warnings given by an English-speaking foreman. The following case precisely illustrates accidents of this kind:

February 1, 1905. John Kochin, miner, aged 28 years, single, was killed in the Tallula Coal Company's mine, Tallula, Menard County, by a fall of rock while working in his room. Deceased had been notified by both the mine manager and pit committee of the dangerous condition of the roof in his room, and had been advised to keep out until the timbermen had secured it. Kochin was an Austrian, and did not understand the English language nor comprehend the warnings given to him.

The great importance of a full understanding of all the warnings and orders given to the men at work requires no argument. It is self-evident that where any considerable number of non-English-speaking men are employed the orders and warnings should be given in the language which they understand, as well as that all special rules framed for their guidance and the essential provisions of the mining laws of the State should be made public in the language of the labor class employed.

The next case is a rather interesting one, emphasizing the importance not only of mine experience, but of extreme care and caution on the part of men who for some years or even months may have been following other vocations.

October 30, 1905. John Green, miner, aged 59 years, married, was killed by falling slate in the coal mine at Salisbury, Sangamon County. It was the first day that deceased had worked in a mine for many years. He leaves a widow and 11 children.

The miner is not only exposed to the risk inherent in the mining operation, as such, but also in resulting duties which at times become acts of heroism and self-sacrifice in rescue work. The following case is one in which a man was killed while employed in putting out a mine fire, and such accidents are by no means rare:

October 10, 1903. Charles Nierman, miner, aged 30 years, married, employed in the Centralia Mining and Manufacturing Company's mine No. 2, Centralia, Marion County. Deceased, with others, was engaged in putting out a fire that

had occurred in the mine; the heat from the fire made the roof dangerous, part of it gave way, injuring Nierman seriously, from the effects of which he died the following day. He leaves a widow and 3 children.

It will be argued in many such cases that the miner knew better or that he failed to employ ordinary or customary methods of mining, which, if they had been followed, would have effectually protected his life. This may sometimes be true in the case of men of long experience and advanced in years, but more often the men killed are young and without the proper experience to afford them the necessary amount of protection. Whether a man did or did not do what he ought to have done is also often a matter of mere conjecture, and since the chief witness to the facts is dead the opinions or conclusions of others must be accepted with caution. The penalty of failure to employ safeguards at hand, with disastrous results, is emphasized in the case given below:

June 23, 1908. Louis Hosnak, miner, aged 23 years, single, employed by the O'Gara Coal Company at mine No. 1, located 3 miles north of Harrisburg, Saline County, was killed yesterday while working in No. 8 room on fourth east entry off of the main south entry. A piece of slate 14 feet by 16 feet and 6 inches thick fell on him. He had props and cap pieces in his room, and, had he placed them properly, the accident probably would not have occurred.

Aside from ignorance of mining methods or indifference to the employment of recognized safety precautions, it is occasionally the case that the injury sustained is considered unimportant, or that medical aid is declined as too expensive, or that necessary surgical operations are not resorted to, and, as shown in the following case, with fatal results:

June 20, 1906. Louis Gallo, miner, aged 40 years, married, had his leg broken by falling rock at the face of his working place, in the No. 7 mine of the Wilmington Star Mining Company, Coal City, Grundy County. Gallo was conveyed to his home, where the physician in charge stated that his leg would have to be amputated, but Gallo would not consent to have his leg taken off. He died the next morning.

In many cases the injury sustained is at first of small importance. The injured miner is able to return home, or he is removed to a hospital, where good treatment and surgical skill preserve his life for a considerable length of time. Death ultimately results from the accident, which in the official record of casualties is recorded as one of severe injury. It is impossible, of course, to constantly correct the records of previous years in consequence of a subsequent report (which is rare) to the mine employer that the accident, after all, resulted fatally. The two accidents next described illustrate this difficulty, which is inherent in the official reporting of all mine accidents, and which warrants the conclusion that the true mortality is larger than the reported:

October 30, 1905. Michael Valavinies, miner, aged 38 years, married, was severely bruised on the back by falling roof at the face of his working place in the Spring Valley Coal Company's shaft No. 2, Spring Valley, Bureau County. Deceased was mining in his room when a fall of roof took place, striking him

on the back and seriously bruising him. The injury was such that no thought was entertained that it would have a fatal termination, but he failed to rally, and other complications setting in, as a result of the injury, he died two months after the accident. He leaves a widow and 1 child in some foreign country, probably Russia.

January 15, 1907. Andres Jenco, miner, aged 40 years, married, was seriously injured by falling rock at the face of his working room in No. 6 mine of the Braceville Coal Company, Braceville, Grundy County. He was taken to the hospital in Joliet, where he died 18 days after the accident. He leaves a widow and 1 child.

The foregoing accidents were all caused by fall of rock, "clod," or slate—that is, the material forming the so-called "roof" of the mine. In very thick seams the "roof" may be solid coal, but this is seldom the case in Illinois. Falls of coal, however, occur at the breast, partly because of the necessary operation of "undercutting," partly after blasts, or otherwise. The number of accidents of this kind described in the Illinois report is 51, or 12.1 per cent, of the 423 descriptive accidents from all causes. The following are typical illustrations of fatalities of this kind:

FATAL ACCIDENTS TO MINERS DUE TO FALL OF COAL.

August 10, 1904. Joseph Ferrari, miner, aged 41 years, was severely crushed on the head and body by a fall of coal at the face of his working room in the Illinois Third Vein Coal Company's mine No. 1, Ladd, Bureau County. Deceased was working with his partner and was in the act of taking down a fall of coal when a large mass weighing about 2 tons came down suddenly, crushing him against the pack wall or building. He died from the injuries sustained 48 hours after the accident. He leaves a widow and 4 children in Italy.

November 28, 1904. Mike Hartor, miner, aged 55 years, married, employed in the Newbent Coal Company's mine, Pana, Christian County, was instantly killed by falling coal. Deceased was engaged in mining or undercutting the coal in his working place. He had undercut the coal to a depth of seven feet, but had failed to put in sufficient sprags as supports, part of the coal fell, striking him and breaking his neck. He leaves a widow and 2 children.

February 27, 1905. Lolli Telespero, miner, aged 44 years, married, was killed instantly by a fall of coal at the face of his working place in shaft No. 1 of the Spring Valley Coal Company, Spring Valley, Bureau County. Deceased was in his regular working place and in the act of cutting a sprag to let down the coal when a large mass of coal and roof suddenly fell, crushing his head. The mass of coal and roof that fell would weigh about 1 ton. He leaves a widow and 6 children.

November 6, 1905. Joseph Bocian, miner, aged 38 years, married, was killed instantly by falling coal at the face of his working place in Spring Valley shaft No. 1, Spring Valley, Bureau County. Deceased, with a partner, was at work and had a large fall of coal prepared by undermining. Bocian had removed the sprags to let the coal down. It did not come as soon as he expected, and he was preparing to make a wedge hole to wedge the coal down when it fell suddenly, and he was caught between the falling coal and a standing prop, crushing his breast and body. He was dead when extricated. He leaves a widow and 2 children.

July 30, 1906. August Commiant, miner, aged 45 years, married, was severely crushed through the body by falling coal at the face of his working room in the Spring Valley Coal Company's mine No. 4 at Seatonville, Bureau County. He died from the injuries March 27, 1907, nearly 8 months after the accident. He leaves a widow and 5 children dependent.

December 29, 1906. Anton Towrosa, miner, aged 29 years, single, was severely crushed through the abdomen by falling coal at the face of his working room in the Spring Valley Coal Company's mine No. 2, Spring Valley, Bureau County. Deceased was in the act of lying down, undermining the coal, when a large

mass, that would weigh about 1,500 pounds, suddenly fell, crushing him through the abdomen, from the effects of which he died 26 hours after the accident. Neglect to properly sprag up the coal may be given as the cause of this accident.

February 16, 1907. George Zinkis, miner, aged 50 years, married, had his leg broken and otherwise severely crushed by falling coal at the face of his working room in the Spring Valley Coal Company's mine No. 2, Spring Valley, Bureau County. Deceased, with a partner, was engaged in taking down coal and throwing it out to the roadhead. While so engaged, a mass of coal, about half a ton, suddenly fell, breaking his leg and bruising him generally. His injuries were not considered serious at the time, but, according to the opinion of the attending physician, the shock to the system and a naturally weak heart combined caused his death $4\frac{1}{2}$ days after the accident. He leaves a widow, no children.

June 4, 1907. Lewis Hart, miner, aged 58 years, married, was found dead under some coal at the face of his room in the mine of the Penwell Coal Company, Pana, Christian County. Deceased and his partner had left the room to secure some rails and ties for tracking when, on their way out, Hart suddenly turned and went into his room. When his partner returned, having been away not more than 10 minutes, he found deceased under the coal. It was what is termed a standing shot and deceased knew that it was very dangerous. He leaves a widow and 4 grown children.

The general remarks and conclusions regarding fatal accidents to miners due to falls of rocks or slate, apply as well to falls of coal. It is evident that in many cases well-understood safety precautions were disregarded and that haste in mining methods, hurry to complete the work, anxiety to increase the individual output, were the immediate causes of the accidents, although the larger responsibility for the occurrence manifestly rests with the managers and the supervising officials. A very suggestive accident is reported in one of the above group, in which death did not occur until 8 months after the occurrence. In most of the coal mining States an accident of this kind would not be reported in the fatalities at all.

The dangers of mining include practically every activity comprehended under that term, though, of course, to a varying degree. It has been shown by the fatality table for the State of Illinois that during the decade ending with 1908 accidents due to fall of coal and rock or slate caused 12.15 deaths per 10,000 employees, but it is not clear whether the rate included deaths due to "flying coal," as the after effects of explosions, shots, or blasts. Such accidents properly belong to the group of fatalities due to explosions, or the handling of explosives, shot firing, etc., and they will be so considered further on. Fatal accidents due to persons falling into shafts require to be differentiated from accidents due to objects falling into shafts, which of course are due to entirely different causes. During the 10 years ending with 1908 out of 1,391 deaths from all causes in Illinois, 46 were deaths due to persons falling into shafts, 53 due to objects falling into shafts, 13 to the other causes in this group, and 47 to cage accidents. These totals, of course, include all occupations, while the accidents at present under consideration include miners only, for a period of 5 years.

The descriptive accounts of fatal accidents to miners, due to falling into shafts, include 7 cases, which, on account of their peculiar nature, are all given in detail, as follows:

FATAL ACCIDENTS TO MINERS DUE TO FALLS INTO SHAFTS.

September 3, 1903. Lou Boden, miner, aged 53 years, married, employed by the Royal Coal Company, Belleville, St. Clair County, to retimber a part of the escapement shaft. The fan house and part of the timber in the shaft were burned out by a fire. To retimber part of the shaft that was burned, two scaffolds were built down in the shaft; while at work on the top, one of the upper parts of the shaft, which was not secured, gave away, breaking down the scaffolds, while Boden and his partner were at work. Deceased fell to the bottom of the shaft, killing him instantly. His partner, Tom Davis, was badly injured. The depth of the shaft is 180 feet. He leaves a widow and 5 children.

September 16, 1903. Seb. Romagnolis, miner, aged 19 years, single, was killed instantly by falling down the shaft of the Chicago, Wilmington and Vermillion Coal Company No. 1 mine, South Wilmington, Grundy County. Deceased with 3 other men were on the cage coming out of the shaft; when about 30 feet from the lower landing, deceased let loose of the handle bar, turning round, presumably to get off at the lower landing, when he fell to one side of the shaft, the cage passing him, he fell to the bottom, a distance of 165 feet.

December 24, 1903. Nicholas Alberson, miner, of Princeville, Peoria County, was severely crushed by falling down the shaft, 124 feet, at the Wyoming Coal Company's mine, located at Wyoming, Stark County. Deceased came from Princeville to Wyoming on a visit. He was not an employee of the Wyoming Coal Company. He went to the mine to visit the engineer and others employed there with whom he was acquainted. He walked to the doors at the ground landing, and opening the south door deliberately stepped into the south cage-way and fell to the bottom of the shaft. He was conscious when brought to the surface, and stated that he was going into the engine room. He died from the injuries 1 hour after being brought from the mine.

January 18, 1904. Ed. Maloney, miner, aged 30 years, single, employed in Donk Brothers Coal and Coke Company's mine No. 2, Collinsville, Madison County, was killed by falling down the shaft; he was found early in the morning at the bottom of the shaft.

March 31, 1904. Anton Zolinas, miner, aged 28 years, single, was killed by falling into the sump or cage seat at mine No. 3, operated by the Spring Valley Coal Company, Spring Valley, Bureau County. It is customary at the Spring Valley mines for all miners to be out of the mine at 4.30 p. m. About that time a blacksmith went to the bottom of the shaft to repair a water pipe. Shortly before 6 o'clock deceased came from the inside workings to the shaft bottom, but could not be hoisted because of repairs being made there. He was advised to go to the escape shaft, about 300 feet from the main shaft, in which there is a good stairway. He left the bottom of the main shaft seemingly for the purpose of going to the escape shaft; this was the last seen of him alive. On the following day he was reported missing from his boarding house. A searching party was organized at once, going into the mine. They failed to find him in his working place; when they returned to the shaft bottom they found his dinner bucket in the north cage seat and his dead body in the south one. It seemed evident that the deceased had returned to the main shaft after the blacksmith had gone and that he had attempted to climb up the buntons, as the marks of his hands and feet could be traced for a distance of about 75 feet up the shaft where, in all probability, he had slipped, falling to the bottom. It may be added that the sump or cage seat is about 10 feet deep, as double-decked cages are in use at this mine.

February 21, 1906. Andrew Skalgia, miner, aged 38 years, single, employed by the Shoal Creek Coal Company, Panama, Montgomery County, was killed. Deceased was at his boarding place, having worked that day, and had volunteered to take lunch to a fellow-boarder who had remained in the mine to work an extra shift. Skalgia went with lunch in hand into the engine room and asked the engineer for a cage, stating for what purpose, also telling the engineer that he would ring three bells when he was ready. Just at that time the engineer received a signal from below that men wanted to come up and pro-

ceeded to hoist them. In the meantime, Skalgia had walked to the shaft and while the cages were in motion rang three bells to the engineer and walked into the shaft, falling onto the descending cage about 400 feet below. He was killed instantly.

June 24, 1907. Jacob Black, miner, aged 38 years, married, employed by the Jordan Coal Company, 1½ miles northeast of Fairmount, Vermilion County, where the company is sinking a new mine. The pump which was placed at the water lodgement, about 40 feet from the bottom of the shaft, got out of order; deceased went to repair the pump and fell from the platform to the bottom, killed him instantly. He leaves a widow and 6 children.

All of these accidents are so fully described that they require no extended comment or further explanation. The first of the above accidents gives proof of gross negligence in not properly securing the scaffolding upon which the men were at work, and which is but too common a cause of fatalities in building operations outside of mines, as well as in connection with work in shaft construction or repairs. The second accident of the above group should, perhaps, be considered a cage accident, but the facts are not fully enough explained to make it clear whether the accident was due to neglect to provide the proper safety precautions. Many shafts at the different levels are apparently not provided with proper safety gates, or protective bars, and accidents occur which are, unquestionably, the direct result of indifference to well-known safety devices which make such accidents in well-conducted mines a practical impossibility.

An extremely distressing accident of this kind occurred in the third Illinois coal district on June 29, 1906, causing the loss of 4 lives, including 3 miners. A full account of this accident is given below:

June 29, 1906. August Muesner, miner, aged 30 years, married; Joe Dewasme, miner, aged 36 years, married; Cameo Fancon, miner, aged 35 years, married; and Andrew Mitchell, boss driver, aged 31 years, married, were killed by the breaking of a scaffold about 75 feet from the top of the hoisting shaft of the Roanoke Coal and Mining Company's mine, Roanoke, Woodford County.

The result of this accident is that four wives are made widows and eight children are left fatherless.

Andrew Mitchell, who was the mule boss, and the other men, all practical miners, were working on the night shift as sinkers, enlarging the hoisting shaft; the enlargement of the shaft had been completed. At the time of the accident they were engaged straightening several of the timbers which had slipped from their places; to enable the men to do this work they had erected two scaffolds, about 10 to 15 feet apart, on the opposite side of the shaft from that in which the cage was used. They were using only one cage. About 9 o'clock p. m. Mitchell, Fancon, and Muesner came up on a car of dirt, which they had loaded on the cage, leaving Dewasme on the scaffold; the purpose of the upper scaffold and platform was to prevent falling material injuring the men while at work on the lower platform.

At 9.10 p. m. the regular night shift of the mine got on the cage and were lowered a distance of 7 feet, when the three sinkers named got on the top of the cage (the top of the cage being flat) and were lowered down the shaft to their work. The engineer had received no instructions to stop at either of the scaffolds or platforms; he, however, slowed up as the cage approached the first platform; this platform was all right when the cage passed, as Patrick Brennan, the mine examiner, who was on the cage, spoke to Dewasme, who had been left on the platform to work while the three had gone up to unload the car of dirt upon which they had been conveyed on the cage to the top of the shaft. The cage went down the shaft until it was about 70 feet below the lower plat-

form or scaffold, when the engineer received a signal of "one bell" to stop the cage, which he did; a few moments after stopping he received the signal of "two bells," and lowered the cage to the bottom. While the cage was stopped, about 70 feet below where the men had been working, the men on the cage heard something fall down the shaft on the opposite side, but did not know what it was; they called up to the sinkers but received no answer. On reaching the bottom the men who had gone down on the cage went to the sump at the bottom of the shaft to investigate, and they made the statement that they found nothing to indicate that anything out of the ordinary had taken place, and they went to their work in different parts of the mine.

The next shift of sinkers were to report for work at 11 p. m. Charles Priller, one of the men on this shift, went to the shaft at 10.40 p. m. and was informed by the engineer that the cage had been at the lower landing since about 9.40 p. m. Four workmen, named Priller, Adhern, Fourit, and Fancon, got on the cage at the lower landing and went down the shaft to the first scaffold or platform, and found it gone; they were then lowered to the place where the second or lower scaffold had been and found only two boards of it remaining. They were then lowered to the bottom of the shaft, where they met the night foreman, Alphonse Dourlain, and inquired of him where the sinkers were, and he said he did not know. Michael Proctor, the mine manager, was sent for, and search for the bodies was made. The bodies of the four men were found in the sump, at the bottom of the shaft, which was 16 feet deep and filled with water. After making an examination of the shaft and the places where the scaffolds had been, I am of the opinion that the upper scaffolding had become weakened by the slipping of the timbers on which it was built, and that when the three men jumped from the top of the cage, while the cage was in motion, to the platform, the momentum of the three, with their combined weight and that of Dewasme, who was on this scaffold, was more than it could bear, and that it gave way, carrying with it the men and the lower platform to the bottom of the shaft, a distance of 420 feet. It is evident that the falling timber and men reached the bottom of the shaft before the cage, and that, when the men on the cage called up to the sinkers at the time the cage stopped about 75 feet below the platform, they were lying lifeless in the sump at the bottom of the shaft; also that what the men on the cage heard falling was the noise made by the four men as they fell to the bottom of the shaft.

It is rather difficult to differentiate shaft accidents of this kind from cage accidents proper, of which the following are typical illustrations out of 11 which have been specifically described in the official reports for the 5 years ending with 1908:

FATAL ACCIDENTS TO MINERS DUE TO CAGE ACCIDENTS.

October 19, 1904. Joseph Benedetti, miner, aged 35 years, single, and Louis Paganessi, miner, aged 40 years, married, were both killed instantly by being struck with the descending cage while attempting to climb to the top of the main shaft of the Marquette Coal Company, Marquette, Bureau County. The 2 men who lost their lives by this accident were Italians, and had been in the employ of the company about 6 weeks. It is customary for the men to come out of the mine from 4 to 4.30 o'clock, but these 2 men did not come out this day until about 6 o'clock. On their way to the bottom of the shaft they passed some workmen making repairs on the roadway and were informed by them to wait a short time and they would have company, as one of their number was going up the shaft for something that was needed on the repairs being made. They paid no attention to this advice, probably because of their ignorance of the English language, but passed on to the bottom of the main shaft, passing on their way the opening which led to the escapement in which was a proper stairway. Without notifying the engineer by signal they commenced climbing the buntons in the main shaft, and when about 140 feet from the bottom the engineer, not knowing anyone was making such an attempt, ran the east cage down to take the water out of the cylinders, as a party intended going down; he felt a slight resistance or jar to the descending cage at a certain point about 140 feet from the bottom. It was at this point the men, in all probability, were struck and hurled to the bottom. Their bodies were found about an hour later in the sump or cage seat at the bottom of the shaft. Paganessi leaves a widow and 1 child in Italy.

December 9, 1904. Anton Sgro, miner, aged 30 years, single, was killed instantly by falling down the No. 1 shaft of the Chicago, Wilmington and Vermilion Coal Company, South Wilmington, Grundy County. The accident occurred about 6.45 a. m. The engineer was letting down the men, 9 in number, they getting on the cage at the lower landing; when they were down about 30 feet the engineer suddenly reversed the engine, hoisting them to the top at a very high speed; the cage being self-dumping, the men were thrown out at the top; unfortunately 1 fell down the shaft, the other 8 were more or less injured.

April 12, 1905. M. L. Kearns, miner, aged 66 years, married, received a severe jar by the cage, on which he was coming up the shaft, dropping about 30 feet to the bottom, in Ed. Donahue's local mine, near Sheffield, Bureau County. Deceased and another miner were coming up the shaft, which is 75 feet deep and operated by horsepower; the descending cage stuck in the shaft, and the gin-horse kept going; this caused the rope on the drum to drop down on the spindle, and the ascending cage, on which the men were, dropped slowly to the bottom of the shaft, injuring the foot and leg of Kearns; the other man on the cage was not injured. Kearns did not seem badly hurt, but in about 6 days pneumonia set in, and he died 10 days after the accident. The opinion of a physician was that the shakeup to the system by the cage dropping was a potent factor in setting up the pneumonia; therefore this is given as a fatal accident, due to injuries received in a coal mine. He leaves a widow but no minor children.

May 21, 1905. Joseph Dynjewic, miner, aged 21 years, single, was killed in the Maplewood Coal Company's mine No. 2, Farmington, Fulton County. One of the drivers, being desirous of laying off from work in the afternoon, the deceased was employed to drive a mule the rest of the day. He made one trip on the west side, bringing the loaded cars to the bottom of the shaft. The mule, in turning out of the track, turned to the right instead of the left. Dynjewic got in front of the cars and attempted to stop them, but was pushed under the descending cage, which killed him.

January 26, 1906. Ludwig Keiner, miner, aged 46 years, married, was instantly killed in the Acme shaft of the Acme Coal Company, Streator, LaSalle County. The engineer was letting the men down in the morning; deceased and 7 other men were on the cage; the engineer lost control of his engine, letting the men down very fast; when the cage struck the bottom he reversed the engine; the cage was raised about 6 feet; the head of the deceased struck against the door, breaking his neck. None of the other men were injured. He leaves a widow and 2 children.

August 29, 1906. Angelo Correll, miner, aged 32 years, married, employed by the Carterville District Coal Company, was instantly killed. The cager had his usual number of men on the cage and rang for the engineer to hoist; just as the cage was leaving the bottom the deceased came running past those who were waiting for the next cage to come out, and leaped on the cage; he was caught between the cage and the casing of the shaft, crushing his head. He leaves a widow and 3 children.

September 10, 1906. Charles Hooly, miner, aged 38 years, single, and Charles Pap, miner, aged 41 years, married, were both killed by falling down the shaft at the Mount Pulaski mine, operated by the Mutual Coal Company. The engineer fainted and fell on the lever, his weight reversed the engine, and caused the cage on which the men were riding to go to the pulley; the men seeing the danger jumped from the cage, falling down the shaft a distance of about 360 feet. Pap leaves a widow and 4 children.

December 22, 1906. A very deplorable accident occurred at the Breese Trenton Mining Company's mine at Breese, Clinton County, Saturday morning, December 22, 1906, whereby 6 men lost their lives when descending on the cage to their working places. All of the men were miners. The cage fell down the shaft 300 feet, killing all of the men almost instantly, breaking legs, arms, and crushing their bodies horribly. The unfortunate men were:

August Foppe, miner, aged 32 years, married, leaving a widow and 1 child.

Nay Middeke, aged 45 years, miner, married, leaving a widow and 9 children.

Frank Zeherer, miner, aged 39 years, married, leaving a widow and 3 children.

New Holtmann, miner, age not given, married, leaving a widow and 4 children.

Walter Schaffner, miner, aged 30 years, married, leaving a widow and 2 children.

Herman Schleper, miner, aged 52 years, married, leaving a widow.

All of these accidents are particularly suggestive of the true accident risk inherent in mining operations. It is impossible to foresee or foretell in many cases what a man may do or to determine afterwards why he did what was apparently contrary to the rules and common sense. The fact remains that miners, including men of years of experience, will take chances or risks, and without fatal consequences in so many cases, that the assumption of apparently needless risk becomes almost a habit of life. Men like miners, who are continually surrounded by dangers, simply could not do their work effectually if they were constantly conscious of the perils that surround them. Only upon this ground can it be explained why such an accident as the first of the above could happen; but it will be noticed that the two men who lost their lives were ignorant of the English language, which is rather a trite cause for their indifference to advice. In simple truth, they did not know, or at least did not comprehend, the real danger involved in the climbing of the shaft, and they paid for their ignorance with their lives.

Other cage accidents involve the most serious responsibility of hoisting engineers. In English experience, during 1898-1907, to which we have no corresponding data, out of 768 fatal shaft accidents 202 occurred while the men were ascending or descending, or 26.3 per cent of the whole.^(a) Accidents of this kind are rarely due to identically the same cause, and each requires to be separately investigated, and with great care. Accidents such as the second of the above group involve technical considerations which can only be dealt with properly by experienced mine managers and mining engineers. Mining methods, however, have advanced sufficiently far to warrant the opinion that such an accident as is there described could be made practically impossible by proper safety devices. The same is true of the fifth accident, where the engineer lost control of his engine, and of the seventh, where the engineer fainted and fell on the lever, reversing the engine, etc. Effective safety precautions could have prevented the third accident, but it is rather doubtful if this would hold true for the fourth and the sixth. The worst accident was the last, which involved the loss of 6 miners' lives and made 6 women widows and 19 children fatherless. How the accident occurred, what the surrounding circumstances were, whether it could have been prevented, or who was held responsible, is not made clear by the brief account, which has been given exactly as contained in the official report for 1906. Surely, an accident of this kind, involving the most vital element of mining practice—that is, safety in the transportation of men into and out of the mine—demands, as a

^a Report of a committee appointed by the Royal Commission on Mines to Inquire into the Causes of and Means of Preventing Accidents from Falls of Ground, Underground Haulage, and in Shafts. Cd. 4821, London, 1909, p. 3.

matter of public concern, that all the facts having a bearing on the occurrence should at least be published, so that they may at least contribute to the perfecting of methods and means by which similar accidents may in the future be made impossible.

Underground haulage, or coal transportation from the breast to the surface, requires the use of mine cars which are propelled chiefly by mules or electric motors. In Illinois in 1908 there were 88 coal mines in operation using mechanical traction other than cables, chiefly electric, but including 4 compressed air and 3 gasoline motors. There were 32 mines using cable transportation and 283 mines using mules, and finally, 4 mines using hand power. By tonnage the distribution of hauling methods was as follows:

HAULAGE METHODS IN ILLINOIS COAL MINES, 1908.

Haulage method.	Number of mines using.	Tons of coal transported.	Per cent of total.
Motors.....	88	19,024,665	39.8
Cables.....	32	3,273,753	6.8
Mules.....	283	25,482,634	53.3
Hand.....	4	28,678	.1
Total.....	407	47,809,730	100.0

The kind of motive power must necessarily vary the personal accident liability, but the facts are not conclusive as to whether one or the other form of haulage is decidedly the more dangerous. During the 5 years ending with 1908 the official report gave details of 14 fatal accidents to miners, due to mine cars, chiefly run-over casualties or crushed between cars and walls. Riding on loaded cars is forbidden, but miners often disobey the rule, as shown in the third of the specimen illustrations of accidents of this kind given below:

FATAL ACCIDENTS TO MINERS DUE TO MINE CARS.

October 31, 1903. Three men were killed in an accident in the Newsam Company mine at Farmington, Fulton County: Myron McKann, Ernest Anderson, and Jack Williams. The men were riding in a pit car drawn by a mule. In making a turn near a switch the car jumped the track and ran into the side of the entry, knocking down a prop, thus letting down a portion of the roof on the men. McKann and Anderson were instantly killed and Williams died a half hour later. McKann leaves a widow and 5 children; Williams, a widow and 2 children; Anderson was a single man.

March 17, 1904. Gust Erricson, miner, aged 53 years, married, in the employ of the McLean County Coal Company, Bloomington, McLean County, was almost instantly killed by being run over by empty pit cars. In this mine there is tail-ropo haulage, and for a distance of 3,000 or 4,000 feet there is a double track, with a separate rope for each track. Erricson, having finished his day's work, had started to walk to the shaft bottom; on his way he was overtaken by the loaded trip, in the middle of which was an empty car in which some men were riding to the bottom. It appeared from the evidence at the coroner's inquest that Erricson attempted to get into that car when he was struck by the empty trip, which was passing on its way inside, and knocked under the cars. He died in ten or fifteen minutes after being taken from under the cars. He leaves a widow and 4 grown children.

December 13, 1905. Wesley Batson, miner, aged 43 years, married, was employed at the Pittenger & Davis No. 3 mine, Centralia, Marion County. Deceased was riding on top of a loaded truck and was caught between the load and the roof, receiving injuries from which he died December 21, 1905. He leaves a widow and 4 children.

January 4, 1906. James Winning, miner, aged 66 years, married, employed at the Hafer Washed Coal Company, Cartersville, Williamson County, was walking toward the bottom of the shaft; a driver was going in with a trip of cars, having his back to the mule, guiding the cars over a switch. Deceased did not notice the driver coming, and the cars struck him on the right side. He died 12 hours after the accident, and leaves a widow and 11 children.

March 23, 1907. John Grushalla, miner, aged 56 years, married, was fatally injured by being run over by a trip of cars in mine No. 2 of the Superior Coal Company at Benld, Macoupin County. He had finished his day's work and was waiting, with others, to be hoisted to the top, when a trip of cars was sent to the bottom. Deceased started across the track just at the time the trip arrived and was knocked down and under the cars. He died that night. He leaves a widow and 5 children.

April 8, 1907. Ricardo Milani, miner, aged 41 years, married, was killed instantly by having his head crushed between loaded pit cars in the Illinois Third Vein Coal Company's mine No. 1, Ladd, Bureau County. This accident took place about 7.15 a. m., when the miners were leaving the shaft bottom to go to their working places. Deceased, in passing along between the full and empty tracks on the shaft parting, met a driver with a three-mule team and a trip of loaded cars coming out. Instead of getting on the empty track and out of the way, he got on the full track and was caught between the loaded trip of cars coming out and a trip of loaded cars standing on the shaft parting. He leaves a widow and 3 children in Italy.

January 16, 1908. Ben Grosso, miner and extra driver, aged 19 years, single, was killed instantly by being crushed between loaded pit cars and the side of the entry in the No. 3 mine of the Spring Valley Coal Company, Spring Valley, Bureau County. Deceased was engaged as an extra driver at the time of the accident. The day of the accident he was driving a mule in the thirteenth north, off the main west entry; he was longer in coming to the parting with his loaded trip than usual; another driver who was waiting at the parting for him to come out went inside to look for him; this driver found the mule and trip of two loaded pit cars, and a short distance beyond found the body of Grosso lying partially on the track, dead. There were no witnesses to the accident, and it can only be assumed that he fell or was knocked from his seat on the loaded pit car and caught between the cars and side of the entry.

In considering accidents of this kind it is necessary to take into account the actual condition underground and the important fact that the "breast" of the mine, or the working place of the mine, is often a considerable distance from the shaft. This explains why men often persist in riding on the loaded cars, contrary to rules, since it is only the loaded cars that return to the shaft, where they are hoisted to the surface. It is also quite often the case that the haulage roads are too narrow to permit of the safe passage of a miner between moving cars, and in the darkness or semidarkness confusion is natural and often followed by fatal results. Car accidents underground are not so essentially different from car accidents on the surface, except that they are probably more common in the case of drivers of mules or motors than of railroad engineers. The accidents given in detail are self-explanatory, but the facts are deserving of careful study as an aid to preventive efforts which shall make such occurrences more or less impossible. Strict supervision of underground haulage by experienced men, instead of a let-alone policy, and the strict enforce-

ment of the rules prohibiting riding on loaded cars will aid materially toward this end. It may also be said that many accidents are the result of poor equipment, defective railroad switches, frogs, etc., while others are due to the absence of effective signaling apparatus, double tracks where feasible, etc. Considering the large loss of life due to car accidents underground, causing 116 deaths, in Illinois during the 5 years ending with 1908, out of 859 fatalities due to all causes, or 13.5 per cent, the subject demands more qualified attention than has heretofore been given to it.

In the handling and use of large quantities of explosives a considerable risk is incurred, even on the part of the most careful of mine employees. The explosives risk, for reasons which can not be fully discussed here, has always been rather high, and, as shown by Table XXIII of the appendix, the rate of fatalities due to this group of causes has been 5.02 for Illinois during the decade ending with 1908 against 3.75 for all the coal fields of North America. The quantity of powder and dynamite used in coal mining in Illinois is relatively very large. In 1908, in 702 mines with 59,943 men, 1,328,454 kegs of powder were used to produce 45,172,171 tons of coal, or 23.51 kegs per man, or 32.28 tons of coal were produced per keg of powder consumed. In some of the coal-mining districts the proportion, however, was very much higher, and particularly so in the fourth, where only 10.42 tons of coal were produced to every keg of powder used. The tendency has been distinctly toward a disproportionate increase in the use of powder, as measured by a ratio of 40.71 tons of coal produced per keg in 1900 against 35.02 tons in 1904 and 32.28 tons in 1908. Merely from an economic point of view the subject is deserving of attention, since the aggregate cost of the powder used in 1908 was \$2,324,795, or \$38.78 per person employed.^a In commenting upon the excessive use of powder in Illinois mines, it was said in the Twenty-third Annual Report on the Statistics of Coal for 1904 that—

According to the table of classified causes, one-half of the fatal and nonfatal accidents resulted from falling coal and rock. It is impossible to determine the per cent of accidents listed under this head, due to the use of powder, although the majority of them accrue in the districts where the method of blasting off the solid prevails. Whatever the causes, whether they result from the lack of knowledge in the preparation of blasts, the drilling of dead holes, the adulteration of explosives, the accumulation of dust on the roadways, blasting off the solid, or the indifference or carelessness of men accustomed to the dangers of the miners' occupation, the death rate particularly is entirely too high and some other measures should be tried to reduce it. It was hoped the law passed by the last general assembly, limiting the quantity of powder to be used in any one blast, would dimin-

^a Twenty-seventh Annual Coal Report of the Illinois Bureau of Labor Statistics, 1908, p. 110.

ish the fatalities heretofore due to that source. The law has been in force nearly 2 years and the number of fatal accidents, instead of diminishing, has, in fact, increased. Either its requirements have not been observed by the miners or the facts are strangely out of joint with our expectations. Of the several propositions that have been offered, two are worthy of some consideration. The first, proposed by representatives of the coal operators, is that the present run-of-mine system be abolished and the miners required to undercut or shear the coal. To require that all coal be undermined would, to a very great extent, dispense with the necessity for powder and naturally avoid the accidents due to the use of explosives; and that regardless of whether the present system of paying for mining coal is to be continued or not. The objections urged to this plan are twofold: First, that the mine-run system of this State is provided for by contract presumably satisfactory to both interests and which, under its terms, will continue to operate until the 31st of March, 1906, and second, the low rate of mining fixed by the same contract, was made possible in consequence of the general and recognized practice of blasting off the solid. If the interest of the mine operators in the cause of reducing accidents, is strong enough and sincere enough to warrant a return to the methods of the pick miners, and their employment favored in preference to that of the coal "butcher," then they must be prepared to concede a substantial advance in the mining rate fixed for the thicker seams.

On the other hand the miners, or many of them, think the number of accidents would be materially lessened through the enactment of a law requiring the employment, at the company's expense, of men to be known as shot firers, whose duties would be, after the miners had quit work for the day, to visit each working place and discharge such shots as in their judgment should be fired. It is obvious that under this plan, whatever explosions might occur, only the lives of the firers would be exposed and imperiled, and their number would not exceed four in the larger class of mines. So terrific has been the force developed from blown-out shots that some of our most competent and experienced inspectors assert that under certain circumstances they would not be surprised to learn at any time of scores of men being killed as the result of an improper blast. Another evident point in favor of this plan is that it would tend to educate men in the use of explosives and in the proper preparation of shots. The miner who drilled a hole dead or located it in such a manner that the powder had no possible chance of doing the work expected of it, would be punished in the most effective way by having no coal to load the following morning. He could profitably put in the day learning the forgotten art of pick mining or change the location of the shots. The law, if one is passed, should be explicit in delegating to the shot firer the discretion and authority of firing or not, according as his judgment suggested the propriety or safety of doing so. The anticipated objection to this plan on the part of the employers would be that of requiring them to pay for that class of labor. It is claimed by those who favor this method that financially the operators would be the gainers, that there is from 20 to 30 minutes lost every day by miners and company men on account of the present general practice of shooting at or about quitting time. If this contention can be sustained the saving of nearly half an hour's time during every work-

ing day would more than compensate the operators for the additional expense incurred on account of the employment of shot firers. While the employment of shot firers would no doubt materially reduce the number of fatalities resulting from explosions, the precaution of the miners, where coal is blasted off the solid, should go further and require the shot firers to prepare as well as discharge the blast. By thus divorcing the workmen from all connection with explosives the cause of accidents from that source would be entirely removed, while it would reduce to a minimum the dangers to which the shot firers are necessarily exposed. The immediate necessity for doing something to reduce or prevent the occurrence of accidents is everywhere apparent and it is the result, more than the medium, through which it is hoped to reach it that is most desired.^(a)

After calling attention to the fact that 1,027,373 kegs of powder were used in Illinois coal mining during 1906, and that the amount of coal produced to powder used had been 33.25 tons per keg, the report states:^(b)

Where the mining is done exclusively by machines the product per keg was 101 tons. In the powder-using mines, where machines are not employed, the product was 27 tons to the keg. These figures can not be construed in any other light than a criticism, either of the qualification of the men now employed in the mines, or as a rebuke to their work methods. It requires no further inquiry to condemn any system of mining necessitating the use of powder where the actual results, as in this case, yield but a fraction over 1 ton to every pound of powder burned. These facts, regrettable as they are, fully confirm and justify, in the interest of life, the necessity for and the wisdom of that provision of a recent law requiring that all employees shall be out of the mines during the process of blasting.

In the face of such a situation, the merest consideration for human welfare demands that an unskilled hand should not be permitted to touch a deadly explosive where the life of an innocent person may be involved. Instead of removing any of the safeguards, which recent legislation has placed about the mine workers, it will in the future be necessary, unless a different and better qualified class of men be employed, to absolutely prohibit them from handling or being in any way connected with dangerous explosives. Under the present practice the only lives endangered are those of the shot firers. While the law leaves much to their discretion in the matter of shots that ought not to be fired, they are in many instances forced to take chances, and the death roll among that class since the new regulations became effective indicate with what fatal results. The provisions of the law, that not to exceed a certain amount of powder shall be used in any one blast, have been persistently disregarded by careless, indifferent, and incompetent men. As the person now designated as shot firer has no means of determining the quantity of powder in a blast, particularly where fuse is used, his life is in peril every time he lights a shot.

^a Twenty-third Annual Coal Report of the Illinois Bureau of Labor Statistics, 1904, pp. 2, 3.

^b Twenty-fifth Annual Coal Report of the Illinois Bureau of Labor Statistics, 1906, p. xvi.

The only effective way of avoiding such contingencies, thereby saving the lives of the shot firers, is to absolutely divorce the present class of miners from all contact with powder or other explosives. This plan contemplates the employment of a corps of practical men in each mine where coal is blasted off the solid, men specially trained in that line of work, with a thorough knowledge of the power which explosives of all kinds exert, whose duty it would be to drill, prepare, and explode all blasts. This system would leave to the so-called miners the work chiefly of loading coal, a task for which only most of them are adapted. Nothing short of a plan of this kind will solve the problems which the situation presents. It is a useless waste of valuable time enacting laws requiring that only so much powder shall be used, that drill holes shall be made at a certain angle from the free face of the coal, etc. These are terms that only those educated in the business understand, and but very few of that class are now in the mines. Such regulations might be effective if made for the guidance of intelligent men specially fitted for that work, but not otherwise. Objections to the plan here suggested, which is, in fact, but an extension and completion of the present system of shot firing, may be urged on the ground of expense, and that whether the operator, the miner, or both contribute to meet it. A sufficient reply to such an argument if founded on facts would be that the saving of life is a consideration more important than the saving of dollars. The work of drilling holes and preparing shots would add considerably to the present duties of the shot firers, and consequently require the employment of more men, probably three times the number now employed in that connection. Would this necessarily mean more expense? The purpose of the plan is not alone to save life through the more careful and intelligent preparation of shots, but also to avoid the loss consequent upon the burning of so much unnecessary powder. This report shows that 1,027,373 kegs of powder, equal to 13,000 tons, were burned in the mines this year, being an increase of nearly 90,000 kegs over 1905. Powder at prevailing prices sells for \$1.75 per keg of 25 pounds. According to this calculation, the miners paid in 1906 for powder alone nearly \$1,800,000. Much of this property, representing great value, was practically wasted in the hands of incompetent men. It is entirely safe to state that fully one-half of the powder used was burned not in making, but in destroying coal. If the use of powder in the hands of trained men could perform double the work, as we think it would, then under the present practice the direct money loss to the miners was equal to \$900,000, saying nothing of the loss sustained by the mining plant and the consuming public, accruing from the production of an inferior quality of coal. Instead of an additional expense, under the plan proposed the saving effected would prove the best financial investment the mining industry could make.

In continuation of this discussion in a later report it is said that:(^a)

More than one-third of the entire tonnage was cut by machines. Notwithstanding an unfavorable machine mining rate the quantity

^a Twenty-seventh Annual Coal Report of the Bureau of Labor Statistics, 1908, pp. 2 and 3.

of coal secured through the use of machines continues to steadily increase. Naturally with an increased machine tonnage the quantity of powder used in blasting would decrease proportionately. The figures show the reverse to be true, and that while the machine tonnage for this year compared with last increased 719,969 tons there was an increase of 66,544 kegs in the quantity of powder consumed, or an average of 34 tons of coal to each keg of powder.

The coal miners attribute the increase to the fact that powder is cheaper than formerly and therefore inferior in strength. The powder companies insist that there has been no change either in the composition of the product or in the process of its manufacture. It would seem unnecessary to seriously consider either of these claims, but where the facts show that it requires the consumption in solid shooting mines of nearly 1 pound of powder for every ton of coal produced, the results can not be considered in any other way than as a condemnation of existing methods. In the thick coal seams of the State, furnishing 73.3 per cent of the total product used, and the ratio will continue to increase, powder or some other explosive equally powerful will be necessary in the process of extracting coal, whether it is undercut before shooting or not. The question therefore resolves itself to the simple proposition whether, having in view the conservation of life and property, we shall continue to commit to incompetent and careless hands the use of dangerous explosives or provide, either by statute or mutual agreement, that only men specially educated and trained for such work shall be employed whose exclusive duty it shall be to drill holes, charge, and fire the same. In commenting on this question in the 1906 coal report, in which such a plan was recommended, reference was made to the great and unnecessary expense entailed in the present promiscuous use of powder. On the assumption that fully one-half of the powder consumed was practically wasted, a loss that could be avoided under the proposed plan, in addition to the saving of lives and the production of a better quality of coal, it was estimated that nearly \$1,000,000 could be saved annually to the miners.

So terrific have been some of the explosions in our coal mines that had they occurred while the usual complement of men were at work not a single life would have been spared. It was the consideration of such a possibility that induced the legislature to create the shot-firers law effective July 1, 1905. That law was and is subject to the fair criticism that it transferred the responsibility from the man who prepared the improper shot to the man whose duty it now is to fire the shot. The friends of that law could do no other than admit the truth and force of such an objection, but in answer thereto set up the justifiable plea that if the lives of the men had to be sacrificed in such work it was the part of wisdom to expose the least number possible to the deadly fury of the blast.

Taking the years from 1903 to 1908, inclusive, three years preceding and three years succeeding the enactment of the shot-firers law, it is found that the loss of life directly due to the use of powder is nearly 40 per cent less during the three-year period that the law has been in operation, during which time there has been a very material increase both in the tonnage and in the number of men employed. It was the intention of the law to protect the shot firer in his refusal to fire shots which in his judgment were dangerous.

The foregoing extended extracts clearly emphasize the dangerous nature of mine work in Illinois, and the statistical tables from year to year show the resulting loss of life. Among the 423 descriptive accounts of fatal accidents to miners in Illinois during the 5 years ending with 1908, there were 24 which were the direct result of powder or dynamite explosions, 11 were the result of premature blasts, 23 the result of defective methods of shot firing, and 18 deaths were caused by flying coal after explosions, a total of 76 deaths, or 18 per cent of the whole number attributed to the use and handling of explosives. To a considerable extent the different groups are really identical, since it is next to impossible, if indeed proper, to differentiate between shot-firing accidents, as such, and deaths resulting from flying coal, or undue exposure to the immediate effects of blasts. The same is true of premature blasts, and it is only by a careful study of individual cases that light is thrown upon the nature and surrounding conditions of accidents of this kind. The following are descriptive cases of fatal accidents to miners due to powder explosions, most of which were apparently not directly related to shot firing or blasting:

FATAL ACCIDENTS TO MINERS DUE TO POWDER EXPLOSIONS.

August 21, 1903. Alfred Stockton, miner, aged 32 years, married, was killed at the Higbee Coal Company's mine located at Princeville, Peoria County. Deceased fired a shot which ignited two kegs of blasting powder. The deceased, who was responsible for the accident, died after lingering in agony for over 24 hours. He was working in a room next to his brother William; after he had fired the shot he noticed that his keg of powder had not been put in the powder box, and before he had time to reach the keg the shot in his room exploded. It proved to be a windy shot, which overturned the keg, spilling the powder on the roadway. The flame from the shot fired his keg of powder, which in turn overturned his brother William's box, containing a keg of powder that had been opened, firing it also. William Stockton was very badly burned, but is expected to recover. Since writing the above he is again working in the mine. Deceased leaves a widow and 3 children.

May 11, 1904. This date records the terrible explosion of powder in the mine of the Big Muddy Coal and Iron Company, Herrin, Williamson County. Four men were instantly killed, as follows: Richard Raines, driver, aged 34 years, married, leaves a widow and 2 children; John Miller, driver, aged 22 years, single; Fred Selberg, pumpman, aged 24 years, married, leaves a widow and 1 child; Evan Williams, driver, aged 21 years, single. Eighteen other employees were more or less severely injured by this explosion, 6 of whom died, as follows: May 16, Sherid Busch, miner, aged 29 years, married, leaves a widow and 4 children; John Swafford, miner, aged 40 years, married, leaves a widow and 4 children; Carlo Lualdi, miner, aged 29 years, single. May 25, Thomas Green, driver, aged 36 years, married, leaves a widow and 3 children; Louis Branco, miner, aged 29 years, married, leaves a widow and 2 children, and May 26, William Stagner, miner, aged 24 years, married, leaves a widow. In addition to the 10 men here enumerated as meeting death by this explosion, 12 others were so severely injured that they were not able to return to work July 1, 1904.

In explanation of the causes leading up to this explosion, it would seem that there was a lack of proper precaution in sending powder into the mine. It was the custom at this mine, up to the time of the explosion, for a driver to take the powder that was to be used by the men in the mine, into the mine in the mine cars and deliver it to the miners, a limited time being given to the driver to reach the inside workings before turning on the electric current. On this

fatal morning a driver started with 6 kegs of powder in his car; with him were 1 or 2 other drivers. It is supposed that the car ran into the wire, which was down; the cause of the explosion, however, can only be conjectured, as the drivers who were in the car were instantly killed. It is understood that the company at once took up the matter of damages with the widows and other representatives of the men who were killed or injured, and have made liberal settlements with all with one exception.

The seven following accidents were caused by the *explosion of 30 kegs of powder* in the mine of the Johnston City and Big Muddy Coal and Mining Company, located at Johnston City, Williamson County, at about 11.30 a. m. January 29, 1907.

The practice of handling powder and delivering it at the mine was as follows: The miners order the powder at the office; these orders are given to the teamster, who hauls the powder from the powder house and delivers it at the top of the shaft; the powder is then loaded into a mine car and sent down the shaft; from the bottom of the shaft the powder is taken north 120 feet where the main east and west entries are turned off of the north entry. Three men were employed at the time of the explosion unloading the powder from the mine car and placing it north of the tracks for distribution; one of these men was in the car handing the powder to another man outside of the car; this man then passed the kegs to the third man to be placed where the different drivers would get the powder at this point, and take it into the miners who had ordered powder for that day. I am of the opinion that the explosion was due to the rough handling of the kegs of powder when taken from the mine car and to where the powder is placed, which is 12 feet from the car and 6 feet 6 inches from the north rail. There was no coal dust nor fire damp near the point of the explosion; Frank Meagher was handing the kegs of powder out of the car to Jess Davis, Davis in turn handing the kegs to Martin Lawry, who was placing them in the place as described.

Following are the names, ages, occupation, etc., of the seven men:

George Patterson, bottom laborer, aged 26 years, single, living at Johnston City, died at 11 p. m., January 30, 1907.

Martin Lawry, driver, aged 25 years, married, living at Johnston City, died at 10 p. m., January 29, 1907, and leaves a widow and one child.

Jess Davis, driver, aged 25 years, married, living at Johnston City, died at 3.30 p. m., January 29, 1907, and leaves a widow and one child.

Romulus Fenrenboker, driver, aged 20 years, single, living at Johnston City, was instantly killed.

Claus Morse, cager, aged 46 years, widower, living at Galatia, died January 31, 1907, leaving one child.

Phelix Toner, bottom laborer, aged 27 years, married, living at Murphysboro, died at 9 p. m., January 29, 1907, and leaves a widow and one child.

Frank Meagher, flagman, aged 17 years, single, living at Johnston City, died at 4 p. m., January 29, 1907.

July 1, 1907. Louis Cologna and August Genette, miners, were killed by an explosion of powder and Joseph Welsh severely injured in the Consolidated Coal Company's No. 17 mine near Collinsville, in St. Clair County; and Edward Evans, a boy 12 years of age, was scalded to death at the Bessemer Washed Coal Company's mine at White Oak, St. Clair County, October 9, 1907. On Saturday night, June 29, 1907, Joseph Genette and Joseph Yadra, two miners, from Glen Carbon, Madison County, went to the No. 17 mine of the Consolidated Coal Company, going down the stairway of the escapement shaft and into the working place of Louis Cologna and August Genette (which was the face of the main north entry); they opened the powder box belonging to Cologna and Genette, which contained parts of two kegs of powder, and fixed up an infernal machine, consisting of a double-barreled pistol, with wires attached to the trigger of the pistol, and so connected to the lid of the box that when the lid was lifted the pistol would explode and set off the powder. On Monday morning, July 1, 1907, Louis Cologna and August Genette, in company with Joseph Welsh, went into the mine to go to work. As soon as they got within 100 feet of the working face, where the powder box was standing, Louis Cologna started to open the powder box. He had lifted the lid about one-quarter distance up when an explosion occurred, throwing all three men to the ground; Cologna and Genette were severely burned; Cologna died at noon the same day; Genette died July 4, 1907; Joseph Welsh is yet alive, but will not be able to work as a miner again.

Through the good services of the city marshals of Glen Carbon and Collinsville and the State's attorney of St. Clair and Madison counties, Joseph Genette, a cousin of August Genette, was arrested for the crime; he afterwards confessed that Joseph Yadra and himself had planned the infernal machine which killed Louis Cologna and August Genette and severely injured Joseph Welsh. Joseph Genette and Joseph Yadra are now both serving life terms in the state prison for the crime.

As regards the death of the boy, Edward Evans, his brother, Roy Evans, was night engineer at the White Oak mine; the boy was in the boiler room; his brother, Roy Evans, was standing on a box working at the feed pipe of the boiler with a wrench; the feed pipe bursted and the boy, standing near it, was scalded to death. Roy Evans, the engineer, was also severely scalded.

August 2, 1905. Eli Davidson, miner, aged 63 years, single, and William Corwin, miner, aged 22 years, married, were both killed by an explosion of powder in the Carlinville Coal Company's mine, Carlinville, Macoupin County. Davidson was putting powder into a keg from a can when a spark from his lamp fell into the powder, causing an explosion which killed Davidson instantly, and injuring Corwin so badly that he died August 13, following. It is evident that Davidson had his light on his head while he was handling the powder, and doubtless knew that he was violating the mining law in not hanging his light at least 5 feet away, and in such a position that the air current could not convey the sparks to the powder. I mention this that others may take warning. Corwin leaves a widow and 1 child.

July 5, 1907. Wenzell Ludzka, miner, aged 28 years, married, was killed in a mine of the Citizens Coal Mining Company, Sangamon County. Deceased was in the act of taking powder out of his kegs when a spark from his lamp ignited the powder, the explosion causing his death. He leaves a widow and 1 child.

September 28, 1907. John Adamities, miner, aged 32 years, married, lost his life in the mine of the Illinois Midland Coal Company, Springfield. Deceased stuck his pick into a keg of powder to open it; the powder was ignited and exploded, burning him to death. He leaves a widow and 4 children.

October 28, 1907. Valentine Lepusbetz, miner, aged 36 years, married, was killed under very strange conditions in the mine of the Citizens Coal Mining Company at Lincoln. In my investigation of this case it was found that the shot firer had begun firing the shots in the mine 1 hour before the proper firing time, and while the miners were still in the mine. In questioning Oscar Menzel, the shot firer, in regard to the cause of Lepusbetz's death, he said that the man came out onto the entry and asked him for a squib to light his shot; that he gave Lepusbetz a squib; that afterwards he went into the man's room, after the shot had exploded, and found deceased lying on the gob with the back of his head fractured. He leaves a widow and 1 child.

March 5, 1908. Louis Montibo, miner, aged 31 years, married, was killed by the explosion of a keg of powder. Deceased was preparing the powder for a shot; he filled 1 cartridge and stood it against the rib, his lamp lying on the bottom about 4 feet from him; the cartridge that was against the rib fell over toward the lamp, connecting the powder with the flame of the lamp, which in turn exploded the keg of powder in the hands of deceased, burning him so that he died a few hours afterwards. He leaves a widow and 2 children.

All of these accidents and many others occurring under practically identical conditions are extremely instructive. The direct cause of the accident in most cases was "a spark from a lighted lamp fell into a powder barrel," resulting in an explosion, with fatal consequences. It would seem needless for one to fill cartridges underground by the dim light of an open miner's lamp, but it seems to be a common practice, though, as stated above, in violation of the mining laws. How far accidents of this kind are preventable is an open question, although it would seem that the shot-firing law should effectually safeguard underground workers against accidents of the kind here described. That this is not accomplished is made clear in the account given above of the case which occurred on October 28, 1907.

Quite different are the conditions and circumstances under which premature blasts take place with fatal results to the workmen underground. Of 12 accidents described in more or less detail in the report for the 5 years ending with 1908, the following may be considered typical cases:

FATAL ACCIDENTS TO MINERS DUE TO PREMATURE BLASTS.

May 14, 1907. Eugene Lenzi, miner, aged 42 years, married, was severely burned by the explosion of powder in the No. 6 mine of the Braceville Coal Company, Braceville, Grundy County. Deceased was preparing to fire a shot and found his blasting barrel was clogged. After filling off a small piece of the barrel he inserted and lighted a squib, which failed to pass through the barrel. He then inserted a second squib and thought that it had passed through the barrel. After this preparation he commenced to fasten the barrel to the cartridge, when the powder ignited, burning him severely about the face and body. It is supposed that a spark was hanging fire in the barrel, which caused the powder to ignite. He was taken to the hospital in Joliet, where he died 8 days after the accident. Deceased leaves a widow and 5 children.

October 31, 1903. Ivy Murdock, miner, aged 29 years, married, was severely burned by powder and bruised by coal flying from a premature blast in Moore and Wahlstrom's local mine, located near Coal Valley, Rock Island County. Deceased had charged a drill hole with loose powder, and was in the act of ramming it to the back of the hole with an iron scraper; it is assumed the scraper struck a piece of sulphur, which generated a spark, igniting the powder and the explosion followed. The heel of the shot was blown off by the explosion, and the coal flying therefrom struck the deceased, bruising him severely on his head and body. He died from the injuries received 6 hours after the accident. Two other miners were in the room visiting with Murdock at the time of the explosion; one was severely and the other one slightly burned. Deceased leaves a widow and 3 children.

January 12, 1904. Charles Westerfield, miner, aged 21 years, single, was killed instantly by being struck on the head and body by coal flying from a premature blast in the Wyoming Coal Company's mine, Wyoming, Stark County. The deceased, with his brother, were working in a room; they had drilled a hole about 5 feet in depth and had charged it with powder, and had commenced to tamp the blast; they had about 2 or 3 inches of tamping on the powder when the explosion took place. A copper needle and copper-tipped tamping bar were used in accordance with law. Just how this accident could take place under the conditions stated at the inquest is quite difficult to determine. The brother of the deceased was severely injured.

June 7, 1906. John Roach, miner, aged 55 years, married, was severely injured by coal flying from a premature blast in Cook & Rohr's local mine, located near Alexis, Warren County. Deceased was working in partnership with his son, a young man about 17 years of age, and according to the son's statement they had prepared a blast, tamped the hole, and his father had some difficulty in igniting the match to the squib. He had tried to do so two or three times and failed. He held his lamp under the match when the blast suddenly exploded. The loose coal flying therefrom struck him on the left side, breaking his thigh and injuring him internally. He died from the injuries received 12 hours later. Deceased and two other miners were all that were employed in the mine. He leaves a widow and 6 minor children, 3 of whom, however, can scarcely be classed as dependents.

December 3, 1907. Edward Joiner, miner, aged 34 years, married, employed at the mine of the Franklin County Collieries Company, Sesser, was fatally injured. The miners were double shifting entry work and had four shots prepared, three in the face and one on the right hand rib, to shoot skip off. The four shots had been lighted, three with fuse and one with squib. Deceased and others had gone to the mouth of the entry, and thinking that all the shots had been heard to explode returned to see what the shots had accomplished. When Joiner got opposite a skip shot it exploded, blowing him against the rib, breaking his leg, and bruising him so badly that he died 4 days later. He leaves a widow and 1 child.

Of these accidents the first two precisely illustrate a danger difficult to guard against, even on the part of cautious miners with years of mine experience. The danger is simply inherent in the work, as such, and in fact due more or less to factors beyond the understanding or control of even the most experienced workmen. This can hardly be said of the last two, in which a considerable and self-evident risk was voluntarily assumed by miners with years of experience. How far rules and regulations can guard against accidents of this kind is a question for mine managers and mine inspectors to decide, but apparently the matter is one left largely to individual judgment, however poorly equipped the miner may be to arrive at a safe estimate of the risk incurred by acting upon his own best understanding in matters of this kind.

Practically identical with the fatal results in most cases of premature blasts are deaths due to flying coal after explosions. In both class of accidents the men returned too early to the breast of the mine, naturally anxious to finish the day's work without needless delay. Deaths caused by flying coal are common in case of premature blasts, but the following are typical illustrations selected out of 22 specifically reported in detail in the official reports for the 5 years ending with 1908. All of these accidents, except one, occurred previous to 1908:

FATAL ACCIDENTS TO MINERS DUE TO FLYING COAL AFTER BLASTS.

October 13, 1903. George Faust, miner, aged 19 years, single, employed in the Ruby Coal Company's mine, Caseyville, St. Clair County, was killed by flying coal from a shot which he had fired. He was standing behind a pillar for safety; the shot blew through the pillar.

April 25, 1904. Adolph Crizzati, miner, aged 24 years, married, was instantly killed in the north side mine of the Chicago-Carterville Coal Company, Herrin, Williamson County. Deceased had fired a shot which he evidently thought had exploded, as he had returned to investigate; when within about 18 feet of his working place the shot went off, the flying coal striking him about the head and body. He leaves a widow.

February 11, 1905. Alexander Capron, miner, aged 30 years, married, employed in the mine of the Assumption Coal and Mining Company, Assumption, Christian County, was instantly killed on the right-hand side of his working place by a fall of rock about 3 p. m. This was an accident that could not have been foreseen or guarded against, as there was a slip in the roof which lay outwards from the face of the coal, the mine being worked long wall, and as soon as the coal was taken down the rock, which was about 10 feet long, 4 feet wide, and 2½ feet thick, fell between the coal face and the building, catching Capron, crushing out his life. He leaves a widow and 2 children.

June 28, 1905. A. B. Moore, miner, aged 36 years, married, was killed instantly by being struck on the head with coal flying from a blast in the Alden Coal Company's mine No. 2, Wanlock, Mercer County. Deceased, with his partner, was driving an entry north; coming toward them from the south was a room, to be used as an air course when connection was made. These places had come so close together that the mine manager, fearing that one or the other might blow through, had given orders to the miner driving south not to fire his shots, but leave them ready, and company men would fire them after quitting time. The last-named miner disregarded the orders and agreed with deceased to give him due notice before lighting his shot; the intervening coal had become so thin that they could talk to each other. Both parties prepared

their shots; the miner driving south gave the usual signal that he was going to light his shot, and did so. The flame from his shot evidently exploded the powder in the hole coming from the opposite direction, tearing off the heel of the shot in the entry, and coal flying therefrom struck deceased. He leaves a widow and 1 child.

March 29, 1906. Elisha Bean, miner, aged 45 years, married, employed at the Shoal Creek Coal Company's mine at Panama, Montgomery County, was instantly killed by coal flying from a shot that he had just lighted. It is supposed that the squib was defective, because he had not moved away when the shot went off. He leaves a widow and 3 children.

May 13, 1908. Joseph Macke, miner, aged 35 years, married, was fatally injured by flying coal; died July 22, 1908. Deceased was working with George Ehret, who was killed by a premature blast, when coal flying from the blast that killed Ehret struck him, bruising him very severely. He was at work loading a mine car when the flying coal struck him. He leaves a widow and 2 children.

The circumstances in accidents of this kind vary, but they would appear to be chiefly the result of needless exposure or needless assumption of risk. Pillars of insufficient size account for quite a number of accidents, as illustrated in the first of the above accidents; erroneous assumption of what has taken place accounts for others, and some, as shown in the third case, evidently could not have been foreseen. A lack of discipline is brought out in the fourth case, in which it is admitted that spoken orders had been disregarded, and, no doubt, indifference to rules and regulations accounts for many accidents of this kind. There is probably much truth in the charge, frequently made, that a poor quality of powder and fuse are responsible for a number of these accidents, as in the fifth case, where it is brought out that the squib was at least supposed to be defective.

Shot firing is one of the most responsible duties of the miners in coal fields in which shot firers are not specifically required to be employed by law. The Illinois law to this effect became effective July 1, 1905, and it is claimed that as a result accidents due to defective shot firing, or reckless exposure to the effects of premature blasts, etc., have decreased among the miners of that State. There have been 23 fatal accidents due to shot firing of miners in Illinois during the 5 years ending with 1908, and of these a number of typical cases are given below. Of the number reported in detail in the report, 4 occurred subsequent to the passage of the shot-firing act.

FATAL ACCIDENTS TO MINERS, DUE TO SHOT FIRING.

July 15, 1903. Harry Mills, sr., miner, aged 62 years, widower, was killed at the Ubben Coal Company's mine, Pekin, Tazewell County. Deceased was returning to his room to fire a second shot; at the same time William Houtts fired a shot in a crosscut, in the adjoining room, which blew through the pillar just as Mills was opposite the shot. His neck, arms, and legs were broken. He leaves 2 orphan children.

August 7, 1903. Henry Herpine, aged 37 years, married, was killed instantly in the Kolb Coal Company's mine No. 1, Mascoutah, St. Clair County. He was in the act of charging a hole, and was pushing the powder back with a scraper. In doing so the scraper struck a sulphur, causing sparks, which ignited the powder; an explosion occurred with the result as stated. He leaves a widow and 4 children.

March 3, 1904. George O. Sherer, miner, aged 25 years, single, employed in the Pittenger & Davis mine No. 3, Centralia, Marion County, was preparing to charge a shot; the cartridge lodged halfway in the hole; in trying to cut it with an iron drill, to make it free, the drill caused a spark which ignited the powder, the explosion injuring him. He died March 11, 1904.

March 22, 1904. T. G. Kelley, miner, aged 40 years, married, was killed at the East Peoria Coal Company's mine, located at East Peoria, Tazewell County. Kelley had prepared 2 shots in his room, one of which had exploded, but the other hung fire; after waiting a short time he asked another miner, Doering, to go into the room with him to light the shot; as they entered the room they observed the burning fuse, Kelley ran to seize it with the intention of pulling it out; just at that moment the shot exploded, killing Kelley and burning Doering. Deceased leaves a widow and 3 children.

June 21, 1904. Robert Edwards, miner, aged 50 years, married, employed by the Kellyville Coal Company at mine No. 2, Kellyville, Vermillion County, was instantly killed by the explosion of powder while attempting to force the charge back that had stuck in the drill hole; he used an iron tamping bar, which evidently produced a spark, igniting the powder. He leaves a widow and 2 children.

August 1, 1904. Benjamin Clina, miner, aged 17 years, single, was severely burned and bruised by an explosion of powder in the Alden Coal Company's mine No. 4, located near Viola, Mercer County. Deceased was working in partnership with his grandfather. On the Saturday evening previous a blast had been prepared, but missed fire or failed to explode; the first act of the young man Monday morning following was to commence drilling out the missed shot, using a common steel pointed churn drill. When the work had progressed far enough to reach the powder, the drill undoubtedly struck a piece of sulphur on the side of the drill hole; this generated a spark and an explosion as a matter of course followed, burning him severely on the face, breast, and arms. The force of the explosion threw him 10 or 12 feet across the room, breaking his leg and otherwise severely bruising him. He died from the injuries received 12 hours after the accident.

August 28, 1905. Erastus Bridges, miner, aged 58 years, married, working in the Green Ridge Coal Company's mine at Green Ridge, Macoupin County, was drilling out a missed shot (in violation of the mining law) when for some cause the shot exploded, killing him instantly. He leaves a widow and 1 child.

January 12, 1907. Louis Phillippi, miner, aged 29 years, married, was killed instantly while in the act of drilling out a shot which he thought was a wet hole, as water was running out of the blasting barrel. This shot had been tamped the day before. Deceased was using a churn drill, which must have struck a piece of sulphur, igniting the powder. This accident occurred in the mine of the Duquoin Coal Company, Duquoin. He leaves a widow.

October 22, 1907. Joseph Claybrook, miner, aged 63 years, married, employed at the Majestic Coal and Coke Company's mine, Duquoin. Deceased was preparing a shot for the shot firers, and in some way caused an explosion, burning his face and bruising him with flying coal. He died about a week after the accident. He leaves a widow and 3 children.

March 10, 1908. Walter Schlebo, miner, aged 28 years, single, employed in the mine of the Tilden Coal Company, Tilden. Deceased was taking tamping out of a shot and thought he had it all out. His partner ran a churn drill into the hole when the shot exploded. The men were removing the tamping for the reason that the shot had failed to explode, when the squib was placed by the shot firers it was found that the hole had not been properly tamped. Schlebo was blown on top of a pit car, standing near, and fatally injured in the chest and abdomen.

A considerable number of cases have been included in this group, in view of the unusual importance of accidents of this kind, and the varying conditions under which they may take place. They include full accounts of unusual occurrences, as well as of cases which are more or less typical. It is made evident that many of the men killed could not possibly have been aware of the risk assumed in their efforts to drill out missed shots, or in performing duties which are properly the function of experienced shot firers. Drilling out un-

used shots, as emphasized in the seventh of the above cases, is in violation of the mining laws, but such violations appear to have been common previous to the passing of the shot-firers' law of 1905. The serious risk inherent in the placing and firing of shots is now limited to a single responsible individual, the shot firer, but, as will subsequently be shown, a large number of fatal accidents occur among this class of labor, so that it may still be considered an open question whether the actual results of the act have been as beneficial as anticipated.

Fatal accidents due to gas, or gas and dust, explosions are comparatively rare in Illinois, but, possibly, the statistical information regarding the true number of accidents of this nature is inconclusive, as the result of defective methods of classification. According to a table of fatal accidents by causes,^(a) there have only been 43 casualties due to fire damp or black and white damp in the State of Illinois during a period of 21 years, but it is evident that quite a number of deaths due to these causes have been included in the group of blasts and explosions. In any event, the great accident of 1905 at Ziegler, which caused the death of 53 men, was due to a gas explosion, or, more properly, a gas and dust explosion, but this accident is included in the group of deaths due to blasts and explosions, although only deaths caused by explosives should be so classified. Errors of this kind in classification are quite common in the tabular analysis of mine inspectors' reports, to the evident disadvantage of a clear understanding of the facts reported upon. The great disaster at Cherry, Ill., on November 13, 1909, which caused the loss of 266 lives, was due to a gas and dust explosion combined, and there are strong reasons for believing that as the result of an increasing use of machines and electricity, as well as increasing depth of mines, such explosions will be more general in the future than they have been in the past.

During the 5 years ending with 1908 there have only been 7 deaths of miners specifically reported as due to gas explosions, or asphyxiations, and these are all given below in detail, as extracted from the annual reports. It will be noted that 3 of the deaths occurred in 1908.

FATAL ACCIDENTS TO MINERS AS THE RESULT OF GAS EXPLOSIONS OR ASPHYXIATIONS.

August 5, 1904. William Sloan, miner, aged 19 years, single, was killed in the Wilmington and Springfield Coal Company's mine, Springfield, Sangamon County, by suffocation. He went back on shots previously fired and was overcome by the smoke and gases from the shots.

September 6, 1906. Harry Hall, miner, aged 39, married, employed by the Lake Creek Coal Company, was fatally burned. His death was caused by the

^a Twenty-seventh Annual Coal Report of the Illinois Bureau of Labor Statistics, 1908, p. 150.

ignition of gas in the entry where he was engaged in cutting down a standing shot; the fall caused a draft that brought the gas down on the light, which was sitting on the ground. He was burned so severely that he died 3 days afterwards. He leaves a widow and 2 children.

October 27, 1906. Richard Spezia, miner, aged 30 years, married, employed by the Chicago and Carterville Coal Company at mine "A," was killed by an explosion of fire damp in the first east entry on south side of the shaft. He leaves a widow and 2 children.

September 7, 1907. Four men were killed this date. There was a gas explosion in the Dering Coal Company's No. 11 mine, West Frankfort. The night shift was putting in a stopping to close off a body of gas and was working under the directions of a certified mine manager; the stopping was nearly completed, causing the gas to back up against the decreasing current of air; the gas was ignited by the lamp of one of the party, burning 22 men, of whom the following 4 men died from the effect of the burns, all being Italians: Joe Caruso, miner, aged 21, single; Peter Gigole, miner, aged 18, single; Joe Perconti, miner, aged 36 years, married; he leaves a widow and 4 children; B. Trimcoeli, miner, aged 22 years, single. Eighteen others were burned more or less severely, all of whom except 5 left West Frankfort. I was therefore unable to secure their names and the time lost resulting from the burns endured.

January 11, 1908. James Cousart, miner, aged 27 years, married, employed at mine No. 4 of the O'Gara Coal Company, Harrisburg, Saline County, was fatally burned by igniting the gas in his working place in the No. 12 west entry. Both Cousart and his partner were warned of the presence of gas on the morning of the accident. They removed the board bearing the examiner's mark on the morning of the accident, and supposed they had brushed all the gas out before going to work. After loading one car, Cousart's partner, H. Clark, lighted the gas, which fatally burned Cousart; Clark was not burned at all, on account of his lying down. Deceased leaves a widow and 2 children.

January 25, 1908. August Henri, miner, aged 32 years, married, working in the Stonington Coal Company's mine at Stonington, Christian County. Deceased was severely burned by an explosion of gas and died from the effects 2 days later. He was sent by the mine manager with a naked light to clear away some slate in a room known to contain 7 feet of gas overhead. He leaves a widow.

February 12, 1908. Jasper Nealan, aged 50 years, single, miner, employed at the National Mining Company's mine, Eldorado, Saline County, was, with two other men, opening up a fire that had been sealed up; two of the men had safety lamps. Nealan went in after them with an open lamp; when he reached the first open crosscut the gas from the lighted lamp exploded, blowing him against the rib, fracturing his skull.

It is evident that the groupings of deaths due to gas inhalation or explosion require to differentiate between gases or vapors resulting from the use of explosives and true cases of mine gas inhalation and deaths caused by the explosion of such gases and of such gases in combination with coal dust. The first of the above accidents emphasizes the risk of undue exposure to gases or vapors resulting from the use of explosives, while the second and fifth are typical cases of gas burns as the result of the accidental ignition of mine gas. The third and fourth are true cases of fire-damp explosion.

The sixth accident in this group is typical of a curious disregard of warnings and a more or less open violation of the mining laws. It has been difficult in all mining States to enforce the use of locked safety lamps in gaseous mines, and particularly so in supposed-to-be gaseous mines, as brought out in the description of the seventh case. That two men, making use of known safety precautions, should have had their lives placed in jeopardy by a foolhardy indifference to an apparent danger is only one of the many evidences that the lives of

the best men are menaced by the recklessness, ignorance, and indifference of the worst. But that the men are not alone at fault in this respect is made clear by numerous individual cases, where fire bosses failed to do their duty or give proper warning or insist upon the men keeping out of dangerous parts of mines, known to them to be gaseous as the result of personal inspection. Even more serious is the fault of coal mining companies in this respect. The Ziegler explosion, which occurred on April 3, 1905, may properly be referred to in this discussion of accidents due to gas explosions. Among the killed were a district mine inspector and a mine examiner. Next to a serious accident in 1883, causing the loss of 69 men in consequence of the flooding of a mine, the Ziegler disaster was the greatest in the history of the State previous to the calamity at Cherry in 1909. The joint report of the state mining board and the state mine inspector upon the Ziegler disaster, dated April 20, 1905, reads in part as follows:^(a)

We find that the mine had not been legally examined since March 23, 1905. Under the mining law in force in this State, every mine must be examined every morning before the men are permitted to enter the mine, the examination to be made by a duly qualified person, whose ability to perform such duties are certified to by the state mining board. This requirement was not observed during the period herein stated.

We also find that the mine has been operated in violation of the mining laws, in not having the crosscuts made at the proper distance, which is 60 feet apart.

On entry C, 225 feet south of the second west entry, is located a powder room, the dimensions of which are approximately 7 feet high, 10 feet wide, and 20 feet deep, in which the officials of the company state that 43 kegs of powder, 1½ boxes of masurite (which is a low grade of dynamite), also a quantity of detonating caps, the number unknown, all of which had been exploded.

Having this powder and explosives stored in the mine is in violation of the mining law.

From a statement made by the officials of the company, in which they say the fan was stopped at 11.30 p. m. March 31, 1905, at which time all of the men were called out of the mine, owing to the ventilation being cut off and the mine generating marsh gas.

When the fan was stopped they depended upon the three air compressors to produce ventilation, which was not sufficient to ventilate the mine.

Notwithstanding the above condition, the men were permitted to enter the mine Saturday night, Sunday night, and Monday morning, and at 7.10 a. m. April 3, 1905, the explosion occurred.

The fan was again started at 5.30 p. m. on the same day, before the rescuing party entered the mine.

^a Twenty-fourth Annual Coal Report of the Illinois Bureau of Labor Statistics, 1905, p. 3 et seq.

We are of the opinion that the amount of air furnished by the three air compressors was not sufficient to ventilate the mine, but was sufficient to render the marsh gas explosive.

To make the facts as clear as possible, the following is quoted from the report of the state mine inspector of the third district, who examined the mine after the explosion. After referring to the company's book of record, showing that the mine examiner had reported the presence of explosive gases between September 1, 1904, and March 25, 1905, it is stated that no examination of the mine had been made since that date, which was in violation of the following section of the mining law of the State:

SECTION 8 (par. g). It shall be unlawful for the operator of any mine to employ, or suffer to serve as mine examiner, any person who does not hold a certificate of competency issued by the state mining board: *Provided*, That anyone holding a mine manager's certificate may serve as mine examiner.

Mr. Thomas Carraher, a noncertificate man, made the examination March 23 and 24, and report book shows no examination March 25 and 26. Mr. Mike Canfield made the examination for March 27 and March 31, 1905. He is not a certificated mine examiner or mine manager.

The mine, in fact, was filled with dangerous and explosive gases, and so much so in places that the work of restoring the mine to a working condition would have been long delayed but for the use of rescue apparatus, the practical value of which is referred to by the inspector as follows:

The company having two Vajen-Bader head protectors which had never been used, I put one on and entered the poisoned atmosphere of No. 1 entry and succeeded in taking down the brattice, thereby allowing the fresh air to enter at No. 3 entry and drive out the gases from Nos. 1 and 2 entries. This could not have been accomplished without a head protector.

After giving in detail an account of the quantity of explosives stored in the mine, contrary to the law, reference is made to section 20 of the mining law, which reads:

No blasting powder or other explosives shall be stored in any coal mine, and no workman shall have at any time more than one 25-pound keg of black powder in the mine, nor more than 3 pounds of high explosives.

The fact that the gas explosion caused a powder explosion was no doubt the reason why this accident was classified with casualties due to blasts and explosions, although it is clear that the original cause was a gas explosion and not a powder explosion.

There would seem to have been no doubt in the minds of those who officially inquired into the disaster that the direct cause was defective

or interrupted ventilation, permitting of the accumulation of explosive gases, which, if the ventilating fans had been in proper operation, would probably have been removed from the mines. That the ventilation was not in conformity to section 19 of the mining law is held to have been the case in the opinion of the examining inspector of the third district, who reports:(^a)

I found that the ventilating fan had been stopped at 11.30 p. m. Friday, March 31, 1905, at which time one of the mining officials gave instructions to call out all the men from the mine, owing to the ventilation being cut off. The compressors were at work at the time of stopping the fan and were depended upon to produce ventilation from 11.30 p. m. March 31 to April 3, the morning of the explosion. The three compressors were expected to ventilate this mine, having no less than 1,786,000 cubic feet of space in entries and rooms opened up in which 47 men and 5 mules were working. The catalogue capacity of these compressors is given as 1,200 cubic feet of free air per minute. Taking this as a basis, we have for the three compressors 3,600 cubic feet of air per minute.

Section 19 of the mining law states that throughout every coal mine there shall be maintained currents of fresh air sufficient for the health and safety of all men and animals employed therein, and such ventilation shall be produced by fan or some other artificial means.

The fan being stopped, the men were permitted to enter the mine on Saturday and Sunday night, and again on Monday morning, the day of the explosion, without the mine having been examined by anyone. This is shown by the inspector's book. The quantity of compressed air produced at the working face was not sufficient to produce a lawful amount of ventilation for the men and mules in the mine at the time of the explosion.

This official report, which has not been successfully contradicted, concludes with the following statement in regard to the management of the operating company, responsible for the safety of the men:(^a)

In conclusion, I am of the opinion that the explosive gas in the third east crosscut from entry B to entry A, known to the miners as the stone heading, was ignited accidentally by a common miners' lamp (an open lamp), in possession of one of the 17 men who had gone there to work, as all of these men had naked lamps.

This mine had been operated up to the time of the explosion in violation of the mining laws.

In a separate report, made by a qualified mining and ventilating engineer, Mr. J. G. Massie, to the governor of the State, occurs the significant statement that—

This mine is laid out for the adoption of the best system of ventilation now known to the science of mining, but the ventilation applied to this system is the oldest and most primitive known to mining.

^a Twenty-fourth Annual Coal Report of the Illinois Bureau of Labor Statistics, 1905, p. 3 et seq.

And further (a)—

Now, the facts briefly stated, as I believe, are: There were 41 kegs of powder in the powder rooms, below ground, and about 150 men on the two shifts, and it is only fair to assume that there were not less than 75 kegs of powder at the faces of the working places; that is to say, half a keg for each man. This would be 116 kegs of powder in all. Now, the fan stopped from Friday evening until the time of the explosion, so the ventilating current was also stopped, and all the air that went into the mine was sent in through the two-inch pipes to 7 dead ends, just barely sufficient to prepare an explosive mixture of the most violent nature. The mine was known to generate fire damp. This their report book shows. It also shows the mine was not examined Saturday or Monday. The result—a magazine ready for the flame to set it off. There were two separate and distinct explosions from 2 to 3 seconds apart. The first was the gas and the powder at the working faces, the second the 41 kegs in the powder room; the first explosion burst the kegs and set them off; the first explosion was the most violent; it went up the air shaft; the second went up the hoisting shaft, that being the line of least resistance. I further believe the mine manager is the man who ignited the gas, he having been found about 75 feet further in advance of the workmen. I asked the general manager why he took such desperate chances, or words to that effect. He replied, that at every step since the mine had been started the state inspector of mines had been consulted, and all their work had the stamp of approval of the State. I asked him if he could produce that evidence, if called upon to do so, and he replied that he could. The facts herein stated are self evident.

Finally, all the facts and official evidence were summarized in a report by the secretary of the bureau of labor, which incidentally throws much light upon the then existing labor conditions in the third district, reading in part as follows:(^b)

The reports made by the different investigators are substantially the same. As to the cause of the explosion, all agree in attributing it to gas. That the mine was being operated in violation of the plain provisions of the mining law of this State no one seriously disputes. The records kept by the company itself show that the mine generated gas; furthermore, that certain daily examinations were made by employees who did not have the certificate authorizing them to perform such work, and that for several days just preceding the explosion the mine had not been examined at all. Upon the strength of this testimony the attorney-general of the State secured several indictments against the company and its agents. The verdict of the coroner's jury sought to exonerate the company by holding that the disaster was due to a powder explosion, thus indicating a criminal purpose to blow up the mine. Considering the special precautions the company had taken to protect its property, this conclusion reflected upon the integrity of the jurymen and invited the suspicion that the men conducting the inquest had been selected for the pur-

^a Twenty-fourth Annual Coal Report of the Illinois Bureau of Labor Statistics, 1905, p. 10.

^b *Idem*, p. 11.

pose of shielding the company. There was certainly no evidence to warrant such a finding. To support such a theory it would be necessary for the jury to suppose that certain men were willing, in their desire to destroy the property of the company, to sacrifice their own lives. This imposes too heavy a tax on human credulity. To fully understand this phase of the case and the occasion for such a verdict, the explanation should be made that for 9 months preceding the explosion the company had been engaged in a bitter conflict with the miners' union. While the initial cause of the trouble was a disagreement over the scale rate for that mine, following a change from day work to a tonnage basis, this was later lost sight of in the apparent determination of the company to defy and defeat the union. Mr. Joseph Leiter, the owner, a man of most positive character, denied the right of the union to interfere in any way with the management of his property. Having decided upon this course and appreciating the power and influence of the miners' unions, he immediately prepared for a siege. A stockade was constructed and men heavily guarded were stationed around the premises. On the top of the tall tower a rapid-firing gun was placed; also a searchlight, by means of which objects moving in the night could be seen within a radius of several miles. The method of protection was so complete as to make it impossible for anyone to approach within a reasonable distance of the property without being subject to the closest scrutiny. If the person was properly identified and vouched for he was permitted to enter. Notwithstanding this system of espionage the company's officials are represented as contending that some time during the night preceding the explosion some maliciously disposed people eluded the guards, scaled the stockade, descended the mine, and exploded the powder magazine. It would seem that a mere statement of the facts is sufficient to disprove such a contention without attempting any argument to further expose the patent weakness of such a defense. The fact that a jury, in the absence of any investigation, would lend the influence of its verdict to a statement of that kind testifies not so much to the unreliable character of such agencies as to the strong local control exercised by the company's officials in a community of that kind.

The investigation and reports of the several experts who were detailed to examine the premises are notably clear, strong, and unanimous in the opinion that the explosion was the result of gas, which, on account of the impaired condition of the ventilating apparatus, had been allowed to accumulate in excessively dangerous quantities. While the judgment of the investigators is that the powder stored in the magazine and at other places in the mine intensified the power of the explosion, the increased damage from that source must have been comparatively slight. The exploding of 40 or more kegs of powder in the face of such force would have no more effect than the throwing of a splinter into a raging furnace or the pop of a firecracker in the roar of a cannon.

It is unfortunate that official inquiries into mining disasters in America have not been made with the thoroughness and the aid of scientific ability characteristic of the reports made upon mine disasters in England and the continent of Europe. Such a fearful loss

of life should at least have its compensation in resulting contributions to the science of mine management, so that the true cause of such disasters may be better understood with resulting measures and means for their prevention in the future. It may be argued that all that requires to be known in regard to such accidents is practically a matter of record, but that view is shallow and opposed to the scientific character of the present age. In any event, all the important facts which have a relation to the occurrence of fatal and serious accidents in mining should be ascertained with impartial and scientific accuracy, so that the true cause and responsibility for the occurrence may be precisely determined.

Aside from the fatal accidents to miners which have been described in detail, only a few more require consideration. Electrical accidents have not been common in the coal mines of Illinois, and only three such cases have been described in detail in the reports for the five years ending with 1908. Electricity in mining is a factor of increasing importance, but properly installed, electric power need not necessarily increase the actual risk, although it can not be doubted that in practice such an increase has taken place. It is evident that underground installation requires even more careful supervision than electrical installment generally, and indeed the whole subject of electricity in mining deserves to be more carefully considered in its relation to the safety of the men than has heretofore been the case. In 1902 the Census Office reported^(a) that 309 bituminous coal mines in the United States used electricity to the extent of 68,139 horsepower, but since that date there must have been a large increase in the application of electricity to mining proper—that is, drilling, coal-cutting, haulage, hoisting, electric shot firing, lighting, pumping, ventilating, etc. Considering the extensive use of electric currents, it is remarkable that the number of fatal accidents to miners should actually have been so small. In ten years ending with 1908 there have only been five deaths from the direct effect of electricity in the coal mines of Illinois, out of a total of 1,391 deaths, or 0.09 per 10,000, of employees. In the whole coal field of North America there have only been 193 deaths officially recorded due to electricity, out of a total of 18,346 deaths from all causes, or at the rate of 0.35 per 10,000 employed. In detail the three fatal electrical accidents to miners in Illinois have been as follows:

FATAL ACCIDENTS TO MINERS DUE TO ELECTRICITY.

January 8, 1904. John Frew, miner, aged 26 years, single, employed at the mine of the Greenview Coal Company, Greenview, Menard County, was killed while passing over the electric motor. He had finished his day's work and was on his way to the bottom of the shaft, and stopped for a while on the main entry parting until the motor had finished switching; by some means unknown his

^a Special Reports of the Census Office: Mines and Quarries 1902, p. 146.

neck came in contact with the live wire and the shock killed him. The statement that electric generators having only 250 voltage will not kill is disproved by this fatal accident, which took place $1\frac{1}{4}$ miles from the generator, showing that at that distance where the voltage would be less than 250 the shock proved fatal.

May 30, 1905. William Johnson, miner, aged 27 years, single, employed at the mine of the Greenview Coal Company, Greenview, Menard County, was killed while riding on an electric motor, coming in contact with the wire. He had finished his day's work and was riding to the bottom of the shaft.

October 27, 1905. James Gray, miner, aged 27 years, single, employed in mine No. 1 of the Illinois Collieries Company, at Virdin, Macoupin County, was loading a car on an entry where electric wires were strung and hanging within 18 inches of the side of the car. Deceased, in topping the car on the side where the wires were, is supposed to have touched them, as he fell dead into the entry.

These accidents are fully explained in the descriptive accounts and there is nothing exceptional about them which differentiates electrical accidents in mining from such accidents generally. Evidently extreme care is necessary in insulating wires carrying electrical currents underground, since the voltage may run as high as 3,000 and in damp mines the insulating material is easily destroyed. A departmental committee of the British home office, in reporting upon the use of electricity in mining,^(e) properly call attention to the necessity that "the electrical plant should always be considered as a source of potential danger, and this emphasizes the need of thoroughly qualified supervision of all electrical installations underground by a competent person."

Two very curious fatal accidents occurred in Illinois coal mining, both during the year 1907 and in the eighth district, due to the slipping of a crowbar in the act of prying down the coal. The accidents are briefly described as follows:

January 12, 1907. Natal Mental, miner, aged 19 years, single, was killed, being struck by a crowbar, in the Prairie Coal Company's mine near O'Fallon, St. Clair County. He was taking down top coal with the bar, when it slipped, striking him. He was injured internally and died from the effects January 16.

May 28, 1907. James Gussach, miner, aged 47 years, married, was fatally injured by being struck by a crowbar from which he died June 1, 1907. Deceased was in the act of taking down top coal when the bar swung around, striking him and injuring him internally. He was employed in the Mount Olive and Staunton Coal Company's No. 1 mine, near Staunton, Madison County. He leaves a widow and 4 children.

These accidents bring out the incidental dangers of a miner's life, which by its nature involves the exposure to innumerable unknown risks, which no experience can foresee and no wisdom or mechanical devices can entirely prevent. An accident like the following may occur only once in many years, but the implication is the same, of an element of risk which it will always be impossible to guard against with absolute certainty.

January 25, 1905. Peter Greff, miner, aged 30 years, married, was injured by falling over a prop in an old and abandoned room in the Illinois Collieries Company's mine No. 5, Girard, Macoupin County. He died the next day. He leaves a widow and 1 child.

^e Report of the Departmental Committee on the use of electricity in mines. Parl. paper Cd., 1916. London, 1904.

It requires no additional proof to demonstrate the serious risk to human life in coal mining operations as the industry is conducted in the coal fields of North America. While the illustrations derived from the experience of the State of Illinois are not wholly applicable to the conditions in all the coal fields and coal-mining States, it is safe to assume that on the whole the most important dangers are clearly emphasized in the cases cited as more or less typical and suggestive of the true underlying causes. The occupation of the miner is, of course, only one of many employments underground indispensable to coal-mining operations. So numerous are these occupations that consideration of all in full detail would unduly enlarge the scope of the present inquiry. An analysis of the 859 fatal accidents occurring in the State of Illinois during 1904 to 1908 discloses the fact that these accidents occurred among 41 different occupations but not all of these can be specifically dealt with. In other States the number of specific occupations is even larger than in the State of Illinois, and reference may be had to Table X of the appendix for the occupations of the killed in the State of West Virginia.

FATAL ACCIDENTS TO DRIVERS IN MINES.

Out of 859 mine workers killed in Illinois during 1904 to 1908, it appears that 96, or 11.2 per cent, were drivers of mine cars. As has been pointed out in the discussion of fatal accidents to miners, mine cars are a source of considerable risk, even to those who are not employed in their operation, and it is probably safe to assume that the introduction of electric motors has increased this hazard to the miners, the drivers, and other underground workmen. During the 21 years ending with 1908 it is recorded that 218 fatal pit-car accidents have occurred in Illinois, or 10.4 per cent of the total number of fatal casualties, but the large majority of these accidents have been deaths of drivers. The descriptive accounts for the 5 years ending with 1908 include 71 fatal accidents to drivers, of which over half, or 41, were deaths from falls in front of mine cars. Accidents of this kind are due to various causes, but they all have this in common, that the driver was so insecurely seated, or placed, that an unaccustomed jar or unexpected stop caused a loss of balance, with fatal results. The following are typical accidents of this nature, and common not only to the coal fields of Illinois, but to the coal fields of all the other States:

FATAL ACCIDENTS TO DRIVERS DUE TO FALLS IN FRONT OF CARS.

March 1, 1905. Frank Romesburg, driver, aged 27 years, married, was severely crushed by falling in front of a trip of loaded pit cars, in the Empire Coal Company's mine No. 3, Gilchrist, Mercer County. Deceased was coming out of the main north entry with a trip of six loaded pit cars, riding on the tail chain and drawbar of the front car—a customary but very dangerous

proceeding—when by some means he lost his footing and fell in front of the trip. One car passed over him, and he was found under the second one. He died 20 hours after the accident. He leaves a widow and 1 child.

November 11, 1905. John Cummins, driver, aged 28 years, single, was killed in the Dering Coal Company's mine No. 2, being run over by pit cars. This was the first day deceased had worked in this mine. He was bringing his trip down the incline in the mine without sprags. The cars jumping from the track at the foot of the entry passed over him, killing him instantly. He formerly worked in mines at Pana.

September 11, 1906. Robert Gray, driver, aged 20 years, single, employed at the mine of the Chicago and Carbondale Coal Company, was riding in front of a car on the tail chain and fell off, the car running over him, injuring him fatally. He died 3 hours afterwards.

September 19, 1906. George Walton, driver, aged 23 years, single, employed in the mine of the Maplewood Coal Company at Farmington, was instantly killed by a loaded pit car. The deceased was taking a trip of two loaded cars from the parting to the bottom of the shaft; sitting on a seat hung on the front end of the first car; when about 400 feet from the parting the seat became detached from the car, Walton falling in front of the trip; he was dragged about 50 feet.

November 3, 1906. John Kurasotte, driver, aged 18 years, single, was fatally injured in the No. 6 mine of the Big Four Wilmington Coal Company, Carbon Hill, Grundy County. Deceased was attempting to hold a loaded car on the down grade when his foot caught against a tie, causing him to fall in front of the car, which passed over his body. He died the following day.

January 7, 1907. Albert Mauer, driver, aged 24 years, single, employed at mine No. 1 of the Superior Coal Company near Gillespie, Macoupin County, was found dead under the front car of the trip he was taking to the bottom. It is supposed that he was riding on the front end of his trip and fell under the car. This part of the mine has a heavy grade, requiring several sprags. The usual number was found on the trip. His home was in Collinsville, Ill.

May 9, 1907. William C. Hoover, driver, aged 23 years, single, was severely crushed internally by being caught under a trip of loaded pit cars in the Empire Coal Company's mine No. 3, Gilchrist, Mercer County. Deceased was coming down a grade in the eleventh east entry with two loaded pit cars, riding on the front of the car and tail chain, a rather dangerous custom. By some means unknown, as no one was near him at the time, he fell in front of the rapidly moving cars. His light was extinguished. Another driver, following down the grade with 3 loaded cars, not knowing of the accident, ran into the first trip, pushing the front car on top of the deceased. He was extricated as soon as possible and removed from the mine; medical aid was secured, but he died from the injuries 3 hours later.

May 17, 1907. Joseph Bardsley, driver, aged 23 years, single, was severely crushed internally by being thrown in front of a trip of moving loaded pit cars in the Coal Valley Mining Company's mine No. 2, Sherrard, Mercer County. This accident occurred at the parting on the main north entry. Deceased was having some trouble with the mule. He was driving a vicious animal. He had hold of the lines when suddenly the mule gave a lunge with sufficient force to throw Bardsley across from the empty to the full track, where he fell in front of a rapidly moving trip of 2 loaded cars. Before these cars could be stopped the front one ran on to him, crushing him internally. He died from the injuries about 1 hour after the accident.

February 24, 1908. Hubert Morris, driver, aged 22 years, single, was killed instantly by being crushed under a trip of 2 loaded pit cars in the No. 5 mine of the Spring Valley Coal Company, located at Dalzell, Bureau County. The facts as to just how this accident occurred are quite hard to determine, as no one was present at the time. Deceased was coming down a slight gradient with 2 loaded pit cars, riding on the front of the first car, according to custom; and the most reasonable theory is that he lost his balance and fell in front of the rapidly moving cars. He was found under the first car shortly afterwards and was dead when found.

March 11, 1908. Henry Kinse, jr., driver, aged 20 years, single, employed in the mine of the Breese-Trenton Mining Company, Breese. He was pulling a loaded trip down a hill when suddenly the mule kicked him off of the seat, causing him to fall under the cars, which passed over his body. He died 4 days after the accident.

June 22, 1908. Charles Davis, driver, aged 19 years, single, employed at the Saline Coal Company's No. 1 mine, Ledford, Saline County, was killed while driving in the fourth west entry. Deceased, when about 100 feet from the main east entry, was told to stop and was heard to say, "I can't stop," but he turned the mule and fell under the car, which was not coming fast. His sprags were found on top of the car. A number of men were standing close by and in 2 minutes had the car taken off of him; there was room for him to have gotten on the side of the road out of the way of the car.

June 27, 1908. Harry McClane was found dead under a mine car in the O'Gara Coal Company's mine No. 10, Eldorado, Saline County. Deceased was employed as a driver; aged 32 years and single. The cause of the accident is not known, but it is supposed that he was in the act of unhitching his mule, and that his foot slipped on the rail and he fell in front of the car; when he was found the car was on his head and shoulders; there was no one present when the accident occurred.

It is difficult to determine how far any or all of these accidents could have been prevented by different methods of haulage or improved mine cars. It would seem possible that the method of "spragging," which is the equivalent of braking, could be improved, and that a safe seat or some protective device could be applied to mine cars to secure the driver more effectually than is at present the case. The "customary but very dangerous proceeding" of "riding on the tail chain" should be prohibited under severe penalties, if security to life can not be otherwise obtained. It must be taken into consideration that drivers are as a rule young men, mostly between 15 and 25, often just married or fathers of families of small children. The descriptive accidents of this class are certainly suggestive of a legitimate duty to provide in some manner against their common occurrence to the extent indicated by the returns of the State of Illinois.

Somewhat similar in the nature of their surrounding circumstances, though due to different causes, are the fatal accidents resulting from drivers being crushed between cars or between cars and the wall of the driveway. Of such accidents 20 have been described in detail in the official reports for the 5 years ending with 1908. Of these, one-half were caused by drivers being crushed between two cars, 6 by drivers being crushed between cars and the "coal rib" or wall, 2 by being crushed between cars and doors; 1 was crushed between a car and a prop and 1 between a mule and a loaded car. Of these the following are typical illustrative cases:

FATAL ACCIDENTS TO DRIVERS DUE TO BEING CRUSHED BETWEEN CARS, CARS AND WALLS, ETC.

June 28, 1905. Thomas McGray, driver, aged 24 years, married, employed in the Moweauqua Coal Mining and Manufacturing Company's mine, Moweauqua, Shelby County, was instantly killed by being crushed between a mule and loaded pit cars.

December 29, 1905. William Overly, driver, aged 18 years, single, employed at the Peabody Coal Company's mine No. 2, Marion, Williamson County, lost his life while driving a team of mules and riding in front of the car. The lead mule stopped, causing the rear mule to back up. Deceased, in jumping off of the car, was caught between the car and rib. He was injured internally and died 1 week later.

January 27, 1906. Penly Johnson, driver, aged 17 years, employed at the Royal Colliery Company's mine at Virden, Macoupin County, was caught between a loaded car and a partly opened door, which he was trying to open to let the mule and car go through, and injured, from the effects of which he died February 1, 1906.

July 25, 1906. Lawrence Bowman, driver, aged 25 years, single, employed at the No. 1 mine of the Illinois Collieries Company, Virden, Macoupin County, was bringing out a trip of loaded cars to the double parting where other loaded cars were standing, and while unhooking his mule did not get out of the way in time to avoid being caught between his trip and the standing loads. He lived about 8 hours.

March 13, 1907. Ora Haahn, driver, aged 22 years, single, was killed in I. Wantling & Co.'s mine, Elmwood, Peoria County. The cause of this accident is unknown. When deceased was found his body was lying on the side of a loaded car, with his right shoulder and head in front of the wheels of the third car, it being a three-car trip; his cap and lamp were found at a distance of about 15 feet in the rear of the trip; his lamp was crushed but was still hooked in the cap. He was found by the shot firers at about 3.30 p. m. and was dead.

November 29, 1907. Peter Ostrowski, driver, aged 21 years, single, was seriously injured in the Oglesby Coal Company's mine, Oglesby, Lasalle County. Deceased, with three other men, were riding out on the motor trip, which is against the rules of the company; while the trip was going up grade, the loaded cars became detached from the motor; when the cars began running back, Ostrowski jumped to one side, but was caught between the rib and the cars and was dragged about 50 feet; both legs were broken and he was injured internally. He was taken to the hospital in La Salle, where he died 3 hours after the accident.

The most suggestive of these accidents is the last, in which it is admitted that the deceased was acting contrary to the rule, but in most of the cases it is evident that the accident was more or less unavoidable and the result of inherent risks in the employment. It may be said, of course, that if the driveways were wider accidents of this kind would be next to impossible, but it is often a most costly proceeding to provide wider roadways, although the question of cost in a matter of this kind should be of secondary consideration. Important differences in this respect will be found in the case of large and well-managed mines, but no careful inquiry has been made to determine how far the actual conditions are responsible for accidents of this kind. As far as it is possible to judge of the cases which have occurred, the responsibility does not, as a rule, lie with the driver, who at best has a most difficult and dangerous duty to perform under most trying conditions and particularly in the case of vicious animals, which are gradually being replaced by electricity or cable haulage systems.

Quite a different class of accidents is represented by the following series of cases, of drivers riding on the top of loaded pit cars, and, as a rule, contrary to specific orders against what is well recognized to be a most dangerous practice, which is also often indulged in at their peril by miners and other underground employees.

FATAL ACCIDENTS TO DRIVERS RIDING ON TOP OF LOADED CARS.

October 17, 1903. Tony Claretz, driver, aged 35 years, married, was fatally injured in Mrs. E. Hakes mine, Rutland, Lasalle County. Deceased was coming down grade with a loaded trip and was sitting on the front end of the car,

when his head struck against the roof, breaking his neck; he died the following day. He leaves a widow and 2 children in Italy.

February 16, 1904. William Loveland, driver, aged 23 years, single, employed at the mine of Spoon River Coal Company, Ellisville, Fulton County, was killed 100 feet from bottom of the main shaft, on the main north entry, where there is a curtain hung across the entry. He had made one two-car trip and went back to make another, but did not have time to get two cars, so started to the bottom with one; throwing the coal back from the front end of car that he could have a seat, and passing under the curtain, which is held up by a 2 x 8 inch board, he struck his forehead against the board, throwing him backward on the coal on top of the car, crushing his skull.

July 17, 1905. Desire Herroin, driver, aged 24 years, single, was seriously injured in the No. 1 mine of the Lasalle County Carbon Coal Company, La-salle County. Deceased was coming out with loaded trip, and was sitting on the front end of the car; his head was caught between the roof and the loaded car, fracturing his skull. He was removed to the hospital, where he died the following day.

March 15, 1906. David Frances, driver, aged 26 years, single, was seriously injured by being caught between the roof and a loaded car in the No. 4 mine of the Wilmington Coal Mining and Manufacturing Company, Braidwood, Grundy County. He died 1 week after the accident occurred.

October 4, 1907. Silas Webb, driver, aged 21 years, single, lost his life in the mine of the Tuxhorn Coal Company, Keyes. Deceased was riding on top of a loaded car; his head was caught by a cross-bar.

November 24, 1907. Matt Krenosz, driver, aged 22 years, single, working in the mine of the Christian County Coal Company, Taylorville, was watering the roads, driving with a very high iron tank, riding in front and standing on the drawbar; looking backwards while passing a place where the entry was very high he unexpectedly came to a low place where his head was caught between the roof and the top of the tank, killing him instantly.

Accidents of this nature are of much the same character as similar accidents among railway brakemen, who occasionally are killed by being struck by overhead bridges and passageways. The precautions which are taken for the safety of railway employees do not appear to have been generally if at all adopted in coal mines, although it would not seem impracticable to do so. Some of the accidents appear to have been the result of a necessary assumption of risk, as, for illustration, in the last of the above cases, but it is practically impossible, in view of the more or less indifferent information, to arrive at an absolutely accurate conclusion. The practice of riding on the top of cars may occasionally be justified by necessity and unless a proper and safe seat is provided for the driver, it would seem useless to insist upon compliance with a rule which in practice can not be carried out.

Among the miscellaneous causes of fatal accidents to drivers in coal mines are falls of roof or slate, which caused 6 deaths during the 5 years ending with 1908; cars jumping tracks caused 2 deaths; 1 man was kicked off his seat by a mule; 1 was crushed by a cage, being employed both as a driver and a cager; 1 fell down a shaft; and 3 were killed in other ways, described in detail below:

FATAL ACCIDENTS TO DRIVERS DUE TO MISCELLANEOUS CAUSES.

November 27, 1908. James McClarnon, driver, aged 24 years, married, was killed by falling slate in the Capital Cooperative Coal Company's mine at Springfield, Sangamon County. The mine car jumped the track, knocking out the props and crossbars, causing the slate to fall on him. He leaves a widow.

February 12, 1904. George Weindel, teamster, aged 37 years, married, employed by the Trenton Coal Company, Trenton, Clinton County. Deceased was sending a carload of cap pieces down the shaft; thinking that the cage was at the bottom landing, he pushed the car forward and into the shaft; the cage was not there and the car went to the bottom, taking him with it and killing him instantly. He leaves a widow and 5 children.

July 17, 1905. Charles Jenkins, driver, aged 18 years, single, employed in the Illinois Collieries Company's mine at Girard, Macoupin County, was killed by being kicked off his seat by his mule, throwing him under the cars.

October 21, 1905. Robert Welsh, driver, aged 23 years, single, was injured by a falling niggerhead in the McLean County Coal Company's mine at Bloomington from the effects of which he died November 14, 1905. The deceased was on his way out with his mule and car to the bottom of the shaft, having finished his day's work. There were 5 men riding in the car, while Welsh was sitting on a seat hanging over the front end of the car. The accident occurred on the main hauling road fully one-half mile from his usual working place. His mother, who is a widow, was dependent on him.

November 21, 1905. Arthur Kepler, driver, aged 56 years, married, in the employ of the Monarch Coal and Mining Company, at Farmington, Fulton County, was instantly killed by being crushed between the side of the shaft and the floor of the cage. The deceased was employed both as driver and cager. About 7.30 a. m., after the miners had descended into the mine, the engineer signaled for an empty cage; Kepler gave the return signal and then stepped onto the cage and attempted to cross over to the opposite side and was caught, with the result as stated. He leaves a widow and 6 children.

November 2, 1906. Anton Motto, driver, aged 32 years, single, had his leg severely crushed between an empty pit car and a cog in the Marquette Coal Company's mine located at Marquette, Bureau County. Deceased was going in with a trip of 2 empty cars. On coming to a switch he failed to guide the cars in the proper direction; therefore, the mule went straight along, the cars running into the switch. Motto jumped in front of the cars to stop them, but failed, and they were pulled off of the track against the cog, crushing his leg. He was removed to the hospital at La Salle, where the leg was amputated, but he died of lockjaw November 14, 12 days after the accident.

May 30, 1907. Haley Haff, driver, aged 33 years, married, was killed in the Black Diamond mine, Auburn. One of the cars of his trip jumped the track, knocking out a prop which struck him on the head, causing his death in 3 hours. He leaves a widow and 3 children.

September 24, 1907. George Pritchett, driver, aged 22 years, single, employed by the Saline County Coal Company, Ledford, Saline County, was killed while waiting at the double parting for empty cars to come in from the shaft bottom; the cars did not come as expected, and deceased went into a crosscut and lay down to wait. A piece of slate weighing about 100 pounds fell on his head, crushing his skull. The accident occurred on the main south entry, about 600 feet from the shaft bottom.

October 2, 1907. Haze Burnett, driver, aged 30 years, married, employed at the Brilliant Coal Company's mine, Duquoin. Deceased was coming out of an entry with a trip, when one of the cars jumped the track on the curve; he was riding on the seat, and in getting off made a misstep; the car caught his foot, cutting it at the base of the little toe, crushing the same. He died from blood poisoning October 2, 1907, and leaves a widow and 2 children.

These accidents require no extended comment. They all emphasize the perilous danger of the driver's occupation, and the last case especially proves the serious risk involved in the neglect of comparatively trivial injuries. It is made clear by the preceding illustrations that the driver's occupation in mining must be included among the dangerous occupations, subject to inherent risk and various unfavorable conditions, beyond the control of the employee himself.

FATAL ACCIDENTS TO SHOT FIRERS.

Shot firing, whether by miners or shot firers, is dangerous work, even when all known precautions are employed, including the firing

of blasts by electricity. The Illinois shot firers' law went into effect July 1, 1905, but it is held that the desired effects have not all been realized. The law is briefly referred to and discussed in the Twenty-seventh Annual Coal Report of the Illinois Bureau of Labor Statistics, 1908, pages 3 and 4. In part, as follows:

So terrific have been some of the explosions in our coal mines that had they occurred while the usual complement of men were at work not a single life would have been spared. It was the consideration of such a possibility that induced the legislature to create the shot firer's law, effective July 1, 1905. That law was, and is, subject to the fair criticism that it transferred the responsibility from the man who prepared the improper shot to the man whose duty it now is to fire the shot. The friends of that law could do no other than admit the truth and force of such an objection, but in answer thereto set up the justifiable plea that if the lives of the men had to be sacrificed in such work it was the part of wisdom to expose the least number possible to the deadly fury of the blast.

Taking the years from 1903 to 1908, inclusive, 3 years preceding and 3 years succeeding the enactment of the shot firer's law, it is found that the loss of life directly due to the use of powder is nearly 40 per cent less during the 3-year period that the law has been in operation, during which time there has been a very material increase both in the tonnage and in the number of men employed. It was the intention of the law to protect the shot firer in his refusal to fire shots which, in his judgment, were dangerous.

The causes from which many shot firers have lost their lives indicate either that many of them were selected without considering their qualifications for such employment or that their judgment was defective. No matter what the cause, whether bad judgment on the part of the shot firers or undue haste in the discharge of their duties or a desire not to offend miners whose shots were not properly located or prepared, the law has not been given a fair trial. The deaths in most instances resulted from the firing of dead holes, which is strictly forbidden by the law. If the enforcement of the law had been entrusted only to men particularly equipped for that kind of work, the percentage of loss would have been considerably less.

Of the 29 fatalities reported this year as a result of using powder, 14 were shot firers and 15 miners; 7 of the miners lost their lives in an ignorant and unlawful effort to prepare shots, which is an additional reason why some plan should be adopted that would entirely divorce the present class of miners from all connection with deadly explosives.

The descriptive accounts of fatal accidents to shot firers in Illinois seem, on the whole, to confirm this view. Between July 1, 1904, and June 30, 1905, there occurred 5 fatal accidents against 41 deaths of shot firers between July 1, 1905, and June 30, 1908. Of course, the periods are not of equal length, but the large number of deaths since the law went into effect is at least suggestive of defects, which require to be remedied if the necessary security of the men is to be attained. The following cases have been selected as typical accidents before and sub-

sequent to the enactment of the shot-firers' law, which, as stated, went into effect July 1, 1905.

FATAL ACCIDENTS TO SHOT FIRERS, DUE TO GENERAL CAUSES.

January 16, 1904. F. A. Street, firer, aged 29 years, married, employed at the mine of Clark Coal and Coke Company, located at Limestone, Peoria County. He, with his brother, S. Street, were firing a shot in number 11 room off of the sixth east entry. In this room they had fired 3 shots, 2 with sulphur and 1 with gas squibs; 2 of the shots exploded, and thinking that the third had also exploded, they went back. About the time they got within 10 feet of the shot it exploded, killing F. A. Street and injuring his brother. Deceased leaves a widow and 3 children.

September 29, 1905. William Krueger, shot firer, aged 45 years, married, was killed by flying coal at the Sangamon Coal Company's mine No. 2. Deceased and his partner, Thomas Rambrough, had lighted 2 squibs, 1 a gas, the other sulphur, and had withdrawn to a safe place. One squib, afterwards shown to be the sulphur, fired on time, the gas squib hung, and after waiting a time considered long enough to cover any danger, the 2 men went into the working place. Krueger was ahead, the shot exploding when he was within a few feet of it. He leaves a widow and 1 child.

December 17, 1907. John Wanshor, shot firer, aged 24 years, single, was killed in the mine of the Lincoln Mining Company, Lincoln. Deceased went back to examine a shot before it had exploded. The shot firers were using both sulphur and gas squibs. His partner informed me that he had just passed the switch and that deceased had not had time to place another squib in the hole when he saw Wanshor blown against the rib of the entry, a distance of 30 feet.

It will always be a difficult matter to guard against accidents of this kind, for errors of judgment are inevitable when the governing impulse is to produce results quickly, or where errors of judgment are inevitable on account of the more or less unfavorable conditions underground. When two or more shots are fired at the same time it is a natural assumption that all have exploded at once, although practice has long since proven the contrary to be of common occurrence. A definite time limit, however, should always intervene before the return of the shot firer to make his examination of the results, even though such a practice would interfere more or less with the operation of the mine.

It would be contrary to human experience if all the men employed as shot firers were thoroughly qualified for their work. In fact, the evidence is distinctly to the contrary and, as shown in the following series of cases, fatal accidents are directly traceable to ignorance of proper methods of blasting or the use of defective material, etc.:

FATAL ACCIDENTS TO SHOT FIRERS, DUE TO IGNORANCE OF PROPER BLASTING METHODS, ETC.

October 12, 1905. Paul Pouse, shot firer, 36 years old, married, was killed by the premature explosion of a shot in the mine of the Latham Coal Company, Lincoln, Logan County. It is supposed that while tamping the shot he struck some sulphur in the hole, causing the ignition of the powder. He leaves a widow and 4 children.

February 17, 1906. E. E. Neal, shot firer, aged 38 years, married, employed in the Benton Coal Company's mine No. 1, Benton, Franklin County, was killed by the explosion of 2 shots that were improperly prepared. Upon investigation it was found that 1 of the shots was overcharged with powder. He leaves a widow.

October 10, 1906. John Stratton, shot firer, aged 49 years, married, was killed in the Springfield Colliery Company mine, Springfield. His death was caused by firing a dead hole, the shot blowing the tamping causing the explosion. He leaves a widow and 6 children.

January 6, 1908. Ernest May, shot firer, aged 23 years, single, employed by the O'Gara Coal Company at mine No. 14, Ledford, Saline County, was fatally burned about the face, hands, and body. He fired a shot which was too tightly gripped and which also had an excessive charge of powder.

March 11, 1908. Henry A. Taylor, miner and shot firer, aged 36 years, married, employed in the mine of the Centralia Coal Company, Centralia. Deceased was killed by a shot exploding while lighting it. The shot was located in the crosscut of a room. It is presumed that the squib was defective, or that he lit the squib too close to the powder. He leaves a widow and a step-daughter.

There is an equally close relation between want of knowledge of shot-firing methods and fatal accidents due to blown-out shots, of which a number of typical cases are given below :

FATAL ACCIDENTS TO SHOT FIRERS, DUE TO BLOWN-OUT SHOTS.

January 29, 1906. Fred W. Casey, shot firer, aged 25 years, married, was killed in the Illinois Midland Coal Company's mine, at Sherman, by an explosion of gas and dust from a blown-out shot. The shot was not properly placed. Casey and his partner, McGee, were found dead on the entry at the mouth of the room in which the explosion took place. He leaves a widow and 1 child.

January 29, 1906. Thomas McGee, shot firer, was killed in the Illinois Midland Coal Company's mine, at Sherman, by an explosion of gas and dust, caused by a blown-out shot. The hole was not properly placed. He leaves a widow and 1 child.

March 17, 1908. Ad. Jarman and George Flanery, shot firers, employed in the Shoal Creek Coal Company's mine, Panama, Montgomery County, the former aged 32 years, single, the latter aged 42 years, married, were both killed by an explosion caused by a blown-out shot; they were found three feet from the face of the entry where the shot was fired, and had evidently been suffocated. Flanery leaves a widow and 2 children.

In cases of this kind it is evident that experience and careful supervision alone can afford a reasonable degree of protection, aside from the most rigid discipline and implicit obedience of rational rules and regulations governing the shot firers' duties. Returning too early after a blast has been set off or waiting too long after the fuse has been lit combine to cause fatalities as the immediate result of flying pieces of coal. Accidents of this nature are described in the next group of cases :

FATAL ACCIDENTS TO SHOT FIRERS DUE TO FLYING COAL.

January 12, 1905. Hugh Morgan, miner, acting as a shot firer, aged 23 years, single, employed in the mine of the Latham Coal Company, Lincoln, Logan County, was fatally injured by flying coal from a shot and died from his injuries three days afterwards. Deceased, with his partner, had gone into a room for the purpose of firing two shots; the shot Morgan lighted exploded before he could reach a place of safety, with the result as stated.

November 6, 1907. Jacob Rogi, shot firer, aged 40 years, married, employed in the Meeks Coal Company's mine, Marissa, St. Clair County, was killed by coal flying from a shot. Deceased and his partner were firing shots in the first and second west entries, off the north side of the shaft. They fired a sumping or bursting shot on the rib in the second west entry, and then went into the first entry and fired shots. There were two more shots to be fired in the second west entry; both men went into this entry and lighted the shots; a great deal

of smoke had gathered there, left from the first sumping shot; the men got bewildered from the smoke and could not find the way out; one of the shots went off and both men were struck with flying coal. He leaves a widow and 3 children.

February 13, 1908. J. C. Smothers, shot-firer, aged 37 years, married, employed at the No. 7 mine of the Big Muddy Coal and Iron Company, Herrin, Williamson County, was struck by flying coal from a shot in room No. 67; no one was with him. He was found 25 feet from the face of the room and it is supposed that the squib, when fired, was too short, and that it exploded before he could get to a safe place. He leaves a widow and 4 children.

Equally serious is the risk to the shot firer of being killed by shots blowing through coal pillars or crosscuts, while the shot firer is seemingly safe in an adjoining room. The danger is clearly brought out by the cases given in detail below:

FATAL ACCIDENTS TO SHOT FIRERS, DUE TO SHOTS BLOWING THROUGH PILLARS, ETC.

July 19, 1905. Napolian Goalby, shot firer, aged 41 years, single, was killed at Donk Brothers' Coal and Coke Company's No. 3 mine at Troy, Madison County. Deceased had lighted a shot in a room on the left rib. The shot was opposite a crosscut coming through from the next room. He went into the crosscut in the next room to fire a shot, when the shot from the first room blew into the crosscut, throwing the coal, which caught him. He was killed instantly.

January 31, 1907. John Gray, shot firer, aged 29 years, single, working in the Royal Colliery Company's mine No. 1, Virden, Macoupin County, was killed instantly. He had just lit a shot on the rib of one room and went into the next to charge and fire a shot there. Not knowing that the pillar between the two rooms was thin, the result was, when the shot went off, it blew through, throwing the coal clear across the other room, killing him instantly.

September 27, 1907. John Row, shot firer, aged 34 years, married, was killed in the mine of the Black Diamond Coal Company at Auburn. His death was caused by a shot blowing through a crosscut, between two entries. The pillar at this point was 17 feet thick; about 10 feet had been taken out of the crosscut in the back entry; there was also a shot in the crosscut in the front entry which he or his brother had lighted. Deceased and his brother had gone into the back entry, and were fixing shots to be fired there, when the shot from the front entry blew through, killing John and just slightly scratching his brother's face. Deceased leaves a widow and 1 child.

January 25, 1908. Thomas Staley, shot firer, aged 31 years, married, was killed in the Sherman mine of the Illinois Midland Coal Company by a shot blowing through the rib; he had lighted a shot in one room and was in the act of lighting the shots in the next room when the first shot exploded, blowing through the rib. He leaves a widow and 3 children.

In many cases of this kind a previous examination of the thickness of the intervening coal pillar would have furnished proof of danger, which is often needlessly incurred. Good judgment, as the result of sufficient experience, would go far toward reducing the fatal accident liability due to accidents of this nature. Risks of this kind are shared with all other underground employees, when the rules do not absolutely require that all shall leave the mine except the shot firers, and as shown in the following two cases, the shot firer is often at the risk of being killed by falls of roof or slate, although such accidents have not been common to men in this employment in the coal mines of Illinois.

FATAL ACCIDENTS TO SHOT FIRERS DUE TO FALL OF ROOF OR SLATE.

October 11, 1905. Daniel Hopp, shot firer, aged 38 years, married, was injured by a fall of clod in the Southern Coal and Mining Company's No. 6 mine, at Belleville, St. Clair County. His left leg was broken and he was injured internally, from the effects of which he died 3 days afterwards. He had lit the squib of a shot, when the clod fell and caught him. He called to his partner for assistance, who came and pulled the squib out of the hole and carried deceased to a place of safety. He leaves a widow and 2 children.

January 6, 1908. Edward Stanhouse, miner and shot firer, aged 38 years, married, employed in mine No. 1 of the Jupiter Coal and Mining Company, Duquoin. Deceased was firing shots with his brother while in No. 12 south entry; after firing one of the shots, placed in the face of the entry, deceased returned to the face and was in the act of lighting a second shot when there was a fall of slate, which caught him, from which he sustained injuries resulting in his death the morning of January 8. He leaves a widow and 7 children.

Finally, the shot firers, more than any other class of men employed in labor underground, are exposed to risk of suffocation from powder smoke or gas explosions resulting from shots igniting dangerous gases. The following are typical accidents of this kind:

FATAL ACCIDENTS TO SHOT FIRERS DUE TO ASPHYXIATION, AFTER-DAMP, ETC.

January 9, 1904. George T. Prince, shot firer, aged 58 years, married, was killed by being suffocated by afterdamp, produced by a windy shot, in the Victor Coal Company's mine at Pawnee, Sangamon County. He leaves a widow and 2 children.

November 14, 1904. John Wilson, shot firer, aged 55 years, single, was asphyxiated by powder smoke while firing shots for the miners working in the Phoenix Coal Company's mine, Wesley City, Tazewell County.

December 7, 1905. William Walters, shot firer, aged 35 years, single, employed at the O'Gara Coal Company's No. 3 mine, Harrisburg, Saline County, was shooting a hole in the face of the second south entry on the east side. The hole was drilled in on the dead to the extent of 5½ feet, which caused a blown-out shot. Death was caused by suffocation.

February 12, 1907. William A. Stevenson, shot firer, employed in the mine of the Avery Coal Company, Winkle, Perry County, aged 53 years, married, was overcome with afterdamp caused from a blown-out shot, the explosion tearing down all doors on that side of shaft and destroying the top of the air shaft. He leaves a widow and 7 children.

September 26, 1907. Oscar Poland, shot firer, aged 22 years, single, and Molad Rutherford, shot firer, aged 40 years, married, both employed at the No. 1 mine of the National Mining Company, Eldorado, Saline County, were suffocated. These men had the fuses lighted in five rooms; the shots were going off in rapid succession; one of the shots, however, was a dead hole, which caused a windy shot, and an explosion followed. Death was caused by suffocation. Rutherford leaves a widow.

The preceding analysis of individual cases of fatalities to shot firers makes it clear that the occupation, even under the new law, remains a decidedly hazardous one, which should be followed only by men of trained judgment, unexceptionable habits, and possessed of a full knowledge of the actual conditions underground. The total number of shot firers killed in Illinois mines during the 5 years ending with 1908 was 50, out of 859 deaths from all causes, which is decidedly out of proportion to the actual number employed. It is not possible, unfortunately, to determine the true rate of accident liability by occupation in Illinois mines, since no occupation returns

of the employed are given in the annual report. It may be safely asserted that shot firing must be classed as perhaps the most dangerous employment underground.

FATAL ACCIDENTS TO MINE LABORERS.

Mine laborers rank next to shot firers in numerical importance of the killed in Illinois coal mines during the 5 years ending with 1908. Out of 859 deaths in all occupations 36 were laborers, or 4.2 per cent of the total. The term "laborer" is very indefinite and no clear distinction is made in the returns between laborers underground and overground. In the individual returns, however, the term "top laborer" is used and the duties of these are officially described as "men employed to work at any kind of labor on the surface of a mine." There have been 13 deaths of "top laborers" during the 5-year period, and of this number 10 were caused by surface railroad accidents, 2 by falling into shafts, and 1 by being caught in the screen machinery. The following are carefully selected illustrations of fatal accidents to top laborers in Illinois coal mines:

FATAL ACCIDENTS TO TOP LABORERS DUE TO VARIOUS CAUSES.

April 11, [1904.] John Sapp, top laborer, aged 56 years, married, employed at Donk Brothers Coal and Coke Company's mine No. 3, Troy, Madison County. Deceased fell down the shaft with a carload of props, killing him instantly. He leaves a widow and 4 children.

May 17, 1904. John Sheppard, top laborer, aged 48 years, married, was killed by being caught in the screen machinery at the Capital Cooperative Coal Company's mine at Springfield, Sangamon County. He leaves a widow and 6 children.

March 10, 1905. Joseph Friddle, topman, aged 31 years, married, employed in the mine of the Stonington Coal Company, Stonington, Christian County, was instantly killed by falling down the shaft; the accident occurred about 10 p. m., while the men were changing shifts, the shaft being in process of sinking. Deceased was alone at the top of the shaft, and no one saw him fall, but the supposition is that he lost his balance while raising the door which covered the top of the shaft, falling to the bottom, a distance of 370 feet. He leaves a widow and 3 children.

July 30, 1905. Benjamin Harris, top laborer, aged 34 years, married, employed by the Big Muddy Coal and Iron Company at mine No. 8, Clifford, Williamson County, was injured while engaged in pinching an empty coal car down to the shaft. An engine backed some cars in and his arm was caught between the cars. The arm had to be amputated, causing his death. He leaves a widow and 4 children.

February 23, 1906. T. L. Beers, top laborer, aged 25 years, married, employed at the Big Muddy Coal and Iron Company's mine No. 8, Clifford, Williamson County, was taking off and putting on picks on a cage. He signaled the engineer to lower the cage. It was evident he was not far enough away from the cage, and fell into the shaft after the cage. His instructions were to put the bar across the shaft before signaling the cage away. He leaves a widow and 2 children.

September 19, 1906. Gus Smith, top laborer, aged 20 years, single, employed by the Big Muddy Coal and Iron Company at its shaft No. 7, was riding on top of a loaded box car, which he was taking to the yard; his brother Fred threw him a bar to use in setting the brake; when he went to tighten the brake rod the bar slipped, causing him to lose his balance, when he fell across the rail, the car passing over him, cutting him in two.

June 25, 1907. Charles Tiffin, top laborer, aged 28 years, married, was killed by falling into the shaft of the Hillsboro Coal Company, Hillsboro, Montgomery County. He and two others had taken a car off of the cage at the lower landing and the signal was given by the foreman to the engineer to hoist the cage to the dump. Tiffin got onto the cage after the signal was given and when the cage started jumped off, falling into the shaft. He leaves a widow and 2 children.

March 30, 1908. Daniel Speakman, top laborer, aged 20 years, married, employed at the Christian County Coal Company's mine, Taylorville, was killed under a railroad car. He had just taken 2 loaded cars down from the mine, and in returning had stepped between 2 other loaded cars that were on another track; these cars were in a string of 13, 10 of which were between deceased and the shaft; while between these cars, 4 other cars were being let down on the same track, striking the 13 cars with such force as to knock him down, with the result as stated. He leaves a widow and 1 child.

Practically all of these accidents were due to causes similar to the fatalities caused by railroad transportation, in yards, at terminals, etc. They do not disclose circumstances or conditions peculiar to the mining industry, except the two accidents (fifth and seventh) due to falling into shafts. As said in connection with shaft accidents to miners, there can be no doubt as to the urgent need of better safety precautions to guard the men against accidents of this kind and the insistence upon absolute obedience to rules and regulations governing ingress into or egress from mines.

"Topmen" hold very responsible positions, and the employment is officially defined as that of employees "whose main duty is to enforce the rules governing the admitting of men to the cage to be lowered into the mine and signal engineers 'lower cage,' and also to see that the men are properly off of the ascending cage when coming from the mine to the surface and to signal the engineer 'cage is empty.'" During the 5 years ending with 1908 there were 6 fatal accidents to "topmen," half of which were due to railroad casualties on the surface.

FATAL ACCIDENTS TO TOPMEN, DUE TO VARIOUS CAUSES.

July 30, 1906. Henog Kopo, topman, aged 22 years, single, was killed at the West End mine, Springfield. The car had slipped off the cage, which was self-dumping, and while trying to replace the car in position he was caught between the car and the cage.

June 19, 1907. Joseph Pemberton, topman, aged 31 years, married, was fatally injured while attempting to stop a moving railroad car with a pinch bar; his foot caught under the bar, when the wheels passed over his leg, crushing it badly. The leg was amputated, but death resulted June 23, 1907. He was employed at the Illinois Fuel Company's mine, Sparta, and leaves a widow and 6 children.

November 15, 1907. John Keim, topman, aged 29 years, married, employed at the Jupiter Coal Mining Company's No. 1 mine, Duquoin, entered a screened coal bin under a revolving screen, for the purpose of shoveling back some coal which had filled up until it was obstructing the working of the screen; in passing between the screen and the housing wall he stumbled and fell or got in some position whereby his body was drawn in, crushing out his life. He leaves a widow and 1 child.

November 27, 1907. Adam Mitchell, topman, aged 50 years, married, employed at the Breese-Trenton Mining Company's Buxton mine, Beckemeyer, was pinching cars down the south track, and while doing so a string of loaded cars run onto him; instead of jumping to the side he jumped between the couplings and was crushed. He leaves a widow and 1 child.

June 29, 1908. Arthur Heddon, topman, aged 25 years, married, employed at the No. 2 mine of the Maplewood Colliery Company, Farmington, was instantly killed under the wheels of a railroad car. The deceased was attempting to get on the car, which was in motion, with the result as above stated. He leaves a widow.

It is shown that some of these accidents, particularly the first three, occurred in the strict discharge of necessary duties, without evidence of neglect or failure to take the proper protective precautions. The accidents emphasize the peculiarly varied conditions under which these men work and the hazardous character of their duties, even under the most favorable circumstances of efficient mine management.

A distinction is made in the individual reports of top bosses, and 5 fatal accidents to men in this occupation occurred, which are all given in detail in the following series of descriptive cases:

FATAL ACCIDENTS TO TOP BOSSES FROM VARIOUS CAUSES.

December 17, 1903. Daniel Gordon, top boss, aged 34 years, married, was killed by being struck with a cage at the lower landing at the Springfield Coal Mining Company's No. 4 mine, Springfield, Sangamon County.

October 17, 1905. Matthew Murray, top foreman, aged 48 years, married, was seriously injured about the body; he was caught between two railroad cars at the Rockwell mine of the Lasalle County Carbon Coal Company, Lasalle, Lasalle County. Deceased was removed to the hospital in Lasalle, where he died 3 hours after the accident. He leaves a widow and 2 children.

August 21, 1906. Sam Voigt, top boss, aged 44 years, married, employed by the Consolidated Coal Company at its mine No. 15, Mount Olive, Macoupin County, was taking a loaded railroad car from under the dump, walking backward in front of the car, when his heel caught in a guard rail, throwing him down, the car running over his leg, cutting it off. He died next day. He leaves a widow and 7 children.

December 3, 1906. N. J. Massey, top foreman, aged 35 years, married, employed by the O'Gara Coal Company at mine No. 8, was fatally injured. The car on the cage had become unlocked and stopped at the top landing; Massey and others had put the car on the track and were trying to move the car so they could latch it again, when they lost control of the car and it ran off the cage into the weighing hopper, catching Massey between the car and the floor sills, fracturing his skull and injuring him otherwise; the accident occurred at 2 p. m. and he died 8 hours afterwards. He leaves a widow and 3 children.

March 17, 1908. Elmer Woods, top foreman, aged 33 years, married, employed at the Royal Colliery Company's mine at Virden. Deceased was caught in the machinery of the coal washer and drawn between the belt and belt wheel, crushing him to death. He was in the act of oiling the machinery; it was supposed that his clothes caught in some manner and drew him in. He leaves a widow and 3 children.

The number of accidents is too small for a safe generalization, but the deaths which have occurred fully emphasize the serious risk to which men in this occupation are constantly exposed. They do not differ materially in their nature, however, from accidents to topmen, and perhaps the two groups should have been combined into one. A peculiarly suggestive accident is the last, in which a top foreman was caught in the machinery of a coal washer and crushed to death. This case was similar, it seems, to the second case shown for topmen, in which a topman was drawn into a revolving screen and crushed to death. In both cases there may have been neglect

of ordinary safety precautions, but they partake of the nature of true accidents; that is, occurrences which take place only under the most unusual or exceptional circumstances.

Bottom laborers, as the term implies, are men employed underground. Only two fatal accidents to men of this occupation have been specifically reported during the 5 years ending with 1908, as follows:

FATAL ACCIDENTS TO BOTTOM LABORERS.

January 2, 1904. Salvador Simon, laborer, employed by the Leiter Coal Company, at Zeigler, Franklin County, was instantly killed by falling to the bottom of the sump, which was about 32 feet from the main shaft. Simon was employed to give signals to the engineer; some shots were fired in the main entries, and in attempting to get out of danger he fell into the sump.

March 14, 1908. James McGill, bottom laborer, aged 33 years, married, employed at the Peabody Coal Company's mine, Marion, Williamson County. Deceased was standing at the passing branch at the side of a mule, which was hitched to a trip of empty cars; he was waiting for a mule to come out with a trip of loaded cars. When the loaded cars came out, one of the cars jumped the track at the switch frogs, the car striking the mule that was hitched to the empty cars, crushing him between the mule and the rib of coal. Deceased was injured internally and died about 2 hours afterwards.

Laborers in general are employed under such varying conditions that it is difficult to arrive at a definite conclusion regarding the limitations of their duties, which, of course, determines the degree of risk exposure. Company men, so called, are classed with laborers, and a total of 13 deaths have been specifically reported for men in these occupations during the 5-year period ending in 1908. The number of mine laborers in Illinois is not officially returned, but the data are available for the anthracite region of Pennsylvania. In 1908, in this coal field, the fatality rate was 7.05 per 1,000 for miners and 4.68 per 1,000 for mine laborers, so that the occupation hazard was nearly 50 per cent greater in the case of miners than of laborers. The following cases are typical of the accidents to mine laborers in Illinois:

December 11, 1906. Gessani Ferdinando, company man, aged 29 years, married, working in No. 5 mine of the Spring Valley Coal Company at Dalzell, Bureau County, was found dead, sitting on a pit car loaded with coal to which a mule was attached. Deceased was engaged in brushing a roadway, working on the night shift. He took a mule into an entry to pull out a car of coal. Shortly afterwards he was found sitting on the car of coal dead, without any external marks to show the cause of his death. However, at the inquest the surgeons testified that they had found that his neck was broken, but just how it had occurred could not be ascertained, the probability being that he was caught between the roof of the entry and top of the loaded car. He leaves a widow and 2 children in Italy.

March 14, 1907. William Loedke, laborer, aged 71 years, married, employed in mine No. 10 of the Consolidated Coal Company, Mount Olive, Macoupin County, was found dead under a loaded car. The duty of deceased was to pick up loose coal falling off of the cars. He had loaded the car under which he was found and had placed his shovel on top of the car. He had also spragged 2 wheels, and after hooking his mule to the car proceeded toward the shaft bottom. It is supposed that he was walking between the mule and the car and fell, when the car ran on to him. He leaves a widow and 3 grown children.

April 30, 1907. Fred Smith, laborer, aged 30 years, married, working for the Illinois Collieries Company at its mine No. 7, Litchfield, Montgomery County, was found dead under a fall of slate in a room where he had been left to clean up some slate that had previously fallen. He was sent to this place with a timberman and another laborer to do this work, and was given instructions to remain and finish the work. The timberman and the other laborer were called away to do other work, but when they returned they found Smith dead under some slate some distance in from where he was left. It is not known why he went there. He leaves a widow and 3 children.

October 24, 1907. George Szoay, laborer, 35 years old, married, no children, employed at mine No. 2 of the Superior Coal Company, near Benld, was riding on a motor with one leg hanging over the end; a mule trip of 2 cars was coming out; the motorman could not stop his motor in time to prevent the motor and cars coming together; Szoay's leg was caught between, crushing it severely. Deceased was taken to the hospital and died from the injuries 1 week later. He leaves a widow.

It is shown in this series of cases that while the causes of accidents to laborers vary, they are much the same as in the case of miners and drivers, due chiefly to falls of roof or slate, or mine cars. The first case given as occurring to a bottom laborer is suggestive of the more or less responsible duties which at times may be required of laborers, since in this case the man killed was employed in giving signals to the engineer and in the discharge of that duty he lost his life. The work of mine laborers is so varied that it is difficult to distinguish it from that of many other underground occupations, and particularly is this true of loaders and loaders and blasters when the two occupations are combined into one. There have been 7 fatal accidents to loaders and 7 also to loaders and blasters, or 14 in all, of which the following contain typical descriptions of the conditions and circumstances under which the accidents occurred:

FATAL ACCIDENTS TO LOADERS.

July 21, 1905. Joseph Hastie, loader, aged 24 years, single, was killed in the mine of the Manufacturers and Consumers Coal Company, Decatur, Macon County, by falling slate. Suit for damages in this case was brought before the courts twice, when, at the second trial, the company took it out of court and settled the claim.

November 12, 1905. Joseph McCrary, loader, aged 31 years, married, was employed also as a shot-firer at the Avery Coal Company's mine, located at Winkle. After lighting a shot, which proved to be badly charged, was about to open a trapdoor when the shot exploded, the force of which forced the door open, striking him and causing his death. He leaves a widow.

June 26, 1908. Fred Whitehouse, loader, aged 54 years, married, working in Mine No. 5 of the Madison Corporation Coal Company, Mount Olive, Macoupin County, was killed under falling coal. He was shoveling for a machine and was taking the first cut under a new room when a piece of coal, weighing about 1,000 pounds, fell on him. He leaves a wife and 9 children.

The most suggestive accident in this group is the second, in which a loader was employed as shot-firer. The accident was caused by the loader's failure to charge properly, emphasizing the need of trained skill in work of this kind, as required by the shot-firers' law of 1905. Accidents to loaders and blasters are described in the next series of cases, which reflect the danger under which these men work and the responsible duties which in some cases they are required to perform.

FATAL ACCIDENTS TO LOADERS AND BLASTERS.

August 8, 1905. John F. Rebeck, blaster and loader, aged 18 years, single, was injured by falling slate in the Madison Coal Corporation's No. 2 mine, at Glen Carbon, Madison County, from which injuries he died at his home in Edwardsville, May 10, 1906.

March 13, 1906. Jos. Matachetiss, blaster and loader, aged 45 years, married, had his right foot crushed by falling coal in Donk Brothers Coal and Coke Company's No. 2 mine, at Marysville, Madison County. The foot was amputated in a hospital. The shock caused his death. He leaves a widow.

May 18, 1906. Max Euchol, blaster and loader, aged 32 years, single, was killed by falling clod at the working face in the De Camp Coal Mining Company's mine, at De Camp, Madison County.

June 23, 1906. Joseph Abrahams, blaster and loader, aged 28 years, married, was killed by falling clod at the working face, in the New Staunton Coal Company's mine at Livingston, Madison County. He leaves a widow.

These accidents all occurred previous to 1907 and they are now practically impossible under the shot-firing law, which requires the employment of shot firers and prohibits blasting by mine laborers, loaders, and others. All of the accidents were caused by fall of coal or rock or slate, and they occurred under practically identically the same conditions under which fatal accidents of this kind occur to miners, etc.

The introduction of coal mining machinery has introduced also a new labor element, which is usually referred to as machine tenders and machine helpers. For reasons which need not be dealt with here, machine mining in Illinois has not the theoretical and practical advantage of machine mining in some other representative coal fields, but the progress in machine mining has nevertheless been considerable in the last decade. The table which follows will show the more important facts of machine mining as given in the annual coal reports for 1900 to 1908.

NUMBER OF MEN EMPLOYED, MINING MACHINES USED, AND TONS OF COAL PRODUCED IN COAL MINES OF ILLINOIS, 1900 TO 1908.

Year.	Mines in which machines are used—						Total.			
	Exclusively.				In part.					
	Mines.	Men.	Ma- chines.	Tons mined.	Mines.	Ma- chines.	Tons mined.	Mines.	Ma- chines.	Tons mined.
1900.....	38	3,883	272	3,765,601	29	158	1,817,993	67	430	5,583,594
1901.....	29	3,499	280	3,761,270	34	184	2,015,369	63	464	5,774,639
1902.....	34	4,811	308	4,460,025	30	156	2,037,098	64	464	6,497,123
1903.....	33	4,378	292	4,393,052	35	230	3,253,725	68	522	7,646,777
1904.....	40	3,691	400	4,903,184	27	223	2,237,243	67	623	7,140,427
1905.....	52	4,635	560	6,406,571	24	224	1,795,495	76	784	8,202,066
1906.....	57	6,137	685	7,638,536	28	277	1,924,694	85	962	9,563,230
1907.....	60	6,858	748	10,434,573	41	357	4,055,881	101	1,105	14,490,454
1908.....	60	12,357	754	11,246,285	45	406	3,964,138	105	1,160	15,210,423

It appears that between 1900 and 1908 the number of machines increased from 430 to 1,160, while the coal produced by machines increased from 5,583,594 tons to 15,210,423 tons, or 31 per cent of the

total output. Different machines are in use, and since the degree of risk exposure, amount of dust produced, etc., varies somewhat, according to the make of the machine, the following table will prove of interest:

NUMBER OF MINING MACHINES IN USE IN COAL MINES OF ILLINOIS, BY KIND OF MACHINE, 1908.

Kind of machine.	Number.	Kind of machine.	Number.
Sullivan.....	476	Electric.....	5
Ingersoll-Sergeant.....	196	Link Belt.....	4
Harrison.....	181	Yock.....	1
Goodman.....	127	Belleville.....	1
Morgan-Gardner.....	112		
Jeffrey.....	34	Total.....	1,100
Herzler & Henninger.....	23		

Nearly half of the machines were of the Sullivan type, which includes both pick and chain mining machinery. The number of machine runners and helpers killed in the mines of Illinois during 1904-1908 is stated to have been 30, of whom 14 were runners and 16 helpers. The duties of the two employments are not sharply distinct, and the actual degree of exposure to risk of fatal accident is probably about the same in the two occupations. In the following descriptive accounts, however, runners are considered separately from helpers and a sufficient number of illustrations is given for each employment.

FATAL ACCIDENTS TO MACHINE RUNNERS.

June 13, 1906. Charles Baumer, machine runner, aged 55 years, married, employed at the Gartside Coal Company's No. 3 mine, Murphysboro, Jackson County, was trying to get onto the cage after it had started up the shaft and fell backward. His shoulders were dislocated, and he received other injuries. This accident was caused by the carelessness of deceased. He died the same day, and leaves a widow and 4 children.

November 20, 1906. John Entnes, machine runner, aged 45 years, single, lost his life at the Clear Lake mine, Sangamon County, by an explosion of powder; deceased was forcing the powder back in the drill hole when it was ignited, causing the explosion and his death.

June 26, 1907. Charles Taylor, machine runner, aged 26 years, single, employed at the O'Gara Coal Company's No. 3 mine at Harrisburg, was engaged in shoveling cuttings from the machine, when a piece of slate, 15 by 12 inches, 3 feet thick, fell, crushing him. He died about 4 hours after the accident.

September 7, 1907. Denny Stamper, machine runner, aged 30 years, single, employed at the O'Gara Coal Company's mine No. 10, Eldorado, Saline County. Deceased was shoveling slack from the machine when the face of the coal fell on him, breaking his back and causing a scalp wound over his right eye. He died 3 days afterwards.

October 7, 1907. Sydney Jones, machine runner, aged 25 years, single, working in the mine of the Kortkamp Coal Company near Hillsboro, was undermining at the face of his room when a large body of coal broke loose and fell on him, killing him instantly.

December 13, 1907. Otto Kanlen, machine runner, aged 25 years, single, employed in the mine of the De Camp Coal Company, near Staunton, Madison County, was fatally injured by a flying cap piece. Deceased was mining a room, and when he cut up to the center of the room, where the hauling track was, the machine truck was standing on the track, being in the way of the machine. He tried to push the truck back, it upended, and when it dropped back struck a cap

piece, which flew up and struck Kanlen on the head; he finished his day's work, walked 2 miles home, washed, and ate a good supper; his head began to hurt him, and he was taken to the doctor at Staunton, and to his sister's home, where he died 22 hours after the accident. The doctor stated congestion of the brain was the cause of his death.

In most cases the accidents were due to fall of coal or slate. In a general way the occupation or risk exposure is identical with that of the pick miners, and this conclusion is fully sustained by reference to the conditions under which the accidents took place. The accidents do not throw light upon the important question whether machine operating, as such, adds materially to the risk of underground work. None of the fatal accidents to machine runners seem to have been directly the result of work specifically required in connection with machine running. The last of the above accidents is of interest as reemphasizing previous instances of neglect to obtain immediate and qualified medical advice in case of apparently minor injuries. In no direction perhaps is the present mining system in the United States more defective than in the lack of prompt and qualified medical aid in all cases of even slight accidents. The cases cited in this analysis would seem to prove that valuable lives might have been saved if prompt medical aid had been available immediately after the accident.

FATAL ACCIDENTS TO MACHINE HELPERS.

November 4, 1904. Charles Williams, machine helper, aged 20 years, single, employed in the De Camp Coal Company's No. 1 mine, Staunton, Madison County, was killed by falling top coal and clod. He was a son of John E. Williams, state inspector of mines for the fourth district from 1897 to 1901.

November 8, 1905. Joseph Bowman, machine helper, aged 56 years, married, was killed by falling coal from the face of the room in the Mount Olive and Staunton Coal Company's No. 1 mine at Staunton, Madison County. He leaves a widow and 5 children.

March 28, 1906. Peter Bohling, machine helper, aged 24 years, married, was killed at the working face by falling coal in the Mount Olive and Staunton Coal Company's No. 2 mine near Staunton, Madison County. He leaves a widow and 1 child.

June 21, 1907. Ernest Lah, machine helper, aged 32 years, married, was killed by falling coal at the working face in the New Staunton Coal Company's mine, Livingston, Madison County. He leaves a widow and 2 children.

October 8, 1907. John Hobby, machine helper, aged 34 years, married, employed by the O'Gara Coal Company in mine No. 9, Harrisburg, Saline County, was killed while shoveling slack for Gus Martin, the machine runner. After they had made the sixth run across the room, Martin told Hobby to examine the coal and see if it was loose. Hobby took his bar and punched the coal, saying he did not think it would fall; after they had started to make the seventh run, about a ton and a half of coal fell on Hobby, killing him almost instantly. He leaves a widow and 3 children.

November 15, 1907. John Gnesky, machine helper, aged 30 years, single, employed in the Lumaghi Coal Company's No. 2 mine, Collinsville, Madison County, was instantly killed by falling coal from the face of a room, which was being cut by the machine; when the coal fell it caught his head on the machine board; the coal had been shattered by previous shots, and had not been blocked or sounded.

December 2, 1907. Gustav Messenbach, machine helper, aged 25 years, employed in the No. 8 mine of the Southern Coal and Mining Company, Belleville, was instantly killed by coming in contact with electric wires. Deceased was working with John Schneider as a helper at the electric coal-cutting machine;

while the machine was backing out, after having made a cut, the safety plug on the machine broke; Schneider went to get the electrician, and a new plug; while he was gone Messenbach commenced to work on the machine trying to take out the broken plug, without turning off the electric current; while at work his neck came in contact with the feed wire, which caused instant death.

All but one of the fatal accidents to machine helpers were due to fall of coal or slate. In nearly all of the cases it was a fall of coal at the breast of the mine, indicating with reasonable certainty that extra risk was assumed by the helpers as a necessary part of their duties. The rarity of fall of slate or rock as a cause of fatal accident among this class is suggestive of a definite relation between machine running and fall of coal at the breast of the mine. To emphasize this important conclusion a number of specific instances are given which appear to have occurred under almost identical conditions and which were probably due to identical causes. In only one case was death caused by electricity and the direct result of special occupation exposure. The electric risk in mining is a most serious one, but as a rule well guarded against. Extreme care is necessary since the voltage is often high and in damp mines it is difficult to prevent defective insulation. Thus far there have been comparatively few electrical accidents in the coal mines of Illinois and of the country at large.

FATAL ACCIDENTS TO HOISTING ENGINEERS.

Out of 922 coal mines in the State of Illinois in 1908 it is reported that the character of the openings for ingress and egress was by shaft in 620, or 67.2 per cent of the total. The hoisting of men or material by means of cages is identical in all essentials with passenger or freight elevator service, but at coal mines these are in charge of hoisting engineers. Of all the responsible occupations in connection with mine operations, the positions of hoisting engineers require men of exceptional ability, training, and experience. A number of extremely technical considerations enter into the problem of safe and effectual hoisting apparatus, more so, since electrical winding is gradually replacing the operation of winding by steam. Speed-controlling devices to prevent overwinding are an absolute necessity for the most certain and constant control of the engine and the cage, amplified by scientifically devised brakes and safety catches to secure the cage in case of an accident from disastrous descent to the bottom of the shaft. The factor of safety in winding ropes or cables requires to be most ample, and frequent inspections by thoroughly trained men are necessary to avoid calamities. The cage, as such, must be thoroughly protected on the sides to avoid the many accidents by crushing, to which reference has been made in the discussion of the fatalities occurring to miners and others in the Illinois coal fields, and all the gates protecting cages and the shaft entrance, as well as the roof of the cage, its proper weight in proportion to length of hoist, thickness of ropes

and cables, all require the most painstaking supervision and most effective control.^(a)

The lives of many men are constantly depending upon a complete fulfillment of all these requirements and many more besides, which can not find a place in this brief discussion. Shaft examination needs to be made at stated intervals of all that enters into construction and maintenance, and in addition a perfect system of signaling is required and effective indicators which shall show at any given time the exact position of the cage. There have been four fatal accidents to hoisting engineers and engineers not otherwise specified in the mine experience of Illinois during the 5 years ending with 1908, which, considering that there are not far from a thousand mines, many of which probably employ more than one engineer, the personal-risk exposure is apparently not a serious factor in this occupation. The descriptive accounts which follow are, however, of considerable interest and suggestive of the conditions under which a loss of life may occur at any time.

FATAL ACCIDENTS TO HOISTING AND OTHER ENGINEERS.

December 21, 1903. Daniel Craig, engineer, aged 58 years, married, was injured in mine No. 3 of the Kellyville Coal Company, Westville, Vermilion County, and died from his injuries December 29, 1903. Deceased was engaged in his duties looking after the engine which pulls the coal cars from the inside with an endless rope; this engine is located at the bottom of the shaft; in some manner unknown he was caught in the hauling rope and dragged into the wheels, cutting off one of his legs. He was a widower, and leaves 4 children.

January 14, 1904. Charles Sells, hoisting engineer, was instantly killed by the explosion of the boiler at the mine of the West Frankfort-Big Muddy Coal Company, West Frankfort, Franklin County. The pumps had failed to work; deceased and others were trying to repair them in order to feed the boilers; no one was able to tell how much water was in the boiler when it exploded.

March 23, 1904. Carl Struck, engineer, aged 40 years, married, was killed by becoming entangled in the machinery of the fan engine at the Sangamon Coal Company's mine, Springfield, Sangamon County. He leaves a widow and 1 child.

December 10, 1904. James Gregg, stationary engineer, aged 55 years, married, had his skull fractured by being struck with the hauling rope of the local coal chute incline at the Spring Valley Coal Company's shaft No. 1, Spring Valley, Bureau County. Deceased was operating the stationary engine used to haul the coal sold to local consumers up an inclined plane to where the wagons are loaded; the car is hauled by the main-rope system; then the engine is thrown out of gear and the empty car runs down the incline by force of gravity, controlled by a brake on the drum. The bolt or pin in the fulcrum broke, which rendered the brake useless, and the car, quite naturally, ran away, causing the rope to vibrate violently. Deceased was in all probability struck by the vibrating rope and thrown against the brake band and from there to the floor, where he was found a few minutes later. He did not regain consciousness and died 50 hours later. He leaves a widow and 3 children.

No fatal accidents to engineers seem to have taken place since 1904, so that, on the whole, the occupation risk does not appear to be a very serious one. The accidents which took place during 1903 and 1904, however, were the direct result of occupation exposure and

^a The whole subject has been fully discussed in a report of a special committee appointed by the Royal Commission on Mines and published as Parliamentary paper Cd. 4821, London, 1909.

decidedly typical of the employment. All of the men whose ages are given were 40 years of age and over, and, as far as it is clear from the published account, the killed were not to blame for neglect to take proper safety precautions. The very great responsibility which rests upon the hoisting engineer requires that only a physically sound type be employed and that their hours of labor and compensation be in proportion to the responsibility which rests upon them.

FATAL ACCIDENTS TO CAGERS.

A lesser responsibility rests upon the cager, but he also should be a man of experience and skill to properly perform his functions. The employment of boys, or even of young men, in the cage should be prohibited by law, and a fixed age should be set to apply to all employees in the running of cages in mines. During the 5 years ending with 1908 there were 10 deaths of cagers in Illinois out of a total of 859 men killed in all occupations, and, considering the large number of cagers employed, the true occupation accident risk is apparently not a very serious one. The incidental danger of the employment is, however, quite clearly brought out in the brief description of the accidents, which are all included in the following series of cases:

December 26, 1903. Samuel E. Shadden, assistant cager, aged 36 years, married, employed by the Springfield Coal Mining Company at mine No. 6, Taylorville, Christian County, was fatally injured, being crushed by a loaded pit car falling on him. The deceased was in the act of pushing an empty car back from the cage; a loaded car had been put on the cage, but had been pushed too far over; before the latter car could be pulled back onto the cage the engineer hoisted the cage, the end of the loose car catching on the door head, which pulled it off the cage, and it fell on Shadden. He died less than 2 hours afterwards, leaving a widow and 5 children.

December 2, 1905. William Walker, cager helper, aged 19 years, employed at the Madison Coal Company's mine, Divernon, was caught between loaded cars at the bottom of the shaft, breaking his leg, from the effects of which he died in about 2 hours.

March 31, 1906. Bruce S. Ellis, cager, aged 37 years, married, employed at the Carterville Coal Company's mine, Carterville, Williamson County, was caught between the cage and the door head of the shaft. He was in the act of pulling a car back onto the cage so that he could secure it. The cage was taken away, killing him instantly. He leaves a widow and 1 child.

August 28, 1906. Michael Hickey, cager, aged 39 years, married, was killed in the No. 1 mine of the Springfield Coal Mining Company; deceased was walking over the shaft bottom instead of going around the manway and was caught by the descending cage. He died 3 days after the accident and leaves a widow and 1 child.

October 1, 1906. Ed. Haum, cager, aged 25 years, married, employed at mine No. 15 of the Consolidated Coal Company, Mount Olive, Macoupin County, was in the act of pushing a loaded car onto the cage, when other loaded cars followed from behind and he was caught between the cars, causing injuries from which he died 3 days later. He leaves a widow and 2 children.

July 1, 1907. Anthony Aklea, cager, 21 years of age, single, employed at the O'Gara Coal Company mine No. 3 at Harrisburg, Saline County, was killed while loading a car of coal; another car of coal ran down on him mashing him between the cars. He died from the injuries the same day.

December 19, 1907. Joseph Ellican, cager, single, aged 28 years, employed by the Johnston City and Big Muddy Coal and Mining Company, Johnston City,

Williamson County, was fatally injured. A trip of 5 cars had come in on the bottom of the south side of the shaft; Ellican took the first car to put it on the cage, but failed to put springs to the balance of the cars; they ran across the cage, crushing him. He died December 23.

With the exception of the last of these accidents, all were the result of a single well-defined cause. Cagers are chiefly employed to push the cars off and on the cage, as a part of their regular duties, a practice which seems to call for serious condemnation. Recalling the trying conditions under which all underground work is carried on, the semidarkness under which the work must be performed, it would seem no more than a matter of self-protection to keep the cagers on the cage in the same manner as an elevator attendant is required to perform only one duty and no more. The only recorded accident due specifically to the employment as a cager as such is the following one, which is fully described, and probably typical of the conditions under which accidents of this kind, however rare, are likely to occur. It is most significant in this connection that there should have been no accidents due to breaking cables, proving apparently that the mechanical details of hoisting are well looked after in the mines of the Illinois coal fields.

July 1, 1907. Edgar Brush, cager, aged 23 years, single, employed at the Carterville Mining Company's mine No. 3, Lauder, Williamson County, was killed while trying to get a car loose that was stuck on the cage. He was standing on the cage when the engineer hoisted it, catching deceased between the cage and door head of shaft, breaking his neck. The top men say that the signal was given from the bottom to hoist the cage, and the bottom men say there was no signal given from the bottom.

FATAL ACCIDENTS TO SHAFT SINKERS.

Aside from the engineers and cagers employed in and about mine shafts there are the so-called "sinkers," employed in the sinking of shafts, who follow a most dangerous occupation, including risks specifically inherent in their work. During the 5 years ending with 1908 there have been 14 deaths of sinkers, of which 13 have been described in full detail, as given below.

January 28, 1904. Samuel Willis, sinker, aged 31 years, widower, was instantly killed by falling out of a sinking bucket to the bottom of the shaft, a distance of about 40 feet, at the mine of the Harrisburg-Big Muddy Coal Company, Harrisburg, Saline County. Willis had been timbering at the bottom of the shaft; when through with his work he got into the bucket to take a step-ladder to the surface. He told one of the men working with him to give one bell instead of three bells, which is the proper signal to hoist to the top. The engineer, responding to the signal, understood that no one was coming up, started the engine at a good rate of speed, when, at the distance stated, deceased fell out of the bucket.

March 24, 1904. Herman Haase, sinker, aged 26 years, married, was killed by falling from a temporary cage while putting in guides at the Consolidated Coal Company's mine No. 14, Staunton, Macoupin County. He leaves a widow.

June 28, 1904. Benjamin Rhodes, sinker, aged 32 years, married, and Wilse Reed, sinker, aged 26 years, single, employed by the Kirksville Coal Company, Kirksville, Moultrie County, were killed by falling down the shaft being sunk at that place. One peculiarity about this accident is to report men being killed in a county that has never produced any coal, nor ever appeared among coal-producing counties in the reports. Rhodes and Reed, both sinkers, had come out of the shaft after lighting a shot; after the shot had exploded they

entered the bucket to descend into the shaft; just as they got below the surface the hook on which the bucket was hung broke, precipitating them to the bottom, a distance of about 100 feet. Rhodes was killed instantly and Reed died about 5 hours after the accident occurred. The men were residents of Shelbyville, Shelby County. Rhodes left a widow and five children.

July 21, 1904. Alexander McLean, sinker, aged 30 years, married, employed in sinking a shaft for the New Staunton Coal Company, Livingston, Madison County, was killed. McLean was being lowered, with other men employed, to the bottom of the shaft, the engineer lost control of the engine, the bucket falling suddenly to the bottom caused his death; the others were slightly injured. He leaves a widow.

February 8, 1905. James Reid, sinker, aged 27 years, single, was killed by being struck on the head with a sinking bucket, in the new shaft being sunk by the St. Paul Coal Company, Cherry, Bureau County. Deceased was at work at the bottom of the shaft, 230 feet from the surface; the top of the shaft was protected by the usual folding doors, with two topmen in attendance. The empty bucket had been lifted from the doors, and the topman in charge of the signals had raised his half of the doors, the other attendant had not gotten his half raised, when the signal was given to the engineer to lower; the bottom of the bucket struck on the edge of the half raised door, tipped over, and the safety hook, so called, became detached, the bucket falling to the bottom of the shaft with the result as stated.

February 11, 1906. Nicolas Bonato, sinker, aged 52 years, married, employed by the Peabody Coal Company, Nokomis, Montgomery County, was instantly killed by falling ice in the shaft. For a few days prior to this accident it had been very cold, and much ice had accumulated on the sides of the shaft near the top, but on this day it was thawing very fast, and a large body of ice gave way, falling at least 50 feet, resulting as above stated. He leaves a widow and 6 children.

May 5, 1906. Florini Boucher, sinker, aged 26 years, single, employed in the United Coal Companies' mine at Christopher, Franklin County, when a loaded bucket had nearly reached the top landing it overturned, the contents falling to the bottom of the shaft. Part of the slate struck deceased on the head, causing instant death.

July 14, 1906. Mike Riley, sinker, aged 37 years, single, employed in sinking the Peabody mine at Nokomis, Montgomery County, had taken sufficient dynamite down in a box to charge eight holes. When 5 of the holes had been charged it was discovered that the sawdust in the box containing the remaining dynamite had taken fire. Riley was in the act of upsetting the box into the water when the dynamite exploded, blowing him to pieces. His home was in Braidwood, Ill. Five other men were in the shaft at the time, but escaped unhurt.

October 28, 1906. William Radford, sinker, aged 33 years, married, working at mine No. 22 of the Burnwell Coal Company, Witt, Montgomery County, was being lowered in the bucket when the drum became detached from the engine, and not having a brake on the drum, the engineer had no control over it. There were 2 men in the bucket when it dropped 100 feet to the bottom, killing Radford instantly. He leaves a widow and 3 children. The other man was badly injured, an account of which is given in the nonfatal accidents.

July 3, 1907. Three men, all sinkers, were killed in the Lasalle County Carbon Coal Company's No. 5 mine at Cedar Point, Lasalle County; Hagen Benson, aged 35 years, single; Frank Basalal, aged 30 years, single; and Charles Agnew, aged 30 years, single. Benson and Basalal were killed instantly and Agnew died in the hospital at Lasalle 18 hours after the accident occurred. These men, with William Spowart, the company's machinist, were changing a line of 4-inch pipe from near the center of the shaft to one corner, so the pipe would not interfere with the cage. They had disconnected the pipe from the pump at the bottom, which was held by a $\frac{1}{2}$ -chain attached to a 4-ton chain block. The men were hoisted up about 45 feet, and were knocking off cleats, when the chain holding the pipe broke, letting down two or three lengths of the pipe from the top, which struck the men working on the float, with the result as stated. Mr. Spowart was only slightly injured.

September 3, 1907. Charles Moore, sinker, aged 24 years, single, employed at mine No. 18 of the Dering Coal Company, West Frankfort, Franklin County, was killed by falling 500 feet out of a hoisting tub. The accident was caused by the rope slipping off of the drum.

This series of cases is of particular interest, for practically without exception the fatalities were due to causes and circumstances inherent in the employment or inseparable therefrom. The variety of specific causes illustrates the peculiarly hazardous nature of shaft sinking and the total absence of reasonable safety precautions in such accidents as the first and second. The fourth case was due to the fact that the engineer lost control of his engine, while in the fifth case a so-called safety hook became detached and caused the death of the shaft sinker at his work. Most curious was the sixth accident, in which a falling icicle caused the death of a sinker, while the seventh accident was clearly one of gross neglect to provide a proper mechanical device, making the overturning of a loaded bucket impossible.

One sinker was killed by an explosion of dynamite, due to causes beyond his control, while in the ninth case a man was killed as the result of the engineer losing control of his engine, in a manner similar to case 4. Three sinkers were killed in one accident, due to what was apparently gross carelessness, while in the last case a sinker was killed as the result of a rope slipping off the drum. The evidence in all these cases would seem to be quite conclusive that, without exception, the sinkers killed lost their lives as the result of an inherent occupational risk or due to causes or conditions beyond their own control.

FATAL ACCIDENTS TO TIMBERMEN.

Mine timbering is a most important function in mine arrangement, involving many complex technical questions arising out of the varying character of the coal bed, thickness of seam, depth of mine, etc. So-called "steel timbering"^(a) is gradually coming into use, and in some places concrete work is taking the place of timber in permanent positions in large mine properties. The proper placing of heavy timbers underground requires much physical strength and skill, considering the different conditions under which the work must be done with economy and efficiency. In the coal mines of Illinois during the 5 years ending with 1908 there have been 13 timbermen killed and, with one exception, all by falls of slate or rock. The risk assumed by a timberman is much the same as that of the miner, but the risk exposure is probably greater on account of the inherent uncertainties in the conditions, which are subject to almost constant variations and changes. The descriptive accidents which follow emphasize this risk and prove that the danger is practically limited to falls of rock or slate:

FATAL ACCIDENTS TO TIMBERMEN.

May 11, 1904. Joseph Lecowieys, timberman, aged 27 years, married, employed in the Kellyville Coal Company's mine No. 2, Kellyville, Vermillion County, was instantly killed by falling rock. Deceased was breaking up some

^a See pamphlets on Steel Mine Timber, issued by the Carnegie Steel Company, Pittsburg, Pa., 1908 and 1910.

rock, which had fallen on the fourth north entry, when a mass of rock 8 feet long, 4 feet wide, and 18 inches thick, which he had failed to secure, fell on him with the result as stated. He leaves a widow and 2 children.

October 13, 1904. Peter Barrista, timberman, aged 35 years, single, employed in the Jones & Adams Company's mine, located at Catlin, Vermillion County, was engaged in pulling up a crossbar and was struck on the head by falling rock, about 9 p. m. the above date; apparently he was not hurt very much, as he walked home from the mine, but gradually became worse during the night, and died about 10 o'clock the next morning; the blow on his head produced concussion of the brain.

September 20, 1906. Simon Malle, timberman, aged 43 years, married, employed at No. 6 mine of the Consolidated Coal Company, Staunton, Macoupin County, was sent with others to clean a fall on the entry. It happened that there was some loose slate still hanging, of which he had been warned by other workmen. However, he did not heed the warning and went to work under the slate, when it fell on him, killing him instantly. He leaves a widow.

October 3, 1907. Walter Bone, timberman, aged 45 years, married, was killed instantly by falling rock on the first parting east in the Lasalle County Carbon Company's No. 1 mine at Jonesville, Lasalle County. Deceased and his partner were renewing the cross timbers on the parting, and were preparing to put up a liner or timber support that the old timbers could be taken out; but, without any warning, a great mass of rock weighing about 35 or 40 tons fell, breaking the new timbers that were put up the night previous, crushing Bone underneath. He leaves a widow and 7 children.

January 11, 1907. Edward Delaney, timberman, aged 50 years, single, was killed in No. 2 mine of the Illinois Collieries Company; deceased was caught between two pit cars, crushing his head.

Mine carpenters working overground constitute quite a considerable labor element and there is probably not a mine at which at least one or two mine carpenters are not regularly employed. Four carpenters were killed by accidents at Illinois mines during the 5 years ending with 1908, which are quite fully described below:

FATAL ACCIDENTS TO MINE CARPENTERS.

August 10, 1903. Albert Goekel, carpenter, aged 38 years, married, was injured by falling from the roof of the boiler house, at the Consolidated Coal Company's mine No. 6, Staunton, Macoupin County, dying the same day. He leaves a widow and 5 children.

February 25, 1905. Edward Acres, carpenter, aged 34 years, married, was killed by falling down the shaft of the Illinois Collieries Company's No. 1 mine, Virden, Macoupin County. A mine car had been thrown from the dump cage into the weigh pan; a chain was attached to the car to draw it back to the cage; Acres was standing on top of the cage, when the chain broke, causing the cage to rebound, throwing him off and down the shaft. He leaves a widow and 2 children.

July 7, 1906. Elmer Voorhees, carpenter, aged 28 years, married, employed at the Big Muddy Coal and Iron Company, shaft No. 9, was killed by a gin pole falling on him. He leaves a widow and 1 child.

September 18, 1906. L. C. Foster, carpenter, aged 35 years, single, employed at the Royal Colliery Company washery, Virden, Macoupin County, was on a scaffold painting, about 40 feet from the ground, when, from some cause unknown, he fell to the ground, striking his head on the track rail. He died instantly.

Two mine machinists were killed in Illinois mines during the period under consideration, one by a fall of coal and the other by being caught in the machinery of a coal-washing plant. The descriptive accounts of these two cases are as follows:

FATAL ACCIDENTS TO MINE MACHINISTS.

October 6, 1903. John Rohe, machinist, aged 21 years, single, employed as machine helper in the Staunton Coal Company's mine No. 1, Staunton, Macoupin County, was killed by falling coal at the face of a room.

May 23, 1904. Robert Bradbeer, machinist, aged 45 years, married, was killed instantly by being caught in the machinery of the coal-washing plant at the Illinois Third-Vein Coal Company's mine, Ladd, Bureau County. Deceased had charge of the jiggling apparatus at the coal washer. By some means, which could not be explained, he got his foot caught in the machinery; his leg was drawn in and crushed up to the groin. The engine was stopped as soon as the alarm was given, but life was extinct before he could be extricated. He leaves a widow and 5 children.

FATAL ACCIDENTS TO PUMPMEN.

Pumpmen in mines, next to timbermen, may be classed as among the most skilled workers underground, and since all deep mines at least require an efficient system of drainage, the number of pumpmen employed must be quite large. Few fatal accidents, however, seem to have occurred among men in this occupation, and out of 74 deaths of pumpmen occurring during the 5 years ending with 1908, the following three have been briefly described in the official report:

November 11, 1905. Charles Swartz, pumpman, aged 40 years, married, employed at the Dering Coal Company's mine, No. 11, West Frankfort, Franklin County, was engaged in making repairs on a pump near the bottom of the shaft. The carriage had been stopped at the lower landing to send down tools. In putting on a grip bar it missed the car and fell down the shaft, striking Swartz, killing him instantly. He leaves a widow.

December 29, 1906. Frank Nelson, pumpman, aged 23 years, single, employed at the Madison Coal Company's No. 9 mine, was killed by being caught in the cogwheels of an electric pump.

October 27, 1906. Peter Brennar, pumpman, aged 54 years, married, employed by the Chicago and Carterville Coal Company at mine "A," was killed by an explosion of fire damp in the first east entry on south side of shaft. He leaves a widow and 6 children.

All of these accidents were strictly the result of inherent occupation dangers and apparently none could have been prevented by the foresight or care on the part of the men killed. Had the cogwheel of the electric pump causing the fatality in the second of the above cases been properly protected, the death could easily have been prevented. As a matter of fact, it is the exception rather than the rule that the cogwheels of mine pumps or of other machinery in mines are properly protected, so as to make accidents a practical impossibility, when ordinary care is used on the part of the workmen.

FATAL ACCIDENTS TO POWDERMEN.

Only one powderman employed underground in Illinois coal mines during the 5 years ending with 1908 was killed, and the accident was due to the fall of rock. The description of this accident is as follows:

February 2, 1905. Tony Norkis, powderman, aged 30 years, married, employed in mine No. 5 of the Kelly Coal Company, Westville, Vermillion County, was instantly killed by falling rock the evening of this date. Deceased was employed to deliver powder to the different rooms in the mine, the powder being sent into the mine in the evening for the next day's work; while in the performance of this duty Norkis was struck by a falling rock, with the result as stated. He leaves a widow and 2 children.

FATAL ACCIDENTS TO ROADMEN OR TRACKMEN.

In the maintenance of tracks underground and the building of new tracks or extensions a considerable number of men are employed who are known as roadmen or trackmen, and of these, seven have been killed in Illinois coal mines during the 5 years ending with 1908, of which the following are typical cases. Four of the accidents were due to fall of coal or slate and three to mine cars.

September 29, 1904. P. Caulfield, roadman, aged 29 years, single, was injured by being caught between mine cars at the Springfield Coal Mining Company's No. 4 mine, Springfield, Sangamon County. He died October 5, 1904.

February 26, 1906. Louis Pelletto, roadman, aged 24 years, single, was killed instantly by falling rock in the Deer Park mine of the Illinois Zinc Company, LaSalle County. Deceased and his partner, Charles Blow, were brushing a crossroad; the night boss told them to take down the loose rock on the switch before firing the shot in the brushing. Pelletto went to take down the loose rock; his partner told him to stand to one side, where the roof was good; deceased replied that it was nothing to be afraid of and stood directly under the rock, knocking the prop out; the rock fell on him with the result as stated.

August 26, 1906. Louis Phillips, roadman, aged 48 years, married, was severely crushed by falling rock on the main west entry, 450 feet from the working face, in the Chicago, Wilmington and Vermillion Coal Company's No. 2 mine, South Wilmington, Grundy County. Deceased and his son were working nights, cleaning the haulage road, when a rock fell from the roof, striking deceased on the head. He was conveyed to his home, where he died 3 hours after the accident. He leaves a widow and 8 children.

September 5, 1906. Frank Galley, trackman, aged 48 years, single, employed by D. A. Jenkins, Danville, Vermillion County, was killed by being crushed between the rib of the entry and a car.

October 20, 1906. Wesley Lamb, trackman, aged 20 years, single, was killed in the Kerns Donnewald Coal Company's mine at Worden, Madison County. Deceased was struck by a mine car on which was T rails. He switched his working truck into a room switch, but did not put the truck in far enough. A driver passing with an empty trip struck the rails and the car, which caught Lamb, killing him.

September 23, 1907. Joseph Davis, roadman, aged 32 years, single, was killed instantly by falling rock in the Illinois Zinc Company mine at Deer Park, LaSalle County. Deceased was helping to put a loaded car on the track when a mass of rock fell without any warning, crushing him underneath.

June 18, 1908. Joseph Monzze, roadman, aged 46 years, married, was severely crushed and injured internally by falling rock in the B mine of the Clark City, Wilmington Coal Company, Kankakee County. Deceased was cleaning out the neck of an old room for the purpose of making a sump when a rock fell without warning, crushing him underneath. He died of his injuries 7 hours after the accident. He leaves a widow and 5 children in Italy.

In all essentials these accidents occurred under conditions identical with those causing fatalities to drivers underground. The theoretical risk is considerable, but actually it would seem that the number of fatal accidents among men in this occupation in Illinois mines is small. Aside from roadmen or trackmen a number of other men are employed underground in connection with mine cars, haulage, etc., though numerically of comparatively small importance. Among the fatal accidents of this class were the following, described in more or less detail as the circumstances may have called for:

FATAL ACCIDENTS TO RAILROAD EMPLOYEES IN CONNECTION WITH MINES.

August 13, 1903. John Lane, brakeman, aged 21 years, single, employed by the Consolidated Coal Company at the Mission Field mines, Vermillion County, was fatally injured in the afternoon and died 8 hours afterwards. Deceased

was riding on the footboard of the locomotive which pulls coal from the mines to the railroad, accidentally falling, the wheels passed over him, inflicting severe injuries, resulting as above stated.

December 29, 1903. John Benedict, spragger, aged 18 years, single, was instantly killed in the mine of the Chicago-Herrin Coal Company, Herrin, Williamson County. Deceased had spragged some cars near the shaft, and was letting down some more cars; while doing this his head was caught and crushed between the cars in motion and those standing still.

November 25, 1904. John Corrilli, pusher, aged 19 years, single, was severely injured by a loaded pit car running over him in the No. 7 mine of the Wilmington Star Mining Company, Coal City, Grundy County. Deceased was in front of the car on a steep grade, but lost control of the car. He died 6 days after the accident occurred.

October 26, 1905. John Tetter, trip rider, aged 25 years, single, was killed in the Donk Brothers Coal and Coke Company's No. 3 mine, at Troy, Madison County. He was making a flying switch and fell from the rear end of the motor. The empty cars ran over him.

February 15, 1906. Earl Gladden, switchman, aged 18 years, single, was killed in No. 2 mine of the Kelley Coal Company, being run over by an electric motor. Deceased was getting off of the front end of the motor to make a flying switch when his foot caught the ground, the motor pulling him under and crushing him.

March 3, 1906. Charles Wall, yard man, aged 33 years, married, working on the surface, was killed by railroad cars on the side track at the New Staunton Coal Company's mine at Livingston, Madison County. Deceased was repairing a car on the side track when a switch engine pushing some cars onto the side track bumped the car he was working on, when he fell under the wheels and was crushed. He leaves a widow and 4 children.

June 13, 1907. Bousilar Wevilkosky, trip rider, aged 21 years, single, employed at the Zeigler Coal Company's mine, Zeigler, Franklin County, was killed. The power gave out, delaying his trip; when the power came on the motorman started the motor; at the same time he cautioned Wevilkosky about holding his head so high, but the trip rider did not heed the warning and was struck by wire, causing almost instant death.

September 6, 1907. Albert Gillot, gripper, aged 19 years, single, was fatally injured in the Reed City mine, Peoria County, operated by Newsam Brothers. Deceased was riding on a trip of empty cars and jumped out of the car and stepped onto the loaded track; part of a loaded trip had broken loose, and, owing to the roadway having a downward grade toward the working face at this particular place, the cars ran back, knocking him down, injuring him so that it caused his death.

October 1, 1907. El. C. Worley, car pincher, aged 19 years, single, employed on the surface at mine No. 2 of the Superior Coal Company, at Bend; deceased was between 2 railroad cars, trying to separate them, in order to get the front car nearer to the dump, when an engine from behind struck the cars and he was run over and instantly killed.

October 29, 1907. John Furnsock, spragger, aged 25 years, single, working in the mine of the Christian County Coal Company, Taylorville, was spragging at the bottom, 2 days before he died, when his hand was mashed; blood poisoning set in, causing his death.

All of these accidents are described in sufficient detail to bring out the conditions and circumstances under which they occurred. The small number of deaths in each occupation, in some cases only a single death, precludes definite conclusions as to the true occupation hazards or the responsibility for their occurrence. Trip riders, it may be explained, are men who have charge of a trip of cars in the mine when the cars are hauled by cable or motor power. The two accidents to trip riders in Illinois coal mines, as shown in the descriptive accounts of the fourth and fifth cases above, were due to causes inherent in the employment. One of the two spraggers probably needlessly lost his life by not securing medical aid at the proper

time, while the other died from a mine-car accident, typical of the employment. A gripper and a car pincher were killed by car accidents, also typical of the employment, while a pusher was killed by losing control of his car in the performance of his duty and apparently by no fault of his own.

FATAL ACCIDENTS TO TRAPPERS OR DOOR TENDERS.

The only remaining important occupation underground which has not been considered is that of the trapper, or door tender, as the occupation is termed in other coal fields. As a rule, boys are employed in this occupation, but occasionally old men who have become incapacitated for other work. There were 10 deaths of trappers in Illinois coal mines during the 5 years ending with 1908, and of these the following cases will illustrate the conditions and circumstances under which accidents occur among persons in this employment:

September 23, 1903. John Murphy, trapper, aged 14 years, employed in mine No. 6 of the Big Muddy Coal and Iron Company, Murphysboro, Jackson County. The boy attempted to jump on a moving pit car, when he fell under the wheels; one leg and arm were crushed, the severe shock causing his death.

March 19, 1904. Walter Ferrell, trapper, aged 16 years, was killed at the No. 6 mine of the Big Muddy Coal and Iron Company, Murphysboro, Jackson County. The boy attempted to run past a moving loaded trip and was caught and crushed between the cars and rib.

March 23, 1904. Claude Wolf, trapper, aged 16 years, employed by the Latham Coal Company, Lincoln, Logan County, was fatally injured by a loaded pit-car running over him, from the effects of which he died four hours afterwards. The driver had stopped his mule at the door to fill his lamp with oil; while doing so the mule started and the boy thinking he was going to run away, jumped on the seat to stop the mule. There being a down grade at that place and the cars running rather fast, the boy became frightened, lost his light and jumped from the car to the side; the first car passed him, when he either stepped or fell between the cars, the last one passing over him with the above result.

June 14, 1904. Pearl Beenblossom, trapper, aged 17 years, single, was killed by being struck by a lagging timber. The mine cars jumped the track, striking the lagging timber, forcing it onto the boy. He was at his trap door in the Litchfield Mining and Power Company's mine, Litchfield, Montgomery County.

March 25, 1906. Michael Debre, trapper, aged 17 years, employed in the Zeigler Coal Company's mine, Zeigler, Franklin County. For some unknown reason he got in front of an electric motor, which knocked him down, running over his body, killing him instantly.

November 14, 1906. Richard Lee, trapper, aged 16 years, single, employed by the Big Muddy Coal and Iron Company at mine No. 6, was killed while coming up on a cage; at about 50 feet from the bottom he lost his balance from some unknown cause and fell from the cage to the bottom of the shaft.

December 22, 1906. John Willis, trapper, aged 66 years, married, employed at mine No. 3 of the Peabody Coal Company, near Marion, was trapping the main east door; the motor started from the third south parting with 12 loaded cars; the last 3 cars of the trip became uncoupled between the parting and the door; when the trapper saw the motor trip going past him, he stepped into the middle of the track and the 3 cars that had been uncoupled struck him, the first one ran over him, and he was found dead under the second car. He leaves a widow and 5 children.

January 15, 1907. August Smith, trapper, aged 71 years, married, employed at mine No. 10 of the Consolidated Coal Company, Mount Olive, Macoupin County, was run over by a trip of cars and killed. He was employed to trap a door at the foot of a steep hill. The driver had to get his trip from different entries and make it up on top of this hill. Two of the cars started down the hill toward the door. The trapper supposing that it was the driver coming

with his trip, opened the door and walked leisurely down the track to where he was accustomed to pull out the spraggs. Being partly deaf he could not hear the cars until it was too late for him to get out of the way. He leaves a wife and 3 grown children.

With the exception of two cases all of the killed were mere boys, some as young as 14 years. Two old men were killed, one of whom was partly deaf, which made it impossible for him to hear the approaching car. All of the deaths were caused by mine cars and some, no doubt, were due to reckless indifference to the risk incurred in needlessly taking chances. The question naturally arises whether such accidents can not be prevented by prohibiting the employment of young persons underground, below the age of 18 years, or by the use of mechanical, automatic door opening and closing devices, which ingenuity applied to the task may not find it very difficult to suggest. It may safely be assumed that the risk exposure on the part of door boys is very considerable and probably not so very much less than that of the miner himself, but the facts are not available to show the number exposed to risk, required to calculate the risk upon the basis of the reported deaths.

FATAL ACCIDENTS TO DUMP MEN AND TRIMMERS.

Young persons are also employed in underground work as trimmers and dumpers, and among these four deaths have occurred. There were two trimmers and one dump man killed during the period under consideration, which are reported upon in detail as follows:

October 1, 1904. Thomas Funderburk, dumper, aged 25 years, married, employed at the Mount Olive and Staunton Coal Company's mine No. 2, Staunton, Madison County, was killed by falling down the shaft. He was engaged in dumping coal at a temporary landing; in going back with the empty car to the cage he went to the wrong side of the shaft, and, as there was no protection, the car went down the shaft, dragging him with it. He leaves a widow.

October 11, 1905. Floyd Palmer, trimmer, aged 18 years, employed at the Penwell Coal Company's mine at Pana, Christian County. Deceased was trying to shut off the steam on the elevator engine which was running away, caused by the belt slipping off, when the fly wheel burst, a piece of which struck Palmer, knocking him out through the building onto the railroad track and fatally injuring him. He died in about 4 hours.

June 26, 1908. Clinton Boyer, car trimmer, aged 21 years, married, employed in the mine of the Franklin County Collieries Company, Sesser. Deceased was riding on a flat car and fell off onto the rails. The car passed over him, cutting him in two. He leaves a widow.

One trimmer was killed by a bursting fly wheel, another by being run over by a car, and the dump man by falling down a shaft, all more or less characteristic occupation accidents, resulting from occupation exposure to special hazards inherent in the employment followed.

FATAL ACCIDENTS TO WEIGHERS AND WATCHMEN.

Two weigh men were killed and one night watchman, of which the following descriptive accounts have been rendered, and which are reprinted in full from the official report.

FATAL ACCIDENTS TO WEIGHERS AND WATCHMEN.

December 9, 1903. Allen Cox, top weigh man, aged 54 years, married, employed by the Pana Coal Company, at mine No. 1, Pana, Christian County, was fatally injured while repairing the roller screen. Deceased, with some other men, his son among the number, were engaged in cleaning slack and fine coal around the screen house and elevators. Cox, leaving the other men, went up into the screen house to repair some broken places in one of the screens; his son having forgotten or not knowing that his father was working in the screens, started the engine, causing the screens to revolve; before the engine could be stopped, or Cox taken out, he received injuries which caused his death before he reached his home. He leaves a widow and 8 children.

July 5, 1905. John Madison, night watchman, aged 60 years, married, employed at the Lasalle shaft of the Lasalle County Carbon Coal Company, was instantly killed at the coal chutes of the Illinois Central Railroad, about 300 feet from the shaft. It was the duty of the deceased to coal the engines during the night, but it could not be ascertained how the accident occurred. It is supposed, however, that, while waiting for an engine to coal he fell asleep, leaning over the railing at the top of chutes, and fell to the railroad track below, a distance of 30 feet; his body was found some time afterwards, his head having been severed from the body. He leaves a widow and two children.

August 16, 1907. Tilford S. Botts, weigh man, aged 32 years, single, employed in the Johnston City Coal Company's mine, Johnston City, Williamson County, was killed instantly while trying to replace a car on the cage which had been thrown into the hopper. Deceased lost his balance and fell to the bottom of the shaft.

All of these accidents were due to conditions and circumstances inherent in the occupation followed and were not, apparently, due to negligence or indifference on the part of the workmen killed.

FATAL ACCIDENTS TO MINE OWNERS, OPERATORS, ETC.

Mine owners, operators, agents or lessees, business managers, superintendents or foremen, mine engineers, examiners, and state inspectors all share in common a considerable degree of true accident liability, which is increased, no doubt, by the very fact that these officers or officials are often only occasionally required to visit particular mines or particular workings for inspection or supervising purposes. The superintendent of a mine and his assistant are officially in charge thereof and responsible for the safety of the conditions underground and while their duties may not require daily personal inspection, it is in the nature of the position followed that there must be a thorough familiarity with the actual conditions, dangers, progress, etc., underground. The mine foreman is required, in many States, by law, to examine each working place, or have it examined by his assistant at least once every other day, and while these duties may be badly defined, they are all-inclusive of what constitutes personal responsibility for the conditions under which mining is carried on. In the coal mines of Illinois during the 5 years ending with 1908, there have been 10 fatal accidents to mine managers, including 1 mine operator—7 fatal accidents to mine examiners, and 1 fatality to a state inspector. There have also been

3 fatal accidents to foremen, or 21 deaths in all of persons having official or supervisory duties of mine work. The mine owner, or operator, was killed by a boiler explosion, described briefly as follows:

FATAL ACCIDENT TO A MINE OWNER, OR OPERATOR.

March 23, 1906. Louis Grossman, aged 49 years, married, owner and operator of a local mine near Smithton, St. Clair County, was killed by a boiler explosion. A new upright boiler had been set up and had been in operation a few days. The boiler was used to furnish steam to the pump a short distance in the mine. Grossman had charge of the boiler, and was standing close to it when it exploded. He leaves a widow and 7 children.

The nine fatalities to mine managers or superintendents are all of peculiar interest, as illustrating the very varied dangers which even in the case of the most experienced may prove fatal. The accounts are brief, but sufficiently descriptive of the actual conditions and circumstances under which the accidents took place.

FATAL ACCIDENTS TO MINE MANAGERS.

April 29, 1904. T. F. Jolly, mine manager, aged 49 years, married, employed by the Consolidated Coal Company at the Abbey mine No. 3, Collinsville, Madison County. While passing through the shaft bottom from one side of the shaft to the other, he was caught by a descending cage, causing his death. He leaves a widow and 3 children.

September 5, 1905. Peter Brooks, mine manager, aged 54 years, married, employed by the Stonington Coal Company, Stonington, Christian County, was riding out of the shaft in a sinking bucket, when, about 90 feet up from the bottom, he fell out of the bucket to the bottom, killing him almost instantly. He leaves a widow and 5 children.

September 15, 1905. Ledly Handel, mine manager, aged 36 years, married, employed by the Stonington Coal Company, Stonington, Christian County, was being hoisted out of the shaft, together with 3 other men, on a temporary cage (the mine being in course of equipment); the engineer lost control of the engine and could not stop it until the cage was drawn to the pulleys, crushing Handel between the cage and the pulley timbers. He died before they could get him out. Two of the other 3 men had jumped off the cage at the surface landing; the other man was taken up to the pulleys. All three received injuries, and are reported in the nonfatal injuries.

December 19, 1905. John Postle, superintendent, aged 43 years, married, employed at the Peabody Coal Company No. 3, Marion, Williamson County, lost his life while trying to start a stationary engine that was used to pull cars down the track. The supposition is that the engine got on the center, and he put his foot on the fly wheel to get off, with the steam on the engine, and when the engine started it threw him into the gearing of the pinion wheel, killing him instantly. No one witnessed the accident. He leaves a widow and 2 children.

March 2, 1906. Daniel Griffeth, assistant mine manager, aged 43 years, married, employed at the Zeigler Coal Company's mine, Zeigler, Franklin County, was assisting a miner in taking down some top coal which gave way unexpectedly, falling on him, causing his death. He leaves a widow and 4 children.

January 2, 1907. John Marland, mine manager, aged 60 years, married, employed at the No. 1 mine of the Wenona Coal Company, Wenona, Marshall County, was fatally injured. He was in the vicinity of the mule stables on the main haulage, the mule which was worked at the bottom of the shaft became unruly and kicked the tail chain attached to the harness, causing it to wrap around Mr. Marland's leg and over the haulage rope, which was moving; the mule started to pull when his leg was caught between the haulage rope, lacerating the flesh on the under side of the knee and breaking the bones in 2 or 3 places. He was taken to his home and the leg amputated between 9 and 10

o'clock the following day. He died the evening of January 4, 1907, leaving a widow and 4 children.

January 29, 1907. John H. Riordan, mine manager, aged 37 years, single, was cleaning up some coal with the intention of pulling slate down afterwards. However, the slate fell on him, with the result that he died from the injuries 12 hours afterwards. He was employed at the local mine of John Anderson, Pinckneyville, Perry County.

February 9, 1907. John Triskey, mine manager, aged 56 years, married, was killed by falling rock near the working face of a room in the Home Trade Coal Company's mine, Edwardsville, Madison County. He was in the act of examining the room as to its safety for men to work at the time when the rock fell. He was sounding the roof with a pick. He leaves a widow.

November 25, 1907. John B. Price, mine manager, aged 40 years, married, employed at the mine of the Johnson Coal Company, Marissa, St. Clair County. Deceased was in the elevator house examining something about the elevator chains, in some way his feet got entangled in the conveyor buckets, when his feet and legs were crushed. He was taken to the hospital at Belleville; the doctors amputated one of his legs, but he died from the shock December 31, 1907. He leaves a widow and 2 children.

All of the killed were men of mature years and experience. The accidents took place under most varied conditions, but in most of the cases proper safety or protective devices would have been effective in preventing loss of life. Open gearing, uncovered chains in motion, badly fixed buckets, etc., were responsible for accidents which under a system with a more proper regard to safety of life and limb could not have occurred. The first of the above accidents may possibly have occurred in a mine shaft not provided with a convenient or safe traveling way. The Ohio mining code provides that the owner, etc., "shall provide and keep free from obstruction a traveling or passage way from one side of the shaft bottom to the other." The Illinois code provides that "a safe and commodious passageway must be cut around said landing place to serve as a traveling way by which men or animals may pass from one side of the shaft to the other without passing under or on the cage." The number of deaths in Illinois mines due to accidental exposure to the descending bucket indicate that if such protective devices are common they were not made use of by those killed. Recklessness in this respect is not limited to foreign-born miners, but extends to all classes of labor, including the men legally responsible for the safe condition of the mine.

The third of the above cases was due to the fact that "the engineer lost control of his engine." Accidents of this kind are rare and, on the whole, the evidence is quite conclusive that the ingress and egress of persons at mines is attended with few casualties. It is clear, however, from the various accidents that have occurred in Illinois coal mines, that extra precautions are required to fully safeguard the lives of miners and others during the hoisting or lowering of the cage. In the fourth case a superintendent of a mine was killed by being thrown into the gearing, while in the fifth, seventh, and eighth mine managers were killed by falls of rock or slate. The sixth was caused by an unruly mule, while in the ninth a mine manager was killed by having his legs caught in the conveyor buckets. These accidents

in their nature and circumstances do not differ essentially from corresponding accidents to miners and other underground employees, and merely reemphasize the element of risk exposure in all occupations, from the highest to the lowest, in mine work.

Mine examiners, as the title indicates, are required to examine into the actual condition of the mine. It does not appear that this title specifically or generally includes the duties of fire bosses, but in the Illinois returns for the 5 years ending with 1908 no death of a fire boss has been reported in the official returns. The 6 deaths of mine examiners in the Illinois coal fields during the 5 years ending with June 30, 1908, are described in detail, as follows:

FATAL ACCIDENTS TO MINE EXAMINERS, ETC.

September 25, 1903. William Losley, mine examiner, aged 27 years, married, was killed instantly in the mine of the Muddy Valley Mining and Manufacturing Company, Hallidayboro, Jackson County. Deceased had gone into a room to show a miner how he should take down top coal; he began to pick at the coal, at the same time endeavoring to avoid its falling on him, but he was caught and crushed. He leaves a widow and 3 children.

September 16, 1904. Eugene Kidd, mine examiner, aged 43 years, married, employed in the Mentor mine, operated by Joseph Taylor, O'Fallon, St. Clair County, was making an examination of the mine before the mine commenced work, and was instantly killed by falling clod. He leaves a widow and 4 children.

July 17, 1905. J. E. Cardwell, mine examiner, aged 25 years, married, was killed by falling down the air shaft of the Zeigler Coal Company's mine at Zeigler, a distance of 417 feet. He leaves a widow and 1 child.

December 28, 1905. Clarence Gerrard, night boss, aged 30 years, married, was killed in the Dering Coal Company's mine No. 2 by falling rock. There were 2 men loading rock in the entry when Gerrard came in to see them, about 9.30 p. m. The men told him that they were afraid to load under the rock, because it was not safe. Deceased told the men that it was safe, and to prove it he took a pick and passed under the rock to the center, and struck the rock with the pick, when the whole mass fell on him. The rock was 14 feet long, 6½ feet wide, and 2½ feet thick. He leaves a widow and 2 children.

February 23, 1906. Edward E. Taulbee, mine examiner, aged 30 years, married, and William Mason, aged 21 years, single, a machine runner, both employed in the Hillsboro Coal Company's mine at Hillsboro, Montgomery County, were caught under falling slate and instantly killed. At the face of the entry where Mason and his partner were working they had mined one cut with the electric machine and had just moved the machine into a place ready to mine the second cut when Taulbee came in. All three were standing, Mason and Taulbee on one side of the machine and Mason's partner on the other. Mason was telling Taulbee about some repairs that had been made on the machine that day, which were not satisfactory, when, without the slightest warning, about 20 tons of coal and slate fell on Mason and Taulbee. Mason's partner happened to be in the corner of the entry and was not hurt. He leaves a widow and 1 child.

January 18, 1907. Oliver P. Draper, mine examiner, aged 25 years, married, employed at the O'Gara Coal Company No. 1 mine, near Harrisburg, met his death while examining the mine at 5.30 a. m. This accident occurred at the face of the second east entry on the north side of the shaft; it is believed that he fired the gas with a naked light and that death was due to after damp. He leaves a widow.

June 28, 1907. W. T. Hiser, mine examiner, aged 35 years, married, was killed by falling slate in the Missouri and Illinois Coal Company's No. 4 mine at Willisville. He leaves a widow and 2 children.

With two exceptions these deaths were caused by fall of coal or rock and slate. Some of the "examiners" were comparatively

young men, or under 30, so that they may not have had the required amount of experience for the full discharge of this very responsible duty. One young man was killed by falling down an air shaft, and another, an "examiner," aged 25, was killed by after damp, probably as the result of firing gas with a naked light. Included in this series is the case of a "night boss," aged 30, who was killed by a fall of rock, after having been warned by his own men against the assumption of risk. But only those who work in the mines can really understand why some things are done that seem acts of inexcusable foolhardiness to one who knows nothing of the actual facts of life underground. It is a most difficult matter to place the responsibility, but if these accounts of fatal occurrences teach anything at all they seem to prove conclusively that a considerable degree of risk of serious injury and death is inherent in the mining industry and inseparable therefrom, and that the hazards will be unnecessarily great as long as the most obvious protective measures are not made use of, regardless of their proven utility to both the employer and the employee in the mining industries of this and other lands.

STATISTICAL ANALYSIS OF FATAL ACCIDENTS IN WEST VIRGINIA, 1899 TO 1908.

West Virginia has within recent years attracted world-wide attention by some of the most disastrous explosions in the whole history of mining. The Monongah disaster in 1907 caused a loss of 359 lives, and others have occurred which indicate with reasonable certainty that for geologic and other reasons the mining of coal in West Virginia is a peculiarly dangerous pursuit. As shown by previous tables, the average fatality rate for West Virginia for the 20-year period ending with 1908 was 4.64 per 1,000, against 3.11 per 1,000 for the whole coal field of North America, but during 1908 this rate attained to the enormous figure of 10.35 per 1,000, due chiefly, however, to the mine explosion at Monongah. The total number of deaths in coal mining in West Virginia in 1908 among 60,397 mine employees was 625, so that even if the Monongah disaster had not occurred the rate would still have been 4.40 or considerably above the general average. That disaster was the result of a coal-dust explosion, and practically throughout the entire coal field of West Virginia the condition of the mines is one of extreme danger, particularly during the winter months. Aside from the geologic character of the West Virginia coal field, more or less favorable to the occurrence of disastrous explosions, the State has probably the most mixed labor supply of any coal field in the United States. In 1908 statistics were required of coal-mining companies as to the race and nativity of the employees, and for 51,777 workers of known nativity the necessary information was returned.

The table below will show the principal nativities in a convenient form: (a)

EMPLOYEES IN COAL MINES IN WEST VIRGINIA, BY NATIVITY, 1908.

Nativity.	Employees.		Nativity.	Employees.	
	Number.	Per cent of total.		Number.	Per cent of total.
American (white).....	23,979	46.3	Welsh.....	118	0.23
American (Negro).....	11,270	21.8	Scotch.....	115	.22
Italian.....	6,046	11.7	Swedish.....	69	.13
Hungarian.....	3,668	7.1	Belgian.....	25	.05
Polish.....	1,901	3.7	Danish.....	23	.04
Austrian.....	1,013	2.0	Syrian.....	20	.04
Russian.....	851	1.6	Macedonian.....	13	.03
Slavic.....	620	1.2	French.....	11	.02
Lithuanian.....	506	1.0	Roumanian.....	8	.02
English.....	488	.9	Spanish.....	7	.01
German.....	430	.8	Bohemian.....	5	.01
Irish.....	264	.5			
Litvich.....	180	.3	Total.....	51,777	100.00
Greek.....	147	.3			

Assuming that the employees whose nativity was unknown (8,707) were proportionately distributed among all the several nationalities, it is possible by means of this table and the corresponding information concerning fatal accidents contained in the report to determine with approximate accuracy the fatality rate by nativity, but the results are, to a certain extent, disturbed by the Monongah disaster, in which a disproportionately large number of Italians lost their lives. Subject to this possible impairment, the figures are as follows:

APPROXIMATE FATAL ACCIDENT RATES, BY NATIVITY, WEST VIRGINIA, 1908.

Nativity.	Em- ployees.	Fatal accidents.	
		Number.	Per 1,000 em- ployees.
American (white).....	28,010	176	6.3
American (Negro).....	13,168	50	3.8
Italian.....	7,065	200	28.3
Hungarian.....	4,286	27	6.3
Poles.....	2,223	44	19.8
All other (a).....	5,732	128	22.3
Total.....	60,484	625	10.3

* For a detailed list of nativities of persons killed, see Annual Report of Department of Mines of West Virginia, 1908, p. 212.

Without enlarging upon the very considerable difference in the rates of fatality among the different racial elements, it is significant to find that, with only about one-fourth the number exposed to risk, the Italians had 24 more fatal accidents during the year than the

^aAnnual Report of Department of Mines of West Virginia, 1908, p. 92.

native-born Americans (whites). The returns for a single year are, of course, insufficient to warrant a definite conclusion, but the fact is brought out by all inquiries of this kind that proportionately the fatality rate is much higher among the foreign-born element employed in coal mining than among the natives or the other English-speaking nationalities. Until, however, the required statistical information is systematically collected for all the mining States from year to year it will be impossible to arrive at a definite conclusion as to the true degree of difference in accident liability among the various racial elements employed in coal mining in North America.

For the present purpose it seemed best to select a typical mining State, for which most of the information could be secured, to emphasize the facts of most importance in general statistical inquiries of this kind. The tables which follow are in each case for the 10-year period ending with 1908 and all the data are derived from the official reports of the mine inspector of the State. The first of the tables will show the fatality rate in West Virginia coal mining, according to inside and outside employment, as well as the average rate for both classes of labor combined.

FATAL ACCIDENTS IN COAL MINES OF WEST VIRGINIA, 1899 TO 1908.

Year.	Inside employees.			Outside employees.			Inside and outside employees.		
	Number.	Killed.		Number.	Killed.		Number.	Killed.	
		Number.	Per 1,000.		Number.	Per 1,000.		Number.	Per 1,000.
1899	19,634	79	4.0	5,474	10	1.8	25,108	89	3.5
1900	21,820	133	6.1	6,197	8	1.3	28,017	141	5.0
1901	25,693	121	4.7	6,693	9	1.3	32,386	130	4.0
1902	27,720	110	4.0	7,427	10	1.3	35,147	120	3.4
1903	30,450	147	4.8	9,002	12	1.3	39,452	159	4.0
1904	36,316	123	3.4	9,176	17	1.9	45,492	140	3.1
1905	39,903	176	4.4	10,047	18	1.8	49,950	194	3.9
1906	40,865	250	6.1	10,904	18	1.7	51,769	268	5.2
1907	44,147	324	7.3	12,118	32	2.6	56,265	356	6.3
1908	48,938	599	12.2	11,459	26	2.3	60,397	625	10.3
Total.	335,486	2,062	6.2	88,497	160	1.8	423,983	2,222	5.2
1899-1903	125,317	590	4.7	34,793	49	1.4	160,110	639	4.0
1904-1908	210,169	1,472	7.0	53,704	111	2.1	263,873	1,583	6.0

It is shown by this table that the average fatality rate for employments inside was 6.2 per 1,000, against 1.8 per 1,000 for outside employment. The difference emphasizes the necessity of discrimination in the use of mining fatality data and makes it clear, as, of course, is quite well known, that the true risk in mining attaches to the inside work, although it is shown that the outside work, in West Virginia at least, has also been quite dangerous, and particularly so in recent years, when the outside rate reached 2.6 per 1,000 in 1907 and 2.3 per 1,000 in 1908. Comparing the first 5 years of the period with the last,

it appears that the inside fatality rate has increased from 4.7 per 1,000 during 1899-1903 to 7 per 1,000 during 1904-1908, while the outside rate increased from 1.4 per 1,000 during the first 5 years to 2.1 per 1,000 during the last. It is significant, and not explained by even the most careful analysis of the causes in detail for recent years, that the inside fatality rate has steadily risen from 3.4 in 1904 to 4.4 in 1905, 6.1 in 1906, 7.3 in 1907, and 12.2 in 1908. For convenient comparison the corresponding data are given for Illinois and for the anthracite and bituminous districts of Pennsylvania:

FATALITY RATE PER 1,000 OF INSIDE AND OUTSIDE EMPLOYEES, FOR THE PERIOD 1899 TO 1908.

State.	Inside employ-ees.	Outside employ-ees.
West Virginia.....	6.15	1.81
Illinois.....	2.78	1.31
Pennsylvania (anthracite).....	4.26	1.65
Pennsylvania (bituminous).....	3.60	.84

It is clearly shown that the inside risk in West Virginia coal mining is extremely high, so much so that the average rate for a period of years approaches closely to the general death rate from all causes in the general population of corresponding ages.

Coal mining in West Virginia is distributed over a vast area and coal is mined in 33 counties of the State. The most important coal-producing counties are Fayette, McDowell, Kanawha, and Marion. Tables VI, VII, and VIII of the appendix contain in detail the average number of men employed in each county during the 10-year period ending with June 30, 1908, the number of fatal accidents, and the fatality rate per 1,000 exposed to risk one year. Against an average rate of 5.25 for the State the rate for Marion County (due to the Monongah disaster) was 15.08; for McDowell, 5.15; and for Fayette, 5.63 per 1,000.^a Grouped according to geographical districts, the different sections of the State compare as follows:

FATAL ACCIDENT RATES IN COAL MINING IN WEST VIRGINIA, BY DISTRICTS, FOR THE PERIOD 1899 TO 1908.

District.	Employ-ees.	Fatal accidents.	
		Number.	Rate per 1,000 employ-ees.
Wheeling district.....	10,947	35	3.20
Kanawha, New River.....	172,789	774	4.48
Norfolk and Western.....	129,722	605	4.66
Potomac.....	21,707	106	4.88
Monongahela.....	88,500	703	7.94
Interior.....	356	4	11.24
Total.....	424,021	2,227	5.25

^a Table VIII of the appendix.

Small numbers impair the value of the returns for the interior district, which is hardly entitled to be called a coal field in its present stage of development. The same holds true for some of the counties which return extremely high fatality rates, due also to the small number of men employed. (Lewis County, for illustration, with a total number of employees in 10 years of only 69, of whom 3 were killed, or at the rate of 43.48 per 1,000.) Aside from these exceptions, the differences in accident liability in the several coal fields of the State are well marked, and during the 10-year period under consideration they have ranged from 3.20 per 1,000 to 7.94, or, in other words, they have been extremely high for every important coal field of the State. How far these differences are the result of important variations in the geological formation, the character of the coal, roof, etc., and the chemical composition of the coal itself can not here be discussed. Some light is thrown upon the question by the analysis in detail of the causes of accident, by counties, in Table IX of the appendix, which is here given in an abbreviated form for the different geographical divisions of the State:

FATAL ACCIDENTS IN WEST VIRGINIA DUE TO SPECIFIED CAUSES, BY DISTRICTS, FOR THE PERIOD 1899 TO 1908.

District.	Fatal accidents due to—								Total.
	Falling coal, roof, rock, and slate.		Explosion of gas, dust, blasts, etc.		Mine cars, motors, etc.		Other causes.		
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	
Potomac.....	49	46.2	31	29.2	11	10.4	15	14.2	106
Monongahela.....	177	25.2	447	63.6	52	7.4	27	3.8	703
Wheeling.....	25	71.4	1	2.9	5	14.3	4	11.4	35
Interior.....	1	25.0	.....	.....	.....	.....	3	75.0	4
Kanawha, New River.....	333	43.0	255	33.0	127	16.4	59	7.6	774
Norfolk and Western.....	393	65.0	101	16.7	87	14.4	24	3.9	605
Total.....	978	43.9	835	37.5	282	12.7	132	5.9	2,227

The variations in the relative proportions of causes brought out by this table are quite striking and suggestive of fundamental differences in the character and stratification, thickness, and dip of the coal beds of the State. It would be possible to extend this analysis to groups of mines, arranged according to the thickness of the coal seams, but the limits of the present inquiry preclude such an extended research into the subject. It may be observed, however, that it is the general opinion of mine inspectors that the accident risk due to fall of coal and roof is proportionate to the thickness of the seam, and the practical importance of this conclusion will be better understood when it is stated that in West Virginia the range in thickness

is from 2.8 to 12 inches. In this connection the observations of Mr. John D. Jones, state coal mine inspector of Colorado, are of peculiar application, and from the thirteenth biennial report for 1907-8, of that official, in a discussion of the causes and conditions contributing toward accidents by fall of roof and coal, after referring particularly to "thick coal beds," the following is extracted:

The more distant the roof is from the worker the more difficult it is to examine and detect any sudden changes that may unexpectedly occur in its physical condition. Where long props are used, the timbering is not as rigid and solid as where short ones are used, and hence less efficient in the capacity in which they are to serve. The greater the height of the roof the more destructive is the force of the rock and coal when it falls. Coal falling from a thick face naturally covers more ground and thus lessens the miner's chances to get away safely.

It does not appear that the full importance of the relation of thickness of seam to accident liability due to fall of coal and roof or slate has been as clearly recognized as would be desirable for the protection of the men. Mine experience, no doubt, has much weight in all matters of this kind, but most of the labor employed in the West Virginia coal mines is without this essential prerequisite in safe and economical work. Age also counts for much, and a large proportion of the deaths fall upon the young, who combine youth with inexperience and recklessness, as perhaps the worst element of all. Out of 2,032 fatal accidents in West Virginia coal mines during 1899-1908, in which the age was known, 31, or 1.5 per cent, were deaths of mere children under 15 years of age; 229, or 11.3 per cent, occurred at ages 15 to 19, and 430 more, or 21.2 per cent, at ages 20 to 24, so that almost exactly one-third of all the fatal accidents occurred at ages under 25, when real mine experience, combined with judgment, discretion, and forethought, is practically out of the question. Certainly so in the case of labor of recent foreign extraction—young Italians, Poles, Slovaks, etc.—and so, also, with the Negroes. The table which follows will show the age distribution of 2,032 fatalities by quinquennial periods of life:

FATAL ACCIDENTS IN COAL MINING IN WEST VIRGINIA, FOR THE PERIOD 1899 TO 1908, BY AGES AT DEATH.

Age.	Fatal accidents.		Age.	Fatal accidents.	
	Number.	Per cent of total.		Number.	Per cent of total.
10 and under 15 years.....	31	1.5	45 and under 50 years.....	95	4.7
15 and under 20 years.....	229	11.3	50 and under 55 years.....	67	3.3
20 and under 25 years.....	430	21.2	55 and under 60 years.....	26	1.3
25 and under 30 years.....	427	21.0	60 and under 65 years.....	15	.7
30 and under 35 years.....	306	15.1	65 years and over.....	9	.4
35 and under 40 years.....	249	12.2			
40 and under 45 years.....	148	7.3	Total.....	2,032	100.0

It is not practicable to compare the fatalities by ages in their relation to the age distribution of the mining population, since this information is not required to be furnished by the operators, and in any event difficult to secure with even approximate accuracy. Table XVIII of the appendix gives in full, however, the age distribution of fatalities due to 10 groups of causes, although the number of deaths due to some of these causes is hardly sufficient to warrant safe conclusions. Some of the differences disclosed by these tables are decidedly suggestive, and in the table below the proportion of deaths at ages under 25 is shown for each of 14 causes, followed later by a similar table showing the proportion of deaths at ages 45 and over:

PER CENT OF FATAL ACCIDENTS IN COAL MINING IN WEST VIRGINIA TO PERSONS UNDER THE AGE OF 25 YEARS, FOR THE PERIOD 1899 TO 1908, BY CAUSES.

Cause.	Fatal accidents.		
	Total at all ages reported.	To persons under 25 years of age.	
		Number.	Per cent.
Explosion of boiler.....	5	3	60.0
Mine cars, motors, etc.....	252	126	50.0
Electrocution.....	25	12	48.0
Outside cars.....	17	8	47.1
Mules.....	7	3	42.9
Explosion of dynamite or powder.....	63	26	41.3
Miscellaneous.....	40	15	37.5
Explosion of gas or dust.....	610	196	32.1
Falling roof, slate.....	767	238	31.0
Falling coal.....	179	51	28.5
Falling into shaft.....	29	8	27.6
Explosion of blast.....	21	3	14.3
Mining machinery.....	15	1	6.7
Asphyxiation.....	2	.....	.....
Total.....	2,032	690	34.0

Leaving out of consideration the accidents due to boiler explosions, which were relatively of small importance, mine cars and motors caused the largest proportionate loss of life among the young, or 50.0 per cent of all the fatal accidents due to this cause occurred at ages under 25. Next to these stand electrical casualties, with 48.0 per cent, which in turn are followed by deaths caused by outside cars, with 47.1 per cent, and deaths caused by mule kicks, etc., with 42.9 per cent. All these accidents have a close relation to carelessness and reckless exposure, which are characteristic of the young. Clearly it is not to the interest of the State to permit the employment of very young persons under conditions which at best involve a serious risk to life and health. No child or young person can be made to realize the true risk involved in the employment of door tender, driver, etc. In mining itself—that is, work at the breast with exposure to the risk of fatal accident due to fall of coal or roof—the percentages of deaths

at ages under 25 are more favorable, though only slightly below the average for all causes. It appears that of those who were killed by fall of coal 28.5 per cent were under 25 years of age, while of those killed by fall of roof or slate 31 per cent were under 25. The proportion of deaths due to falls into shafts was about the same, or 27.6 per cent. Other causes do not require special mention, but it may be stated that the proportion of young persons of those killed by gas and dust explosions was 32.1 per cent.

Conversely, it is possible to consider the proportion of the aged according to casualties from specified causes, but the number of men of advanced years actually at work is quite small in so relatively new a mining territory as West Virginia. Of 2,032 deaths according to specified ages, only 9 were of ages 65 and over, or 0.4 per cent, while in addition only 15, or 0.7 per cent, were of ages 60 to 64.

It would be a most valuable contribution to the knowledge of the subject if the fatality rate by ages could be determined in its relation to age of the living population, but, unfortunately, no trustworthy data on this subject are to be had for the United States, except the more or less defective statistics for the registration States in the census of 1900. The returns for West Virginia show that of the deaths at all ages 212, or 10.4 per cent, were of ages 45 and over, and, considered by principal causes, the distribution was as follows:

PER CENT OF FATAL ACCIDENTS IN COAL MINING IN WEST VIRGINIA TO PERSONS 45 YEARS OF AGE AND OVER, FOR THE PERIOD 1899 TO 1908, BY CAUSES.

Cause.	Fatal accidents.		
	Total at all ages reported.	To persons 45 years and over.	
		Number.	Per cent.
Mining machinery.....	15	4	26.7
Explosion of boiler.....	5	1	20.0
Explosion of blast.....	21	4	19.1
Miscellaneous.....	40	7	17.5
Falling into shaft.....	29	5	17.2
Falling roof or slate.....	767	103	13.4
Outside cars.....	17	2	11.8
Mine cars, motors.....	252	25	9.9
Falling coal.....	179	17	9.5
Explosion of gas or dust.....	610	41	6.7
Electrocution.....	25	1	4.0
Explosion of dynamite or powder.....	63	2	3.2
Mules.....	7		
Asphyxiation.....	2		
Total.....	2,032	212	10.4

Leaving miscellaneous accidents out of consideration, it is seen that of the deaths caused by mining machinery 26.7 per cent occurred at ages 45 and over. The numbers are small for this group and do not

warrant final conclusions, though it is a practical certainty that the old are more likely to be injured by mine machinery than persons of middle age. Falls into shafts or other mine openings are in part, no doubt, the results of clumsiness, defective vision, hearing, etc., resulting in apparent disregard of rules or the neglect of proper precautions; but, in fact, age itself is a serious factor in accident liability. Of the accidents due to fall of roof and slate 13.5 per cent and of the accidents from fall of coal 9 per cent occurred to persons of the age of 45 years and over. Of the deaths at all ages due to mine cars and motors and outside cars 10.5 and 11.5 per cent, respectively, occurred to persons of the age of 45 years and over, but the figures in the last group are probably too small for a safe generalization. The most suggestive figure is the percentage of deaths from gas and dust explosions at ages 45 and over, which was only 6.4 per cent against 10.3 from all causes. It may well be the case that the more experienced miners used greater caution and skill in their efforts at self-protection, and that the relatively small percentage of deaths among the aged as the result of a cause which of all others in mining experience is classified as inherently accidental was the result of long experience, care, and skill, which is wanting in the young and often among those of middle age.

Race and nativity are among the most important factors in coal-mining casualties. Primarily it is the human element which accounts for a large proportion of the accidents, many of which are preventable by methods and means which are quite clearly understood by intelligent mine managers and foremen. Mining is always dangerous work and rigid discipline, or obedience to rules and regulations, is of the utmost importance; in fact, no more and no less than a question of life and death. Ignorance of the language alone must, in the nature of the case, account for many casualties where orders and warnings had been given, but were not heeded because they were not understood. All who have carefully considered the subject are agreed that coal-mining casualties are more numerous among the foreign-born, and particularly the non-English speaking races, than among the native American or those from English-speaking countries. The Germans are perhaps an exception, but they seem never to have figured to a large extent in American coal mining, and in West Virginia only 430 Germans were employed out of a total of 51,777. The table below will show in detail the fatalities grouped according to the principal races and nativities employed in West Virginia coal mines, but it must be taken into account that in West Virginia of the whole mining population at least 39.6 per cent, and among those returning their nativity at least 46.3 per cent, were American-born white men.

FATAL ACCIDENTS IN COAL MINING IN WEST VIRGINIA, BY NATIVITY, FOR THE PERIOD 1899 TO 1908.

Nativity.	Fatal accidents.		Per cent of mining population, 1908.
	Number.	Per cent of total.	
American (white).....	871	39.1	46.3
American (Negro).....	430	19.3	21.8
Italian.....	343	15.4	11.7
Hungarian.....	118	5.3	7.1
Slav.....	113	5.1	1.2
Poles.....	98	4.4	3.7
English.....	45	2.0	.9
German.....	31	1.4	.8
Lithuanian.....	29	1.3	1.0
Austrian.....	22	1.0	2.0
Russian.....	18	.8	1.6
All other and not reported.....	109	4.9	1.9
Total.....	2,227	100.0	100.0

In a general way the table confirms the theory that fatal accidents are relatively more common among the foreign-born than among the natives or other English-speaking races and the Germans and Austrians, which no doubt include a considerable proportion who have had actual mine experience. This can not be true of the vast majority of Italians and probably of most of the Hungarians and Slavs (Bohemians, Slovaks, etc.). It is rather surprising the find the Negro come out relatively so well, for in States farther south, particularly Alabama, it seems to have been conclusively established that the fatality rate is higher for the colored than for the white miners. When the nativity distribution is considered by causes some very curious differences are brought out, but these facts as yet are hardly sufficiently numerous to warrant an extended analysis in detail.^(a) Recalling that the proportion of deaths of Americans in the fatalities from all causes was 39.1 per cent, it appears that this average was exceeded in the case of fatal accidents from falling roof and slate (42.2 per cent), falling into shafts (51.7 per cent), mine cars and motors (57.6 per cent), mining machinery (81.1 per cent), and electrocution (48 per cent). It will be observed that the averages for Americans were higher for all the occupations in which the young are employed, and it is reasonable to assume that many of the American-born were native-born of foreign parentage, in view of the well-known tendency on the part of the foreign-born to send their children to work at an earlier age than is the custom with the native-born. The most marked exception to the rather high percentages of the native born is to be found in the case of explosions of gas and dust (28.8 per cent). Other causes, but numerically of less importance, in which the percentage of Americans was below the average for all causes were accidents due to outside

^a See Table XX of the appendix.

cars and blast explosions, while in the case of fall of coal the percentage for Americans was 36.9, or only a little less than the average of 39.1 per cent.

Recalling the proportion of deaths of Italians in the fatalities due to all causes, of 15.4 per cent, it is shown that the percentages were excessive in the case of fatalities due to explosions of gas and dust (27.7 per cent), and explosions of powder and dynamite (20 per cent), but for all the other causes the proportions were less, and particularly so in the case of falls of roof or slate (8 per cent). It is very difficult to reconcile these conclusions, as arrived at by the proportionate method, but it would be a hazardous guess to apply the more or less uncertain nativity returns for a single year to the whole number of deaths reported during a decade, since the two sets of facts might widely vary according to the influence of new immigrants. The facts in detail of nativity and its apparent relation at least to the principal causes of coal-mining fatalities are given in Table XX of the appendix.

Equally important is the relation of nativity to mining experience. Since many foreign nationalities have come to the United States in considerable numbers only within recent years, it is obvious that in many cases a short duration of mine life is incidentally the result of the cause just mentioned, but it is difficult to explain upon this ground alone why coal-mining fatalities should occur so largely among foreign-born immigrants of less than a few years of mine experience.^a The facts as they are here given must be considered with caution, but they would seem to warrant the conclusion that inexperience, as approximately measured by the ages at death and relative liability to fatal accidents, are closely related to each other. It is brought out by the West Virginia returns that of 1,669 employees killed by coal-mining accidents, 9.1 per cent had been less than 3 months at work in mining, 6.3 per cent from 3 to 6 months, and 6.6 per cent from 6 to 12 months. In other words, 22 per cent of all those who were killed had less than 1 year of actual mine experience. The table below will show the length of mine experience in detail for 1,669 mine employees killed in West Virginia during the decade ending with 1908.

^aThe investigations of the Immigration Commission into the condition of foreign-born labor in the bituminous coal mines of Pennsylvania brought out the fact that accidents were largely confined to those who had had no mining experience abroad. See *Engineering and Mining Journal*, July 9 and September 3, 1910.

FATAL ACCIDENTS IN COAL MINING IN WEST VIRGINIA, BY DURATION OF MINE EXPERIENCE, FOR THE PERIOD 1890 TO 1908.

Length of mine experience.	Fatal accidents.	
	Number.	Per cent of total.
Under 3 months.....	152	9.1
3 and under 6 months.....	105	6.3
6 and under 12 months.....	110	6.6
1 and under 5 years.....	669	40.1
5 and under 10 years.....	348	20.9
10 and under 15 years.....	144	8.6
15 and under 20 years.....	62	3.7
20 years and over.....	79	4.7
Total.....	1,669	100.0

The fact is shown by this table that over one-fifth of the accidents were the deaths of men who had been less than 1 year at work in the mine, two-fifths of the men killed had been at work from 1 to 4 years, inclusive, one-fifth from 5 to 9 years, inclusive, and the remainder, or about one-fifth, from 10 years and upward. Only about 5 per cent were deaths of men who had been at work for 20 years or more.

In the absence of data as to the actual length of mine experience among the men at work, it is impossible, of course, to estimate the true degree of mine risk in its relation to the duration of mine work. Assuming, however, that a short mine experience is more or less the equivalent of ignorance and incapacity in meeting successfully the conditions which govern safety in coal mining, the table which follows is of interest, as showing the different nationalities arranged in the order of the percentage of deaths of men who had had less than 1 year's experience in mining work:

PER CENT OF DEATHS OF MEN OF EACH NATIVITY HAVING LESS THAN ONE YEAR OF MINING EXPERIENCE, FOR THE PERIOD 1890 TO 1908.

Nativity.	Per cent.	Nativity.	Per cent.
Russian.....	57.1	Italian.....	22.1
Austrian.....	47.6	Negro.....	22.8
Hungarian.....	31.0	All nationalities.....	22.0
German.....	28.6	American.....	18.4
Pole.....	25.0	Lithuanian.....	11.6
Slav.....	23.3	English.....	3.2

The results of this analysis conform to general experience. The most ignorant class of labor is most likely to suffer in consequence of want of knowledge and understanding of mine rules and regulations. Breaches of discipline occur among all classes, but they are much more common among the foreign element, unfamiliar with American methods, and practically completely ignorant of the language or the meaning and importance of written, printed, or verbal orders of the foremen, fire bosses, etc. The Russians, Austrians, and Hungarians are shown to have suffered the largest proportion of deaths

among men of short experience in mining. Granting that most of this class is of recent introduction into this country, the facts are none the less significant. It must be considered that ignorant and unskilled labor in coal mining endangers not only its own existence, but also the existence of the most skilled and experienced labor. The position of the Germans in the list is rather surprising, but, as a matter of fact, many German laborers learn English very slowly, although this element is, no doubt, more tractable than the Russians, Poles, etc., and particularly the Italians, who rank close to the Negroes and Slavs in the proportion of deaths of men with less than a year of mining experience. The proportion for Americans was below the average, or 18.4 per cent; for Lithuanians (of whom, however, only a small number are employed), 11.6 per cent; and for the English, as a class the most experienced in mining, the proportion was only 3.2 per cent. Admitting that these figures may be differently interpreted, they are none the less decidedly suggestive of the close relation between accident liability and duration of mine experience, which, after all, is but the equivalent of care, skill, and absolute obedience to mine regulations. The details of nationality in its relation to mine experience are given in Table XIX of the appendix.

In commenting upon the highly important aspect of the accident problem in coal-mine management, it was said by Mr. John D. Jones, state inspector of mines for Colorado, in his report for 1907-8, with respect to inexperienced and careless men: (^a)

This is one of the main causes of most of the accidents. In mining, as well as in any other occupations, there are as many grades of workers as there are men employed. However, in general the miners can be classified into three distinct groups, to wit: The experienced and careful; the experienced and reckless; and the inexperienced and incompetent. The accidents which the former class usually meet with occur through the carelessness of their co-workers or others, and also those accidents which are termed "unforeseen," such as falling roof, which previously gave evidence of being absolutely sound and safe, but released by invisible slips and by the bursting out of bodies of coal or rocks, by occluded gases in the form of heavy "blowers," etc. The competent but careless miner often takes desperate chances against the danger of partially loose coal or roof by neglecting to timber the roof, or "sprag the coal," which he considers a more remunerative method than by first doing the necessary timbering for his safety.

Owing to the scarcity of skilled labor, the mines of this State employ annually hundreds of men who never saw the inside of a coal mine before taking up the occupation here. The majority of this class are men who come from Mexico and the different countries of Continental Europe and Asia, and are entirely unable to speak or

^a Thirteenth Biennial Report of the State Coal Mine Inspector, p. 8.

understand the English language. Naturally these men are greatly handicapped when it comes to the question of protecting themselves against the multitude of dangers from roof and coal, or mine cars and "trips" of any kind, as they are not familiar with these phases of danger and therefore are not watchful, and, even were they, can not detect them when apparent. This class could be considerably assisted, and the accidents resulting from their ignorance minimized, by the superintendents of the mines establishing and enforcing a rule forbidding two incompetent miners to work together, by arranging so that every green miner employed would be paired off with an experienced man until he had acquired sufficient skill and knowledge to at least protect himself and others in a mine. Of course, the skilled miner will offer some objections to this rule from the fact that the novice could not perform in full his share of the work, rather he would retard the efforts of the skilled worker, but this could be adjusted by allowing a difference in their payments equal to the difference in their efficiency. Should conditions be such that all the green men could not be paired off in the manner stated above, then any place worked exclusively by them should be governed by a strict rule of systematic timbering and spragging—that is, to see that props are put up in their working places a certain number of feet apart and within a specified distance from the faces, regardless of the good or bad condition of the roof.

This summing up by an experienced observer of actual conditions quite fully sustains the statistical evidence of a definite relationship between accident frequency and the length of mine experience and ignorance of mining methods and the English language. Whether the suggestions of "pairing off" an experienced man with a "green" man could be carried through is an open question, in view of the scarcity of labor in most of the mining camps of the United States. The necessity of better supervision and control of the quality of the labor employed in mining is forcibly brought out in the facts derived from the experience in West Virginia. The responsibility for the occurrence of strictly preventable accidents in coal mining is, however, a very much divided one. No single element is alone responsible for the large proportion of preventable accidents in coal mining. Only by a full analysis of all the elements and factors and a thorough understanding of the actual conditions under which modern mining is carried on will the truth become known as the most essential aid in deliberate efforts to solve a problem which has seemingly heretofore been considered a hopeless one.

As has been shown elsewhere in this discussion, the rate of accident liability varies considerably with occupation. The West Virginia returns do not include a statement of the number employed in the principal occupations, except as to inside and outside employees. It is therefore not possible to calculate the rate of fatal accident liability by specific occupations for West Virginia coal mines, but certain facts regarding particular occupation hazards are available

which are useful for the present purpose to determine the possible relations of the several elements of coal-mining fatalities to each other. The details, however, are so numerous that it would not be feasible to deal with the same analytically, except in a general way. Naturally, the first consideration is the relation of occupation to cause of accident, and all the necessary facts under this grouping for fifteen specific occupations and twelve groups of causes are contained in Table XI of the appendix; and there is also a table (Table X) of full details for every occupation specifically mentioned, according to the cause of death. The details of these tables are of considerable interest, and while the numbers for many of the employments or groupings are small, they are often suggestive of important aspects of mine labor not heretofore brought to public attention.

It is self-evident that the occupation itself to a large extent determines the cause of the accident, as is well illustrated in the 29 deaths of brakemen, of whom only 3, or 10.3 per cent, were killed by fall of slate. Men following this occupation have little or no actual duties to perform in mines, and the deaths from fall of slate are probably the direct result of needless exposure, which, however, is a natural sequence of employment about mines. The same conclusion holds with regard to other causes, except deaths due to mine cars, causing 51.7 per cent, and outside cars, causing 3.5 per cent of the deaths of brakemen from all causes. There were 8 deaths of chargers, or too small a number for a safe conclusion. Of coal loaders, 33 were killed, chiefly by falls of coal or slate, or 51.5 per cent. Drivers were killed to the number of 132, mostly young men below 25 years of age. The principal causes of death were mine cars, or 40.1 per cent of the total, and fall of roof or slate, which caused 29.5 per cent of the deaths from all causes. Of the 7 fire bosses who were killed, 6, or 85.7 per cent, died as the result of gas or dust explosion. There were 17 deaths of gripmen, of whom 9, or 52.9 per cent, were killed by mine cars, and 1 was killed by fall of roof or slate. There were 177 deaths of mine laborers, and of these 7, or 3.9 per cent, were killed by fall of coal; 45, or 25.4 per cent, by fall of roof or slate; 4, or 2.3 per cent, by falls into shafts; and 33, or 18.7 per cent, by mine and outside cars combined. The chief cause of accidents in this group was gas or dust explosion, causing 60 deaths, or 33.9 per cent of the whole, aside from 13 deaths caused by explosions in blasting, etc., or 7.3 per cent of the total. Of the 48 machine runners, 25, or 52.1 per cent, were killed by dust and gas explosions, and 17, or 35.4 per cent, by falls of coal, roof, and slate.

Miners, as such, naturally constitute numerically the most important group, with 1,384 deaths from all causes, of which 588, or 42.5 per cent, were caused by fall of roof and slate. In addition there were 160 deaths due to fall of coal and 7 deaths due to falls into

shafts. The number of men killed by mine cars was 72, or 5.2 per cent of the whole. Next to falls of roof and slate the most important cause of death was gas and dust explosions, responsible for 450 fatalities, or 32.5 per cent of the whole. There were also 56 deaths from powder and dynamite and 17 from blasts, a combined mortality of 5.2 per cent of the whole. Electrical accidents caused 14 deaths in this group, while miscellaneous accidents caused 17, or a combined mortality of 2.2 per cent of the whole.

There were seven deaths of pumpmen, quite generally distributed among the several groups of causes. Twelve shaft sinkers lost their lives, and of these 9, or 75 per cent, were killed by falls into shafts and 2 by falls of slate or roof. There were 33 deaths of slate men, of whom 22, or 66.7 per cent, were killed by fall of slate. Nine timbermen were killed, and of these 5, or 55.6 per cent, by fall of slate and roof and 4 by gas or dust explosion. Of the 27 track layers killed 13, or 48.2 per cent, were killed by falls of roof or slate and 9, or 33.3 per cent, by gas or dust explosion. Finally, of 44 trappers 21, or 47.7 per cent, were killed by gas or dust explosion, and 17, or 38.6 per cent, by mine cars.

In a general way this analysis confirms the inference that the causes of accidents are conditioned by the employments. Among brakemen, it is cars, inside or outside; among loaders, fall of roof or slate; among drivers, mine cars chiefly, mules to a lesser extent, but still a factor, and falls of roof and slate; fire bosses meeting death in the discharge of their duties died, nearly all, as the result of gas or dust explosion; gripmen as the result of mine car accidents; laborers from fall of roof and slate and dust and gas explosions; machine runners from falls of coal and roof and slate; miners from fall of coal and roof and slate and gas and dust explosions; shaft sinkers from falls into shafts; slatemens from fall of slate; timbermen and tracklayers from the same cause; and trappers from mine cars and dust and gas explosions. The statistical evidence is fully conclusive to prove that the majority of these accidents in the case of each group of occupations were conditioned by the nature of the employment, and whether as cause or effect, whether because of indifference, negligence, or recklessness, they constitute an inherent characteristic of the conditions under which mining is carried on at the present time.

Additional evidence to this effect is to be found in the relation of occupation to age at death. The facts in full detail are contained in Tables XII and XIII of the appendix. The age distribution varies widely in the different employments, and in some the relatively large proportion of deaths in early life is an indication of premature responsibility combined with exposure to exceptional risk. Of the 29 brakemen killed, 13, or 44.8 per cent, were less than 20 years of age. Of 129 drivers, 3, or 2.3 per cent, were less than 15 years of age, and

34, or 26.4 per cent, were of ages 15 to 19. Fire bosses killed were naturally all men of mature years, or from 30 to 54. Gripmen killed, to the number of 17, were nearly all young men, mostly below 30. Laborers were largely young men; 60 out of 125, or 48 per cent, were below 25 years of age. Among the 1,294 miners killed, 2 were less than 15 years of age. It is possible that an error was made in the official age returns, but it is so recorded in the reports.^a There were 98 miners killed at age 15 to 19, or 7.6 per cent of the whole. About three-fourths of the men killed were of the age period 20 to 39, inclusive, or, to be exact, 72.7 per cent. Gradually the numbers diminish with increasing age, and at age 60 to 64 there were only 12 deaths, and at ages 65 and over only 7. Advancing age, with diminishing physical strength, must of itself tend to eliminate miners actually at work underground, but there are numerous cases on record of miners following their accustomed employment to a very advanced age, and men at work between 65 and 75 are not rare in the older coal fields of the United States and Europe. That accidents are not much more common in old age than is actually the case is no doubt due to the fact that increasing length of mining experience results in increasing efficiency, caution, and care, combined with obedience to rules and regulations framed solely for the protection of the men.

The relation of nativity to fatal accident occurrence by occupation, is more or less indefinite, largely, no doubt, because of the fact that low-paid employments attract the least qualified, or the most recent immigrant element. The details given in Table XV of the appendix are, however, of interest and value in connection with special inquiries concerning particular ethnic elements in our increasingly heterogeneous population. Of the 29 brakemen killed, 20, or 69 per cent, were Americans (white), but of the 33 loaders only 24.3 per cent were native whites, while 30.3 per cent were Italians. Drivers being largely boys, or very young men, were nearly all native born, but that term, of course, includes native born of foreign parents. The data are not available to show the distribution of the mining population by parent nativity, and for the present purpose this would hardly be of much consequence, except in so far as it would facilitate a qualified inquiry into the question of child labor in mines (including breakers) and its possible relation to parent nativity. In any event, at the present time the facts would hardly be sufficiently numerous to warrant definite conclusions. In brief, the employments in which, as measured by the fatal accident record, the native white population predominate are: Brakemen, 69 per cent; drivers, 54.2 per cent; fire bosses, 71.4 per cent; gripmen, 93.8 per cent; machine

^a Annual Reports of the West Virginia Department of Mines, 1907, p. 218, and 1900, p. 343.

runners, 80.8 per cent; pumpmen, 50 per cent; shaft sinkers, 58.4 per cent; timbermen, 66.7 per cent; tracklayers, 69.2 per cent; and trappers, 52.3 per cent. The negro element was of relatively large importance in the group of brakemen, 17.2 per cent; drivers, 30.5 per cent; laborers, 32.4 per cent; miners, 17.7 per cent; slatemen, 27.3 per cent; and trappers, 15.9 per cent. The Austrians, English, and Germans were not sufficiently numerous in any particular occupation to require special consideration. Hungarians formed 10.8 per cent of the killed among the laborers, 6.5 per cent among the miners, and 18.2 per cent among the slatemen, but the actual number of the latter was really quite small. Italians were relatively most common among car loaders, or 30.3 per cent of the whole number killed, and they constituted 27.3 per cent among the trappers, 19.1 per cent among the miners, and 10.2 per cent among the laborers. For the other foreign elements the actual numbers were too small to give significance to the relative proportions, which, however, are set forth in full detail in Table XIV of the appendix.

More suggestive is the relation of mining experience to occupation, but the data require to be used with great caution. Many employments, such as driving, are primarily occupations for the young, who subsequently become mine laborers, and finally miners. The highly skilled employment of fire bosses naturally can be filled only by men who have had many years of actual experience. The term "mining experience" is here used in a general sense, and includes all duties performed in connection with mine labor, and not only the actual work of coal mining, as might perhaps be assumed. The 24 brakemen for whom the information regarding their experience is given in the return, included 21, or 87.5 per cent, who had been from 1 to 9 years at work. Of the loaders, 5, or 23.8 per cent, had been less than 6 months at work, while of 112 drivers, 18, or 16 per cent, had been less than half a year at their work. Among the drivers, however, were 83, or 74.1 per cent, who had had from 1 to 9 years' experience, while 5 had been at work for more than 10 years. Of the 96 laborers killed and of whom it was known how long they had been at work, 34, or 35.4 per cent, had had less than 6 months' experience, 10.4 per cent from 6 to 12 months, and 45.8 per cent from 1 to 4 years, inclusive. Machine runners had nearly all had considerable actual experience, or from 1 to 9 years, while of the 1,108 miners, 88, or 7.9 per cent, had been less than 3 months at work, 67, or 6.1 per cent, from 3 to 5 months, inclusive, and 71, or 6.4 per cent, from 6 to 12 months. Of the whole number, 442, or 39.9 per cent, had been from 1 to 4 full years at work, while 21.3 per cent had worked from 5 to 9 years, 8.9 per cent from 10 to 14 years, 4.3 per cent from 15 to 19 years, and 5.2 per cent for 20 years and more. Full details are given in Table XVI of the appendix.

It is a particularly significant result of this analysis that 204 of the 1,108 miners, or 18.4 per cent, should have had 10 years or more of actual mining experience, and that 106 of the miners, or 9.5 per cent, should have had 15 or more years' experience. Experience of this kind and length is unquestionably one of the most valuable economic assets of the nation, and its destruction by accidents is a positive loss and waste, just as much as waste in coal-mining methods represents an irreparable material loss of incalculable dimension. Every year of experience must somehow add to the efficiency of mine management, and the death of an experienced miner is, therefore, from an economic point of view, a much more serious loss than the death of a man who is new to the work and who, in all probability, in other respects is of lower industrial efficiency. There can be no doubt that many of these deaths of men of years of experience and skill were the result of carelessness and recklessness and indifference on the part of "green" hands, or new men, without much, if any, actual experience in mining, and direct evidence in support of this statement is furnished by the previous analysis of the individual cases of fatal accidents in the coal-mining experience of the State of Illinois. Considering also that many mining casualties involve a large amount of damage to mine property, loss of working time, and curtailed output, it is clear that the prevention of accident by the employment of skilled labor in mining is as much to the interest of the mine owners as of the mine workers in the coal fields of North America.

It is not necessary to consider in detail the mining experience of men in the remaining groups of occupations, for which the numbers in each case are too small to warrant definite conclusions. In most of the occupations it is clearly shown that the proportion of men with a very limited amount of actual experience, or less than one year, in their work is relatively large, averaging as much as 20.4 per cent for miners and 45.8 for mine laborers. The data are as yet too limited for miscellaneous employments, but Tables XVI and XVII of the appendix give all the available information by groups of occupations and particular employments, which will be found useful in connection with further inquiries.

Information as to the conjugal condition of the reported fatalities shows that out of 2,222 deaths 1,054 were married men, 1,094 single men, and that for 74 the information was not obtained. The number of widowers also is not stated, nor is it clear whether they were included (as may probably have been the case) among the single. Assuming that this was not the case, there were 1,054 widows left with an average of not less than 3.5 children, or 3,690 children of an average age of perhaps 8 years. Assuming that the average age of the widows was the same as that of the men killed and that one-third would remarry, the economic problem is represented by 703 widows

forced to self-support, with 2,460 orphans requiring support for an average period of, say, 6 years at an average cost per child of not less than \$52 per annum, or \$1 per week. Thus the economic aspect of the accident problem assumes increasingly serious proportions as the underlying facts of the whole problem are brought to light by careful statistical analysis.

The question of family support in the event of accidental death involves extended consideration of employers' liability and insurance, which can not be dealt with in this study. Evidence, however, is available to show that to a very limited extent family support is provided by voluntary insurance, and according to the official returns, out of 2,378 persons killed in West Virginia coal mines during the decade ending with 1908 the number insured was 407, or 17.1 per cent of the total. The proportion has been as low as 6.5 per cent in 1897 and as high as 8.23 per cent in 1906. Among the married miners killed by accident, the proportion insured was 18.9 per cent, and among the single 16.4 per cent. The tendency, however, is only slightly toward a more general use of insurance among miners, due, no doubt, in part at least, to the very considerable risk of the occupation in West Virginia, which precludes insurance at normal rates with accident or regular life insurance companies. For native American miners in West Virginia, including a large proportion of young and unmarried persons, the proportion of insured miners was 13.8 per cent for the whites and 24.6 per cent for the Negroes. The much higher proportion for the Negroes is explained by the extensive development of Negro insurance organizations, which, however, are social rather than economic in their objects, and the rates of which are rarely in conformity to scientific principles of insurance. Among the foreigners the proportions of insured miners were 22.0 per cent for the Poles, 24.2 per cent for the Germans, 26.1 per cent for the English, 28.6 per cent for the Scotch, 43.5 per cent for the Austrians, and 71 per cent for the Lithuanians. In most cases the insurance benefits arise out of membership in fraternal or secret beneficial societies, and only to a small extent from payments to regular industrial or ordinary life or personal accident insurance companies.

The evidence is entirely conclusive that the insurance in the large majority of cases provides little more than the burial expenses. Out of 403 cases in which the amount of insurance was known, 17 had less than \$50 provided by insurance, 239 had from \$50 to \$99, 133 had from \$100 to \$499, 6 had from \$500 to \$999, and only 8 left \$1,000 insurance or over. It is, therefore, self-evident that the problem of family support in the event of accidental death in coal mining is not fully met by insurance in West Virginia at the present time.

The question of family dependence, of course, includes the support of dependent children, but it is not entirely clear from the

official reports whether the line of dependence was in all cases drawn with accuracy at some fixed age—say 14 years, which would, broadly speaking, eliminate children more or less in a position to provide for their own support. It is, therefore, quite doubtful whether the returns for West Virginia can be relied upon, but it is of interest to note that of 394 married miners killed who had no children, 76, or 19.3 per cent, were insured; while of 571 miners killed who left from 1 to 4 children, 106, or 19.6 per cent, were insured; and, finally, of 126 miners who left from 5 to 10 children, 24, or 19 per cent, were insured. Under normal conditions, as shown by investigations of the Bureau of Labor, the proportionate tendency to insurance diminishes with the increasing size of the family. While the foregoing data are not entirely conclusive they are at least suggestive of a fruitful line of inquiry which might properly be taken up by other mining bureaus. Thus far the State of West Virginia alone seems to have taken the question of insurance into account.^(a)

THE FATAL-ACCIDENT RATE IN PENNSYLVANIA, BY OCCUPATIONS.

The mining bureau of Pennsylvania requires the operator to report the number of men employed according to their principal occupation, and whether at work inside or outside the mine. It is therefore possible to calculate with accuracy the rate of risk exposure in all the important and specific occupations, and for the present purpose this has been done for the anthracite and bituminous coal fields for the 5-year period ending with 1908. By combining the returns for single years the aggregate number of persons employed in each occupation represents the total number exposed to the risk of fatal accidental injury one year, and by dividing this total into the actual number of fatal accidents reported as having occurred in the particular occupations and by multiplying the result by 1,000 the average rate per 1,000 is obtained. By the use of the aggregate it is possible to determine in each case the numerical value of the returns, which conveys a more accurate idea than if the average number exposed to risk had been determined, which, of course, can easily be done by simply dividing the totals given by 5. In the anthracite coal field the total number of persons employed one year in coal mining during the 5 years ending with 1908 is officially returned as 839,036, which is equal to an average annual risk exposure of 167,807. The total number of fatal accidents occurring among anthracite-mine employees

^a For an extended discussion of miners' accident, sickness, invalidity and old-age pension funds, including the support of widows and orphans, under the compulsory German system, see a series of four articles by Frederick L. Hoffman, commencing with the issue of October 29, 1910, of the *Engineering and Mining Journal*, New York.

during the 5 years was 3,182, or an annual average of 636. Dividing 839,036 into 3,182 and multiplying the result by 1,000 gives a fatal-accident rate of 3.79 per 1,000 employed in anthracite mining 1 year.^(a)

In the same manner the rate has been calculated for the bituminous coal field. The total number of persons employed in bituminous mining during the 5 years ending with 1908 was 858,577, or an average of 171,715 per annum. The total number of fatal accidents officially reported among bituminous miners was 2,870, or an average of 574 per annum. Dividing 858,577 into 2,870 and multiplying the result by 1,000 results in an average fatality rate of 3.34 per 1,000. In the table which follows the inside and outside fatality rates are compared for the two Pennsylvania mining fields, according to the official returns as published by the mining bureau for the last decade:

FATAL ACCIDENTS PER 1,000 EMPLOYEES IN COAL MINES IN PENNSYLVANIA,
1899 TO 1908.

Year.	Fatal accidents per 1,000—			
	Inside employees.		Outside employees.	
	Anthracite mines.	Bituminous mines.	Anthracite mines.	Bituminous mines.
1899.....	4.22	3.34	1.49	0.48
1900.....	3.80	2.84	1.07	.57
1901.....	4.48	2.99	1.46	.68
1902 (a).....	2.49	4.02	1.11	.55
1903.....	4.17	3.03	1.85	.92
1904.....	4.49	3.95	1.94	.97
1905.....	4.73	3.26	1.79	1.30
1906.....	3.97	3.21	1.98	.71
1907.....	5.10	5.08	2.10	1.22
1908.....	4.79	3.61	1.63	.75

^a Year of the great anthracite coal strike, when the mines, on an average, were only 116 days in operation. Anthracite report, 1908, p. lviii; Bituminous report, 1908, p. 72.

The constant excess in the anthracite fatality rate over the corresponding bituminous rate (except in 1902 as the result of the strike) may be accepted as proof that the inherent risk is greater in anthracite mining than in bituminous. The difference may be ascribed to various causes, but chiefly to the more complex character of the anthracite coal beds, which are often badly folded and broken up, while most of the bituminous seams lie horizontal on a gradually inclining or de-

^a An account of mining methods and appliances used in the anthracite coal fields is given in a report by H. M. Chance, published by the Second Geological Survey of Pennsylvania, Harrisburg, Pa., 1883. This report includes a full account of the different mining systems, coal-mining tools and methods, underground haulage, mine gases and explosives, roof falls and other accidents, mine fires and the hygiene of mines, and also a comprehensive glossary of mining terms.

clining level. It is much more difficult to understand why the fatality rate of outside employees should have been about twice as high throughout in anthracite mining as the corresponding rate for outside employees in bituminous mining, since the surface conditions, liability to car accidents, etc., are probably about the same in both coal fields. In the comparison below the data for the 5-year period are compared to bring out this important difference in a more striking and different form:

FATAL-ACCIDENT RATES IN INSIDE AND OUTSIDE OCCUPATIONS IN ANTHRACITE AND BITUMINOUS COAL MINES IN PENNSYLVANIA FOR THE PERIOD 1904 TO 1908.

Class of employees.	Employees.	Fatal accidents.	
		Number.	Per 1,000 employees.
Inside employees:			
Anthracite.....	583, 813	2, 700	4.62
Bituminous.....	710, 182	2, 727	3.84
Outside employees:			
Anthracite.....	255, 223	482	1.89
Bituminous.....	143, 395	143	.96
Inside and outside employees:			
Anthracite.....	839, 036	3, 182	3.79
Bituminous.....	858, 577	2, 870	3.34

The excess of the inside fatality rate of anthracite over bituminous mine work, according to these returns, was 0.78 per 1,000. Had the anthracite inside rate prevailed in the bituminous coal field there would have been 554 more fatal accidents than actually occurred. Had the inside fatality rate of the bituminous coal field prevailed in the anthracite coal field there would have been 458 fewer deaths than actually occurred during the 5 years ending with 1908. It is therefore evidently a matter of most serious concern to determine the exact degree of difference in the fatality rates of the various occupations in the two mining fields, with a due regard to the essential differences in the causes of coal mining fatalities underground. Calculated upon a percentage basis the anthracite rate was to the bituminous fatality rate as 100 to 83.1, or in other words, the bituminous inside fatality rate was 16.9 per cent below the corresponding rate for anthracite coal fields.

Even more startling is the contrast in the outside fatality rates of the two coal areas. The outside fatality rate for the anthracite field was 1.89 per 1,000, against 0.96 for the bituminous coal fields. The anthracite outside rate was, therefore, 0.93 per 1,000 in excess of the bituminous outside fatality rate, or 97 per cent. Had the anthracite outside rate prevailed in the bituminous coal field there would have been 280 fatal accidents among outside employees instead of the 143 deaths which actually occurred. If the bituminous outside rate had

prevailed in the anthracite coal field, there would have been 245 fatal accidents among the outside employees, instead of the 482 which actually occurred. The underlying causes of this very material difference in accident liability are also evidently a matter of most serious concern.

Before considering the fatal accident rate by specific occupations, it will be of value to discuss briefly the principal causes of coal-mining fatalities in the anthracite and bituminous coal fields, and to give to the returns an increased value upon the basis of large numbers, the rates have been calculated upon the total number of men employed and the fatal accidents officially reported during the 10 years ending with 1908. The fatalities due to different causes, inside and outside of mines, are given in the following table, but additional details are given in Tables XXI and XXII of the appendix:

FATAL-ACCIDENT RATES IN INSIDE OCCUPATIONS IN ANTHRACITE AND BITUMINOUS COAL MINES IN PENNSYLVANIA, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accident rate per 1,000 employees.		In anthracite mines greater (+) or less (-) than in bituminous mines.
	Anthracite mines.	Bituminous mines.	
Fall of coal.....	0.62	0.32	+0.30
Fall of roof or slate.....	1.49	1.66	-.17
Falls into shafts.....	.13	.07	+.06
Falls into slopes.....	.05	.....	+.05
Falls down manways.....	.04	.....	+.04
Explosion of gas or dust.....	.33	.72	-.39
Explosion of powder or dynamite.....	.13	.03	+.15
Explosion of blast.....	.39	.05	+.34
Asphyxiation.....	.09	.01	+.08
Mine cars.....	.65	.50	+.15
Mules.....	.04	.01	+.03
Crushed at batteries.....	.01	.....	+.01
Electricity.....	.01	.08	-.07
Miscellaneous.....	.24	.14	+.10
Total.....	4.26	3.60	+.66

This comparison is most instructive and quite conclusive. The return is for a 10-year period, and for all the principal causes, at least, the facts are amply sufficient. The net excess in the anthracite inside fatal rate is 0.66 per 1,000, and in all but 3 of the 14 groups of causes the anthracite rate is in excess of the bituminous rate by from 0.01 to 0.34 per 1,000. The only causes where rates exceed in bituminous coal mining those in anthracite mining are falls of roof or slate (0.17 per 1,000 higher), explosion of gas and dust (0.39 per 1,000 higher), and electricity (0.07 per 1,000 higher). All these are most important from a miner's point of view, but the total excess in the bituminous rate on account of these three causes was only 0.63 per 1,000 against a total excess in anthracite mining in the other 11 groups of causes of 1.32 per 1,000, and, as previously stated, there was a

net excess in the anthracite rate of 0.66 per 1,000 of inside employees. Among the most suggestive causes decidedly higher among anthracite mine workers than in the bituminous coal region of the same State are falls of coal (0.30 per 1,000 higher), explosion of powder and dynamite (0.15 per 1,000 higher), explosion of blasts (0.34 per 1,000 higher), mine cars (0.15 per 1,000 higher), and miscellaneous causes (0.10 per 1,000 higher). It is, therefore, clearly shown that while certain important causes are relatively more common in bituminous mining, most of the causes responsible for fatalities in coal mining are decidedly more common in the anthracite coal fields. Equally significant and suggestive is the comparative accident liability in anthracite and bituminous mining to outside employees.

FATAL-ACCIDENT RATES IN OUTSIDE OCCUPATIONS IN ANTHRACITE AND BITUMINOUS COAL MINES IN PENNSYLVANIA, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accident rate per 1,000 employees.		In anthracite mines greater (+) or less (-) than in bituminous mines.
	Anthracite mines.	Bituminous mines.	
Cars.....	0.63	0.39	+0.24
Machinery.....	.41	.10	+ .31
Boiler explosions.....	.02	.02	.....
Asphyxiation.....	.11	.01	+ .10
Miscellaneous.....	.48	.32	+ .16
Total.....	1.65	.84	+ .81

With the exception of boiler explosions, for which the rates in the two coal fields were exactly the same, the fatality rate for all other causes was higher among outside anthracite employees, compared with outside bituminous employees. The excess was relatively largest for accidents due to machinery, chiefly because of employment in coal breakers, but it is difficult to explain the great difference in the fatality rates due to cars, except on the ground that the railroad trackage is possibly larger, that there may be heavier traffic, or that safety precautions are more neglected or disregarded in the anthracite than in the bituminous coal fields. It is equally difficult to account for deaths due to asphyxiation, since if such deaths occurred at coke ovens they should be more common in the bituminous coal fields, while, as a matter of fact, the rate was higher by 0.10 per 1,000 among outside anthracite employees. Miscellaneous causes were 0.16 per 1,000 in excess over bituminous mine laborers.

The net difference in the rates is an excess among outside anthracite mine workers of 0.81 per 1,000. There can be no question of doubt that most of this excess is due to strictly preventable causes;

and properly guarded machinery, properly protected railroad crossings, heavy penalty for trespassing on railroad tracks, and similar precautions would reduce the loss materially—easily by one-half—in the anthracite region. The loss is of exceptional economic importance in that many of the killed are very young men, who have only commenced to earn money and make a social return for the capital expended in their support and education by their parents or the State. Whatever may be true of inside occupations as being subject to inherent risk in mine work, this claim can not be made for outside employments, and the more fully industrial accidents are considered the more convincing becomes the evidence that most of these casualties are strictly preventable.

Aside from the inherent or incidental circumstances which govern more or less in determining the fatality rate due to specific causes in coal mining with reference to the place of employment, the various occupations followed are subject to wide variation in the degree of accident liability. The table below will show the details for all the principal underground employments in anthracite mining in Pennsylvania for the 5 years ending with 1908, and the fatality rate calculated for each occupation on the basis of the average number employed:

FATAL-ACCIDENT RATES IN INSIDE OCCUPATIONS IN ANTHRACITE COAL MINES IN PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Occupation.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Mine foremen and assistant mine foremen.....	4,234	11	2.60
Fire bosses and assistants.....	4,391	14	3.19
Miners.....	211,102	1,339	6.58
Miners' laborers.....	155,673	716	4.60
Drivers and runners.....	59,343	139	3.18
Door boys and helpers.....	15,057	79	5.25
Pump men.....	5,178	8	1.54
Company men.....	56,953	167	2.93
All other.....	71,882	127	1.77
Total.....	583,813	2,700	4.62

The highest fatality rate occurred among miners, or 6.58 per 1,000 employed. This rate is 1.96 in excess of the average rate for all inside employments and 2.79 per 1,000 in excess of the rate for inside and outside employments in anthracite mining combined. It is clearly not far from an abuse of statistics to emphasize the general fatality rate in coal mining as being indicative of the true risk of mine employment. It is held, and rightly so, that a normal underground fatality rate in coal mining should not exceed 1.5 per 1,000, but here is the conclusive evidence, based upon an aggregate of

211,102 persons exposed to risk one year and 1,389 deaths, that the fatality rate among anthracite miners is actually 6.58 per 1,000, or more than four times the rate assumed to represent the actual inherent danger in the industry as a whole.^(a) The fatality rates for other occupations underground bring out the same deplorable facts. The table shows that the rate for door boys and helpers was 5.25 per 1,000, for miners' laborers, 4.60; for fire bosses and their assistants, 3.19; for drivers and runners, 3.18; for company men, 2.93; for foremen and their assistants, 2.60; for pump men, 1.54; and for all other inside employments, 1.77 per 1,000. Without exception, therefore, all underground occupations in anthracite mining during the period under consideration experienced a fatality rate above the 1.5 per 1,000, which is considered a fair measure of the true inherent risk in underground work.

Fatalities aboveground caused an average rate of 1.89 per 1,000 in Pennsylvania anthracite mining during the period under consideration. The fatality rates by principal occupations are given in detail in the table following:

FATAL-ACCIDENT RATES IN OUTSIDE OCCUPATIONS IN ANTHRACITE COAL MINES IN PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Occupation.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Superintendents.....	719	1	1.39
Foremen.....	2,015	5	2.48
Blacksmiths and carpenters.....	13,596	21	1.54
Engineers and firemen.....	28,206	24	.85
Slate pickers.....	77,955	79	1.01
Bookkeepers and clerks.....	3,953	.....	.....
All other.....	128,780	352	2.73
Total.....	255,223	482	1.89

The highest fatality rate occurred among "all other" outside employments, or 2.73 per 1,000. The term "all other" outside employments is too indefinite to warrant safe conclusions. The next highest rate occurred among outside foremen, or 2.48 per 1,000, while among blacksmiths and carpenters the rate was 1.54, among superintendents 1.39, among slate pickers (in breakers) 1.01, and engineers and firemen 0.85 per 1,000. No fatalities occurred among the clerical force employed by mining companies in the anthracite coal fields. The accidents for specific occupations are all excessive. The high outside

^a See article on "Coal mining fatalities in Belgium," by F. L. Hoffman, in *Engineering and Mining Journal*, September 10, 1910, p. 519. The average fatality rate underground for Belgian coal mines for 1908 was 1.26 per 1,000 employees.

fatality rate of 1.89 for all occupations is due to the causes previously discussed, and for most of the employments a material reduction in the rate would result from the use of proper safety devices, protected railroad crossings, guarded machinery, and heavy penalty for trespassing upon the tracks of railroad companies. Little has been done in this direction and drastic measures are called for. As shown by the table, 482 deaths occurred among outside employees in 5 years, and while some of these deaths occurred inside of mines, and a small number were the result of heroic self-sacrifice in rescue work, the large majority represent an utterly needless waste of life in an industry sufficiently perilous to demand strict supervision and control in all matters that affect the safety of life and limb.

What is true for the anthracite-coal region is equally true for the bituminous-coal field. While the fatality rates for particular occupations are somewhat less, they are excessive for all inside employments, upon the assumption that the occupation fatality rate in coal mining should not exceed 1.5 per 1,000. The facts in detail are given in the table below:

FATAL-ACCIDENT RATES IN INSIDE OCCUPATIONS IN BITUMINOUS COAL MINES IN PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Occupation.	Em- ployees.	Fatal accidents.	
		Number.	Rate per 1,000 em- ployees.
Mine foremen and assistant mine foremen.....	7,165	11	1.54
Fire bosses.....	3,344	23	6.88
Miners.....	342,876	1,297	3.78
Machine runners.....	19,965	66	3.31
Machine loaders.....	200,802	641	3.19
Machine scrapers.....	18,845	48	2.55
Drivers and runners.....	48,184	213	4.42
Door boys and helpers.....	9,752	36	3.69
Company men.....	39,384	183	4.65
All other.....	19,865	209	10.52
Total.....	710,182	2,727	3.84

Excepting miscellaneous occupations, as indefinitely accounted for employments, the highest fatality rate occurred among fire bosses, or 6.88 per 1,000. It is quite possible that if specific returns were made for shot firers the fatality rate among them would be as high if not higher. The occupation of a fire boss is inherently the more dangerous of the two, on account of the great element of uncertainty in the conditions which give rise to accidents due to gas and dust explosions, as compared with the conditions which give rise to accidents in connection with shot firing and blasting. In fact, if the latter work is done with a due regard to established principles, the risk is relatively much less, but neglect of ordinary safety precautions is probably more common among shot firers than among fire bosses, who may be said to represent the most skilled workmen employed underground,

next to foremen and superintendents. The fatality rate for company men, which term is practically inclusive of mine laborers, was 4.65 per 1,000. The rate for drivers and runners was 4.42, for miners 3.78, and for door boys and helpers 3.69. Machine runners had a lower rate than miners, or 3.31 per 1,000, while for machine loaders the rate was 3.19 and for machine scrapers 2.55 per 1,000. As far as it is possible to judge by these returns, the men employed exclusively in the use of coal-cutting machinery experienced a fatality rate of 0.47 per 1,000 less than underground bituminous miners. The fatality rate for foremen and their assistants was 1.54 per 1,000.

Outside employees in bituminous mining experienced an average fatality rate of 0.96 per 1,000, or less by 0.93 per 1,000 than the corresponding rate for anthracite mine employees. The details for the more important employments are given in the table below.

FATAL-ACCIDENT RATES IN OUTSIDE OCCUPATIONS IN BITUMINOUS COAL MINES IN PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Occupation.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Superintendents.....	3,662		
Foremen.....	2,519	5	1.98
Blacksmiths and carpenters.....	12,040	4	.33
Engineers and firemen.....	14,780	7	.47
Coke employees.....	55,975	12	.21
Bookkeepers and clerks.....	5,118		
All other.....	54,301	115	2.12
Total.....	148,395	143	.96

The highest rate among outside employees occurred among the group classified as "all other," or 2.12 per 1,000. The group is very large and it should not be difficult to secure returns in detail for specified classes of outside labor, which would give greater practical value to the rate, which is decidedly excessive. For foremen the rate was also relatively high, or 1.98 per 1,000. For other employments the rates were below the general average, or 0.47 for engineers and firemen, 0.33 for blacksmiths and carpenters, and 0.21 for coke employees. There were no fatal accidents, or at least none were officially reported as having occurred among mine superintendents in the bituminous coal field nor among the clerical force.

The foregoing analysis of the occupation fatality rates in anthracite and bituminous coal mining in Pennsylvania by specified occupations suggests a more extended comparison of accident risks in particular employments in the two coal fields, with a due regard to the causes responsible for fatal accident occurrence. It would materially add to the practical value of such a comparison if corresponding information were available for other coal fields, but at

the present time the State of Pennsylvania alone gives publicity to all the facts of mine employment by occupation, which are required for the calculation of occupation fatality rates. As a contribution toward a more scientific study of coal-mining fatalities, with special reference to the occupation risk, the following comparison of the occupation fatality rate in the two coal fields and the causes responsible for their occurrence will prove of interest. It must be taken into consideration, however, that some of the occupations are common only in one of the two coal fields, but in view of the fact that the occupation will be considered with reference to the causes of death such occupations will also be considered in the discussion which follows.

MINE FOREMEN AND ASSISTANT FOREMEN (INSIDE).

The table below will show the comparative fatality rate of men employed as inside foremen and assistant foremen in anthracite and bituminous mining in Pennsylvania during the 5 years ending with 1908:

FATAL-ACCIDENT RATES OF MINE FOREMEN AND ASSISTANT FOREMEN (INSIDE) IN COAL MINES IN PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Kind of mine.	Employees.	Fatal accidents.	Rate per 1,000 employees.
Anthracite.....	4,234	11	2.60
Bituminous.....	7,165	11	1.54
Excess of anthracite rate.....			1.06

The fatality rate among inside foremen in anthracite mining was 1.06 per 1,000 in excess of the corresponding rate for bituminous foremen and their assistants. The causes of fatal accidents among these two groups during the decade ending with 1908 have been as follows:

FATAL ACCIDENTS AMONG FOREMEN IN PENNSYLVANIA ANTHRACITE AND BITUMINOUS COAL MINES, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

[The term "foremen" includes headmen, 16 having been specifically returned as such.]

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	4	16.0	2	11.1
Fall into shaft, slope, or manway.....	5	20.0	.....	.....
Killed by mine cars.....	10	40.0	5	27.8
Explosion of gas or dust.....	2	8.0	10	55.5
Machinery.....	.....	.....	1	5.6
Miscellaneous.....	4	16.0	.....	.....
Total.....	25	100.0	18	100.0

Accidents due to fall of coal, rock, or slate, falls into shafts or slopes, mine cars, and miscellaneous accidents were proportionately more common among mine foremen and their assistants, including "headmen," so called, in the anthracite than in the bituminous coal field. In the bituminous coal area the chief cause of fatalities was explosion of gas or dust, which cause was comparatively rare among foremen and their assistants in the anthracite coal field. In both coal fields mine cars caused a disproportionate number of deaths among a class of labor decidedly superior to the average in experience, intelligence, and caution.

FIRE BOSSES AND THEIR ASSISTANTS (INSIDE).

The table below will show the comparative fatality rates for men employed as fire bosses or assistant fire bosses in anthracite and bituminous mining, underground, in Pennsylvania during the 5 years ending with 1908.

FATAL-ACCIDENT RATES OF FIRE BOSSES AND THEIR ASSISTANTS (INSIDE) IN COAL MINES IN PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Kind of mine.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Anthracite.....	4,391	14	3.19
Bituminous.....	3,344	23	6.88
Excess of bituminous rate.....			3.69

The fatality rate among fire bosses and their assistants in bituminous coal mining in Pennsylvania was 3.69 per 1,000 in excess of the rate among the same class in anthracite coal mining. The causes of fatal accidents among these two groups during the decade ending with 1908 have been as follows:

FATAL ACCIDENTS AMONG FIRE BOSSES IN PENNSYLVANIA ANTHRACITE AND BITUMINOUS COAL MINES, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	3	10.7	7	21.2
Fall into shaft, slope, or manway.....	3	10.7	1	3.0
Mine cars.....	2	7.1	4	12.1
Mules.....			1	3.0
Explosion of gas or dust.....	12	42.9	16	48.5
Asphyxiation.....	3	10.7	1	3.0
Powder, dynamite, blast.....	1	3.6	1	3.0
Electrocution.....			1	3.0
Miscellaneous.....	4	14.3	2	6.1
Total.....	28	100.0	33	100.0

Accidents due to fall of coal, rock, or slate caused 21.2 per cent of the deaths among fire bosses and their assistants in the bituminous coal field, against 10.7 per cent in the anthracite. The fact that there are few deep mines in the bituminous coal fields explains why accidents due to falls down shafts, slopes, or manways caused only 3 per cent of the deaths among fire bosses in the bituminous coal field against 10.7 for the anthracite field. Mine-car accidents and deaths caused by mules were more common in the bituminous field, but deaths due to gas and dust explosion were somewhat more common in the anthracite coal field. Asphyxiation, powder, dynamite, and miscellaneous causes were more common among fire bosses in the anthracite coal field. The extremely high accident rate among fire bosses in the bituminous coal area can not be ascribed to race type of the men employed, as compared with the anthracite class, since, by nativity, the deaths were distributed as follows:

PER CENT OF FATAL ACCIDENTS TO FIRE BOSSES AND ASSISTANTS OF EACH NATIVITY, IN COAL MINES IN PENNSYLVANIA, FOR THE PERIOD 1899 TO 1908.

Nativity.	Per cent of persons killed in—	
	Anthracite mines.	Bituminous mines.
American.....	21.0	43.8
English.....	26.3	21.9
Irish.....	5.3	6.2
Other.....	47.4	28.1
Total.....	100.0	100.0

It is quite possible, however, that the fire bosses and assistants killed in the bituminous region had, on the average, a shorter mine experience, as far as this element can be measured by the age at death. Of the fire bosses killed in the anthracite region none were under 25 years of age; but one such death occurred in the bituminous coal field. Of the deaths of known ages among fire bosses in the anthracite region, 50 per cent were 45 years of age and over, against 43.8 per cent in the bituminous.

MINERS.

The table below will show the comparative fatality rates of miners in the anthracite and bituminous coal regions of Pennsylvania during the five years ending with 1908.

FATAL-ACCIDENT RATES OF MINERS IN PENNSYLVANIA COAL MINES, FOR THE PERIOD 1904 TO 1908.

Kind of mine.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Anthracite.....	211,102	1,389	6.58
Bituminous.....	342,876	1,297	3.78
Excess of anthracite rate.....			2.80

The fatality rate of anthracite miners was 2.80 per 1,000 in excess of the rate for bituminous miners. The causes responsible for fatalities among miners in Pennsylvania during the decade ending with 1908 have been as follows:

FATAL ACCIDENTS AMONG MINERS IN ANTHRACITE AND BITUMINOUS COAL MINES OF PENNSYLVANIA, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	1,353	58.5	1,747	72.5
Fall into shaft, slope, or manway.....	40	1.7	23	1.0
Mine cars.....	76	3.3	188	7.8
Mules.....	2	.1	3	.1
Explosion of gas or dust.....	195	8.4	262	10.9
Asphyxiation.....	66	2.9	7	.3
Powder, dynamite, blast.....	463	20.0	62	2.6
Electricity.....	2	.1	1	.1
Outside cars.....	3	.1	1	.1
Machinery.....	3	.1	3	.1
Miscellaneous.....	112	4.8	51	2.1
Total.....	2,315	100.0	2,408	100.0

Falls of coal, rock, or slate, accidents due to mine cars, and deaths due to explosions of gas and dust were proportionately more common among bituminous miners. The principal cause, actually and proportionately, in excess among anthracite miners when compared with miners of bituminous coal was powder and dynamite explosions and premature blasts. Accidents due to this group of causes formed 20 per cent of the total in anthracite mining, compared with 2.6 per cent in bituminous mining. The leading cause among both groups was fall of coal and roof. In neither coal field is proper attention paid to systematic timbering and other methods by which accidents of this class can be materially reduced. In both coal fields ignorance, neglect, and indifference, combined with much foolhardy assumption of needless risk, prevail to an extent which would seem impossible in a civilized country if the facts were not matters of daily occurrence. Many mine-car accidents are also due to these causes, but the effect

of a lax discipline and defective training in sound methods of mining, including all that the term implies, are nowhere so evident as in an excessive fatality rate due to premature blasts, flying coal, blown-out shots, missed shots, and other accidents of a similar nature.

The necessity of better training for mine work has frequently been emphasized in the reports of mine inspectors, as well as the increase in risk resulting from the employment of unintelligent, undisciplined mine labor of recent immigration into this country. The need of better education of mine workers has been emphasized in the annual report of the chief mine inspector of Pennsylvania for 1908, who remarks that—

In the development of the art of coal mining in America the scientific side has heretofore been largely neglected, but recently there has been a general awakening to the fact that attention should be given to the theoretical and technical education of the mine workers as well as their practical education. The opportunities for advancement are many for persons properly equipped for this work, and a greater realization of this fact is impelling many persons to seek a more thorough education. In no other industry are the requirements of practical knowledge greater than in coal mining. In nearly all the coal-mining States mine inspectors, mine foremen, and assistant mine foremen must pass a rigid educational test before they can receive certificates qualifying them to serve in their respective positions. A better and more comprehensive training of these men would no doubt result ultimately in a still higher grade of efficiency.

The coal output of the United States has been increasing at the rate of 10 per cent a year or 100 per cent in every decade for some time past, with a corresponding increase in the number of miners and mine officials. It is obvious that under such conditions there must be a better and more efficient class of miners and mine officials to meet the ever-increasing problems of operation. In fact, there exists at this time a very urgent demand among the coal companies for competent officials. There are in Pennsylvania probably 10,000 persons holding official positions in the mines of greater or less responsibility, and the desire to obtain these positions should be an incentive to the acquiring of more thorough education on the part of the mine worker. It is doubtful if any other industry offers as great opportunity for advancement from the lowest position to the highest. As Pennsylvania holds a preeminent place in the coal trade of the world, this matter has for her a peculiar significance.^(a)

The importance of this suggestion is emphasized by the statistical proof of an excessive fatality rate in both anthracite and bituminous mining. It must be considered in this connection that of all the miners killed in anthracite mines during the decade ending with 1908 only 13 per cent were American born, 3.3 per cent were English, 3.5 per cent German, and 7.7 per cent Irish. In contrast, 31.3 per cent were Poles, 11.1 per cent Lithuanians, 10.5 per cent Russians and

^a Report of the Department of Mines of Pennsylvania, 1908, Part I, p. vi.

other Slavs, 6.2 per cent Austrians and Hungarians, and 6.1 per cent Italians. In the bituminous coal fields the proportion of American-born mine laborers was even less than in the anthracite, or only 9.2 per cent, while the proportion of English was 2.8 per cent, of Germans 4 per cent, and of Irish only 1.9 per cent. In contrast, the proportion of Russians and other Slavs was 22.9 per cent, of Austrians and Hungarians, 20.8 per cent, of Italians 15.7 per cent, and of Poles, 13.7 per cent. Evidently the enforcement of necessary rules and regulations and the maintenance of a rigid discipline must be a most difficult task, with a mixed labor supply, indicating so large a variety of totally dissimilar nationalities, and mostly men who have been only a few years in this country and many of whom know little or no English.

Mine laborers in Pennsylvania are only returned as such in the reports for anthracite mines, and, according to an official explanation, they are employed exclusively in loading the coal for the miners. They are, therefore, loaders in the same sense as machine loaders, except that they work with the regular miners other than those employed in the use of coal-cutting machines. The conditions of labor are, therefore, quite similar. Mine laborers, in the sense of the foregoing definition, are not returned as such for the bituminous mines, so that no exact comparison of the two classes of labor for the two mining fields can be made. The total number of mine laborers employed in the anthracite districts of Pennsylvania during the five years ending with 1908 was 155,673, among whom there occurred 716 fatal accidents, or at the rate of 4.6 per 1,000. The corresponding rate for machine loaders was 3.19 per 1,000, but the rate was considerably less than the fatality rate of anthracite miners, which has previously been given as 6.58 per 1,000. During the ten-year period ending with 1908 there occurred 1,454 deaths by accidents in the Pennsylvania anthracite mines, of which 223, or 15.3 per cent, were due to fall of coal; 614, or 42.2 per cent, due to fall of roof or slate; 51, or 3.5 per cent, due to falls into shafts; and 10, or 0.7 per cent, due to falls into slopes. The number of fatal accidents to mine laborers due to mine cars was 197, or 13.5 per cent, and outside cars 12, or 0.8 per cent. The number of fatal accidents due to explosion of gas or dust was 70, or 4.8 per cent; powder or dynamite, 38, or 2.6 per cent; blasts, 64, or 4.4 per cent; and boilers, 0.2 per cent. Machinery accidents caused 41 deaths, or 2.8 per cent; mules, 2 deaths, or 0.2 per cent; asphyxiation, 56, or 3.9 per cent; electricity, 2, or 0.2 per cent; and miscellaneous, 71, or 4.9 per cent.

MACHINE RUNNERS, LOADERS, AND SCRAPERS.

Machine runners, loaders,^(a) and scrapers are not separately returned for the anthracite coal region, so that no comparison can be made of the fatality rate with the bituminous coal field.^(b) As a matter of convenient reference, the rates are given for the three occupations in the table below :

FATAL-ACCIDENT RATES OF MACHINE RUNNERS, LOADERS, AND SCRAPERS IN BITUMINOUS COAL MINES OF PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Occupation.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Machine runners.....	19,965	66	3.31
Machine loaders.....	200,802	641	3.19
Machine scrapers.....	18,845	48	2.55

The causes of fatal accidents among men employed in these occupations during the decade ending with 1908 have been as follows:

FATAL ACCIDENTS AMONG MACHINE RUNNERS, MACHINE LOADERS, AND MACHINE SCRAPERS IN BITUMINOUS COAL MINES OF PENNSYLVANIA, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents to—					
	Machine runners.		Machine loaders.		Machine scrapers.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	24	37.4	59	43.4	35	49.3
Fall into shaft, slope, or manway.....	2	3.1			2	2.8
Mine cars.....	6	9.4	6	4.4	2	2.8
Mules.....	8	12.5				
Explosion of gas or dust.....	14	21.9	64	47.1	15	21.2
Asphyxiation.....	1	1.6				
Powder, dynamite, blast.....			3	2.2		
Electricity.....	5	7.8	1	.7	5	7.0
Machinery.....					10	14.1
Miscellaneous.....	4	6.3	3	2.2	2	2.8
Total.....	64	100.0	136	100.0	71	100.0

Accidents caused by fall of coal, rock, or slate were of common occurrence in each of the three groups of occupations, but most frequent among machine scrapers, or 49.3 per cent. Gas and dust explosions caused a large proportion of the deaths among machine loaders, or 47.1 per cent, but the proportions were practically the same

^a According to the Pennsylvania Department of Mines "a machine loader loads the coal cut by machinery. A loader loads the coal cut by pick."

^b According to the same department "there are no machine runners in the anthracite mines at present."

among machine runners and machine scrapers. Electricity caused 7.8 per cent of all fatalities among machine runners, 7 per cent among machine scrapers, while the proportion of deaths from this cause was practically nil among machine loaders. The facts disclosed by this analysis emphasizes what has previously been said regarding the danger of electricity in underground mining, and while the number of recorded accidents is not very large it is quite probable that the true number due to this cause is greater. Mine cars caused 9.4 per cent of the deaths among machine runners, 4.4 per cent among machine loaders, and 2.8 per cent among machine scrapers. All these occupations are evidently subject to a serious accident risk, reflected in the high fatality rate of 3.31 per 1,000 for machine runners, 3.19 for machine loaders, and 2.55 for machine scrapers.

COMPANY MEN.

Company men are practically mine laborers, but the exact meaning of the term is a question of doubt.^(a) The fatality rate for this class of employees in the anthracite and bituminous coal fields of Pennsylvania during the 5 years ending with 1908 has been as follows:

FATAL-ACCIDENT RATES OF COMPANY MEN IN COAL MINES OF PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Kind of mine.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Anthracite.....	56,953	167	2.93
Bituminous.....	39,384	183	4.65
Excess of bituminous rate.....			1.72

^a According to the Department of Mines of Pennsylvania, "company men comprise timbermen, trackmen, and bratticemen; the mine laborers are their helpers. Mine laborers in the anthracite mines are the men who load for the miners."

The fatality rate of company men in bituminous mines was 1.72 per 1,000 in excess of the corresponding rate for anthracite miners. The causes of fatal accidents among company men during the decade ending with 1908 are set forth in the table below:

FATAL ACCIDENTS AMONG COMPANY MEN IN ANTHRACITE AND BITUMINOUS COAL MINES OF PENNSYLVANIA, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	17	18.1	23	41.1
Fall into shaft, slope, or manway.....	8	8.5	2	3.6
Mine cars.....	43	45.7	19	33.9
Mules.....	1	1.1		
Explosion of gas or dust.....	5	5.3	4	7.1
Asphyxiation.....	3	3.2	1	1.8
Powder, dynamite, blast.....	1	1.1	2	3.6
Electricity.....	1	1.1		
Outside cars.....	4	4.2		
Machinery.....	2	2.1		
Miscellaneous.....	9	9.6	5	8.9
Total.....	94	100.0	56	100.0

It has been shown that falls of coal, rock, or slate were proportionately the most important cause of fatal accidents among bituminous coal miners in Pennsylvania. The proportion of deaths due to fall of coal and roof was 41.1 per cent for company men in bituminous mines, against 18.1 per cent for company men in anthracite mines. Accidents due to falls into shaft, deaths due to asphyxiation and outside car accidents and machinery were proportionately more common among company men in anthracite mines. Accidents due to mine cars caused 45.7 per cent of the deaths of company men in the anthracite coal mines and 33.9 per cent in the bituminous. In both branches of mining the liability to inside car accidents is, therefore, a most important factor, more or less inherent in the conditions under which the duties of company men must be performed. No outside car accidents or deaths due to machinery appear to have occurred among company men, but some deaths due to these causes may have been classified as miscellaneous. The work of company men probably requires little skill, but considerable physical strength and absolute obedience to rules and the prompt heeding of warnings and notices, verbal or written, which is often out of the question on account of ignorance of the language. Of the company men killed in anthracite mines, 25 per cent were native born and 18 per cent were Irish, but of the remainder of foreign birth 16.7 per cent were Poles and 6.9 per cent Italians. In the bituminous coal mines, of the company men killed during the decade ending with 1908 the proportion of native born was 34.7 per cent, English 10.2 per cent, and Irish only

2 per cent. Of the non-English speaking nationalities, 26.5 per cent were returned as Slavs, 8.2 per cent as Italians, 8.1 per cent as Austro-Hungarians, and 4 per cent as Russians and Poles.

DRIVERS AND RUNNERS (INSIDE).

Drivers and runners constitute a considerable proportion of inside mine labor.^(a) The fatality rate of persons employed in these occupations in Pennsylvania anthracite and bituminous mines during the 5-year period 1904-1908 are given in the table below :

FATAL-ACCIDENT RATES OF **DRIVERS AND RUNNERS** IN COAL MINES OF PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Kind of mine.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Anthracite.....	59,343	189	3.18
Bituminous.....	48,184	213	4.42
Excess of bituminous rate.....			1.24

The fatality rate was 1.24 per 1,000 in excess among drivers and runners in the bituminous mines, but for both coal fields the rates are extremely high, considering the nature of the duties performed. The causes of fatal accidents among drivers and runners during the decade ending with 1908 have been as follows:

FATAL ACCIDENTS AMONG **DRIVERS AND RUNNERS** IN COAL MINES OF PENNSYLVANIA, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	30	9.2	28	9.7
Fall into shaft, slope, or manway.....	9	2.7		
Mine cars.....	218	66.7	203	70.5
Mules.....	31	9.5	7	2.4
Explosion of gas or dust.....	11	3.4	28	9.7
Asphyxiation.....	4	1.2	3	1.1
Powder, dynamite, blast.....	6	1.8	3	1.1
Electricity.....			2	0.7
Outside cars.....				
Machinery.....	5	1.5		
Miscellaneous.....	13	4.0	14	4.8
Total.....	327	100.0	288	100.0

^a According to the Pennsylvania Department of Mines, "a runner is employed to run cars down a grade by the use of sprags or brakes."

Accidents due to fall of coal, rock, or slate were relatively rather rare among this class of labor, having been 9.2 per cent for drivers and runners in anthracite mines and 9.7 per cent for drivers and runners in bituminous mines. Mine cars caused by far the largest proportion of fatal accidents and the percentages are nearly the same for both coal fields. In the anthracite mines cars caused 66.7 per cent of the deaths of drivers and runners and in the bituminous mines 70.5 per cent. The greater use of electric traction or haulage in the bituminous mines probably accounts for the fact that mules caused only 2.4 per cent of the deaths in bituminous mines against 9.5 per cent in anthracite mines. Explosions of gas and dust caused relatively a much larger loss of life among drivers and runners in bituminous mines, or 9.7 per cent, against only 3.4 per cent in anthracite mines. The chief cause of fatal accidents, that is, mine cars, is plainly shown to be inherent in the work itself, but it requires to be taken into consideration that most of the drivers and runners are young persons, naturally disposed to reckless exposure and the needless assumption of risk. Of the 287 drivers killed in bituminous mines during the decade ending with 1908 about one-half, or to be exact, 51.2 per cent were under 25 years of age, while of the 22 runners killed 10, or 45.5 per cent, were under 20 years of age and 7, or 31.8 per cent of the total, from 20 to 24 years of age. In the anthracite coal fields, out of 327 drivers killed during the decade ending with 1908, 61.5 per cent were under 20 years of age and 29.4 per cent from 20 to 24 years of age, or 90.9 per cent were of ages under 25. Of the 80 runners killed in anthracite mines 31, or 38.7 per cent, were under 20 years of age and 42.5 per cent of ages 20 to 24, or 81.2 per cent were of ages under 25. About half of the drivers killed in anthracite mines were native born, but probably a large proportion were of foreign parentage. Among the foreign born 15.5 per cent were Poles and 6.2 per cent Slavs. The nativity distribution is quite similar for runners in the anthracite coal field. Of the drivers killed in the bituminous coal mines 44.1 per cent were native born, 20.5 per cent Slavs, 9.6 per cent Hungarians, 6.2 per cent Russians and Poles, and 5.2 per cent Italians. Of the runners killed 68.4 per cent were native born and 10.5 per cent were of Austrian birth. The inherent risk in the employment is, therefore, materially increased by the youth of the employees and the probability of ignorance of the English language, lack of training, and indifference to rules and regulations necessary for the protection of life in underground mining.

RUNNERS.

The details regarding the cause of fatalities among runners only are given in the table below :

FATAL ACCIDENTS AMONG RUNNERS IN PENNSYLVANIA ANTHRACITE AND BITUMINOUS COAL MINES, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	18	22.5	2	9.1
Mine cars.....	40	50.0	19	86.4
Mules.....	2	2.5		
Explosion of gas or dust.....	4	5.0		
Powder, dynamite, blast.....	3	3.7		
Electricity.....			1	4.5
Outside cars.....	1	1.2		
Machinery.....	9	11.3		
Miscellaneous.....	3	3.8		
Total.....	80	100.0	22	100.0

Of the deaths from all causes among runners, as distinct from drivers and runners combined, in the anthracite coal field 50 per cent were the result of mine-car accidents, against 86.4 per cent in the bituminous districts. Fall of coal and roof caused 22.5 per cent in the anthracite, but only 9.1 per cent of the deaths in the bituminous coal field. The causes of accidents among runners were more varied in the anthracite region, including 4 deaths from explosion of gas and dust, 2 deaths caused by mules, 3 by powder or dynamite, 1 by outside cars, 9 by machinery, and 3 by miscellaneous causes.

DOOR BOYS AND HELPERS.

Door boys and helpers are chiefly of foreign birth or parentage, and largely young men of an age period when the normal death rate from all causes is about 5 per 1,000.^(a) The fatality rates for door boys and helpers in anthracite and bituminous coal mines in Pennsylvania during the 5 years ending with 1908 have been as follows :

FATAL-ACCIDENT RATES OF DOOR BOYS AND HELPERS IN COAL MINES OF PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Kind of mine.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Anthracite.....	15,067	79	5.25
Bituminous.....	9,752	36	3.69
Excess of anthracite rate.....			1.56

^a Volume III, Part I, Vital Statistics, p. lxxvix, United States Bureau of the Census.

The fatality rate among door boys and helpers in anthracite mining was 1.56 per 1,000 in excess of the bituminous rate. The rates for both coal fields are extremely high, considering the nature of the duties performed. The causes of fatal accidents among this class of labor during the decade ending with 1908 are given in the table below:

FATAL ACCIDENTS AMONG DOOR BOYS AND HELPERS IN PENNSYLVANIA ANTHRACITE AND BITUMINOUS COAL MINES, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	8	7.2	1	5.6
Fall into shaft, slope, or manway.....	5	4.5	.....	.....
Mine cars.....	84	75.7	16	88.8
Mules.....	4	3.6	.....	.....
Explosion of gas or dust.....	2	1.8	1	5.6
Powder, dynamite, blast.....	1	.9	.....	.....
Miscellaneous.....	7	6.3	.....	.....
Total.....	111	100.0	18	100.0

The chief causes of death among door boys and helpers in both coal fields have been due to run-over accidents by mine cars. In the anthracite coal fields the proportion was 75.7 per cent and in the bituminous 88.8 per cent. In anthracite mines falls into shafts, etc., caused 4.5 per cent and kicks by mules 3.6 per cent of the deaths from all causes. No deaths from these causes occurred in this occupation in the bituminous coal field. The risk of door tending does not require experience or much strength and mostly young persons are employed in this occupation. In anthracite mining out of 111 door tenders killed during the decade ending with 1908, 10, or 9 per cent, were under 15 years of age, 73 of ages 15 to 19, and 13, or 11.7 per cent, of ages 65 and over. It is evident that, by preference, the very young and the very old are employed at this kind of work. The loss of life in proportion to the number employed must be considered appalling, and few occupations in mining show a higher death rate due to fatal accidents than this group of either very young or very old men, probably receiving the lowest wages for the work, which, while not requiring much skill, certainly requires strict obedience to orders, since the life and safety of all the men underground may depend upon the prompt closing of a door as a necessity of noninterruption of the air currents produced by artificial ventilation.

PUMP MEN.

Pumpmen underground are employed to a considerable extent only in anthracite mines, and no corresponding returns are available for bituminous mines.^(a) The fatality rate in this occupation in Pennsylvania anthracite mines during the 5 years ending with 1908 has been 1.54 per 1,000, there having been 8 deaths among 5,178 pumpmen exposed to risk of death 1 year. The occupation is probably one of the safest in coal mining, although the rate is relatively high, considering the comparatively small amount of actual risk exposure. The number of deaths is too small to warrant safe conclusions as to the causes of death among men employed as pumpmen in the anthracite coal field.

MINE SUPERINTENDENTS.

Mine superintendents inside, in the strict sense of the term, are practically inside foremen and their assistants. Outside superintendents rarely go into the mines, except under favorable conditions, but occasionally they incur extreme exposure in connection with rescue work, when acts of heroism are common. Only one fatal accident has occurred among mine superintendents in the anthracite coal field of Pennsylvania during the 5 years ending with 1908 among 719 superintendents exposed to risk 1 year, or at the rate of 1.39 per 1,000. No fatal accidents occurred among outside superintendents in bituminous mines, although the number exposed to risk 1 year was 3,662. It is possible, of course, that the returns have not been accurately made and that mine superintendents have been included in other groups, but this is hardly probable, since the official reports are made up by the mine officials themselves. It seems safe, however, to assume that the true accident risk is not excessive among superintendents and their assistants employed chiefly, if not exclusively, outside of mines.

OUTSIDE FOREMEN.

The fatality rates of outside foremen are given in the table below:

FATAL-ACCIDENT RATES OF OUTSIDE FOREMEN IN COAL MINES OF PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Kind of mine.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Anthracite.....	2,015	5	2.48
Bituminous.....	2,519	5	1.98
Excess of anthracite rate.....			.50

^a According to the Pennsylvania Department of Mines, "there are pumpmen in the bituminous mines, but they are likely to be reported as 'other outside employees.'"

The fatality rate among outside foremen and their assistants in anthracite mining was 0.50 per 1,000 in excess of the corresponding rate for bituminous miners. The actual number of deaths is too small for safe conclusions as to the causes responsible for fatal accidents among foremen and assistants in anthracite or bituminous mines.

BLACKSMITHS AND CARPENTERS.

The fatal accident rates of blacksmiths and carpenters employed outside of mines, but in connection therewith, are set forth in the table below:

FATAL-ACCIDENT RATES OF BLACKSMITHS AND CARPENTERS IN COAL MINES IN PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Kind of mine.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Anthracite.....	13,595	21	1.54
Bituminous.....	12,040	4	.33
Excess of anthracite rate.....			1.21

The fatality rate of blacksmiths and carpenters in anthracite mining was 1.21 per 1,000 in excess of the corresponding rate for bituminous mining. The rate for the anthracite coal field is decidedly excessive, but due, in part, no doubt, to hazardous exposure underground, although these occupations are always classified as outside mine labor. No returns in detail by causes are available for the bituminous coal field, but out of 36 carpenters killed in anthracite mining in Pennsylvania during the decade ending with 1908, 33.3 per cent were killed by mine cars, 5.6 per cent by fall of coal or roof, 5.6 per cent by falls into shafts, and 8.3 per cent by machinery. There were two deaths caused by powder and dynamite and one by electricity. It is evident that mine "carpenters" are quite seriously exposed to the general accident liability of underground workers, and it is quite probable that they often perform duties more or less identical with the duties of timbermen.

ENGINEERS AND FIREMEN.

The fatality rates of engineers and firemen in anthracite and bituminous coal mining are set forth in the table which follows:

FATAL-ACCIDENT RATES OF ENGINEERS AND FIREMEN IN COAL MINES IN PENNSYLVANIA, FOR THE PERIOD 1904 TO 1908.

Kind of mine.	Employees.	Fatal accidents.	
		Number.	Rate per 1,000 employees.
Anthracite.....	28,206	24	0.85
Bituminous.....	14,780	7	.47
Excess of anthracite rate.....			.38

The excess in the fatality rate of engineers and firemen in anthracite mining is 0.38 per 1,000 over the corresponding rate in bituminous mining. The causes of fatal accidents among engineers in anthracite and bituminous coal mining during the decade ending with 1908 are given in the table below. The corresponding information for firemen is only available for the anthracite region and requires to be separately discussed.

FATAL ACCIDENTS AMONG ENGINEERS IN PENNSYLVANIA ANTHRACITE AND BITUMINOUS COAL MINES, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	1	4.8		
Fall into shaft, slope, or manway.....			1	7.7
Mine cars.....	5	23.8	2	15.4
Outside cars.....	2	9.5		
Machinery.....	11	52.4	3	23.1
Miscellaneous.....	2	9.5	7	53.8
Total.....	21	100.0	13	100.0

As far as reported, the chief cause of fatalities among engineers employed in surface work of coal mining has been machinery, causing 52.4 per cent of the deaths of engineers in the anthracite and 23.1 per cent in the bituminous coal field. The next most important cause has been mine cars and outside cars among engineers of the anthracite district. The number of deaths is too small for a safe conclusion. As far as it is possible to judge, the fatal accident risk of engineers is primarily a true occupation hazard resulting from the nature of the employment, but many, if not most, of these accidents could be prevented by properly safeguarding machinery in motion,

gearing, shafting, belting, etc. It would seem to speak well for the safety of mine power plants that no deaths due to boiler explosions should have occurred among the 34 engineers killed during a whole decade of active mine development, but, as a matter of fact, such accidents have been the chief cause of death among firemen employed in anthracite mining. Out of 22 deaths of firemen from all causes in the anthracite coal district during the 10 years ending with 1908, there were 10 deaths due to boiler explosions, or 45.5 per cent of the total number killed.^a Among other causes were machinery, with 13.6 per cent, and outside car accidents also with 13.6 per cent; but the number of deaths is too small for a safe conclusion.

SLATE PICKERS.

Slate pickers employed in the breakers are not reported for the bituminous coal region, but the occupation is one of considerable interest, considering the youth of the employees. During the 5 years ending with 1908 there occurred 79 fatal accidents to slate pickers in the anthracite region of Pennsylvania among 77,955 exposed to risk one year, or 1.01 per 1,000. The cause of fatal accidents among 122 slate pickers killed during the decade ending with 1908 has been as follows:

FATAL ACCIDENTS AMONG SLATE PICKERS IN PENNSYLVANIA ANTHRACITE COAL MINES, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in anthracite mines.	
	Number.	Per cent.
Fall of coal, rock, or slate.....	2	1.6
Fall into shaft, slope, or manway.....	11	9.0
Mine cars.....	20	16.4
Asphyxiation.....	15	12.3
Electricity.....	1	.8
Outside cars.....	1	.8
Machinery.....	59	48.4
Miscellaneous.....	13	10.7
Total.....	122	100.0

The preceding table is most interesting and instructive. The chief duties of slate pickers in breakers consist in picking out the pieces of slate mixed in with the coal, which has previously been reduced to various sizes. The coal, as a rule, is conveyed on endless belting and passes before the boy, who rapidly picks out the slate and throws it away. The danger due to machinery is very considerable as most of it is imperfectly guarded. Of the 122 deaths of slate pickers, 48.4 per cent were due to machinery. This is most sug-

^a See article by F. S. Crum in *The Spectator*, New York, October 27, 1910, entitled "Some comparative statistics of boiler explosions."

gestive and clearly emphasizes the true occupation risk in this occupation. Some slate pickers are employed underground, no doubt, but the deaths due to fall of coal or rock, falls into shafts, slopes, or manways, accidents caused by mine cars, are all probably the result of needless or accidental risk exposure, and not primarily due to an inherent occupation hazard. The extraneous risk naturally arises out of propinquity and can be guarded against only by the enforcement of stringent rules against the admission of other than underground workers to the underground workings, including the shafts, etc. There can be no question of doubt that a large proportion of the deaths of slate pickers are avoidable, and considering the youth of the employees it is particularly urgent that everything proper should be done to make such accidents impossible. Out of 122 slate pickers killed in anthracite mining, 47, or 38.5 per cent, were under 15 years of age and 52.5 per cent were between 15 and 19 years of age. In other words, 91 per cent of the workers were mere boys, or persons under 20 years of age. The boys were largely of foreign birth or foreign parentage, and only 42.8 per cent were native born. Among the foreign nativities, 13.2 per cent were Poles, 8.8 per cent Italians, and 5.5 per cent Slavs. Ignorance of language, methods, and customs no doubt have also an important bearing upon the relatively high degree of accident frequency among this class of labor in anthracite mining.

COKE EMPLOYEES.

Coke employees are found only in the bituminous coal field. Out of 55,975 coke workers exposed to risk only 12, or 0.21 per 1,000, were killed by accidents. The rate is the lowest for any class of labor specifically dealt with in the report of the mine inspector of the State. The occupation is one which should hardly be classed with mining, but it is customary to do so. The theoretical accident risk is considerable, particularly to asphyxiation, gas explosion, burns, and falls, but in practice few fatalities occur. The occupation has never been fully inquired into by mining or labor bureaus, but in view of the large amount of labor employed therein and the new risk arising out of the extensive development of by-product coke ovens, the employment is one which should be fully reported upon by those qualified to do so.^(a)

For other specific occupations in coal mining the information required for the calculation of fatality rates is not available at the present time and they are, therefore, grouped as miscellaneous. The term is of no practical significance and comparison of the rates would

^a An extended discussion, historical and descriptive, of coke-making processes, including by-product ovens, and a bibliography, is contained in Bulletin No. 65 of the Bureau of the Census, on Coke, Washington, 1907.

be of no value. For most of the occupations, however, the facts are available to show the proportionate distribution of causes, and these are briefly considered in the following summary:

BOTTOM MAN.

This occupation is reported only from the anthracite coal region and in the 10 years ending with 1908 there have been 16 deaths, of which 10, or 62.5 per cent, were due to mine cars, while 5, or 31.3 per cent, were due to either fall of coal or rock, or falls into shafts.^(a)

BRAKEMEN.

In the anthracite region there occurred 16 deaths of brakemen employed by coal-mining companies during 1899 to 1908, and of these 15, or 93.7 per cent, were due to mine cars and 1, or 6.3 per cent, to electricity. In the bituminous coal field occurred 17 deaths of brakemen, of which 9, or 52.9 per cent, were due to mine cars; 5, or 29.4 per cent, to explosions of gas or dust; and 3, or 17.7 per cent, to miscellaneous causes.

CAGERS.

This occupation was specifically reported as such only for the bituminous coal fields, although deep shafts are rare in that section. There were 13 deaths of cagers during the decade ending with 1908, of which none occurred in combination with shaft accidents, but 5, or 38.5 per cent, were due to gas or dust explosion, and 2, or 15.4 per cent, to mine cars.

CHARGE MEN.

Charge men were reported only for the anthracite coal field, and in ten years only three deaths occurred in this occupation.^(b) The causes were: One death due to fall of coal or roof, 1 to dynamite and powder, and 1 to miscellaneous cause.

CUTTERS.

This term in all probability includes men employed in the cutting of coal by machines only and the number of deaths should perhaps have been included in machine runners, which would have materially increased the death rate for that group. Cutters were reported only from the bituminous coal region, and during the decade there have been 31 deaths, of which 25, or 80.6 per cent, were caused by gas or dust explosion, 4 by fall of coal or roof, and 2 by mine cars.

^a According to the Pennsylvania Department of Mines, "a bottom man's duty is to hitch cars on and unhitch cars at bottom of slope."

^b According to the same department, "a charge man is a shot firer, or one who charges the blast."

FOOTMEN.

Footmen were reported only for the anthracite area.^(a) In the 10 years ending with 1908 there have been 39 deaths from all causes, of which 16, or 41.5 per cent, were caused by mine cars; 9, or 23 per cent, by falls into shafts, slope, or manway; 4, or 10.2 per cent, by fall of coal or roof; and 11, or 25.8 per cent, by other causes.

LOADERS.

This occupation has been considered under machine loaders, but the number employed otherwise as loaders is not returned, so that the fatality rate can not be calculated. In the anthracite region there have been 79 deaths of loaders, of which 58.2 per cent were due to mine cars and 11.4 per cent to fall of coal, rock, or slate. Outside cars caused 12.7 per cent of the deaths from all causes, and explosions of gas and dust, powder, dynamite, or blast, and asphyxiation 6.3 per cent. In the bituminous mines there occurred 640 deaths of loaders, of which 58.1 per cent were caused by fall of coal or roof. In marked contrast to the extremely high proportion of deaths due to mine cars in anthracite mines, this cause was responsible for only 5.5 per cent in bituminous mines. In other words, out of 79 deaths from all causes in anthracite mining 46 were due to mine cars, while out of 640 deaths from all causes in bituminous mines only 35 were due to mine cars. In further contrast, it appears that, while only 2.5 per cent of the deaths of loaders in anthracite mining were caused by gas or dust explosion, this cause was responsible for 25.6 per cent in bituminous mines. Finally, as a most suggestive fact, it is brought out that 31 deaths, or 4.8 per cent of the deaths from all causes, were the result of electricity among loaders in bituminous mining, but no deaths occurred from electricity in anthracite mining. The details for the two coal regions are given in full in the table below:

FATAL ACCIDENTS AMONG LOADERS IN PENNSYLVANIA ANTHRACITE AND BITUMINOUS COAL MINES, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	9	11.4	372	58.1
Fall into shaft, slope, or manway.....	1	1.3	5	.8
Mine cars.....	46	58.2	35	5.5
Explosion of gas or dust.....	2	2.5	164	25.6
Asphyxiation.....	1	1.3	3	.5
Powder, dynamite, blast.....	2	2.5	5	.8
Electricity.....			31	4.8
Outside cars.....	10	12.7		
Machinery.....	2	2.5	1	.2
Miscellaneous.....	6	7.6	24	3.7
Total.....	79	100.0	640	100.0

^a According to the Pennsylvania Department of Mines, "a footman does the same work as a cager or bottom man."

MACHINISTS.

The returns for this occupation are limited to the anthracite coal field, and only 22 deaths have been reported during the decade under consideration. The deaths have been chiefly due to powder and dynamite explosions, or 22.8 per cent, and to falls into shafts, slopes, or manways, or 13.7 per cent. For a considerable proportion of the deaths, 36.5 per cent, no details are given, as they are classed as miscellaneous.

MOTORMEN.

The number of deaths among motormen in the anthracite region was 18, of which 15, or 83.3 per cent, were caused by mine cars and 3 by electricity. In the bituminous coal region there occurred 32 deaths of motormen, of which 16, or 50 per cent, were caused by mine cars; 13, or 40.6 per cent, by explosions of gas and dust; and 3, or 9.3 per cent, from other causes.

OILERS.

There were 25 deaths of oilers returned from the anthracite region, but none from the bituminous. The principal cause of death was machinery, causing 44 per cent of the deaths from all causes. Mine cars caused 24 per cent of the total deaths and falls into shafts, etc., 12 per cent. The principal cause of death was, therefore, closely related to the occupational duties of men in this employment.

PATCHERS.

There were 29 deaths of men in this occupation in the anthracite region, but none was reported for the bituminous coal field.^(a) Of the deaths from all causes, 65.6 per cent were caused by mine cars, 17.3 per cent by explosion of gas and dust, and 17.1 per cent by miscellaneous causes.

REPAIRMEN.

There were 31 deaths of repairmen reported for the anthracite coal field, but none for the bituminous. Of the mortality from all causes, 35.5 per cent were the result of mine cars, 22.6 per cent were due to falls of coal and roof, 9.7 per cent to explosions of gas and dust, 9.7 per cent to machinery, and 6.5 per cent to powder, dynamite, and blasts.

ROADMEN.

Only 4 deaths of roadmen were reported from the anthracite coal fields, of which 3 were caused by mine cars.^(b) There were 29 deaths among men in this occupation in the bituminous coal region, and of

^a According to the Pennsylvania Department of Mines, "a patcher is the driver's helper, opening doors and doing such work."

^b According to the same department, "a roadman lays the tracks and keeps them in repair."

the deaths from all causes 44.8 per cent were due to gas and dust explosion, 24.1 per cent to falls of coal or roof, and 20.6 per cent to mine cars.

ROCKMEN.

The returns for this occupation are limited to the anthracite coal field.^(a) There were 10 deaths from all causes, of which 40 per cent were caused by falls of coal or roof, 30 per cent by explosions of gas and dust, and 30 per cent by other causes.

SINKERS.

Sinkers, or shaft sinkers, are employed in both anthracite and bituminous mines, but relatively the occupation is of small importance in the former. There occurred 13 deaths of sinkers in anthracite mining, of which 46.1 per cent were caused by shaft accidents, and 30.8 per cent by falls of coal, rock, or slate. In the bituminous coal field 42.9 per cent of the 14 deaths were caused by falls into shafts, slopes, manways, and the remainder by various causes, most of which were not classified.

STARTERS.

There were 15 deaths of men in this occupation reported^(b) for the anthracite coal field, but none for the bituminous. Of the deaths of starters from all causes, 46.7 per cent were due to fall of coal and roof and 33.3 per cent to asphyxiation. The remainder were caused by mine cars and powder or dynamite explosion.

TIMBERMEN.

The details of the causes of fatal accidents to timbermen in the anthracite and bituminous coal mining regions are given in the table below:

FATAL ACCIDENTS AMONG TIMBERMEN IN PENNSYLVANIA ANTHRACITE AND BITUMINOUS COAL MINES, BY CAUSES, FOR THE PERIOD 1899 TO 1908.

Cause.	Fatal accidents in—			
	Anthracite mines.		Bituminous mines.	
	Number.	Per cent.	Number.	Per cent.
Fall of coal, rock, or slate.....	5	10.9	7	58.3
Fall into shaft, slope, manway.....	15	32.6		
Mine cars.....	9	19.6		
Explosion of gas or dust.....	7	15.2	4	33.3
Powder, dynamite, blast.....	7	15.2		
Electricity.....			1	8.3
Miscellaneous.....	3	6.5		
Total.....	46	100.0	12	100.0

^a According to the Pennsylvania Department of Mines, "a rockman blasts the rock and sometimes is in charge of the men doing that work."

^b According to the same department, "a starter in the anthracite region is the man who starts the coal in the manways and chutes when blocked or wedged between top and sides of same."

Mine timbering is a well-defined occupation, and it is a matter of regret that the facts required for the calculation of the fatality rates in this occupation should not be available.^(a) There were 46 deaths of timbermen in the anthracite region, of which 32.6 per cent were due to shaft and slope accidents, 19.6 per cent to mine cars, 15.2 per cent to gas or dust explosion, and the same proportion to powder, dynamite, and blast. The proportion of deaths due to fall of coal, rock, or slate was 10.9 per cent and to miscellaneous causes 6.5 per cent. In the bituminous coal field 58.3 per cent of the deaths were caused by fall of coal, rock, or slate, 33.3 per cent by explosion of gas and dust, and 8.3 per cent by electricity. The numbers for the bituminous region are too small for a safe conclusion.

TOPMEN.

There were 14 deaths of topmen in the anthracite region, but none was reported for the bituminous coal field. Of the deaths of topmen from all causes, 21.4 per cent were due to falls into shafts, slopes, or manways, 50 per cent were deaths resulting from mine cars, and 28.6 per cent were due to miscellaneous causes.

TRACKMEN.

In the anthracite region there occurred 25 deaths of trackmen, caused chiefly by mine cars (28 per cent) and fall of coal or roof (24 per cent). In the bituminous region there occurred 12 deaths of trackmen, caused chiefly by electricity (33.3 per cent), fall of coal or roof (25 per cent), explosion of gas and dust (25 per cent), and mine cars (16.7 per cent).

TRAPPERS.

In the bituminous mines there occurred 19 deaths of trappers, but no deaths in this employment were reported from the anthracite coal field.^(b) The causes of accidents were 52.6 per cent on account of gas and dust explosions, 36.9 per cent on account of mine cars, and 10.5 per cent were due to fall of coal or roof.

SUMMARY.

In the foregoing analysis it has not been feasible to give full consideration to every employment in anthracite and bituminous mining in Pennsylvania. The analysis is rather suggestive of the method by which the true fatal accident hazard in the various employments should be determined and coordinated to the causes responsible for the accidents. The evidence is conclusive that many mine employ-

^a See Company men and also footnote, on p. 593.

^b According to the Pennsylvania Department of Mines, "a trapper is a driver's helper, in some places called a patcher." See also p. 606.

ments are subject to an occupation accident rate out of all proportion to the normal accident hazard in other trades more or less dangerous to life. It has been shown that the fatality rate among anthracite miners was 6.58 per 1,000 during the five-year period, while the corresponding rate among bituminous miners was 3.78. Even higher rates than these have been experienced in other inside occupations. It is evident that the general fatality rate of 3.79 for anthracite and of 3.34 for bituminous coal mines in Pennsylvania is entirely inconclusive and rather obscures the true element of risk in present-day mining experience. It would, therefore, seem of great practical importance that these facts should be dealt with in more detail in the reports of mine inspectors than has heretofore been the case, and the foregoing analysis suggests the most convenient as well as most trustworthy method by which they can be presented in entire fairness to both the employer and the employee.

AN ESTIMATE OF THE TOTAL LOSS OF LIFE IN COAL MINING IN NORTH AMERICA, 1808 TO 1909.

It is only for recent years that the returns of fatal accidents in coal mining in North America are reasonably accurate and complete. For earlier years no trustworthy data are available, except for a few accidents of historic and exceptional importance. It is possible, however, to estimate the total loss of life in coal mining in North America during the past 100 years with approximate accuracy upon the known basis of coal production, which represents totals of such a colossal magnitude that the remote possibility of error is not a factor of real importance.

There are no official records of coal production previous to 1814, but the production must have been a negligible quantity, since in that year only 22 tons of anthracite coal were mined in Pennsylvania. It is, therefore, safe to estimate the coal production as for a period of 100 years ending with 1908, and the aggregate for the whole United States is given by the United States Geological Survey as 7,280,940,265 tons. For Canada the production has been officially reported only since 1874, when 1,063,742 tons were mined in the settled Provinces of the Dominion. The aggregate production from 1874 to 1908 was 140,231,601 tons. When these two aggregates are combined, the total recorded coal production of North America is 7,421,171,866 tons, which, allowing for the not reported production in Canada previous to 1874, may be considered in round figures as seven and a half billion tons.

The officially reported fatal accidents in coal mining in North America from 1866 to 1908, inclusive, numbered 37,020, excepting, of

course, for States and Provinces and years for which the returns are not available. The corresponding coal production during the years and in the area for which the fatal accidents have been reported was 6,347,985,581 tons^(a) representing 85.5 per cent of the total production, estimated at seven and a half billion tons. The average production per life lost was, therefore, 171,474 tons of coal, and when this ratio is applied to the total production of seven and a half billion tons the probable total loss of life in coal mining in North America may be conservatively estimated at 43,738, or in round numbers as 44,000.

THE USE OF EXPLOSIVES IN MINES.

Great progress has been made within recent years in the competent attention which has been given to the use of explosives in mines. The introduction of permissible explosives and the compulsory use of such explosives, to the exclusion of other powders and nitro compounds, will unquestionably tend to reduce the dangers and disadvantages of mining, with a resulting diminution in the loss of life. In this connection, mention may be made of the fact that in England only 1 pound of explosives is used to every 7 tons of coal mined, while the proportion in the State of Illinois in 1908 was 5.4 pounds of powder for every 7 tons of coal mined. In England progress has been made in the use of permissible explosives to such an extent that about 34 per cent, by weight, of the explosives used in British mines in 1908 was of the permissible class, the remainder being gunpowder, etc. In England in 1908 about 15,656,000 shots were fired by electricity, 577,000 by permitted ignited fuses, 10,836,000 by other fuses, and 12,652,000 by squibs. In view of the wide public interest in the question of permissible explosives in this country, the following is quoted concerning the requirements of the British Government, as embodied in the explosives-in-coal-mines order, including the composition of the different explosives permitted:^(b)

THE EXPLOSIVES ORDER.

Under section 1 of the order dated February 10, 1910, the use of explosives, other than "permitted explosives," is prohibited in seams (also the communicating shafts or drifts in process of being driven) in which dangerous quantities of inflammable gas have been found within the previous three months. This prohibition extends to coal mines which are not naturally wet throughout, permitted explosives only having to be used on roads and in dry and dusty parts of the mine (also communicating shafts in drifts in process of being driven).

^a See Table XXIX of the appendix.

^b See Use of Explosives in British Coal Mines: Engineering and Mining Journal, September 24, 1910, p. 613.

Section 2 sets forth the conditions to be observed in such coal mines or parts: (a) Charges have to be fixed by a competent person called the shot firer, who is appointed, in writing, by the owner, agent, or manager, and whose wages do not depend on the mineral output. (b) Charges have to be placed in properly drilled shot holes, must have sufficient stemming, and in each case consist of cartridge or cartridges of one description of explosive only. (c) Cartridges have to be marked in the manner set forth in the schedules. (d) Cartridges have to be fired by efficient electrical apparatus inclosed to afford reasonable security against gas ignitions, or by a permitted igniter fuse. (e) In firing, a cable not less than 20 yards in length has to be used, the shot firer himself coupling up the cable to the charge before coupling the cable to the firing apparatus. He is required first to see that persons in the vicinity have taken proper shelter, and in the event of a missfire he must immediately disconnect the cable from the firing apparatus. (f) The electrical firing apparatus must be provided with a removable handle or safety plug or push button, to be placed in position or operated only when the shot is required to be fired and released immediately after firing, the handle or safety plug to be in the personal custody of the shot firer on duty. (g) Each explosive has to be used in the manner and subject to conditions prescribed in the schedules. (h) When two or more shots are fired in the same place, and are not fired simultaneously, the shot firer must examine for gas immediately before firing each shot; he must not fire until the place and all contiguous places within 20 yards are free from gas and safe for firing.

Section 3 prohibits the use of any explosive in main haulageways and intakes beyond 100 yards of the coal face unless all workmen have been removed from the seam in which the shot is to be fired, and from all seams communicating with the shaft on the same level, except the men engaged in firing the shot, and other persons (not exceeding 10) necessarily engaged in attending to furnaces, boilers, engines, machinery, etc., or in inspecting the mine—or unless a permitted explosive is used as required by section 2, and the roof, floor, and sides of the road or intake, within a distance of 20 yards, is at the time of firing thoroughly wet, either naturally or from the application of water.

DETONATORS MUST BE UNDER CONTROL OF MANAGER.

In accordance with section 4, detonators must be under the control of the owner, agent, or manager, or person appointed in writing by the same. They may be issued only to shot firers or other persons authorized in writing, who must keep the detonators, until about to be used, in a locked case or box separate from other explosives.

Mines of clay and ironstone are exempted from sections 1, 2, and 3 of the order; also shafts in course of being sunk from the surface, or deepened, or drifts and other outlets being driven from the surface, except as provided in section 1. The order applies to each seam in a mine as if it were a separate seam.

Conditions regulating the manner of use and manufacture and marking of each explosive are given and must be observed. Altogether the explosives in the first schedule number 62, and it is claimed

that during the time the order has applied to the mines of Great Britain the death rate from explosions has been reduced one-half or more. Selecting the 10 [nine] most commonly used of the permitted explosives, they consist of mixtures as shown in the accompanying table:

Composition of permitted explosives.

Ingredients.	Parts by weight.		Ingredients.	Parts by weight.	
	Not more than—	Not less than—		Not more than—	Not less than—
Ammonite:			Carbonite—Concluded.		
Nitrate of ammonium.....	89	87	Carbonate of calcium.....	0.5	.....
Di-nitronaphthalene.....	13	11	The wood meal to contain not more than 20 per cent and not less than 10 per cent, by weight, of moisture.		
Moisture.....	0.5	.....		
Arkite:			Monobel powder:		
Nitroglycerin.....	56	51	Nitrate of ammonium.....	82	78
Nitro-cotton.....	4	3	Nitroglycerin.....	11	9
Nitrate of potassium.....	23	21	Wood meal (dried at 100° C.)..	10	8
Wood meal.....	8	6	Moisture.....	2.5	0.5
Chalk.....	0.5	.....		
Oxalate of ammonium.....	16	14	Rippite:		
Bellite:			Nitroglycerin.....	62.5	59.5
Nitrate of ammonium.....	95	92	Nitro-cotton.....	4.5	3.5
Di-nitrobenzol.....	8	5	Nitrate of potassium.....	20	18
Moisture.....	0.75	.....	Oxalate of ammonium.....	11	9
			Castor oil.....	1.5	0.5
Bobbinite:			Wood meal (dried at 100° C.)..	5.5	3.5
Nitrate of potassium.....	66	63	Moisture.....	1	.....
Charcoal.....	20.5	18.5	Roburite No. 3:		
Sulphur.....	2.5	1.5	Nitrate of ammonium.....	89	86
Rice or maize starch.....	9	7	Di-nitrobenzol.....	13	9
Paraffin wax.....	3.5	2.5	Chloro-naphthalene.....	2	.....
Moisture.....	3	.....	Moisture.....	0.5	.....
			The chloro-naphthalene to contain not more than 1 part of chlorine.		
Carbonite:			Westphalite No. 1:		
Nitroglycerin.....	27	25	Nitrate of ammonium.....	96	94
Nitrate of barium.....	36	30	Resin.....	6	4
Nitrate of potassium.....	36	30	Moisture.....	9.5	.....
Wood meal.....	42	39			
Sulphuretted benzol.....	0.5	.....		
Carbonate of sodium.....	0.5	.....		

CHRONOLOGICAL ACCOUNT OF THE PRINCIPAL MINE DISASTERS IN NORTH AMERICA.

The record of mine disasters which have occurred in the history of coal mining in North America is not complete. The magnitude of an accident is, of course, not necessarily measured by the loss of life, since many serious accidents have occurred which were, fortunately, not accompanied by a loss of life or serious injury to the employees. Most of the accidents causing a considerable loss of life are the result of gas or dust explosion, but in some cases a considerable loss of life has resulted from the cave-in of mines, or the flooding, due to an onrush of water, or other causes. The following list is as nearly

complete as it is possible to make it by an extended research into the literature of mining operations in North America:

CHRONOLOGICAL LIST OF PRINCIPAL COAL MINE DISASTERS IN NORTH AMERICA.

Year.	Date.	Name of mine, or locality, and State.	Lives lost.	Year	Date.	Name of mine, or locality, and State.	Lives lost.
1869	Sept.	Avondale, Pa.	179	1902	July 10.	Johnstown, Pa.	112
1873		Drummond, Nova Scotia	73	1902	July 16.	Park City, Utah.	34
1880	Mar. 29.	Richhill, Mo.	23	1902	Aug. 7.	Bowen No. 3 mine, Colo.	16
1880		Fort Pitt, Nova Scotia. .	44	1902	Sept. 15.	Algoma, W. Va.	17
1883	Feb. 16.	Braidwood, Ill.	69	1903	Jan. 23.	Primerio, Colo.	24
1883	Nov. 23.	Kettle Creek, Pa.	17	1903	July 1.	Hanna, Wyo.	235
1884	Jan. 24.	Crested Butte, Colo.	59	1903	Nov. 21.	Ferguson mine, Pa.	17
1884	Feb. 20.	West Leisenring, Pa.	19	1904	Jan. 25.	Harwick mine, Pa.	179
1884	Mar. 13.	Pocahontas mine, W. Va.	114	1904	Apr. 3.	Zeigler, Ill.	53
1884		Johnstown mine, Pa.	14	1904	Apr. 23.	Eleanora shaft, Pa.	13
1885		McBeam mine, Nova Scotia.	13	1904	Dec. 1.	Diamond mine, Mo.	18
1890	May 15.	Ashley mine, Pa.	26	1905	Jan. 4.	Bluefields, W. Va.	22
1890	June 16.	Hill Farm mine, Pa.	31	1905	Jan. 18.	Panther Creek, W. Va. .	18
1891	Jan. 27.	Mammoth mine, Pa.	109	1905	Feb. 20.	Virginia City, Ala.	108
1891	Feb. 21.	Spring Hill, Nova Scotia	125	1905	Feb. 27.	Welch, W. Va.	15
1892	July 23.	York Farm mine, Pa.	15	1905	Mar. 18-19.	Rush Run, W. Va.	24
1893	Jan. 10.	Como, Colo.	24	1905	Apr. 3.	Zeigler, Ill.	47
1894	Feb. 13.	Gayland, Pa.	13	1906	Jan. 4.	Coaldale, W. Va.	22
1896	Feb. 18.	Vulcan mine, Colo.	49	1906	Jan. 18.	Detroit and Kanawha, W. Va.	18
1896	Mar. 23.	Berwind mine, Pa.	13	1906	Feb. 8.	Parrall mine, W. Va.	23
1896	June 28.	Twinn Shaft mine, Pitts- ton, Pa.	58	1906	Mar. 22.	Century, W. Va.	23
1899	June 16.	Caledonia mine, Nova Scotia.	11	1906	Apr. 21.	Trinidad, Colo.	23
1899	Dec. 10.	Carbonado mine, Wash. .	33	1907	Jan. 23.	Primerio, Colo.	20
1899	Dec. 23.	Brazella mine, Pa.	20	1907	Jan. 26.	Penco mine, W. Va.	12
1899	Dec. 23.	Sumner mine, Pa.	19	1907	Jan. 29.	Stuart, W. Va.	85
1899		North Carolina.	22	1907	Feb. 4.	Thomas mine, W. Va. .	25
1900	Mar. 6.	Red Ash mine, W. Va. .	46	1907	May 1.	Whipple mine, W. Va. .	16
1900	May 1.	Schofield, Utah.	200	1907	Dec. 1.	Naomi mine, Pa.	34
1900	Nov. 2.	Berryburg, W. Va.	15	1907	Dec. 6.	Monongah No. 8 mine, W. Va.	359
1901	Feb. 15.	Union mine, No. 6, British Columbia.	63	1907	Dec. 19.	Darr mine, Pa.	239
1901	Mar. 2.	Diamond mine, Wyo.	28	1908	Jan. 12.	Lick Branch, W. Va. .	105
1901	May 15.	Chatham, W. Va.	10	1908	May 1.	Mount Lookout, Pa.	12
1901	June 10.	Fort Royal mine, Pa.	20	1908	Aug. 26.	Halleyville, Okla.	29
1901	Sept. 30.	Extension mine, British Columbia.	16	1908	Nov. 28.	Mariana mine, Pa.	154
1902	Jan. 14.	Milby and Dowe mine, Ind. T.	10	1909	Jan. 10.	Lieter mine, Ill.	26
1902	Jan. 25.	Lost Creek mine, Iowa. .	22	1909	Nov. 13.	St. Paul mine, Cherry, Ill.	266
1902	May 19.	Fraterville, Penn.	184	1909	Dec. 28.	Lick Branch, W. Va.	51
1902	May 22.	Fernie mine, British Columbia.	127	1910	Jan. 31.	Primerio, Colo.	75
				1910	Feb. 1.	Drakesburg, Ky.	30
				1910	Apr. 20.	Mulga, Ala.	40
				1910	Apr. 21.	Amsterdam mine, Ohio. .	16
				1910	May 5.	Palos, Ala.	83

The first recorded accident of considerable importance, involving a loss of 179 lives, occurred at Avondale, Pa., in September, 1869. This accident brought about the organization of the present system of mine inspection in the State of Pennsylvania, and in several other important instances far-reaching improvements in mine legislation have followed the occurrence of mine disasters of exceptional magnitude. The accident causing the largest loss of life occurred on December 6, 1907, at Monongah No. 8 mine, West Virginia, where 359 lives were lost as the result of a gas and dust explosion. In the aggregate 78 disasters, each causing a loss of more than 10 lives, involved a total loss of 4,671 lives, or 12.6 per cent of the 37,020 lives officially reported as having been lost in coal-mining operations in North America during the period covered by records. The significance of accidents of this kind is easily overestimated, but they constitute a

most serious menace, not only to the employees, but to the industry as well, on account of the material destruction of mine property and the interference with normal mine production. The fact, however, remains that accidents which have attracted national attention constitute but a relatively small proportion of the vast number of accidents due to other causes, particularly falls of coal and roof, which in 1908 were responsible for 44.1 per cent of the deaths from all causes. Mine disasters of exceptional seriousness are, however, apparently increasing. Mine disasters, large or small, require to be reported upon by qualified authority, and the widest publicity should be given to the results. While some of the mine disasters which have occurred have been reported upon in considerable detail, there is urgent need of thoroughly scientific and exhaustive reports, accompanied with the necessary maps and illustrations. A vast amount of experience which would have been decidedly suggestive of far-reaching improvement in mining methods has been irrevocably lost because of indifference to the scientific needs of the problem. Full publicity should be given to all the facts which have a direct or indirect bearing upon the occurrence of mine disasters, as well as upon mine accidents in general, so that the true facts may become known and understood and the lesson of experience be applied toward the deliberate purpose of preventing the occurrence of such disasters and accidents, as far as this is possible.

The chronological list of coal-mining disasters may be summarized by periods, with reference to the corresponding coal production and the fatality rate per million tons of coal mined. Such a comparison brings out the material increase in risk during recent times compared with the past, and without a lengthy discussion in detail it may be stated that during the period 1869-1888 there were 624 lives lost in the coal-mine disasters referred to in the chronological list, and since 1,592,000,000 tons of coal were mined during this period, the fatality rate was 0.39 per million tons of coal mined. During the twenty year period, 1889-1908, 3,460 lives were lost in the coal mine disasters referred to in the chronological list, and during this period 5,442,000,000 tons of coal were mined. The fatality rate during this period was, therefore, 0.64 per million tons of coal mined. Comparing the rate of 0.39 for the first period with 0.64 for the last, there has, therefore, been an increase in the fatality rate of 64.1 per cent. The contrast would have been still more suggestive if only more recent periods had been considered. It is extremely significant that the frequency of disasters causing a very considerable loss of life should have materially increased during recent years, although it must be considered that the great disasters constitute only about one-eighth of the mortality from fatal accidents from all causes in coal mining.

SUMMARY.

It has been the chief object of the preceding account of coal-mining fatalities in the United States and in the Provinces of Canada to assemble in a convenient form the essential facts of past mining experience in order to emphasize the industrial and social importance of a problem which vitally concerns the welfare of some 700,000 workmen engaged in the mining of anthracite and bituminous coal. The risk factor of this industry is only approximately indicated by an average fatality rate of 3.11 per 1,000 for the twenty-year period ending with 1908, but the true degree of hazard is clearly brought out by the analysis of the returns for the several States, mining districts, and particular occupations, in some of which the fatality rate attains to almost incredible proportions. Compared with other important coal-mining countries of the world the fatality rate in North America is decidedly higher, or, for illustration, 3.13 per 1,000 for the decade ending with 1906 against 1.29 per 1,000 for the United Kingdom, 1.35 for Austria, 1.81 for France, and 2.13 for Prussia. This contrast in the fatality rate reflects seriously upon American mining methods and conditions, more or less responsible for the occurrence of accidents, which, by every standard of conservative mining, are largely though not of course entirely preventable. The analysis by causes draws attention to conditions which are clearly traceable to indifference and neglect in mining methods as well as to a general disregard of the lessons of past experience. The appalling loss of life is inadequately measured by the more than 40,000 deaths officially reported to have been caused by coal-mining accidents in North America, for in addition to these there has been a vast amount of bodily injury through accidents not immediately fatal, but many of which, unquestionably, must have diminished the normal after lifetime of mine employees by many years.

Aside from the loss of life and bodily injury, there is also the larger question of dependent survivors of mine-accident victims, including not only widows and orphans, but other members of the family. The social loss by mine accidents is unquestionably of very serious proportions, even though the direct evidence may not be obtainable from the returns of poor relief departments or other official sources.

Aside from the question of social dependence resulting from coal-mining casualties, the present inquiry brings out the needless waste of life in the mining of anthracite and bituminous coal. The average age at death of the men killed by accidents during 1908 was only 31.8 years, but some of the persons killed were mere boys, as young as 13 and 14 years, while there were also men who had passed beyond threescore and ten. The extended consideration of individual mine

accidents in the State of Illinois emphasizes the general aspects of the question of prevention which has not received the consideration required to bring about a material improvement and a reduction in the fatality rate. A single mine disaster causes the loss of a considerable number of lives and, therefore, attracts national attention, although from 1869 to 1910 the loss of life by such disasters in the aggregate represented only 12.6 per cent of the total loss of life; but the vast majority of accidents occur singly or in small groups, and thus fail to attract proper attention, even in the localities in which they occur. Heretofore most of the consideration of mineowners and managers has been toward the prevention of mine disasters, since it is these that involve not only a loss of life, but invariably a considerable destruction of mine property. The accidents due to falls of roof or coal or slate and to mine cars, as well as to the reckless or improper use of explosives and to many other causes, rarely involve a material destruction of mine property. This, however, does not fully justify the fact that such accidents receive merely incidental consideration in the reports of mine inspectors.

The problem of safety in coal mining is no doubt a much more complex and difficult one in the United States and in Canada than perhaps in any other coal mining field in the world. Within recent years the production of coal has greatly increased and new fields have been opened, regardless of the quality of the available labor supply. Economy in production and safety in operation have been of secondary consideration to the chief purpose of rapidly marketing coal in large quantities at a minimum cost of production. Mining methods are often crude, and known safety precautions are disregarded or not used at all. Child-labor laws have been, and still are, indifferently complied with in many States and a number of fatalities occur each year among children at an age when they should be in school. Foreign-born workmen, without actual experience in mining, are employed in large numbers, and through misunderstanding of orders or by reckless disregard of the necessary rules of operation, often imperil not only their own lives, but also the lives of the trained and experienced workers. In this connection it may be stated that a recent report of the United States Immigration Commission shows that at the present time the mining community in the Pennsylvania bituminous field is composed chiefly of the foreign-born who have been in the United States only a short time. Of the 37,016 individuals studied, 40.3 per cent had been in the United States less than five years, and 29 per cent less than ten years. The foreigners, moreover, were not miners abroad, but were in most instances farmers or farm laborers, nearly three-fifths belonging to the latter class in a group of 17,246 individuals selected for special study.

Regarding this showing by the Immigration Commission it was pointed out, in a mining periodical, with particular reference to the view that accidents are largely confined to those who have had no mining experience, that—

Practically none of the southern Europeans had been miners abroad. This condition undoubtedly has had its effect in enlarging the proportion of mine accidents, and the commission shows, by data drawn from State investigations and elsewhere in conjunction with its own figures for racial distribution, that accidents were probably more numerous in those regions where the inexperienced immigrants were found.^(a)

These conclusions are confirmed by the results of the present investigation and in particular by the analysis of the statistical data for the State of West Virginia, and the accidents in detail for the State of Illinois. The chief difficulty is not so much, apparently, the ignorance of the English language as ignorance of mining methods and the almost utter lack of discipline on the part of many of the foreign-born miners, of whom the large proportion have been in the United States only a comparatively short period of time. But lack of discipline and disregard of mining rules and regulations is not confined to the foreign-born miners, nor even to those of the more recent immigrant class. In the case of the Cherry mine disaster, causing the loss of 266 lives, the verdict of the coroner's jury was in part that "we find that they [the men who lost their lives in the third seam] came to their death by explosion and suffocation. We further find that the mining laws of the State of Illinois, in relation to means of escape, were violated, with the full knowledge and consent of the mine inspectors of District No. 2."

The true responsibility for many mining accidents is primarily the willful disregard of mine rules and regulations and failure of full compliance with the laws enacted for the safeguarding of life and limb in mining operations. The following argument in favor of the enforcement of existing laws, rather than the enactment of additional mining legislation, is from the *Engineering and Mining Journal* of September 8, 1906:

Every operator and mine manager should be held closely responsible for any violation of existing laws, and when found guilty should receive personal punishment. But let those who are considering this question not throw all the blame upon the management and ignore the responsibility of the employee. To point out the latter it is necessary only to call attention to the many accidents resulting from the negligence of the miner, or his willful disregard of the carefully prescribed rules intended to insure his safety.

There is a general opinion among colliery engineers that the number of mining accidents is too great and should be reduced. The

^a *Engineering and Mining Journal*, September 3, 1910, p. 468.

remedy most often suggested is stricter legislation and a more rigid enforcement of the law. This, however, will not accomplish the desired result unless the mine managers themselves require strict observance on the part of the foreman, and the latter compel absolute obedience by the miners. If in conjunction with such a policy the miners' unions will strongly support the mine authorities in their attitude, recognizing the fact that criminal neglect on the part of their members should be punished, we will begin to approach the matter in an effective way.

One mine inspector states that 24 out of 48 nonfatal explosions in his district were caused by miners acting in direct contravention of regulations. Another instance shows that 47 injuries were suffered by workmen who were careless with regard to retiring to a place of safety during shot firing. In West Virginia alone during 1905 there were 14 fatalities resulting from the mishandling of powder and dynamite. Six men were seriously injured by premature blasts or the excessive use of dynamite, while many other accidents were caused by carelessness in handling lights, approaching gas, etc. In nearly all cases innocent persons suffer with the reckless and in a way pay the price of his neglect. Such being the case, it is reasonable to believe that nothing will more effectually tend to lessen mine accidents than the effective education of the miners themselves.

It also can not be questioned but that our miners are in urgent need of better training for their responsible duties than is obtained by the present let-alone policy of indifferent supervision and ineffective control. Not only do the miners themselves require better education, but there is even greater need of better training of foremen, superintendents, and examiners. What can not be obtained by an improvement in this direction can, to a certain extent at least, be brought about by better legislation. Progress is being made in this direction, and within the last few years some States have enacted laws for the safety of mine management, of which the following summary of legislation for 1908-1909 is suggestive of practical methods by which good results are certain to be achieved:

The Oklahoma statutes direct the preparation and furnishing of maps, prescribed methods of working, the provision of two exits, of travel ways around shafts, the supply of shields for mining machines, of speaking tubes, the supply of timbers, the installation of electric wires, the construction of shelter holes along travel ways, require wash rooms to be furnished, supplies to be provided for first aid in case of injury by accident, direct the employment of shot firers and of mine foremen where more than ten workmen are employed, and regulate the construction and operation of hoists and the use of explosives. The weighing and screening of coal are regulated, and the employment of convicts in mines is prohibited. An inspector of mines is to be elected, and the State divided into three districts, each with an assistant inspector, such assistants also to be chosen by popular vote from and after 1910. The [mining] laws of Oklahoma relate principally to coal mining.

Laws relating to mine inspectors were passed in several States, including Kentucky, Montana, Nevada, Ohio, and Wyoming. The Kentucky statute provided for two additional inspectors in the State, and requires all inspectors to pass an examination to determine their competency before being appointed. In Montana also the inspector must pass an examination before appointment, this provision being substituted for the earlier requirement of graduation from a school of mines.

The Nevada law created the office of inspector of coal mines, the incumbent to have had seven years' experience in underground workings; he is given authority to enter and inspect mines, order changes, and to investigate accidents, and annual reports are required to be made to the governor of the State.

The law of Ohio provides for the appointment of three additional inspectors, making the number of inspectors and inspection districts 10, instead of 7, as before; the chief inspector must have had five years' experience and be acquainted with the uses and dangers of electricity in mines. The same act directs that at least quarterly inspections be made, instead of "as often as possible," as in the earlier law; a map or plan must also be furnished for each vein worked, and more efficient provisions were enacted for the securing of ventilation. This law also directs that shaft men be employed to attend hoists, that self-dumping cages be not used unless they can be securely locked, and that shelter holes be furnished for the use of door boys.

Other statutes were enacted covering a variety of details connected with the operation of mines, the use of explosives, the handling of workmen, etc. Thus a statute of Kansas regulates blasting, prohibiting the use of dynamite except under rules agreed upon by employers and employees and approved by the state mine inspector; employees are not to be sent into any sinking shaft or development work after a charge of dynamite or other detonating explosive has been fired, until the smoke and gases are removed. Another statute of this State directs the sprinkling or removal of dust from mines, requires all drill cuttings to be removed at least 15 feet before shots are fired, and prohibits the use of coal drillings for tamping.

Mine explosives are the subject of an Ohio statute which regulates the sale, storage, size of packages, and the locking and opening of boxes containing explosives used or to be used in mines; the tamping of charges and the firing of shots are also regulated by this law.

Semiweekly inspections of ropes, cages, catches, brakes, etc., used for hoisting men are directed by a statute of Missouri, the reports of such inspection to be recorded. Another statute of the same State requires shaft men to be employed where men are hoisted, regardless of the power used, instead of only where steam is used as a motive power, as provided in an earlier law.

A statute of Ohio directs the insulation of electric wires and the installation of shields on mining machines. A Wyoming statute provides for the sprinkling of dusty places, and the monthly removal of accumulations of dust, including slack, machine cuttings, and track cleanings.

The exclusive use of safety lamps, magnetic locked, air locked, or lead locked, is prescribed in gaseous mines in the State of Washington, except by superintendents, foremen, and certain designated em-

ployees, who may use other lamps of a type approved by the state mine inspector. Safety lamps are to be the property of the operator of the mine. Other laws of this State provide that weekly measurements of the quantity of air furnished for ventilation are to be made, and a record thereof kept; and amend the laws relative to maps, plans, etc., directing signboards to be placed at the intersection of ways, so as to indicate the most direct means of exit from the mines.^(a)

All of these enactments are in the direction of greater safety and security in the mining of coal. The laws are suggestive, however, rather as a recognition of dangerous conditions than of a clear understanding as to the best methods and means by which the desired end can be achieved. It is evident that, regardless of the legislation which has heretofore been enacted chiefly for the same purpose, the fatality rate in American coal mines has increased from year to year until it has now attained to proportions exceeding the rate of any other coal-mining field in the world.

We have never made in this country a thorough inquiry into the whole subject of mine disasters, such as have been made in England and other foreign countries from time to time. The most important and conclusive of these is the investigation of the British royal commission on mines, appointed in 1906, which has thus far published two final and a number of highly important special reports, including a large amount of evidence of great practical value. No American inquiry, aided by expert ability of the highest order, has been made to determine the proper methods of ventilation suitable to coal mines and the most effective methods of examining for fire damp. Nor have we inquired with thoroughness and impartiality into the causes and means for preventing accidents from falls of coal and slate, the innumerable accidents due to mine cars, and the many which occur in connection with shaft sinking and the ingress and egress of miners to and from their place of work.

The whole subject of the use of electricity in mines is also of special interest, as this is unquestionably the cause of a larger accident liability and mortality than appears from the recorded number of accidents conceded to have been so caused. The increasing use of electricity involves the risk not only of death from electric currents, but also the liability to mine explosions as the result of electric sparks. Electric shot firing has been officially recommended as more safe than the ordinary method, with the suggestion that this method be made compulsory in the several States.

What can be done in respect to improved safety in the use of explosives in coal mines has been shown in the discussion on page 610, and is an indication of the methods that should be followed with

^a Bulletin of the United States Bureau of Labor, No. 85, November, 1909. pp. 468-470.

regard to all the other elements of danger which surround the miner's life. The analysis by occupations brings out vividly the varying hazards of different employments required in connection with coal-mining operations above and below ground, and the tabular statement of causes makes it evident that each employment has dangers of its own which require to be carefully studied and specifically considered to ascertain, if possible, more effective methods of providing for increased safety to life and limb.

It may safely be assumed, however, that if the prevention of mine accidents were an easy matter the number of casualties would long since have been reduced to a minimum. The causes responsible for their occurrence are often extremely complex and highly involved, and they vary widely with the different coal fields and often with the different mines in the same field, as well as according to the method of mining itself, which is largely conditioned by the depth, thickness, dip, etc., of the coal bed. What is possible or advantageous in the Indiana coal field to prevent squeezes due to hard roof and soft bottom may be difficult, if not impossible, in the anthracite coal field of Pennsylvania or the bituminous coal field of Alabama. In the Hocking Valley field of Ohio, for illustration, an overlying stratum of quicksand makes it impossible to rob pillars and permit the surface to cave in, which is feasible and practiced in other fields. In the State of Washington there are some very steep coal seams, some of which pitch as much as 38 degrees, but in which it has not been impossible to employ coal-punching machines to advantage. There are differences between the southern and northern coal fields of Pennsylvania, which require differences in mining methods, the placing of mine timbers, etc., all of which have their relation to accident liability and occurrence. Thick coal seams, on the whole, are more difficult or dangerous to work than thin seams, and extreme care is necessary in their operation to prevent serious accidents from falls of roof. The whole question as to whether the long-wall system is decidedly advantageous and less dangerous than the pillar and room system is still open to discussion, with particular reference to the accident liability of the employees.

The mere enumeration of these variations in conditions emphasizes the complex nature of the accident problem, as it is conditioned by mining methods which are governed by the nature of the coal beds themselves. While the reports of mine inspectors fail to disclose evidence of qualified consideration and expert inquiry into the causes of accidents and methods of their prevention, the proceedings of mine institutes and contributions to the technical mining periodicals give proof of serious attention to the subject on the part of the mine managers, superintendents, foremen, examiners, inspectors, and others.

Immense progress has been made in many directions, and the results reflect most favorably upon the skill of American mining engineers and mine managers, but much remains to be done to reduce the fatality rate to more reasonable proportions than is at present the case.

In recognition of the seriousness of the problem, the United States Congress at its last session established a mining bureau, specifically charged with the duty of making inquiry into the causes of mine accidents and the best methods for accident prevention. The consideration of the subject by the technologic branch of the United States Geological Survey foreshadows the strictly scientific and impartial methods of inquiry by which the causes of mine accidents will be determined and by which the best methods of accident prevention will be ascertained and brought to the attention of mine managers and mine workers. It is to be hoped that in the future mining bureaus will give more publicity to the facts and surrounding circumstances of individual accidents, and that the reports will precisely exhibit the conditions under which the accidents occurred. All the facts which have a bearing upon the occurrence of mine accidents involving a loss of human life should be made a matter of permanent and accurate record and should be explained for the information of the public, so that the sad and sorrowful experience may at least serve the purpose of paving the way by which similar calamities in the future may be done away with.

APPENDIX.

TABLE I.—NUMBER OF FATAL ACCIDENTS TO PERSONS OF EACH AGE IN COAL MINES OF NORTH AMERICA AND AVERAGE AGE OF THOSE KILLED, 1908.

Age.	Number of fatal accidents.	Aggregate years of life.	Age.	Number of fatal accidents.	Aggregate years of life.	Age.	Number of fatal accidents.	Aggregate years of life.	Age.	Number of fatal accidents.	Aggregate years of life.
13.....	1	13	30...	123	3,600	47...	17	799	64.....	2	128
14.....	9	126	31...	31	961	48...	18	864	65.....	7	455
15.....	13	195	32...	83	2,656	49...	20	980	66.....		
16.....	34	544	33...	49	1,617	50...	40	2,000	67.....	1	67
17.....	38	646	34...	45	1,530	51...	5	255	68.....	3	204
18.....	58	1,044	35...	88	3,080	52...	21	1,092	69.....	1	69
19.....	89	1,691	36...	58	2,088	53...	14	742	70.....		
20.....	70	1,400	37...	30	1,110	54...	12	648	71.....	2	142
21.....	87	1,827	38...	73	2,774	55...	21	1,155	72.....	1	72
22.....	96	2,112	39...	51	1,989	56...	11	616	73.....	1	73
23.....	75	1,725	40...	109	4,360	57...	9	513	74.....		
24.....	87	2,088	41...	9	369	58...	6	348	75.....	1	75
25.....	93	2,325	42...	38	1,596	59...	5	295			
26.....	100	2,600	43...	27	1,161	60...	5	300	Total.....	2,269	72,254
27.....	80	2,160	44...	26	1,144	61...	1	61			
28.....	128	3,584	45...	65	2,925	62...	6	372	Average age.....		31.8
29.....	46	1,334	46...	25	1,150	63...	5	315			

TABLE II.—NUMBER OF FATAL ACCIDENTS TO PERSONS IN EACH SPECIFIED AGE GROUP IN COAL MINES OF NORTH AMERICA, BY OCCUPATIONS, 1908.

Occupation.	Fatal accidents to persons of the age of—											Not reported.	Total.	
	10 and under 15 years.	15 and under 20 years.	20 and under 25 years.	25 and under 30 years.	30 and under 35 years.	35 and under 40 years.	40 and under 45 years.	45 and under 50 years.	50 and under 55 years.	55 and under 60 years.	60 and under 65 years.			65 years and over.
Ashman.....			1											1
Bankman.....					1		1							2
Barn boss.....								1						1
Batterymen.....								1						1
Bitt boy.....		1												1
Blacksmith.....										1				1
Brakemen.....		8	5	5	2					1			3	24
Bratticemen.....				1	1	1	1			1				5
Breaker cleaner.....		1												1
Bricklayer.....												9		9
Cager.....			3	3								1		7
Car coupler.....		2	3			1						2		8
Car ditcher.....								1						1
Car dropper.....												1		1
Car pincher.....		1												1
Car repairer.....											1			1
Carman.....				1										1
Carpenter.....			1	1	1				3		1			8
Civil engineer.....			2	1								1		4
Coal pusher.....			1			1						1		3
Coke worker.....		1												1
Company laborer.....						2	1							3
Company man.....		2		4		2	2	1		1	1			13
Contractor.....								1						1
Chute tender.....		2												2
Door tender.....		14		1								2		17
Driver.....		39	56	21	13	8		1	1			5		144
Driver boss.....			2	1	2			1						9
Drum runner.....												1		1
Dumpman.....			1	1	1	1		1				1		6
Electrical engineer.....						1								1
Electrician.....			1		1			1						3
Engineer.....							1	1						2

TABLE II.—NUMBER OF FATAL ACCIDENTS TO PERSONS IN EACH SPECIFIED AGE GROUP IN COAL MINES OF NORTH AMERICA, BY OCCUPATIONS, 1908—Concluded.

Occupation.	Fatal accidents to persons of the age of—													Not reported.	Total.
	10 and under 15 years.	15 and under 20 years.	20 and under 25 years.	25 and under 30 years.	30 and under 35 years.	35 and under 40 years.	40 and under 45 years.	45 and under 50 years.	50 and under 55 years.	55 and under 60 years.	60 and under 65 years.	65 years and over.			
Facemen.....														1	1
Fire boss.....				2	1	2	1	1	1	2				1	11
Firemen.....			1			1	3							1	6
Footmen.....			1	1		1									3
Fuelman.....			1												1
Gang boss.....										1					1
Greaser, oiler.....	2	1												1	4
Gripper.....		1													1
Jig runner.....		2				1									3
Loader.....		12	22	29	27	12	15	9	4	3	1			41	175
Loader boss.....					1										1
Locomotive engineer.....		1	3												4
Machine boss.....														1	1
Machine cutter.....			3	1		3								7	14
Machine inspector.....				1											1
Machine loader.....						1									1
Machine runner.....	1	7	16	12	6	6	2	1	1					1	53
Machine scraper.....		3	1	1	1	1		1							8
Machinist.....														1	1
Mechanical engineer.....						1									1
Mine foreman.....		1		2	2	3	2		1	1			3		21
Mine manager.....					1	1	6								3
Miner.....		63	163	240	181	188	114	86	52	27	12	7	87	1,220	
Miner's laborer.....		17	60	51	39	21	16	8	10	4	1	1	18		246
Mining engineer.....						1									2
Motor conductor.....			1												1
Motor psicher.....		3	1												4
Motor runner.....		1	8	7	1	2							6		25
Night foreman.....						1							1		2
Nipper.....		1	1												2
Operator.....														1	1
Patcher.....														1	1
Pick boy.....		1													1
Pipe fitter.....		1												1	2
Platform man.....							1								1
Power house.....										1					1
Pumpman.....		2		1	1	2		1	4						11
Repairman.....				1				1						1	3
Rib boss.....								1							1
Roadmen.....		1	2		2		3	2		1		2	3		16
Rockmen.....				2	2	1									5
Roller.....									1						1
Runner.....		7	4	1	1	1									12
Shaft head man.....			1	1	1	1									4
Shaft sinker.....			5	2	4	2	1	1						1	16
Shift boss.....														1	1
Shiftpan.....				1	1				1						3
Shot firer.....			4	3	3	6	7	2	2			1			33
Slate boss.....			1					1							2
Slate picker.....	4	11	2	2		1		2							22
Snapper.....				3											3
Spragger.....				1											1
Stable boss.....				1											1
Stablemen.....														1	1
Starter.....								1							1
Switchmen.....			2												2
Table tender.....		1													2
Tail-rope rider.....		1													1
Timberman.....			2	5	1	3	5	3	1	1		1	7		30
Tipman.....		1													1
Tipplemen.....							1								1
Topmen.....			1	1		1								1	4
Trackmen.....		1	2	3	1	3	3		1				2		16
Trammer.....			1	1											1
Trapper.....	2	20	2	1				1							26
Trimmer.....			1	1					1						3
Trip rider.....		1	2												3
Water bailer.....			2												3
Weighman.....		1		1	1										3
Wreman.....							1	1						2	5
Unclassified.....	2	7	28	25	24	15	15	9	9	7	2	2	169		314
Total.....	10	232	415	447	331	300	209	145	92	52	19	17	391	2,660	

TABLE III.—NUMBER OF FATAL ACCIDENTS DUE TO EACH SPECIFIED CAUSE IN COAL MINES OF NORTH AMERICA, BY OCCUPATIONS, 1908.

Occupation.	Fatal accidents due to—												Total.		
	Fall- ing coal.	Fall- ing slate, etc.	Fall- ing into shaft.	Mine cars or motors.	Out- side cars.	Explosions of—				Min- ing ma- chinery.	Mules	As- phyx- ia-tion.		Elec- tro- cution.	Other caus- es.
						Gas or dust.	Pow- der, etc.	Blast.	Boil- er.						
Ashman.....														1	1
Bankmen.....										1					2
Barn boss.....				1								1			1
Batteryman.....	1														1
Bitt boy.....						1									1
Blacksmith.....					1										1
Brakemen.....				6	4	14	5								24
Bratticemen.....						5									5
Breaker cleaner.....						9				1					9
Cager.....			2	2		2	3							1	7
Car coupler.....			1	3		3						1			3
Car ditcher.....						1									1
Car dropper.....					1										1
Car pincher.....					1										1
Car repairer.....					1										1
Carmen.....				1											1
Carpenter.....			2	1	1								1	3	8
Civil engineer.....			3			1									4
Coal pusher.....									1					2	3
Coke worker.....					1										1
Company laborer.....														2	3
Company men.....			1	8		1				1	1	1			13
Contractor.....					1										1
Chute tender.....										2					2
Door tender.....			1												1
Driver.....	1	19	1	90	3	19		2			6	1		2	177
Driver boss.....	1	1		4		3									9
Drum runner.....													1		1
Dumpman.....			1	3	2										6
Electrical engineer.....				1											1
Electrician.....				2						1					3
Engineer.....					1					1					2
Facemen.....						1									1
Fire boss.....		2	1	1		6		1							11
Firemen.....			1	1	1	1			3						6
Footmen.....			1	1										1	3
Fuelmen.....										1					1
Gang boss.....					1										1
Greaser, oiler.....				1		1				2					4
Gripper.....				1											1
Jig runner.....									3						3
Loader.....	14	63	6	9	4	68			2			3	5	1	175
Loader boss.....														1	1
Locomotive engineer.....				1	1									2	4
Machine boss.....						1									1
Machine cutter.....	2	2		1		9									14
Machine inspector.....										1					1
Machine loader.....		1													1
Machine runner.....	9	11		3		25			3				2		53
Machine scraper.....	2	2							3				1		8
Machinist.....					1										1
Mechanical engineer.....				1											1
Mine foreman.....	3	4	2	2	2	7			3						21
Mine manager.....			2						1						3
Miner.....	158	505	16	51	6	323	43	71	2	3	1	16	13	1,220	2,200
Miner's laborer.....	25	98	9	20	22	30	5	14	5	5		1	5	12	246
Mining engineer.....		1				1									2
Motor conductor.....				1											1
Motor patcher.....				3	1										4
Motor runner.....				9	1	13							2		25
Night foreman.....				1										1	2
Nipper.....				2											2
Operator.....	1														1
Patcher.....				1											1
Pick boy.....	1														1

TABLE III.—NUMBER OF FATAL ACCIDENTS DUE TO EACH SPECIFIED CAUSE IN COAL MINES OF NORTH AMERICA, BY OCCUPATIONS, 1908—Concluded.

Occupation.	Fatal accidents due to—													Total.	
	Fall- ing coal.	Fall- ing slate, etc.	Fall- ing into shaft.	Mine cars or mo- tors.	Out- side cars.	Explosions of—				Min- ing ma- chin- ery.	Mules	As- s- ph- ys- i- a- tion.	Elec- tro- cu- tion.		Other caus- es.
						Gas or dust.	Pow- der, etc.	Blast.	Boil- er.						
Pipe fitter.....										1				1	2
Platform men.....										1					1
Power house.....										1					1
Pumpmen.....			2	3	1	2				2			1		11
Repairmen.....	1	1													3
Rib boss.....		1													1
Roadmen.....		4		4		7							1		16
Rockmen.....		1		2		2									5
Roller.....				1											1
Runner.....		3		7				1					1		12
Shaft head man.....			3	1											4
Shaft sinker.....		3	8					1						4	16
Shift boss.....			1												1
Shiftmen.....		3													3
Shot firer.....		4				5	5	17				2			33
Slate boss.....			1				1								2
Slate picker.....		4				2				15			1		22
Snapper.....		1		1									1		3
Spragger.....				1											1
Stable boss.....			1												1
Stablenen.....			1												1
Starter.....				1											1
Switchmen.....				1											2
Table tender.....	1													1	1
Tail rope rider.....				1										1	2
Timbermen.....		19		1		7		1						2	30
Tipmen.....				1											1
Tipplemen.....					1										1
Topmen.....			3	1			5								4
Trackmen.....		8													16
Trammer.....		1											1	1	1
Trapper.....		4		7		15									26
Trimmer.....						3									3
Trip rider.....				3											3
Waterballer.....						3									3
Weighman.....			1	2											3
Wiremen.....						5									5
Unclassified.....	9	138	3	44	1	34	6	26	2	3	1	10	16	21	314
Total.....	229	906	75	326	60	636	61	133	7	58	9	32	55	73	2,660

TABLE IV.—NUMBER OF FATAL ACCIDENTS IN SPECIFIED OCCUPATIONS IN COAL MINES OF NORTH AMERICA, BY LENGTH OF EXPERIENCE, 1908.

Occupation.	Under 3 months.	3 and under 6 months.	6 months and under 1 year.	1 and under 5 years.	5 and under 10 years.	10 and under 15 years.	15 and under 20 years.	20 years and over.	Total.	Average years experience.
Bltt boy.....				1					1	3.0
Brakemen.....				9	3				12	2.7
Bratticemen.....					1	1			2	7.5
Car coupler.....		1			1				2	2.7
Car ditcher.....						1			1	12.0
Carpenter.....			1						1	.7
Door tender.....				1					1	2.0
Driver.....	2	2	3	9	14	2			30	3.5
Driver boss.....					2	1			3	8.7
Drum runner.....	1								1	.1
Electrical engineer.....					1				1	6.0
Electrician.....					1				1	5.0
Fire boss.....					2	1			3	8.0
Firemen.....					1				1	8.0
Greaser, oiler.....				1					1	1.0
Loader.....	1	1		5	2				9	2.7
Locomotive engineer.....					1				1	5.0
Machine runner.....		1	1	7	15	5	1	1	31	6.6
Mechanical engineer.....				1					1	2.0
Mine foremen.....				1		5	1	1	8	11.5
Miner.....	23	17	40	180	96	21	9	6	392	3.8
Miner's laborer.....	3	1	3	5		2			14	2.7
Mining engineer.....					2				2	8.5
Motor runner.....					4	2			6	7.3
Pick boy.....				1					1	2.0
Power house.....								1	1	40.0
Pumpmen.....				2	1				3	4.0
Roadmen.....				1					1	3.0
Shaft sinker.....	3			2	1		1		7	4.1
Shot firer.....		1		1	1				3	3.7
Slate boss.....				1					1	1.1
Slate picker.....		2		3		1			6	5.2
Stable boss.....								1	1	20.0
Timberman.....				4					4	1.8
Tipplemen.....			1						1	.5
Trackmen.....				4	2	2	1	1	10	8.0
Trapper.....		2	1	14	1				18	1.4
Water bailer.....				1	2				3	3.3
Wiremen.....						1			1	5.0
Unclassified.....			1	1					2	.8
Total.....	33	28	51	255	154	43	13	11	588	4.2

TABLE V.—NUMBER OF FATAL ACCIDENTS IN SPECIFIED OCCUPATIONS IN COAL MINES OF NORTH AMERICA, BY CONJUGAL CONDITION OF THOSE KILLED, 1908.

Occupation.	Conjugal condition.			Number of children.	Occupation.	Conjugal condition.			Number of children.
	Married.	Single.	Not reported.			Married.	Single.	Not reported.	
Ashmen		1			Mine foreman	17	3	1	51
Barnmen	2			5	Mine manager	1		2	2
Barn boss	1			1	Miner	726	432	62	1,411
Batterymen	1				Miner's laborer	109	123	14	200
Bitt boy		1			Mining engineer	1	1		2
Blacksmith	1			6	Motor conductor		1		
Brakemen	7	15	2	5	Motor patcher		4		
Bratticemen	5			14	Motor runner	12	11	2	16
Breaker cleaner		1			Night foremen	1		1	
Bricklayer		2	7		Nipper		2		
Cager	2	4	1	5	Operator			1	
Car coupler	1	6	1	3	Patcher		1		
Car ditcher	1			5	Pick boy		1		
Car dropper		1			Pipefitter			2	
Car pincher		1			Platform men	1			6
Car repairer	1			1	Power house	1			
Carmen	1			1	Pumpmen	8	3		22
Carpenter	7	1		11	Repairman	3			10
Coal engineer		4			Rib boss	1			7
Coal packer		1	2		Road men	9	6	1	24
Coke worker		1			Rockmen	3	2		2
Company laborer	3			10	Roller	1			5
Company men	10	3		23	Runner		12		
Contractor	1	2		7	Shaft-head men	3		1	5
Chute tender		2			Shaft sinker	5	10		9
Door tender	2	15			Shift boss			1	
Driver	38	97	9	51	Shift man	1		2	
Driver boss	6	2	1	8	Shot firer	17	9	7	43
Drum runner		1			Slate boss	1	1		1
Dump men	4	1	1	7	Slate picker	3	19		8
Electrical engineer	1				Snapper	2	1		4
Electrician	3			1	Spragger		1		
Engineer	2			1	Stable boss	1			7
Facemen			1		Stablemen			1	
Fire boss	9	2		13	Starter		1		
Firemen	3		3	5	Switchmen		2		
Footmen	1	2		1	Table tender		1		
Fuelmen		1			Tail-ropo rider	1	1		
Gang boss		1			Timber men	15	6	9	37
Greaser, oiler		4			Tipmen		1		
Gripper	1				Tipplemen	1			
Jig runner		3			Topmen	2	1	1	2
Loader	77	65	33	189	Trackmen	8	6	2	22
Loader boss	1				Trammer		1		
Locomotive engineer	1		3		Trapper	1	24	1	4
Machine boss	1				Trimmer	3			2
Machine cutter	5	4	5	12	Trip rider	1	2		
Machine inspector	1			1	Water bailer	1	2		
Machine loader	1			2	Weighmen		2	1	
Machine runner	38	13	2	67	Wiremen	3	1	1	7
Machine scraper	2	6		11	Unclassified	28	8	278	44
Machinist			1						
Mechanical engineer	1			1	Total	1,233	963	464	2,421

TABLE VI.—NUMBER OF FATAL ACCIDENTS IN COAL MINES OF WEST VIRGINIA, BY COUNTIES, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

County.	Number of fatal accidents in—										Total.
	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	
Barbour.....		2	15	2	3	5	2	29		3	61
Braxton.....										1	1
Brooke.....							1	3	1	5	10
Clay.....						1		1		1	2
Fayette.....	32	67	37	31	35	32	71	73	132	61	571
Grant.....					3	4	2				9
Hancock.....		1				1					2
Harrison.....	2	4	7	8	15	5	13	10	8	14	86
Kanawha.....	2	3	7	6	6	8	21	35	22	23	133
Lewis.....										3	3
Logan.....								1	5	3	9
Marion.....	4	13	17	15	17	16	13	13	14	372	494
Marshall.....	1		1	1		2	2	1	5	3	16
Mason.....	1	1						1	1		4
McDowell.....	26	30	34	25	48	25	37	49	90	83	447
Mercer.....	8	4	5	6	7	6	7	26	11	6	86
Mineral.....	1				1	2	3	1	1	3	12
Mingo.....	2	2	5	5	4	9	7	9	9	9	61
Monongalia.....	1							1	1	1	4
Nicholas.....								1	1		2
Ohio.....		1	1		2			1	2		7
Preston.....	1	1	2	3	3	7	5	3	4	4	33
Putnam.....	1	1		1	2	3	2	3	1	3	17
Raleigh.....			1	5	4	5	4	3	7	16	45
Randolph.....								2	2	3	7
Taylor.....	1	1	1	1	1				1		6
Tucker.....	6	10	1	11	8	9	4	3	26	7	85
Upshur.....									12		12
Wyoming.....										2	2
Total.....	89	141	134	120	159	140	194	269	356	625	2,227

TABLE VII.—AVERAGE NUMBER OF EMPLOYEES IN COAL MINES OF WEST VIRGINIA, BY COUNTIES, 1899 TO 1903.

[From the annual reports of the West Virginia department of mines.]

County.	Average number of employees in—										Total of yearly averages.
	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	
Barbour.....	90	382	493	647	766	900	784	962	1,083	1,088	7,195
Braxton.....									76	100	176
Brooke.....	119	118	136	149	78	254	379	735	651	758	3,377
Clay.....						128	131	109	130	131	629
Fayette.....	7,054	7,931	9,039	9,801	9,927	10,516	11,665	11,463	11,505	12,505	101,406
Gilmer.....									7	31	38
Grant.....				33	81	241	244	272	285	399	1,555
Greenbrier.....									30	43	73
Hancock.....	57	64	69	72	122	180	90	110	94	110	968
Harrison.....	590	1,222	1,795	1,990	2,621	3,041	3,067	3,043	3,439	3,819	24,627
Kanawha.....	2,935	2,797	3,283	3,238	4,711	6,007	6,316	6,624	7,174	7,010	50,095
Lewis.....									21	48	69
Lincoln.....				61	97	83	34	67	39	108	489
Logan.....						131	402	675	1,080	1,677	3,965
Marion.....	2,245	3,062	2,923	3,239	3,193	3,353	3,771	3,565	3,809	3,597	32,757
Marshall.....	310	313	322	318	470	524	478	525	632	558	4,450
Mason.....	211	292	262	305	306	303	271	315	256	356	2,877
McDowell.....	4,592	5,511	6,311	6,881	8,119	9,411	10,169	10,600	11,942	13,226	86,762
Mercer.....	2,540	1,462	1,624	1,663	1,735	1,809	2,554	2,511	2,586	2,799	21,283
Mineral.....	504	580	658	526	613	809	737	759	753	890	6,619
Mingo.....	617	751	1,414	1,489	1,370	1,781	2,548	2,624	2,624	2,346	17,564
Monongalia.....	96	107	106	136	309	258	282	381	553	570	2,798
Nicholas.....	31			61	98	135	206	200	193	213	1,137
Ohio.....	159	174	201	235	206	200	206	192	315	264	2,152
Preston.....	393	502	583	943	1,071	1,472	1,472	1,333	1,681	1,741	11,191
Putnam.....	489	467	579	509	588	1,047	866	1,040	1,000	830	7,415
Raleigh.....	150	188	366	467	506	869	1,020	1,183	1,718	2,274	8,741
Randolph.....	41	136	259	357	535	615	601	664	616	745	4,569
Taylor.....	416	537	694	607	444	404	408	461	514	578	5,063
Tucker.....	1,469	1,459	1,269	1,420	1,486	1,221	1,225	1,286	1,309	1,389	13,533
Upshur.....								48	113	139	300
Wayne.....							24	22	37	61	144
Wyoming.....										4	4
Total.....	25,108	28,055	32,386	35,147	39,452	45,492	49,950	51,769	56,265	60,397	424,021

TABLE VIII.—NUMBER OF EMPLOYEES, FATAL ACCIDENTS, AND RATE PER 1,000 EMPLOYEES IN COAL MINES OF WEST VIRGINIA, BY COUNTIES, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

County.	Employees.	Fatal accidents.		County.	Employees.	Fatal accidents.	
		Number.	Per 1,000 employees.			Number.	Per 1,000 employees.
Barbour.....	7,195	61	8.48	Mercer.....	21,283	86	4.04
Braxton.....	176	1	5.68	Mineral.....	6,619	12	1.81
Brooke.....	3,377	10	2.96	Mingo.....	17,564	61	3.47
Clay.....	629	2	3.18	Monongalia.....	2,798	4	1.43
Fayette.....	101,406	571	5.63	Nicholas.....	1,137	2	1.76
Gilmer.....	38			Ohio.....	2,152	7	3.25
Grant.....	1,555	9	5.79	Preston.....	11,191	33	2.95
Greenbrier.....	73			Putnam.....	7,415	17	2.29
Hancock.....	968	2	2.07	Raleigh.....	8,741	45	5.15
Harrison.....	24,627	86	3.49	Randolph.....	4,569	7	1.53
Kanawha.....	50,095	133	2.65	Taylor.....	5,063	6	1.19
Lewis.....	69	3	43.48	Tucker.....	13,533	85	6.28
Lincoln.....	489			Upshur.....	300	12	40.00
Logan.....	3,965	9	2.27	Wayne.....	144		
Marion.....	32,757	494	15.08	Wyoming.....	4	2	500.00
Marshall.....	4,450	16	3.60				
Mason.....	2,877	4	1.39	Total.....	424,021	2,227	5.25
McDowell.....	86,762	447	5.15				

TABLE IX.—NUMBER OF FATAL ACCIDENTS, DUE TO EACH CAUSE, IN COAL MINES OF WEST VIRGINIA, BY COUNTIES, 1899 TO 1903.

[From the annual reports of the West Virginia department of mines.]

County.	Fatal accidents due to—						
	Falling coal.	Falling slate, etc.	Falling into shaft.	Mine cars or motors.	Outside cars.	Explosion of gas or dust.	Explosion of powder, etc.
Barbour.....	1	11		1		26	18
Braxton.....		1					
Brooke.....	2	5			1		
Clay.....				2			
Fayette.....	34	184	14	90	4	206	10
Grant.....		3	1	1		3	
Hancock.....		2					
Harrison.....	23	34		13		2	3
Kanawha.....	11	54		21	1	18	9
Lewis.....							
Logan.....		2		2			
Marion.....	14	60	3	21	4	376	3
Marshall.....		12		3			
Mason.....	1	2		1			
McDowell.....	47	242	7	64	7	34	30
Mercer.....	13	44		5	1	22	1
Mineral.....	3	4		4	1		
Mingo.....	3	42		8		3	3
Monongalia.....	2	1			1		
Nicholas.....	1	1					
Ohio.....		4		1		1	
Preston.....	9	13	1	4	1	1	
Putnam.....		13		3			
Raleigh.....		32	3	5		1	
Randolph.....	3	1		1			1
Taylor.....	3	2		1			
Tucker.....	13	26	1	5		25	1
Upshur.....							12
Wyoming.....							2
Total.....	183	795	30	262	20	718	93

County.	Fatal accidents due to—							Total.
	Explosion of blast.	Explosion of boiler.	Mining machinery.	Mules.	Asphyxiation.	Electrocution.	Other causes.	
Barbour.....			1				3	61
Braxton.....								1
Brooke.....						2		10
Clay.....								2
Fayette.....	6	2	4	2		7	8	571
Grant.....							1	9
Hancock.....				2				2
Harrison.....			3				1	86
Kanawha.....	3		2	1			13	133
Lewis.....							3	3
Logan.....	3		1			1		9
Marion.....	4		2	1	1	2	3	494
Marshall.....							1	16
Mason.....								4
McDowell.....	2		1		1	4	8	447
Mercer.....								86
Mineral.....								12
Mingo.....	1					1		61
Monongalia.....								4
Nicholas.....								2
Ohio.....						1		7
Preston.....	1				1	1	1	33
Putnam.....						1		17
Raleigh.....			1	1			2	45
Randolph.....						1		7
Taylor.....								6
Tucker.....	2		1			5	6	85
Upshur.....								12
Wyoming.....								2
Total.....	22	2	16	7	3	26	50	2,227

TABLE X.—NUMBER OF FATAL ACCIDENTS DUE TO EACH CAUSE IN COAL MINES OF WEST VIRGINIA, BY OCCUPATION OF PERSONS KILLED, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Occupation.	Fatal accidents due to—												Total.			
	Falling coal.	Falling slate, etc.	Falling into shaft.	Mine cars or motors.	Outside cars.	Explosions of—				Mining machinery.	Mules.	Asphyxiation.		Electrocution.	Other causes.	
						Gas or dust.	Powder, etc.	Blast.	Bolter.							
Backhand.....		2														2
Bitt boy.....						1										1
Blacksmith.....				2												2
Brakeman.....	3		15	1		9	1									29
Bratticeman.....						2										2
Cager.....	1					3								1		5
Car coupler.....				2		2										4
Car dropper.....					2											2
Car greaser.....				2												2
Car rider.....				4												4
Car tagger.....					1											1
Car trimmer.....					3									1		4
Carpenter.....	1	1													3	5
Chargeman.....	1		1			3	3									8
Check weighman.....									1							1
Civil engineer.....	1															1
Coal cutter.....						2										2
Coal hauler.....				2												2
Coal loader.....	17		3	3		8	1	1								33
Coal shoveler.....	2															2
Cokeman.....														1		1
Coke-oven worker.....									1					1		2
Coke-yard hand.....				1												1
Company man.....						3										3
Contractor.....	2					1										2
Ditching.....				1												1
Dock boss.....				5												5
Door tender.....	1			1												2
Drill runner.....	1	1	1											1		3
Driver.....	1	39		53		29		1			5		1	3		132
Driver, boss.....	1			1		3										5
Dumper.....				4												4
Electrical engineer.....				1												1
Electrician.....	1			2					1							4
Engineer.....				1					1							2
Fire boss.....	1					6										7
Fireman.....						1			1							2
Foreman.....	1	2	1	1		2			1	1						9
Foreman, assistant.....		1	1			2						1				5
Foreman, outside.....					1					1						2
Forker.....				1												1
Furnace tender.....	1															1
General manager.....									1							1
Gripman.....	1			9		5	1					1				17
Headman.....			2													2
Helper.....	2					1								1		4
Hoisting engineer.....															1	1
Laborer.....	7	45	4	29	4	60	10	3			2	4		9		177
Load runner.....									1							1
Locomotive engineer.....				1	1									1		3
Machine boss.....						1										1
Machine helper.....	6	3		1												10
Machine loader.....	1	1							1							3
Machine runner.....	2	15		2		25			3			1				48
Machinist.....									1							1
Mechanical engineer.....			1													1
Mine boss.....		3				3										7
Mining engineer.....		1				3										4
Miner.....	160	588	7	72		450	56	17		1	1	1	14	17		1,384
Motor helper.....		1		1												2
Oiler.....				1												1

TABLE X.—NUMBER OF FATAL ACCIDENTS DUE TO EACH CAUSE IN COAL MINES OF WEST VIRGINIA, BY OCCUPATION OF PERSONS KILLED, 1899 TO 1908—Concluded.

[From the annual reports of the West Virginia department of mines.]

Occupation.	Fatal accidents due to—											Total.				
	Fall- ing coal.	Fall- ing slate, etc.	Fall- ing into shaft.	Mine cars or mo- tors.	Out- side cars.	Explosions of—				Min- ing ma- chin- ery.	Mules		As- phyx- ia- tion.	Elec- tro- cu- tion.	Other caus- es.	
						Gas or dust.	Pow- der, etc.	Blast.	Boil- er.							
Outside boss.....						1										1
Pick boss.....				1												1
Pick boy.....	1															1
Pit boss.....							1									1
Power house man.....										1						1
Pumpman.....		1	1	2		1				1				1		7
Rockman.....		2								1						2
Rollerman.....				1												1
Rope rider.....														1		1
Salesman.....						1										1
Scraper.....						2										2
Secretary.....				1												1
Shaft sinker.....		2	9				1									12
Slate boss.....		1														1
Slate foreman.....		2														2
Slateman.....	3	22				6	2									33
Slate picker.....												1				1
Spragger.....		2		1												3
Stable boss.....			1			1	1									3
Superintendent.....				1		1			1							3
Switch boy.....				3												3
Teamster.....														1		1
Timberman.....		5				4										9
Tippleman.....				3	1											4
Track layer.....		13		3		9						1		1		27
Trapper.....		2		17		21								4		44
Water bailer.....		1		1		4										6
Weigher.....				1	1											1
Weigher, boss.....				1											1	2
Wireman.....						1									1	1
Not reported.....	1	4	1	8	2	41	16					2	1			76
Total.....	183	795	30	262	20	718	93	22	2	16	7	3	26	50		2,227

TABLE XI.—NUMBER AND PERCENT OF FATAL ACCIDENTS IN SPECIFIED OCCUPATIONS IN COAL MINES OF WEST VIRGINIA, BY CAUSES, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Cause.	Fatal accidents to—									
	Brakemen.		Chargemen.		Coal loaders.		Drivers.		Fire bosses.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Falling coal.....							1	0.8		
Falling slate, etc.....	3	10.3	1	12.5	17	51.5	39	29.5	1	14.3
Mine cars.....	15	51.7	1	12.5	3	9.1	53	40.1		
Outside cars.....	1	3.5			3	9.1				
Explosion of gas or dust.....	9	31.0	3	37.5	8	24.3	29	21.9	6	85.7
Explosion of powder or dynamite.....	1	3.5	3	37.5	1	3.0				
Explosion of blast.....					1	3.0	1	.8		
Mules.....							5	3.8		
Electrocution.....							1	.8		
Other causes.....							3	2.3		
Total.....	29	100.0	8	100.0	33	100.0	132	100.0	7	100.0
	Gripmen.		Laborers.		Machine runners.		Miners.		Pumpmen.	
Falling coal.....			7	3.9	2	4.2	160	11.6		
Falling slate, etc.....	1	5.9	45	25.4	15	31.2	588	42.5	1	14.3
Falling into shaft.....			4	2.3			7	.5	1	14.3
Mine cars.....	9	52.9	29	16.4	2	4.2	72	5.2	2	28.5
Outside cars.....			4	2.3						
Explosion of gas or dust.....	5	29.4	60	33.9	25	52.1	450	32.5	1	41.3
Explosion of powder or dynamite.....	1	5.9	10	5.6			56	4.0		
Explosion of blast.....			3	1.7			17	1.2		
Machinery.....					3	6.2	1	.1	1	14.3
Mules.....							1	.1		
Asphyxiation.....			2	1.1			1	.1		
Electrocution.....	1	5.9	4	2.3	1	2.1	14	1.0		
Other causes.....			9	5.1			17	1.2	1	14.3
Total.....	17	100.0	177	100.0	48	100.0	1,384	100.0	7	100.0
	Shaft sinkers.		Slatemen.		Timbermen.		Tracklayers.		Trappers.	
Falling coal.....			3	9.1						
Falling slate, etc.....	2	16.7	22	66.7	5	55.6	13	48.2	2	4.6
Falling into shaft.....	9	75.0								
Mine cars.....							3	11.1	17	38.6
Explosion of gas or dust.....			6	18.1	4	44.4	9	33.3	21	47.7
Explosion of powder or dynamite.....	1	8.3	2	6.1						
Electrocution.....							1	3.7		
Other causes.....							1	3.7	4	9.1
Total.....	12	100.0	33	100.0	9	100.0	27	100.0	44	100.0

TABLE XII.—NUMBER OF FATAL ACCIDENTS TO PERSONS IN EACH SPECIFIED AGE GROUP IN COAL MINES OF WEST VIRGINIA, BY OCCUPATIONS, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Occupation.	Fatal accidents to persons of the age of—													Total.
	10 and under 15 years.	15 and under 20 years.	20 and under 25 years.	25 and under 30 years.	30 and under 35 years.	35 and under 40 years.	40 and under 45 years.	45 and under 50 years.	50 and under 55 years.	55 and under 60 years.	60 and under 65 years.	65 years and over.	Not reported.	
Backhand.....			2											2
Bit boy.....		1												1
Blacksmith.....				1		1								2
Brakeman.....		13	6	6	4									29
Bratticeman.....				1	3	1	1							2
Cager.....				1										5
Car coupler.....		1	2			1								4
Car dropper.....		1											1	2
Car greaser.....	1	1												2
Car rider.....		1		1	1	1								4
Car tagger.....		1												1
Car trimmer.....				2	1				1					4
Carpenter.....			1	2	2			1						5
Chargeman.....			1	2	1	1	1	1	1				1	8
Check weighman.....											1			1
Civil engineer.....				1										1
Coal cutter.....			1				1							1
Coal hauler.....		1	1											2
Coal loader.....		2	7	5	7	6	2	1	1					22
Coal shoveler.....				2									2	3
Cokeman.....			1											2
Coke-oven worker.....		1				1								1
Coke-yard hand.....					1		1							2
Company man.....				1			2							3
Contractor.....						1	1							2
Ditching.....								1						1
Dock boss.....								1						1
Door tender.....	2	3	1											6
Drill runner.....			1	1	1									3
Driver.....	3	34	55	23	11	2	1						3	132
Driver, boss.....				2	1	1		1						5
Dumper.....		2	1					1						4
Electrical engineer.....							1							1
Electrician.....				1	1	1	1							4
Engineer.....			1										1	2
Fire boss.....					2	2	1	1	1					7
Fireman.....					1	1	2							2
Foreman.....		1		1	3	2	2							9
Foreman, assistant.....					1	1	1		1	1				5
Foreman, outside.....					1	1								2
Forker.....					1	1								1
Furnace tender.....										1				1
General manager.....														1
Gripman.....		1	7	6	1	2		1						17
Headman.....			1		1									2
Helper.....	1	3												4
Hoisting engineer.....														1
Laborer.....		20	40	23	10	13	8	3	4	3	1		52	177
Load runner.....				1										1
Locomotive engineer.....			1	1					1					3
Machine boss.....						1								1
Machine helper.....		1	2	3	3	1								10
Machine loader.....			1	1			1							3
Machine runner.....		1	7	16	11	8	4	1						48
Machinist.....							1							1
Mechanical engineer.....						1								1
Mine boss.....			1		1	1		2	1				1	7
Mining engineer.....					1	1							2	4
Miner.....	2	98	254	292	214	179	105	68	42	21	12	7	90	1,384
Motor helper.....		1	1											2
Oiler.....		1												1
Outside boss.....						1								1
Pick boss.....							1							1
Pick boy.....		1												1

TABLE XII.—NUMBER OF FATAL ACCIDENTS TO PERSONS IN EACH SPECIFIED AGE GROUP IN COAL MINES OF WEST VIRGINIA, BY OCCUPATIONS, 1899 TO 1908—Concluded.

[From the annual reports of the West Virginia department of mines.]

Occupation.	Fatal accidents to persons of the age of—												Total.	
	10 and under 15 years.	15 and under 20 years.	20 and under 25 years.	25 and under 30 years.	30 and under 35 years.	35 and under 40 years.	40 and under 45 years.	45 and under 50 years.	50 and under 55 years.	55 and under 60 years.	60 and under 65 years.	65 years and over.		Not reported.
Pit boss.....							1							1
Power-house man.....										1				1
Pumpman.....		1		1		1			4					7
Rockman.....			1	1										2
Rollerman.....								1						1
Rope rider.....				1										1
Salesman.....													1	1
Scraper.....		1				1								2
Secretary.....					1									1
Shaft sinker.....			5	2	2		1	1	1					12
Slate boss.....			1											1
Slate foreman.....				1									1	2
Slateman.....		1	3	8	10	5	1	3	2					33
Slate picker.....			1											1
Spragger.....		3												3
Stable boss.....			1				1	1						3
Superintendent.....								1	1			1		3
Switch boy.....	3													3
Teamster.....								1						1
Timberman.....			1	3		1	2	1	1					9
Tippleman.....		1	1		1		1							4
Track layer.....		1	2	5	3	5	4	1	4				1	27
Trapper.....	14	22		1	1			1					5	44
Water bailer.....			3	1	2									6
Weigher.....		1												1
Weigher, boss.....					1				1					2
Wireman.....								1						1
Not reported.....	5	5	17	8	3	2	2	1					33	76
Total.....	31	229	430	427	306	249	148	95	67	26	15	9	195	2,227

TABLE XIII.—NUMBER AND PER CENT OF FATAL ACCIDENTS IN SPECIFIED OCCUPATIONS IN COAL MINES OF WEST VIRGINIA, BY AGE GROUPS, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Age group.	Fatal accidents to—									
	Brakemen.		Chargemen.		Coal loaders.		Drivers.		Fire bosses.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
10 and under 15 years.....					2	6.5	3	2.3		
15 and under 20 years.....	13	44.8			7	22.6	34	26.4		
20 and under 25 years.....	6	20.7	1	14.3	5	16.1	23	17.8		
25 and under 30 years.....	6	20.7	2	28.5	7	22.6	11	8.5	2	33.3
30 and under 35 years.....	4	13.8	1	14.3	6	19.3	2	1.6	2	33.3
35 and under 40 years.....			1	14.3	2	6.5	1	.8	1	16.7
40 and under 45 years.....			1	14.3	1	3.2				
45 and under 50 years.....			1	14.3	1	3.2			1	16.7
50 and under 55 years.....										
Total.....	29	100.0	a 7	100.0	b 31	100.0	c 129	100.0	a 6	100.0
Age group.	Gripmen.		Laborers.		Machine run-ners.		Miners.		Pumpmen.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
	10 and under 15 years.....				1	2.1	2	0.2		
15 and under 20 years.....	1	5.9	20	16.0	7	14.6	98	7.6	1	14.3
20 and under 25 years.....	7	41.2	40	32.0	16	33.3	254	19.6		
25 and under 30 years.....	6	35.3	23	18.4	11	22.9	292	22.6	1	14.3
30 and under 35 years.....	1	5.9	10	8.0	8	16.7	214	16.6		
35 and under 40 years.....	2	11.7	13	10.4	4	8.3	179	13.9	1	14.3
40 and under 45 years.....			8	6.4	1	2.1	105	8.1		
45 and under 50 years.....			3	2.4			68	5.3		
50 and under 55 years.....			4	3.2			42	3.1	4	57.1
55 and under 60 years.....			3	2.4			21	1.5		
60 and under 65 years.....			1	.8			12	.9		
65 years and over.....							7	.6		
Total.....	17	100.0	d 125	100.0	48	100.0	e 1,294	100.0	7	100.0
Age group.	Shaft sinkers.		Slatemen.		Timbermen.		Track layers.		Trappers.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
	10 and under 15 years.....								14	35.8
15 and under 20 years.....			1	3.0			1	3.8	22	56.4
20 and under 25 years.....	5	41.7	3	9.1	1	11.1	2	7.7		
25 and under 30 years.....	2	16.7	8	24.2	3	33.4	5	19.3	1	2.6
30 and under 35 years.....	2	16.7	10	30.3			3	11.5	1	2.6
35 and under 40 years.....			5	15.2	1	11.1	5	19.3		
40 and under 45 years.....	1	8.3	1	3.0	2	22.2	4	15.4		
45 and under 50 years.....	1	8.3	3	9.1	1	11.1	1	3.8	1	2.6
50 and under 55 years.....	1	8.3	2	6.1	1	11.1	4	15.4		
65 years and over.....							1	3.8		
Total.....	12	100.0	33	100.0	9	100.0	a 26	100.0	f 39	100.0

a Not including 1, age not reported.
 b Not including 2, ages not reported.
 c Not including 3, ages not reported.

d Not including 52, ages not reported.
 e Not including 90, ages not reported.
 f Not including 5, ages not reported.

TABLE XIV.—NUMBER OF FATAL ACCIDENTS TO PERSONS OF EACH NATIVITY IN COAL MINES OF WEST VIRGINIA, BY OCCUPATIONS, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Occupation.	Fatal accidents to persons whose nativity was—											Total.	
	Amer-ican.	Aus-trian.	Eng-lish.	Ger-man.	Hun-garian.	Ital-ian.	Lithu-anian.	Negro.	Pole.	Rus-sian.	Slav.		Other and not reported.
Backhand.....	1							1					2
Bitt boy.....									1				1
Blacksmith.....	1							1					2
Brakeman.....	20					4		5					29
Bratticeman.....						2							2
Cager.....								1	1			3	5
Car coupler.....	3							1					4
Car dropper.....								2					2
Car greaser.....	2												2
Car rider.....	4												4
Car tagger.....								1					1
Car trimmer.....	2					2							4
Carpenter.....	5												5
Chargeman.....	3			1		1		1				2	8
Checkweighman.....	1												1
Civil engineer.....	1												1
Coal cutter.....								2					2
Coal hauler.....	1							1					2
Coal loader.....	8			2	1	10	1	6	1	2	1	1	33
Coal shoveler.....	1	1											2
Cokeman.....	1												1
Coke-oven worker.....						1		1					2
Coke-yard hand.....						1							1
Companyman.....					1	1		1	1				3
Contractor.....	1							1					2
Ditching.....												1	1
Dock boss.....	1												1
Door tender.....	2							4					6
Drill runner.....	1							1			1		3
Driver.....	71		2		1	11		40			5	2	132
Driver, boss.....	4										1		5
Dumper.....	4												4
Electrical engineer.....	1												1
Electrician.....	4												4
Engineer.....	1							1					2
Fire boss.....	5		1									1	7
Fireman.....	1							1					2
Foreman.....	7		2										9
Foreman, assistant.....	3							1				1	5
Foreman, outside.....	2												2
Forker.....						1							1
Furnace tender.....												1	1
General manager.....				1									1
Gripman.....	15					1						1	17
Headman.....	2												2
Helper.....	2							1	1				4
Hoisting engineer.....	1												1
Laborer.....	67		1	4	19	18		57	7		1	3	177
Load runner.....	1												1
Locomotive engineer.....	3												3
Machine boss.....	1												1
Machine helper.....	7				1			2					10
Machine loader.....	3												3
Machine runner.....	38					1	2	4				3	48
Machinist.....	1												1
Mechanical engineer.....	1												1
Mine boss.....	4		2										7
Mining engineer.....	3		1										4
Miner.....	438	20	30	22	88	259	22	240	83	12	97	73	1,384
Motor helper.....	2												2
Oiler.....												1	1
Outside boss.....	1												1
Pick boss.....	1												1
Pick boy.....	1												1
Pitt boss.....	1												1
Power house.....	1												1
Pumpman.....	3		1	1								2	7
Rockman.....	1											1	2
Rollerman.....	1												1
Rope rider.....	1												1
Salesman.....	1												1

TABLE XIV.—NUMBER OF FATAL ACCIDENTS TO PERSONS OF EACH NATIVITY IN COAL MINES OF WEST VIRGINIA, BY OCCUPATIONS, 1899 TO 1908—Concluded.

[From the annual reports of the West Virginia department of mines.]

Occupation.	Fatal accidents to persons whose nativity was—											Total.	
	Amer- ican.	Aus- trian.	Eng- lish.	Ger- man.	Hun- garian.	Ital- ian.	Lithu- anian.	Ne- gro.	Pole.	Rus- sian.	Slav.		Other and not re- ported.
Scraper.....							2						2
Secretary.....	1												1
Shaft sinker.....	7							1		3	1		12
Slate boss.....	1												1
Slate foreman.....					1			1					2
Slateman.....	6		3		6	6		9	1		2		33
Slate picker.....						1							1
Spragger.....								3					3
Stable boss.....	3												3
Superintendent.....	1											2	3
Switch boy.....	3												3
Teamster.....	1												1
Timberman.....	6					2			1				9
Tippleman.....	3							1					4
Tracklayer.....	18	1	2			2			1	1	1	1	27
Trapper.....	23					12		7			2		44
Water bailer.....	2					4							6
Weigher.....	1												1
Weigher, boss.....	2												2
Wireman.....	1												1
Not reported.....	29					4		33				10	76
Total.....	871	22	45	31	118	343	29	430	98	18	113	109	2,227

TABLE XV.—NUMBER AND PER CENT OF FATAL ACCIDENTS TO PERSONS IN SPECIFIED OCCUPATIONS IN COAL MINES OF WEST VIRGINIA, BY NATIVITY, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Nativity.	Fatal accidents to—									
	Brakemen.		Chargemen.		Car loaders.		Drivers.		Fire bosses.	
	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.
American.....	20	69.0	3	37.5	8	24.3	71	54.2	5	71.4
English.....							2	1.5	1	14.3
German.....			1	12.5	2	6.1				
Hungarian.....					1	3.0	1	.8		
Italian.....	4	13.8	1	12.5	10	30.3	11	8.4		
Lithuanian.....					1	3.0				
Negro.....	5	17.2	1	12.5	6	18.2	40	30.5		
Pole.....					1	3.0				
Russian.....					2	6.1				
Slav.....					1	3.0	5	3.8		
Other nativities.....			2	25.0	1	3.0	1	.8	1	14.3
Total.....	29	100.0	8	100.0	33	100.0	a 131	100.0	7	100.0
Nativity.	Gripmen.		Laborers.		Machine run-ners.		Miners.		Pumpmen.	
	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.
American.....	15	93.8	67	38.0	38	80.8	438	32.3	3	50.0
Austrian.....							20	1.5		
English.....			1	.6			30	2.2	1	16.7
German.....			4	2.3			22	1.6	1	16.7
Hungarian.....			19	10.8			88	6.5		
Italian.....	1	6.2	18	10.2	1	2.1	259	19.1		
Lithuanian.....					2	4.3	22	1.6		
Negro.....			57	32.4	4	8.5	240	17.7		
Pole.....			7	4.0			83	6.1		
Russian.....							12	.9		
Slav.....			1	.6			97	7.2		
Other nativities.....			2	1.1	2	4.3	45	3.3	1	16.6
Total.....	a 16	100.0	a 176	100.0	a 47	100.0	b 1,356	100.0	a 6	100.0
Nativity.	Shaft sinker.		Slateman.		Timberman.		Track layer.		Trapper.	
	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.
American.....	7	58.4	6	18.2	6	66.7	18	69.2	23	52.3
Austrian.....							1	3.9		
English.....			3	9.1			2	7.7		
Hungarian.....			6	18.2						
Italian.....			6	18.2	2	22.2	2	7.7	12	27.3
Negro.....	1	8.3	9	27.3					7	15.9
Pole.....			1	3.0	1	11.1	1	3.9		
Russian.....	3	25.0					1	3.8		
Slav.....	1	8.3	2	6.0			1	3.8	2	4.5
Total.....	12	100.0	33	100.0	9	100.0	a 26	100.0	44	100.0

a Not including 1, nativity not reported.

b Not including 28, nativity not reported.

TABLE XVI.—NUMBER OF FATAL ACCIDENTS IN EACH OCCUPATION IN COAL MINES OF WEST VIRGINIA, BY LENGTH OF EXPERIENCE, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Occupation.	Fatal accidents to persons whose experience in mining was—								Total.	
	Under 3 months.	3 and under 6 months.	6 months and under 1 year.	1 and under 5 years.	5 and under 10 years.	10 and under 15 years.	15 and under 20 years.	20 years and over.		Not reported.
Back hand.....	1								1	2
Bitt boy.....				1						1
Blacksmith.....			1	1						2
Brakeman.....	2	1		14	7				5	29
Bratticeman.....					1	1				2
Cager.....			1	1					3	5
Car coupler.....		1		1	1				1	4
Car dropper.....									2	2
Car greaser.....			1	1						2
Car rider.....					2	1			1	4
Car tagger.....	1									1
Car trimmer.....	1			2					1	4
Carpenter.....			1	1					3	5
Chargeman.....	1	1		3	1				2	8
Check weighman.....			1							1
Civil engineer.....	1									1
Coal cutter.....		1		1						2
Coal hauler.....					1				1	2
Coal loader.....	4	1		12	2	1	1		12	33
Coal shoveler.....	1		1							2
Cokeman.....									1	1
Coke-oven worker.....				1					1	2
Coke-yard hand.....									1	1
Company man.....	1				1				1	3
Contractor.....					1	1				2
Ditching.....						1				1
Dock boss.....			1							1
Door tender.....				2					1	6
Drill runner.....	3			1	1				1	3
Driver.....	10	8	6	49	34	3	1	1	20	132
Driver, boss.....					2	2		1		5
Dumper.....			1		2				1	4
Electrical engineer.....					1					1
Electrician.....				1	1			1	1	4
Engineer.....			1		1					2
Fire boss.....					2	2		1	2	7
Fireman.....					1				1	2
Foreman.....				3		4		1	1	9
Foreman, assistant.....					2		2		1	5
Foreman, outside.....						1			1	2
Forker.....									1	1
Furnace tender.....								1		1
General manager.....							1			1
Gripman.....				3	8	4	1		1	17
Headman.....				1					1	2
Helper.....									4	4
Hoisting engineer.....		1								1
Laborer.....	24	10	10	44	6	2			81	177
Load runner.....				1						1
Locomotive engineer.....				1	1				1	3
Machine boss.....						1				1
Machine helper.....				4	2	1			3	10
Machine loader.....				2						3
Machine runner.....		1	1	15	15	7	2	1	6	48
Machinist.....									1	1
Mechanical engineer.....				1						1
Mine boss.....			1	1	1			3	1	7
Mining engineer.....					2				2	4
Miner.....	88	67	71	442	236	98	48	58	276	1,384
Motor helper.....					1				1	2
Oiler.....				1						1
Outside boss.....						1				1
Pick boss.....									1	1
Pick boy.....				1						1
Pit boss.....	1									1
Power-house man.....								1		1
Pump man.....				3	1			1	2	7
Rockman.....				1					1	2
Rollerman.....			1							1
Rope rider.....						1				1
Salesman.....									1	1
Scraper.....			1						1	2

TABLE XVI.—NUMBER OF FATAL ACCIDENTS IN EACH OCCUPATION IN COAL MINES OF WEST VIRGINIA, BY LENGTH OF EXPERIENCE, 1899 TO 1903—Concluded.

[From the annual reports of the West Virginia department of mines.]

Occupation.	Fatal accidents to persons whose experience in mining was—									Total.
	Under 3 months.	3 and under 6 months.	6 months and under 1 year.	1 and under 5 years.	5 and under 10 years.	10 and under 15 years.	15 and under 20 years.	20 years and over.	Not reported.	
Secretary.....									1	1
Shaft sinker.....	3			5	1		1		2	12
Slate boss.....				2	1					1
Slate foreman.....				2						2
Slate man.....	6	4	5	4	5	1		2	6	33
Slate picker.....		1								1
Spragger.....				2					1	3
Stable boss.....								1	2	3
Superintendent.....								3		3
Switch boy.....		1							2	3
Teamster.....					1					1
Timberman.....				4		1	1		3	9
Tippleman.....			1	1					2	4
Track layer.....	1			8	3	4	4	3	4	27
Trapper.....	2	7	1	24					10	44
Water bailer.....				3	2	1				6
Weigher.....			1							1
Weigher, boss.....			1			1				2
Wireman.....						1				1
Not reported.....	1					1			74	76
Total.....	152	105	110	669	348	144	62	79	558	2,227

TABLE XVII.—NUMBER AND PER CENT OF FATAL ACCIDENTS TO PERSONS IN SPECIFIED OCCUPATIONS IN COAL MINES OF WEST VIRGINIA, BY LENGTH OF EXPERIENCE, 1899 to 1908.

[From the annual reports of the West Virginia department of mines.]

Length of experience.	Fatal accidents to—									
	Brakemen.		Charge men.		Coal loaders.		Drivers.		Fire bosses.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
Under 3 months.....	2	8.3	1	16.7	4	19.0	10	8.9	.....	.....
3 and under 6 months.....	1	4.2	1	16.7	1	4.8	8	7.1	.....	.....
6 months and under 1 year.....	.....	.....	.....	.....	.....	.....	6	5.4	.....	.....
1 and under 5 years.....	14	58.3	3	50.0	12	57.1	49	43.7	.....	.....
5 and under 10 years.....	7	29.2	1	16.6	2	9.5	34	30.4	2	40.0
10 and under 15 years.....	.....	.....	.....	.....	1	4.8	3	2.7	2	40.0
15 and under 20 years.....	.....	.....	.....	.....	1	4.8	1	.9	.....	.....
20 years and over.....	.....	.....	.....	.....	.....	.....	1	.9	1	20.0
Total.....	a 24	100.0	b 6	100.0	c 21	100.0	d 112	100.0	e 5	100.0
	Gripmen.		Laborers.		Machine run-ners.		Miners.		Pump men.	
Under 3 months.....	.....	.....	24	25.0	.....	.....	88	7.9	.....	.....
3 and under 6 months.....	.....	.....	10	10.4	1	2.4	67	6.1	.....	.....
6 months and under 1 year.....	.....	.....	10	10.4	1	2.4	71	6.4	.....	.....
1 and under 5 years.....	3	18.8	44	45.8	15	35.7	442	39.9	3	60.0
5 and under 10 years.....	8	50.0	6	6.3	15	35.7	236	21.3	1	20.0
10 and under 15 years.....	4	25.0	2	2.1	7	16.7	98	8.9	.....	.....
15 and under 20 years.....	1	6.2	.....	.....	2	4.7	48	4.3	.....	.....
20 years and over.....	.....	.....	.....	.....	1	2.4	58	5.2	1	20.0
Total.....	e 16	100.0	f 96	100.0	g 42	100.0	h 1,108	100.0	i 5	100.0
	Shaft sinkers.		Slate men.		Timbermen.		Track layers.		Trappers.	
Under 3 months.....	3	30.0	6	22.3	.....	.....	1	4.4	2	5.9
3 and under 6 months.....	.....	.....	4	14.8	.....	.....	.....	.....	7	20.6
6 months and under 1 year.....	.....	.....	5	18.5	.....	.....	.....	.....	1	2.9
1 and under 5 years.....	5	50.0	4	14.8	4	66.7	8	34.8	24	70.6
5 and under 10 years.....	1	10.0	5	18.5	.....	.....	3	13.0	.....	.....
10 and under 15 years.....	.....	.....	1	3.7	1	16.7	4	17.4	.....	.....
15 and under 20 years.....	1	10.0	.....	.....	1	16.6	4	17.4	.....	.....
20 years and over.....	.....	.....	2	7.4	.....	.....	3	13.0	.....	.....
Total.....	i 10	100.0	j 27	100.0	k 6	100.0	l 23	100.0	m 34	100.0

a Not including 5, experience not reported.
 b Not including 2, experience not reported.
 c Not including 12, experience not reported.
 d Not including 20, experience not reported.
 e Not including 1, experience not reported.
 f Not including 81, experience not reported.

g Not including 6, experience not reported.
 h Not including 276, experience not reported.
 i Not including 3, experience not reported.
 j Not including 4, experience not reported.
 k Not including 10, experience not reported.

TABLE XVIII.—NUMBER AND PER CENT OF FATAL ACCIDENTS DUE TO SPECIFIED CAUSES IN COAL MINES OF WEST VIRGINIA, BY AGE GROUPS, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Age group.	Fatal accidents due to—									
	Falling coal.		Falling rock, etc.		Falling into shaft.		Mine cars, motors, etc.		Outside cars.	
	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.
10 and under 15 years.....	1	0.6	3	0.4	.....	.....	19	7.5	1	5.9
15 and under 20 years.....	11	6.1	84	11.0	.....	.....	55	21.8	5	29.4
20 and under 25 years.....	39	21.8	151	19.7	8	27.6	52	20.6	2	11.8
25 and under 30 years.....	35	19.6	145	18.9	5	17.2	42	16.7	3	17.6
30 and under 35 years.....	37	20.7	110	14.3	7	24.1	26	10.3	3	17.6
35 and under 40 years.....	23	12.8	111	14.5	3	10.4	25	9.9	1	5.9
40 and under 45 years.....	16	8.9	60	7.8	1	3.4	8	3.2	.....	.....
45 and under 50 years.....	11	6.1	44	5.7	3	10.4	8	3.2	1	5.9
50 and under 55 years.....	3	1.7	33	4.3	2	6.9	9	3.6	1	5.9
55 and under 60 years.....	.....	.....	14	1.8	.....	.....	4	1.6	.....	.....
60 and under 65 years.....	1	.6	10	1.3	.....	.....	1	.4	.....	.....
65 years and over.....	2	1.1	2	.3	.....	.....	3	1.2	.....	.....
Total.....	a 179	100.0	b 767	100.0	c 29	100.0	d 252	100.0	e 17	100.0
	Explosion of gas or dust.		Explosion of powder or dynamite.		Explosion of blast.		Mining machinery.		Electrocution.	
10 and under 15 years.....	2	0.3	1	1.6	.....	.....	.....	.....	.....	.....
15 and under 20 years.....	62	10.1	3	4.8	1	4.8	.....	.....	3	12.0
20 and under 25 years.....	132	21.6	22	34.9	2	9.5	1	6.6	9	36.0
25 and under 30 years.....	159	26.0	13	20.6	3	14.3	3	20.0	9	36.0
30 and under 35 years.....	100	16.4	11	17.5	4	19.0	1	6.6	.....	.....
35 and under 40 years.....	67	11.0	6	9.5	5	23.8	3	20.0	1	4.0
40 and under 45 years.....	47	7.7	5	7.9	2	9.5	3	20.0	2	8.0
45 and under 50 years.....	23	3.9	.....	.....	1	4.8	1	6.7	.....	.....
50 and under 55 years.....	13	2.2	1	1.6	.....	.....	1	6.7	1	4.0
55 and under 60 years.....	4	.6	1	1.6	1	4.8	1	6.7	.....	.....
60 and under 65 years.....	.....	.....	.....	.....	2	9.5	1	6.7	.....	.....
65 years and over.....	1	.2	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	f 610	100.0	g 63	100.0	c 21	100.0	e 15	100.0	c 25	100.0

a Not including 4, age not reported.
 b Not including 28, age not reported.
 c Not including 1, age not reported.
 d Not including 10, age not reported.

e Not including 3, age not reported.
 f Not including 108, age not reported.
 g Not including 30, age not reported.

TABLE XIX.—NUMBER AND PER CENT OF FATAL ACCIDENTS TO PERSONS OF SPECIFIED NATIVITIES IN COAL MINES OF WEST VIRGINIA, BY LENGTH OF EXPERIENCE, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Length of experience.	Fatal accidents to persons whose nativity was—									
	American.		Austrian.		English.		German.		Hungarian.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
Under 3 months.....	44	6.9	4	19.0	1	3.2	2	9.5	15	17.2
3 and under 6 months.....	44	6.9	1	4.8	.....	.....	1	4.8	6	6.9
6 months and under 1 year.....	29	4.6	5	23.8	.....	.....	3	14.3	6	6.9
1 and under 5 years.....	209	33.0	8	38.1	.....	.....	7	33.3	42	48.2
5 and under 10 years.....	140	22.1	2	9.5	.....	.....	3	14.3	16	18.4
10 and under 15 years.....	91	14.3	.....	.....	.....	.....	1	4.8	1	1.2
15 and under 20 years.....	34	5.4	.....	4.8	.....	.....	2	9.5	1	1.2
20 years and over.....	43	6.8	1	.....	16	51.6	2	9.5	.....	.....
Total.....	<i>a</i> 634	100.0	<i>b</i> 21	100.0	<i>c</i> 31	100.0	<i>d</i> 21	100.0	<i>e</i> 87	100.0
	Italian.		Lithuanian.		Negro.		Pole.		Slav.	
Under 3 months.....	25	8.4	.....	.....	34	11.8	9	11.3	10	9.7
3 and under 6 months.....	20	6.7	2	7.7	18	6.2	3	3.7	3	2.9
6 months and under 1 year.....	21	7.0	1	3.9	14	4.8	8	10.0	11	10.7
1 and under 5 years.....	108	56.2	11	42.3	115	39.8	33	41.3	44	42.7
5 and under 10 years.....	59	19.7	7	26.8	64	22.2	20	25.0	27	26.2
10 and under 15 years.....	6	2.0	1	3.9	20	6.9	6	7.5	7	6.8
15 and under 20 years.....	.....	.....	2	7.7	18	6.2	1	1.2	.....	.....
20 years and over.....	.....	.....	2	7.7	6	2.1	.....	.....	1	1.0
Total.....	<i>f</i> 299	100.0	<i>g</i> 26	100.0	<i>h</i> 289	100.0	<i>i</i> 80	100.0	<i>j</i> 103	100.0

a Not including 237, experience not reported.
b Not including 1, experience not reported.
c Not including 14, experience not reported.
d Not including 10, experience not reported.
e Not including 31, experience not reported.

f Not including 44, experience not reported.
g Not including 3, experience not reported.
h Not including 141, experience not reported.
i Not including 18, experience not reported.

TABLE XX.—NUMBER AND PER CENT OF FATAL ACCIDENTS DUE TO SPECIFIED CAUSES IN COAL MINES OF WEST VIRGINIA, BY NATIVITY OF PERSONS KILLED, 1899 TO 1908.

[From the annual reports of the West Virginia department of mines.]

Nativity.	Fatal accidents due to—									
	Falling coal.		Falling slate, etc.		Falling into shafts.		Mine cars or motors.		Outside cars.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
American.....	66	36.9	326	42.2	15	51.7	148	57.6	6	30.0
Austrian.....	5	2.8	9	1.2	1	3.5	1	.4		
English.....	5	2.8	19	2.5						
German.....	1	.6	15	1.9			1	.4		
Hungarian.....	17	9.5	61	7.9			7	2.7		
Italian.....	23	12.8	62	8.0	1	3.5	23	8.9	4	20.0
Lithuanian.....	1	.6	5	.7			1	.4		
Negro.....	29	16.2	178	23.0	6	20.6	64	24.9	10	50.0
Pole.....	10	5.6	38	4.9	2	6.9	3	1.2		
Russian.....	4	2.2	8	1.0	3	10.3	1	.4		
Slav.....	14	7.8	28	3.6	1	3.5	3	1.2		
Other nationalities.....	4	2.2	24	3.1			5	1.9		
Total.....	<i>a</i> 179	100.0	<i>b</i> 773	100.0	<i>c</i> 29	100.0	<i>d</i> 257	100.0	20	100.0
Nativity.	Fatal accidents due to—									
	Explosion of gas or dust.		Explosion of powder or dynamite.		Explosion of blast.		Mining machinery.		Electrocution.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
American.....	206	28.8	34	40.0	6	23.5	13	81.1	12	48.0
Austrian.....	5	.7	1	1.2						
English.....	18	2.5	2	2.3						
German.....	4	.6	2	2.3	4	19.1	1	6.3	1	4.0
Hungarian.....	24	3.3	4	4.7	3	14.3			1	4.0
Italian.....	198	27.7	17	20.0	4	19.1	1	6.3	4	16.0
Lithuanian.....	22	3.1								
Negro.....	107	14.9	21	24.7	2	9.5	1	6.3	3	12.0
Pole.....	41	5.7			2	9.5			1	4.0
Russian.....			1	1.2					1	4.0
Slav.....	65	9.1							2	8.0
Other nationalities.....	26	3.6	3	3.6						
Total.....	<i>e</i> 716	100.0	<i>f</i> 85	100.0	<i>c</i> 21	100.0	16	100.0	<i>c</i> 25	100.0

a Not including 4, nativity not reported.

b Not including 22, nativity not reported.

c Not including 1, nativity not reported.

d Not including 5, nativity not reported.

e Not including 2, nativity not reported.

f Not including 8, nativity not reported.

FATAL ACCIDENTS IN COAL MINING.

647

TABLE XXI.—NUMBER OF FATAL ACCIDENTS AND RATE PER 1,000 EMPLOYEES IN ANTHRACITE MINES OF PENNSYLVANIA, BY CAUSES, 1899 TO 1908.

[From the annual reports of the Pennsylvania department of mines.]

Cause.	Number of fatal accidents.	Per cent of total.	Fatal accident rate per 1,000 employees.
INSIDE OF MINE.			
Falling coal.....	666	14.6	0.62
Falling slate, roof, etc.....	1,597	35.0	1.49
Mine cars.....	690	15.2	.65
Explosion of gas or dust.....	352	7.7	.33
Explosion of powder or dynamite.....	195	4.3	.18
Explosion of blast.....	415	9.1	.39
Falling into shafts.....	136	3.0	.13
Falling into slopes.....	56	1.2	.05
Falling down manway.....	47	1.0	.04
Crushed at batteries.....	15	.3	.01
Mules.....	39	.9	.04
Asphyxiation.....	91	2.0	.09
Miscellaneous causes.....	260	5.7	.24
Total.....	4,559	100.0	4.26
OUTSIDE OF MINE.			
Cars.....	316	38.2	.63
Machinery.....	204	24.7	.41
Asphyxiation.....	56	6.8	.11
Boiler explosion.....	9	1.1	.02
Electrocution.....	3	.4	.01
Miscellaneous causes.....	238	28.8	.47
Total.....	826	100.0	1.65
Grand total.....	5,385	.....	3.43

TABLE XXII.—NUMBER OF FATAL ACCIDENTS AND RATE PER 1,000 EMPLOYEES IN BITUMINOUS MINES OF PENNSYLVANIA, BY CAUSES, 1899 TO 1908.

[From the annual reports of the Pennsylvania department of mines.]

Cause.	Number of fatal accidents.	Per cent of total.	Fatal accident rate per 1,000 employees.
INSIDE OF MINE.			
Falling coal.....	339	9.0	0.32
Falling slate, roof, etc.....	1,997	46.1	1.66
Mine cars.....	602	13.9	.50
Machinery.....	30	.7	.02
Explosion of gas or dust.....	867	20.0	.72
Explosion of powder or dynamite.....	35	.8	.03
Explosion of blast.....	62	1.4	.05
Asphyxiation.....	17	.4	.01
Electrocution.....	95	2.2	.08
Falling into shafts, slopes, etc.....	82	1.9	.07
Mules.....	9	.2	.01
Miscellaneous causes.....	149	3.4	.12
Total.....	4,334	100.0	3.60
OUTSIDE OF MINE.			
Cars.....	100	45.9	.39
Machinery.....	26	11.9	.10
Asphyxiation.....	3	1.4	.01
Explosion of boilers.....	5	2.3	.02
Miscellaneous causes.....	84	38.5	.32
Total.....	218	100.0	.84
Grand total.....	4,552	.....	3.11

TABLE XXIII.—NUMBER OF FATAL ACCIDENTS AND RATE PER 10,000 EMPLOYEES DUE TO SPECIFIED CAUSES, IN TEN-YEAR PERIODS, BY STATES AND PROVINCES.

Cause.	Fatal accidents.					
	Maryland, 1900 to 1908.			Ohio, 1899 to 1908.		
	Number.	Per cent of total.	Per 10,000 employees.	Number.	Per cent of total.	Per 10,000 employees.
Fall of coal or slate.....	16	15.4	3.07	64	6.2	1.57
Fall of roof or rock.....	35	33.7	6.71	614	59.8	15.10
Falling into shafts.....				14	1.3	.34
Falling into tipples.....				2	.2	.05
Falling of timber.....				4	.4	.10
Cages.....	2	1.9	.38	10	1.0	.25
Mine cars.....	25	24.0	4.79	114	11.1	2.80
Outside cars.....				8	.8	.20
Motors.....				19	1.9	.47
Explosion of gas.....				23	2.2	.57
Explosion of powder.....				3	.3	.07
Explosion of fire damp.....				1	.1	.02
Explosion, premature.....				52	5.0	1.28
Explosion of blast.....	3	2.9	.58			
Explosion of boilers.....				3	.3	.07
Shot blown through.....				13	1.3	.32
Mining machinery.....				13	1.3	.32
Mules.....	2	1.9	.38	1	.1	.02
Asphyxiation.....				3	.3	.07
Electrocution.....				40	3.9	.98
Miscellaneous.....	21	20.2	4.03	26	2.5	.64
Total.....	104	100.0	19.94	1,027	100.0	25.25
	Pennsylvania, anthracite, 1898 to 1907.			Pennsylvania, bituminous, 1898 to 1907.		
Fall of coal.....	653	12.8	4.24	372	8.9	2.72
Fall of slate, roof, or rock.....	1,512	29.5	9.82	1,885	45.1	13.76
Falling into shafts.....	130	2.5	.84	68	1.6	.50
Falling into slopes.....	60	1.2	.39	5	.1	.04
Falling down manways, etc.....	42	.8	.27			
Mine cars.....	644	12.6	4.18	557	13.3	4.07
Outside cars.....	296	5.8	1.92	92	2.2	.67
Explosion of gas or dust.....	328	6.4	2.13	717	17.2	5.23
Explosion of powder or dynamite.....	183	3.6	1.19	35	.8	.26
Explosion of blast.....	370	7.2	2.40	61	1.5	.45
Explosion of boiler.....	10	.2	.06	5	.1	.04
Mining machinery.....	189	3.7	1.23	50	1.2	.37
Batteries.....	13	.3	.08			
Mules or horses.....	43	.8	.28	9	.2	.07
Asphyxiation.....	163	3.2	1.06	22	.5	.16
Electrocution.....	5	.1	.03	77	1.9	.56
Miscellaneous.....	477	9.3	3.10	225	5.4	1.64
Total.....	5,118	100.0	33.26	4,180	100.0	30.52

TABLE XXIII.—NUMBER OF FATAL ACCIDENTS AND RATE PER 10,000 EMPLOYEES DUE TO SPECIFIED CAUSES, IN TEN-YEAR PERIODS, BY STATES AND PROVINCES—Con.

Cause.	Fatal accidents.					
	TOTAL, Eastern Section. ^(a)			Northeastern Section (Nova Scotia).		
	Number.	Per cent of total.	Per 10,000 employees.	Number.	Per cent of total.	Per 10,000 employees.
Fall of coal.....	1,105	10.6	3.29	52	21.2	5.27
Fall of roof, slate, etc.....	4,046	38.8	12.04	51	20.8	5.17
Fall of pick.....				1	.4	.10
Falling into shafts.....	212	2.0	.63	6	2.4	.61
Falling into slopes, manways, etc.....	107	1.0	.32	2	.8	.20
Falling down chute.....				5	2.1	.51
Cages.....				12	4.9	1.22
Mine cars.....	1,340	12.9	3.99	50	20.4	5.07
Outside cars.....	396	3.8	1.18	5	2.1	.51
Motors.....	19	.2	.06	1	.4	.10
Explosion of dust or gas.....	1,169	11.2	3.48	17	6.9	1.72
Explosion of after-damp.....				10	4.1	1.01
Explosion of powder or dynamite.....	273	2.6	.81			
Explosion of powder.....				3	1.2	.30
Explosion of dynamite.....				3	1.2	.30
Explosion of blast.....	447	4.3	1.33	5	2.1	.51
Explosion, not specified.....	18	.2	.05			
Mining machinery.....	252	2.4	.75	15	6.1	1.52
Mules.....	55	.5	.16			
Asphyxiation.....	198	1.9	.59			
Electrocution.....	122	1.2	.36			
Miscellaneous.....	670	6.4	1.99	7	2.9	.71
Total.....	10,429	100.0	30.98	245	100.0	24.83
	Kentucky, 1897 to 1906.			Illinois, 1899 to 1908.		
Fall of coal or roof.....	108	54.9	9.51	633	45.5	11.94
Fall of coal.....				11	.8	.21
Fall of slate or clod.....				46	3.3	.87
Falling into shaft.....	4	2.0	.35	53	3.8	1.00
Falling objects in shaft.....						
Falling from tippie.....	3	1.6	.26			
Falling of timber.....	1	.5	.09			
Falling of other objects.....				13	.9	.25
Cages.....	2	1.0	.18	47	3.4	.89
Mine cars.....	14	7.1	1.23	175	12.6	3.30
Outside cars.....	6	3.0	.53	23	1.6	.43
Motors.....	1	.5	.09	4	.3	.08
Explosion of gas or dust.....	10	5.1	.88	71	5.1	1.34
Explosion of powder.....	9	4.6	.79	64	4.6	1.21
Explosion of dynamite.....				1	.1	.02
Explosion of boiler.....	1	.5	.09	2	.1	.04
Explosion of blast.....	8	4.1	.70	111	8.0	2.09
Explosion, shot.....	5	2.5	.44	33	2.4	.62
Explosion, filling cartridge.....	2	1.0	.18			
Explosion, flying coal.....				57	4.1	1.08
Explosion, gasoline torch.....				1	.1	.02
Returning too soon to shot.....	4	2.0	.35			
Mining machinery.....	1	.5	.09	21	1.5	.40
Mules.....				2	.1	.04
Asphyxiation.....	4	2.0	.35	15	1.1	.28
Electrocution.....	1	.5	.09	5	.4	.09
Miscellaneous.....	13	6.6	1.15	3	.2	.06
Total.....	197	100.0	17.36	1,391	100.0	26.24

^a Maryland, Ohio, and Pennsylvania.

TABLE XXIII.—NUMBER OF FATAL ACCIDENTS AND RATE PER 10,000 EMPLOYEES DUE TO SPECIFIED CAUSES, IN TEN-YEAR PERIODS, BY STATES AND PROVINCES—Con.

Cause.	Fatal accidents.					
	Indiana, 1899 to 1903.			TOTAL, East Central Section. (a)		
	Number.	Per cent of total.	Per 10,000 em- ployees.	Number.	Per cent of total.	Per 10,000 em- ployees.
Fall of coal.....	8	2.3	0.53	641	36.9	9.42
Fall of slate.....	140	40.5	9.34	154	8.9	2.26
Falling into shaft.....	22	6.3	1.47	68	3.9	1.00
Cages.....	21	6.1	1.40	.....	.....	.....
Mine cars.....	38	11.0	2.53	213	12.3	3.13
Outside cars.....	7	2.0	.47	30	1.7	.44
Motors.....	2	.6	.13	6	.3	.09
Explosion of dust or gas.....	1	.3	.07	85	4.9	1.25
Explosion of powder or dynamite.....	22	6.3	1.47	192	11.1	2.82
Explosion of fire damp.....	5	1.4	.33	.....	.....	.....
Explosion of smoke.....	8	2.3	.53	.....	.....	.....
Explosion of kerosene.....	1	.3	.07	.....	.....	.....
Explosion, windy shot.....	9	2.6	.60	.....	.....	.....
Explosion, premature shot.....	13	3.7	.87	.....	.....	.....
Explosion, delayed shot.....	21	6.1	1.40	.....	.....	.....
Explosion, misplaced shot.....	8	2.3	.53	.....	.....	.....
Explosion, tamping shot.....	3	.9	.20	.....	.....	.....
Shot blown through.....	6	1.7	.40	.....	.....	.....
Explosion of blast.....	.....	.....	.....	156	9.0	2.29
Explosions, other, and not specified.....	.....	.....	.....	4	.2	.06
Mining machinery.....	.....	.....	.....	21	1.2	.31
Mules.....	3	.9	.20	5	.3	.07
Asphyxiation.....	3	.9	.20	18	1.0	.26
Electrocution.....	3	.9	.20	8	.5	.12
Miscellaneous.....	2	.6	.13	136	7.8	2.00
Total.....	346	100.0	23.08	1,737	100.0	25.54
	Oklahoma, 1897 to 1906.			Iowa, 1900 to 1908.		
Fall of coal.....	9	2.5	1.55	.....	.....	.....
Fall of rock.....	6	1.7	1.04	.....	.....	.....
Fall of roof.....	68	19.2	11.75	.....	.....	.....
Fall of coal, slate, or roof.....	.....	.....	.....	172	57.9	12.51
Falling into shaft.....	6	1.7	1.04	15	5.1	1.09
Falling objects in shaft.....	.....	.....	.....	3	1.0	.22
Falling from tippie.....	3	.8	.52	.....	.....	.....
Cages.....	9	2.5	1.55	12	4.0	.87
Mine cars.....	42	11.9	7.26	29	9.8	2.11
Outside cars.....	1	.3	.17	2	.7	.15
Explosion of gas.....	58	16.4	10.02	.....	.....	.....
Explosion of dynamite.....	19	5.4	3.28	2	.7	.15
Explosion of powder.....	12	3.4	2.07	1	.3	.07
Explosion, premature.....	.....	.....	.....	35	11.8	2.54
Explosion of boiler.....	1	.3	.17	1	.3	.07
Explosion of after-damp.....	.....	.....	.....	3	1.0	.22
Explosion, flying coal.....	.....	.....	.....	13	4.4	.95
Explosion, windy shot.....	21	5.9	3.63	1	.3	.07
Explosion, not specified.....	13	3.7	2.25	.....	.....	.....
Shot firing.....	51	14.4	8.81	.....	.....	.....
Returning too soon to shot.....	7	2.0	1.21	.....	.....	.....
Mining machinery.....	2	.6	.35	3	1.0	.22
Mules.....	3	.8	.52	.....	.....	.....
Asphyxiation.....	17	4.8	2.94	.....	.....	.....
Electrocution.....	6	1.7	1.04	.....	.....	.....
Miscellaneous.....	.....	.....	.....	5	1.7	.36
Total.....	354	100.0	61.16	297	100.0	21.60

* Illinois and Indiana.

TABLE XXIII.—NUMBER OF FATAL ACCIDENTS AND RATE PER 10,000 EMPLOYEES DUE TO SPECIFIED CAUSES, IN TEN-YEAR PERIODS, BY STATES AND PROVINCES—Con.

Cause.	Fatal accidents.					
	Kansas, 1886 to 1899 and 1901 to 1906.			Missouri, 1899 to 1903.		
	Number.	Per cent of total.	Per 10,000 employees.	Number.	Per cent of total.	Per 10,000 employees.
Fall of coal.....	4	1.9	0.43			
Fall of rock or slate.....	92	44.0	9.99			
Fall of coal, roof, or rock.....				86	70.5	9.85
Fall into shaft.....	6	2.9	.65	4	3.3	.46
Falling material in shaft.....				1	.8	.11
Falling of timber.....	1	.5	.11			
Cages.....	9	4.3	.98	1	.8	.11
Mine cars.....	8	3.8	.87	8	6.6	.92
Outside cars.....	3	1.4	.33			
Explosion of gas.....				3	2.5	.34
Explosion of powder.....				2	1.6	.23
Explosion of shot.....	28	13.4	3.04			
Explosion of black damp.....	1	.5	.11			
Explosion of after-damp.....	7	3.3	.76			
Explosion, tamping.....	1	.5	.11			
Explosion, windy shot.....	1	.5	.11			
Explosion, premature shot.....				4	3.3	.46
Explosion, shot blown through pillar.....	2	1.0	.22	6	4.9	.69
Explosion, flying coal.....	5	2.4	.54	2	1.6	.23
Explosion, not stated.....	26	12.4	2.82			
Returning too soon to shot.....				5	4.1	.57
Mining machinery.....	2	1.0	.22			
Asphyxiation.....	5	2.4	.54			
Miscellaneous.....	8	3.8	.87			
Total.....	209	100.0	22.70	122	100.0	13.97
	TOTAL, West Central Section.^(a)			Alabama, 1899, 1900, 1906, and 1907.		
Fall of coal.....	271	27.6	7.23			
Fall of coal or slate.....				120	36.7	18.25
Fall of roof, slate, etc.....	166	16.9	4.43			
Fall into shafts.....	31	3.2	.83			
Cages.....				2	.6	.30
Mine cars.....	77	7.9	2.05	31	9.5	4.71
Outside cars.....	6	.6	.16			
Explosion of dust or gases.....	72	7.3	1.92			
Explosion of dust.....				57	17.4	8.67
Explosion of gas.....				13	4.0	1.98
Explosion of dynamite or powder.....	109	11.1	2.91	27	8.3	4.11
Explosion of blast.....	109	11.1	2.91			
Explosions, other, and not specified.....	41	4.2	1.09			
Returning too soon to shot.....				2	.6	.30
Mining machinery.....	7	.7	.19	9	2.8	1.37
Mules.....	3	.3	.08			
Asphyxiation.....	22	2.2	.59	1	.3	.15
Electrocution.....	6	.6	.16	8	2.4	1.22
Miscellaneous.....	62	6.3	1.65	57	17.4	8.67
Total.....	982	100.0	26.20	327	100.0	49.73

^a Oklahoma, Iowa, Kansas, and Missouri.

TABLE XXIII.—NUMBER OF FATAL ACCIDENTS AND RATE PER 10,000 EMPLOYEES DUE TO SPECIFIED CAUSES, IN TEN-YEAR PERIODS, BY STATES AND PROVINCES—Con.

Cause.	Fatal accidents.					
	Tennessee, 1899 to 1908.			West Virginia, 1899 to 1908.		
	Number.	Per cent of total.	Per 10,000 employees.	Number.	Per cent of total.	Per 10,000 employees.
Fall of coal.....	61	12.7	6.31	183	8.2	4.32
Fall of roof or slate.....				795	35.7	18.75
Fall of roof or rock.....	15	3.1	1.55			
Fall of slate.....	91	18.9	9.41			
Fall into shaft.....	1	.2	.10	30	1.4	.71
Mine cars.....	31	6.5	3.21	262	11.8	6.18
Outside cars.....	2	.4	.21	20	.9	.47
Explosion of gas.....	2	.4	.21			
Explosion of dust.....	217	45.1	22.45			
Explosion of dust or gas.....				718	32.2	16.93
Explosion of boiler.....				2	.1	.05
Explosion of powder or dynamite.....	42	8.7	4.34	93	4.2	2.19
Explosion of blast.....	1	.2	.10	22	1.0	.52
Explosion, windy shot.....	1	.2	.10			
Returning too soon to shot.....	2	.4	.21			
Mining machinery.....	6	1.3	.62	16	.7	.38
Mules or horses.....	1	.2	.10	7	.3	.17
Asphyxiation.....				3	.1	.07
Electrocution.....	8	1.7	.83	26	1.2	.61
Miscellaneous.....				50	2.2	1.18
Total.....	481	100.0	49.75	2,227	100.0	52.52
	TOTAL, Southern Section.			Colorado, 1897 to 1900 and 1903 to 1908.		
	(a)					
Fall of coal.....	364	12.0	6.21	72	12.7	7.11
Fall of slate.....				183	32.3	18.07
Fall of roof.....				101	17.8	9.97
Fall of roof, slate, etc.....	901	29.7	15.36			
Fall into shafts.....	31	1.0	.53	8	1.4	.79
Fall into slopes.....				2	.3	.20
Fall down manways, etc.....				2	.3	.20
Fall of timber.....				1	.2	.10
Cages.....	2	.1	.03	8	1.4	.79
Mine cars.....	324	10.7	5.52	71	12.5	7.01
Outside cars.....	22	.7	.38	1	.2	.10
Explosion of gas.....				30	5.3	2.96
Explosion of dust.....				14	2.5	1.38
Explosion of gas or dust.....	1,007	33.2	17.17			
Explosion of powder.....				3	.5	.30
Explosion of dynamite or powder.....	162	5.3	2.76			
Explosion of fire-damp.....				23	4.1	2.27
Explosion of lamp.....				1	.2	.10
Explosion of blast.....	23	.8	.39			
Explosion, delayed shot.....				6	1.1	.59
Explosion, premature shot.....				14	2.5	1.38
Explosions, other, not specified.....	7	.2	.12			
Mining machinery.....	31	1.0	.53	4	.7	.39
Mules.....	8	.3	.14	2	.3	.20
Asphyxiation.....	4	1.1	.07	10	1.8	.99
Electrocution.....	42	1.4	.72	8	1.4	.79
Miscellaneous.....	107	3.5	1.82	3	.5	.30
Total.....	3,035	100.0	51.75	567	100.0	55.99

a Alabama, Tennessee, and West Virginia.

TABLE XXIII.—NUMBER OF FATAL ACCIDENTS AND RATE PER 10,000 EMPLOYEES DUE TO SPECIFIED CAUSES, IN TEN-YEAR PERIODS, BY STATES AND PROVINCES—Con.

Cause.	Fatal accidents.					
	New Mexico, 1899 to 1908.			Utah, 1899 to 1908.		
	Number.	Per cent of total.	Per 10,000 employees.	Number.	Per cent of total.	Per 10,000 employees.
Fall of coal.....	21	12.6	9.14	21	7.7	10.29
Fall of rock.....	62	37.1	26.99	23	8.5	11.27
Fall of slate.....	10	6.0	4.35			
Fall into shafts.....				1	.4	.49
Cages.....	1	.6	.44	1	.4	.49
Mine cars.....	23	13.7	10.01	17	6.2	8.33
Outside cars.....				2	.7	.98
Motors.....	2	1.2	.87			
Explosion of gas.....	5	3.0	2.18	1	.4	.49
Explosion of dust.....	15	9.0	6.53	2	.7	.98
Explosion of boiler.....	1	.6	.44			
Explosion of powder.....	2	1.2	.87	200	73.5	97.98
Explosion, blast.....	7	4.2	3.05			
Explosion, premature.....				1	.4	.49
Explosions, other, not specified.....	1	.6	.44			
Flying coal from shot.....	1	.6	.44			
Returning too soon to shot.....	4	2.4	1.74			
Mining machinery.....	1	.6	.44			
Elevator.....				2	.7	.98
Caught fire.....				1	.4	.49
Asphyxiation.....	9	5.4	3.92			
Electrocution.....	1	.6	.44			
Miscellaneous.....	1	.6	.44			
Total.....	167	100.0	72.69	272	100.0	133.25
	TOTAL, Western Section. (a)			Washington, 1899 to 1908.		
Fall of coal.....	114	11.3	7.88	30	10.3	6.28
Fall of roof or rock.....				79	27.2	16.53
Fall of roof, slate, etc.....	379	37.7	26.20			
Fall into shafts.....	9	.9	.62	5	1.7	1.05
Fall into slopes, manways, etc.....	4	.4	.28	4	1.4	.84
Fall of timber.....				6	2.1	1.26
Fall from trestle.....				3	1.0	.63
Cages.....				1	.3	.21
Mine cars.....	111	11.0	7.67	40	13.7	8.37
Outside cars.....	3	.3	.21	2	.7	.42
Motors.....	2	.2	.14	1	.3	.21
Explosion of gas.....				49	16.8	10.25
Explosion of dust and gases.....	90	8.9	6.22			
Explosion of dynamite or powder.....	206	20.5	14.24	6	2.1	1.26
Explosion, blast.....	33	3.3	2.28			
Explosion, after-damp.....				22	7.6	4.60
Explosion, white-damp.....				4	1.4	.84
Explosion, shot.....				12	4.1	2.51
Explosions, other, not specified.....	3	.3	.21			
Mining machinery.....	5	.5	.35	4	1.4	.84
Mules.....	2	.2	.14			
Asphyxiation.....	19	1.9	1.31	6	2.1	1.26
Electrocution.....	9	.9	.62	5	1.7	1.05
Mine fire.....				3	1.0	.63
Miscellaneous.....	17	1.7	1.18	9	3.1	1.88
Total.....	1,006	100.0	69.54	291	100.0	60.87

^a Colorado, New Mexico, and Utah.

TABLE XXIII.—NUMBER OF FATAL ACCIDENTS AND RATE PER 10,000 EMPLOYEES DUE TO SPECIFIED CAUSES, IN TEN-YEAR PERIODS, BY STATES AND PROVINCES—Concluded.

Cause.	Fatal accidents.					
	British Columbia, 1899 to 1908.			TOTAL, Pacific Coast Section (a).		
	Number.	Per cent of total.	Per 10,000 employees.	Number.	Per cent of total.	Per 10,000 employees.
Fall of coal.....	37	8.7	8.06	67	9.4	7.15
Fall of rock.....	52	12.2	11.33			
Fall of roof, slate, etc.....				131	18.3	13.98
Falling into shafts.....				5	.7	.53
Falling into slopes, manways, etc.....				7	1.0	.75
Fall of timber.....	5	1.2	1.09			
Cages.....	2	.5	.44			
Mine cars.....	35	8.2	7.63	75	10.5	8.01
Outside cars.....				2	.3	.21
Motors.....				1	.1	.11
Explosion of gas.....	36	8.5	7.85			
Explosion of dust or gases.....				111	15.5	11.85
Explosion of dynamite or powder.....	5	1.2	1.09	11	1.5	1.17
Explosion, blast.....				12	1.7	1.28
Explosions, other, and not specified.....	203	47.9	44.25	203	28.4	21.67
Explosion, cause unknown.....				4	.6	.43
Asphyxiation.....				6	.8	.64
Electrocution.....				5	.7	.53
Mine fire.....	19	4.5	4.14			
Miscellaneous.....	30	7.1	6.54	75	10.5	8.01
Total.....	424	100.0	92.42	715	100.0	76.32
				GRAND TOTAL.		
Fall of coal.....				2,722	14.8	4.99
Fall of roof, slate, etc.....				5,828	31.8	10.68
Falling into shafts.....				369	2.0	.68
Falling into slopes, manways, etc.....				125	.7	.23
Mine cars.....				2,204	12.0	4.04
Outside cars.....				470	2.6	.86
Motors.....				30	.2	.05
Explosion of dust or gases.....				2,571	14.0	4.71
Explosion of dynamite or powder.....				968	5.3	1.77
Explosion of blast.....				793	4.3	1.45
Explosions, other, and not specified.....				232	1.6	.53
Mining machinery.....				332	1.8	.61
Mules.....				73	.4	.13
Asphyxiation.....				271	1.5	.50
Electrocution.....				193	1.0	.35
Miscellaneous.....				1,105	6.0	2.02
Total.....				18,346	100.0	33.09

a Washington and British Columbia.

TABLE XXIV.—NUMBER OF FATAL ACCIDENTS AND RATE PER 1,000 EMPLOYEES IN COAL MINES IN SPECIFIED STATES AND GEOGRAPHICAL GROUPS, BY YEARS, 1889 TO 1903.

Year.	Maryland.			Ohio.			Pennsylvania (anthracite).		
	Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.	
		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.
1889.....				23,295	33	1.42	119,964	397	3.31
1890.....	3,842	8	2.08	22,192	42	1.89	119,919	378	3.15
1891.....	3,891	6	1.54	23,997	44	1.83	122,308	428	3.47
1892.....	3,959	6	1.52	26,972	42	1.56	130,300	418	3.21
1893.....	4,071	5	1.23	28,810	34	1.18	138,069	456	3.30
1894.....	4,147	7	1.69	31,493	45	1.43	139,939	446	3.19
1895.....	3,921	9	2.30	28,998	52	1.79	143,705	421	2.93
1896.....	3,800	6	1.58	28,446	41	1.44	150,088	502	3.34
1897.....	4,276	5	1.17	28,785	40	1.39	149,557	423	2.83
1898.....	4,571	4	.88	28,365	52	1.83	142,420	411	2.89
1899.....	4,627	5	1.08	28,028	59	2.11	140,604	461	3.28
1900.....	5,304	7	1.32	31,702	68	2.14	143,824	411	2.86
1901.....	5,373	12	2.23	33,505	72	2.15	147,651	513	3.47
1902.....	5,827	11	1.89	37,421	81	2.16	148,139	300	2.03
1903.....	5,673	16	2.82	41,396	124	2.75	151,827	518	3.41
1904.....	5,680	12	2.11	45,834	118	2.57	161,330	595	3.69
1905.....	6,230	16	2.57	44,193	114	2.58	168,254	644	3.83
1906.....	6,201	13	2.10	46,501	126	2.73	166,175	557	3.35
1907.....	5,880	5	.85	47,876	153	3.20	168,774	708	4.19
1908.....	5,996	12	2.00	50,267	112	2.23	174,503	678	3.89
Total.....	93,209	165	1.77	678,076	1,452	2.14	2,928,350	9,665	3.30
	Pennsylvania (bituminous).			TOTAL, Eastern Section. (a)			Northeastern Section (Nova Scotia).		
1889.....	62,084	105	1.69	205,343	535	2.61	5,167	8	1.55
1890.....	67,383	146	2.17	213,336	574	2.69	5,324	134	25.17
1891.....	74,135	237	3.20	225,331	715	3.17	5,746	3	.52
1892.....	78,805	134	1.70	240,036	600	2.50	5,806	11	1.89
1893.....	81,872	131	1.60	252,822	626	2.48	5,890	2	.34
1894.....	86,118	123	1.43	261,697	621	2.37	5,396	13	2.41
1895.....	84,976	156	1.84	261,600	638	2.44	5,793	9	1.55
1896.....	83,801	180	2.15	266,135	729	2.74	6,012	8	1.33
1897.....	86,553	150	1.73	269,171	618	2.30	5,175	7	1.35
1898.....	87,893	200	2.28	263,159	667	2.53	4,487	7	1.56
1899.....	91,505	258	2.82	264,764	783	2.96	5,612	19	3.39
1900.....	108,735	265	2.44	289,565	751	2.59	6,626	21	3.17
1901.....	117,501	301	2.56	304,030	898	2.95	7,663	14	1.83
1902.....	135,611	456	3.36	326,998	848	2.59	8,062	19	2.36
1903.....	151,745	402	2.65	350,641	1,060	3.02	11,092	31	2.79
1904.....	155,747	536	3.44	368,591	1,261	3.42	11,659	19	1.63
1905.....	164,941	479	2.90	383,618	1,253	3.27	10,780	20	1.66
1906.....	172,928	477	2.76	391,805	1,173	2.99	12,123	28	2.31
1907.....	183,121	806	4.40	405,651	1,672	4.12	12,107	35	2.89
1908.....	181,840	572	3.15	412,606	1,374	3.33	12,933	39	3.02
Total.....	2,257,204	6,114	2.71	5,956,899	17,396	2.92	153,453	447	2.91

a Maryland, Ohio, and Pennsylvania.

TABLE XXIV.—NUMBER OF FATAL ACCIDENTS AND RATE PER 1,000 EMPLOYEES IN COAL MINES IN SPECIFIED STATES AND GEOGRAPHICAL GROUPS, BY YEARS, 1889 TO 1908—Continued.

Year.	Western Kentucky.			Illinois.			Indiana.		
	Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.	
		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.
1889.....	6,153	13	2.11	30,076	42	1.40	.....	.....	.....
1890.....	7,314	11	1.50	28,574	53	1.85	6,550	5	0.76
1891.....	5,942	16	2.69	32,951	60	1.82	6,975	5	0.72
1892.....	3,534	3	.85	33,632	57	1.69	7,600	19	2.50
1893.....	3,882	1	.26	35,390	69	1.95	7,431	22	2.96
1894.....	3,762	5	1.33	38,477	72	1.87	.....	.....	.....
1895.....	3,536	3	.85	38,630	75	1.94	7,885	23	2.92
1896.....	3,509	1	.28	37,057	77	2.08	7,112	28	3.94
1897.....	3,929	3	.76	33,788	69	2.04	7,984	16	2.00
1898.....	3,653	2	.55	35,026	75	2.14	8,355	22	2.63
1899.....	4,260	3	.70	36,991	84	2.27	7,366	15	2.04
1900.....	4,282	6	1.40	39,384	94	2.39	8,858	18	2.03
1901.....	4,775	9	1.88	44,143	99	2.24	12,096	24	1.96
1902.....	5,477	5	.91	46,005	99	2.15	13,139	24	1.83
1903.....	6,162	9	1.46	49,814	156	3.13	15,128	55	3.64
1904.....	6,338	8	1.26	54,774	157	2.87	17,838	34	1.91
1905.....	7,296	9	1.23	59,230	199	3.36	17,856	47	2.63
1906.....	16,718	40	2.39	62,283	155	2.49	19,562	31	1.58
1907.....	17,592	32	1.82	66,714	165	2.47	19,009	53	2.79
1908.....	18,611	40	2.15	70,841	183	2.58	19,092	45	2.36
Total.....	136,725	219	1.60	873,780	2,040	2.33	209,836	486	2.32
	TOTAL, East Central Section. (b)			Oklahoma.			Iowa.		
1889.....	36,229	55	1.52	.....	.....	.....	10,970	35	3.19
1890.....	42,438	69	1.63	.....	.....	.....	9,903	13	1.31
1891.....	45,868	81	1.77	.....	.....	.....	9,130	19	2.08
1892.....	44,766	79	1.76	.....	.....	.....	9,307	24	2.58
1893.....	46,703	92	1.97	.....	.....	.....	10,486	29	2.77
1894.....	42,239	77	1.82	3,290	12	3.65	10,258	19	1.85
1895.....	50,061	101	2.02	3,648	6	1.64	10,992	20	1.82
1896.....	47,678	106	2.22	3,686	12	3.26	11,451	22	1.14
1897.....	45,701	88	1.93	3,470	22	6.34	11,678	21	1.80
1898.....	47,034	99	2.10	3,529	17	4.82	10,550	26	2.46
1899.....	48,617	102	2.10	4,005	25	6.24	11,029	20	1.81
1900.....	52,524	118	2.25	5,272	40	7.59	13,041	29	2.22
1901.....	61,014	132	2.16	5,272	44	8.35	13,175	27	2.04
1902.....	64,621	128	1.98	6,234	60	9.62	13,002	55	4.23
1903.....	71,104	220	3.09	6,091	33	5.42	13,192	21	1.59
1904.....	78,950	199	2.52	8,260	30	3.63	16,315	31	1.90
1905.....	84,382	255	3.02	7,637	44	5.76	17,624	24	1.36
1906.....	98,653	226	2.29	8,110	39	4.81	16,825	37	2.20
1907.....	103,315	250	2.42	7,710	32	4.15	17,045	35	2.05
1908.....	108,544	268	2.47	14,560	44	3.02	17,312	38	2.20
Total.....	1,220,341	2,745	2.25	90,774	460	5.07	253,285	545	2.15

^a Including figures for eastern Kentucky

^b Western Kentucky, Illinois, and Indiana.

TABLE XXIV.—NUMBER OF FATAL ACCIDENTS AND RATE PER 1,000 EMPLOYEES IN COAL MINES IN SPECIFIED STATES AND GEOGRAPHICAL GROUPS, BY YEARS, 1889 TO 1908—Continued.

Year.	Kansas.			Missouri.			TOTAL, West Central Section. (a)		
	Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.	
		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.
1889.....	5,956	12	2.01	.....	.....	.....	16,926	47	2.78
1890.....	4,523	8	1.77	5,971	11	1.84	20,397	32	1.57
1891.....	6,201	13	2.10	6,879	18	2.62	22,210	50	2.25
1892.....	.....	.....	.....	8,059	21	2.61	17,366	45	2.59
1893.....	9,891	15	1.52	7,767	21	2.70	28,144	65	2.31
1894.....	10,088	26	2.58	7,644	19	2.49	31,280	76	2.43
1895.....	9,021	10	1.11	7,245	13	1.79	30,906	49	1.59
1896.....	8,807	12	1.36	6,588	19	2.88	30,532	65	2.13
1897.....	8,699	6	.69	6,557	8	1.22	30,404	57	1.87
1898.....	8,122	17	2.09	7,391	9	1.22	29,592	69	2.33
1899.....	10,198	16	1.57	7,792	14	1.80	33,024	75	2.27
1900.....	10,673	20	1.87	7,650	10	1.31	36,636	99	2.70
1901.....	9,506	10	1.05	9,226	15	1.63	37,179	96	2.58
1902.....	9,315	30	3.22	9,162	10	1.09	37,713	155	4.11
1903.....	9,972	36	3.61	9,177	17	1.85	38,432	107	2.78
1904.....	5,173	16	3.09	10,134	11	1.09	39,882	88	2.21
1905.....	12,109	36	2.97	10,415	11	1.06	47,785	115	2.41
1906.....	10,175	30	2.95	9,679	16	1.65	44,789	122	2.72
1907.....	11,957	52	4.35	4,717	8	1.70	41,429	127	3.07
1908.....	11,354	31	2.74	9,391	10	1.06	52,597	123	2.34
Total.....	171,720	396	2.31	151,444	261	1.72	667,223	1,662	2.49
	North Central Section (Michigan).			Alabama.			Eastern Kentucky.		
1889.....							(b)	(b)	.....
1890.....							(b)	(b)	.....
1891.....							(b)	(b)	.....
1892.....									.....
1893.....				8,993	17	1.89	3,091	5	1.62
1894.....				8,930	19	2.13	4,657	11	2.36
1895.....				8,246	38	4.61	4,317	5	1.16
1896.....				9,884	28	2.88	4,329	5	1.16
1897.....				11,101	38	3.42	4,041	5	1.24
1898.....				9,900	45	4.55	3,820	9	2.36
1899.....	819	4	4.88	12,881	40	3.11	3,600	4	1.11
1900.....	1,638	10	6.11	14,282	37	2.59	4,185	4	.96
1901.....	1,838	6	3.26	14,143	41	2.90	4,783	11	2.30
1902.....	1,415	6	4.24	17,909	50	2.79	5,008	12	2.40
1903.....	3,149	8	2.54	19,356	57	2.94	6,559	14	2.13
1904.....	2,714	7	2.58	17,626	84	4.77	7,352	16	2.18
1905.....	3,696	8	2.16	17,205	185	10.75	7,508	11	1.45
1906.....	2,119	6	2.83	18,348	96	5.23	7,742	22	2.84
1907.....	2,881	7	2.43	20,241	154	7.61	(b)	(b)	.....
1908.....	3,087	6	1.94	18,783	108	5.75	(b)	(b)	.....
Total.....	23,356	68	2.91	227,828	1,037	4.55	71,052	134	1.89

^a Oklahoma, Iowa, Kansas, and Missouri.

^b Included with figures for western Kentucky.

TABLE XXIV.—NUMBER OF FATAL ACCIDENTS AND RATE PER 1,000 EMPLOYEES IN COAL MINES IN SPECIFIED STATES AND GEOGRAPHICAL GROUPS, BY YEARS, 1899 TO 1908—Continued.

Year.	Tennessee.			West Virginia.			TOTAL, Southern Section. (a)		
	Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.	
		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.
1889.				9,006	13	1.44	9,006	13	1.44
1890.				11,497	27	2.35	11,497	27	2.35
1891.	5,097	22	4.32	11,397	36	3.16	16,494	58	3.52
1892.	4,926	14	2.84	13,023	31	2.38	21,040	50	2.38
1893.	4,976	11	2.21	17,129	72	4.20	35,755	111	3.10
1894.	5,542	12	2.16	19,771	59	2.98	38,560	95	2.46
1895.	5,120	37	7.23	20,889	83	3.97	38,584	163	4.22
1896.	6,531	22	3.37	24,227	65	2.68	44,683	120	2.69
1897.	6,337	10	1.58	21,422	62	2.89	42,680	119	2.79
1898.	7,820	18	2.30	23,262	90	3.87	44,582	157	3.52
1899.	7,694	20	2.60	25,108	89	3.54	49,868	153	3.07
1900.	8,691	10	1.15	28,055	141	5.03	55,811	199	3.57
1901.	8,418	44	5.23	32,386	134	4.14	59,955	231	3.85
1902.	8,759	226	25.80	35,147	120	3.41	68,374	410	6.00
1903.	9,673	26	2.69	39,452	159	4.03	75,333	258	3.40
1904.	9,972	28	2.81	45,492	140	3.08	80,658	263	3.26
1905.	10,517	29	2.76	49,950	194	3.88	85,414	430	5.03
1906.	10,736	33	3.07	51,769	269	5.20	80,853	398	4.92
1907.	11,098	31	2.79	56,265	356	6.32	87,604	541	6.18
1908.	11,122	34	3.06	60,397	625	10.35	90,302	767	8.49
Total.....	143,029	627	4.38	595,644	2,765	4.64	1,037,553	4,593	4.40
	Colorado.			New Mexico.			Utah.		
1889.	5,690	23	4.04						
1890.	7,052	16	2.27						
1891.	6,822	30	4.40						
1892.	7,578	34	4.49						
1893.	7,286	46	6.31				576	2	3.47
1894.	6,212	19	3.06				671	1	1.49
1895.	7,354	23	3.13	1,659	24	14.47	670	1	1.49
1896.	6,716	68	10.13	1,438	7	4.87	690	3	4.35
1897.	7,018	35	4.99	1,365	7	5.13	720	3	4.17
1898.	7,425	24	3.23	1,888	7	3.71	685	3	4.38
1899.	7,321	42	5.74	1,890	15	7.98	1,118		
1900.	7,271	29	3.99	2,015	15	7.44	1,504	209	138.96
1901.	8,000	55	6.88	1,870	9	4.81	1,780	9	5.06
1902.	9,000	73	8.11	1,682	17	10.11	2,468	8	3.24
1903.	10,296	40	3.89	2,341	17	7.26	2,182	7	3.21
1904.	10,769	89	8.26	1,972	15	7.61	2,215	9	4.06
1905.	11,891	60	5.05	2,132	5	2.35	1,963	7	3.57
1906.	12,030	88	7.32	2,354	9	3.82	1,895	7	3.69
1907.	12,900	99	7.67	3,059	31	10.13	2,607	8	3.07
1908.	14,354	61	4.25	3,670	34	9.26	2,680	8	2.99
Total.....	172,985	954	5.51	29,325	212	7.23	24,424	285	11.67

a Alabama, eastern Kentucky, Tennessee, and West Virginia.

FATAL ACCIDENTS IN COAL MINING.

659

TABLE XXIV.—NUMBER OF FATAL ACCIDENTS AND RATE PER 1,000 EMPLOYEES IN COAL MINES IN SPECIFIED STATES AND GEOGRAPHICAL GROUPS, BY YEARS, 1889 TO 1908—Concluded.

Year.	TOTAL, Western Section. (a)			Washington.			British Columbia.		
	Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.		Em- ployees.	Fatal accidents.	
		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.		Num- ber.	Per 1,000 em- ployees.
1889.....	5,690	23	4.04						
1890.....	7,052	16	2.27						
1891.....	6,822	30	4.40				3,094	15	4.85
1892.....	7,578	34	4.49	2,960	55	18.58	2,854	6	2.10
1893.....	7,862	48	6.11	2,828	9	3.18	2,844	16	5.63
1894.....	6,883	20	2.91	3,380	50	14.79	2,929	4	1.37
1895.....	9,683	48	4.96	2,828	35	12.38	2,924	10	3.41
1896.....	8,344	78	8.82	2,683	8	2.98	2,753	9	3.27
1897.....	9,103	45	4.94	2,826	7	2.48	2,433	6	2.47
1898.....	9,998	34	3.40	3,337	9	2.70	2,888	7	2.34
1899.....	10,319	57	5.52	3,308	45	13.00	3,780	11	2.91
1900.....	10,790	253	23.45	4,238	33	7.79	4,031	17	4.22
1901.....	11,650	73	6.27	4,826	27	5.59	3,974	102	25.67
1902.....	13,150	98	7.45	4,342	34	7.83	4,011	139	34.65
1903.....	14,819	64	4.32	4,876	25	5.13	4,264	42	9.85
1904.....	14,950	113	7.56	4,633	31	6.69	4,453	37	8.31
1905.....	15,986	72	4.50	4,976	13	2.61	4,407	12	2.72
1906.....	16,279	104	6.39	5,150	21	4.08	4,805	15	3.12
1907.....	18,566	138	7.43	6,113	37	6.05	6,059	31	5.12
1908.....	20,704	103	4.97	5,341	25	4.68	6,095	18	2.95
Total.....	226,734	1,451	6.40	68,645	464	6.76	68,698	497	7.23

	TOTAL, Pacific Coast Section. (b)			GRAND TOTAL.		
	Em- ployees.	Num- ber.	Per 1,000 em- ployees.	Em- ployees.	Num- ber.	Per 1,000 em- ployees.
1889.....				278,361	681	2.45
1890.....				300,044	852	2.84
1891.....	3,094	15	4.85	325,565	952	2.92
1892.....	5,814	61	10.49	342,406	880	2.57
1893.....	5,672	25	4.41	382,848	969	2.53
1894.....	6,309	54	8.56	392,364	956	2.44
1895.....	5,752	45	7.82	402,369	1,053	2.62
1896.....	5,436	17	3.13	409,320	1,123	2.74
1897.....	5,259	13	2.47	407,493	947	2.32
1898.....	6,325	16	2.53	405,177	1,040	2.59
1899.....	7,088	56	7.90	420,111	1,249	2.97
1900.....	8,269	50	6.05	461,859	1,501	3.25
1901.....	8,800	129	14.66	492,129	1,579	3.21
1902.....	8,353	173	20.71	528,686	1,837	3.47
1903.....	9,140	67	7.33	574,210	1,815	3.16
1904.....	9,086	68	7.48	606,496	2,018	3.33
1905.....	9,383	25	2.66	641,044	2,178	3.40
1906.....	9,955	36	3.62	656,486	2,093	3.19
1907.....	12,172	68	5.59	683,725	2,838	4.15
1908.....	11,436	43	3.76	712,209	2,723	3.82
Total.....	137,343	961	7.00	9,422,902	29,293	3.11

a Colorado, New Mexico, and Utah.

b Washington and British Columbia.

TABLE XXV.—NUMBER OF FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908.

[From reports of state mine inspectors.]

Year.	Fatal accidents.													
	Ala-bama.	Ar-kan-sas.	Colo-rado.	Illi-nois.	Indi-ana.	Iowa.	Kan-sas.	Ken-tucky.	Mary-land.	Mich-igan.	Mis-souri.	Mon-tana.	New Mex-ico.	North Da-kota.
1866.....														
1867.....														
1868.....														
1869.....														
Total...														
1870.....														
1871.....														
1872.....														
1873.....														
1874.....														
1875.....														
1876.....														
1877.....														
1878.....														
1879.....														
Total...														
1880.....														
1881.....					10									
1882.....					(a)									
1883.....				134	11									
1884.....			64	46	9		3							
1885.....			9	39	7		9							
1886.....			6	52	7									
1887.....			12	41	17		7	8						
1888.....			29	55	(a)	28		14						
1889.....			23	42	(a)	35	12	13						
Total...			143	409	61	63	31	35						
1890.....			16	53	5	13	8	11	8		11	1		
1891.....			30	60	5	19	13	16	6		18	7		
1892.....			34	57	19	24		8	6		21	3		
1893.....	17		46	69	22	29	15	12	5		21	1		
1894.....	19		19	72	(a)	19	26	10	7		19	6		
1895.....	38		23	75	23	20	10	8	9		13	8	24	
1896.....	28		68	77	28	22	12	6	6		19	(a)	7	
1897.....	38		35	69	16	21	6	12	5		8	9	7	
1898.....	45		24	75	22	26	17	6	4		9	7	7	
1899.....	40		42	84	15	20	16	7	5	4	14	1	15	
Total...	225		337	691	155	213	123	96	61	4	153	43	60	
1900.....	37		29	94	18	29	20	17	7	10	10	6	15	
1901.....	41	18	55	99	24	27	10	21	12	6	15	7	9	
1902.....	50	13	73	99	24	55	30	19	11	6	10	12	17	
1903.....	57		40	156	55	21	36	25	16	8	17	5	17	
1904.....	84		89	157	34	31	16	19	12	7	11	9	15	
1905.....	185	8	60	199	47	24	36	31	16	8	11	8	5	
1906.....	96	13	88	155	31	37	30	40	13	6	16	13	9	
1907.....	154	10	99	165	53	35	52	32	5	7	8	14	31	
1908.....	108	14	61	183	45	38	31	40	12	6	10	21	34	4
Total...	812	76	594	1,307	331	297	261	244	104	64	108	95	152	4
Grand total.	1,037	76	1,074	2,407	547	573	415	375	165	68	261	138	212	4

ⓐ Not reported.

FATAL ACCIDENTS IN COAL MINING.

661

TABLE XXV.—NUMBER OF FATAL ACCIDENTS IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908—Concluded.

[From reports of state mine inspectors.]

Year.	Fatal accidents.												Grand total.	
	Ohio.	Okla-homa	Pennsyl-vania.		Tenn-see.	Utah.	Wash-ington.	West Vir-ginia.	Wyo-ming.	Total United States.	Brit-ish Col-umbia and Nova Scotia.	Total, Brit-ish Col-umbia and Nova Scotia.		
			An-thra-cite.	Bitu-minous.										
1866.....												5	5	5
1867.....												11	11	11
1868.....												7	7	7
1869.....												4	4	4
Total...												27	27	27
1870.....			211							211		4	4	215
1871.....			210							210		5	5	215
1872.....			223							223		13	13	236
1873.....			264							264		73	73	337
1874.....			231							251		7	7	258
1875.....	20		238							261		2	2	263
1876.....	23		228							241		3	3	244
1877.....	13		194	13						237		5	5	242
1878.....	30		187	48						255		8	8	263
1879.....	20	(*)	262	55						317		3	3	320
Total...	106		2,248	116						2,470		123	123	2,593
1880.....	22		202	48						272		53	53	325
1881.....	29		273	57						369		2	2	371
1882.....	25		291	94						410		2	2	412
1883.....	26		323	54				20		568		17	17	585
1884.....	26		332	105				(*)		585		9	9	594
1885.....	51		332	83				23		553		23	23	576
1886.....	43		279	74				48		509		5	5	514
1887.....	36		316	84						504		10	10	514
1888.....	29		364	90				31		657		2	2	659
1889.....	33		397	105				13		673		8	8	681
Total...	320		3,109	794				135		5,100		131	131	5,231
1890.....	42		378	146				27		719		134	134	853
1891.....	44		428	237	22			36		941	15	3	18	959
1892.....	42		418	134	14			55		866	6	11	17	883
1893.....	34		456	131	11	2		9		952	16	2	18	970
1894.....	45	12	446	123	12	1	50	59		945	4	13	17	962
1895.....	52	6	421	156	37	1	35	83		1,042	10	9	19	1,061
1896.....	41	12	502	180	22	3	8	65		1,106	9	8	17	1,123
1897.....	40	22	423	150	10	3	7	62		943	6	7	13	956
1898.....	52	17	411	200	18	3	9	90		1,042	7	7	14	1,056
1899.....	59	25	461	258	20		45	89		1,220	11	19	30	1,250
Total...	451	94	4,344	1,715	166	13	218	614		9,776	84	213	297	10,073
1900.....	68	40	411	265	10	209	33	141		1,469	17	21	38	1,507
1901.....	72	44	513	301	44	* 9	27	134	41	1,529	102	14	116	1,645
1902.....	81	60	300	456	226	8	34	120	190	1,894	139	19	158	2,052
1903.....	124	33	518	402	26	7	25	159		1,747	42	31	73	1,820
1904.....	118	30	595	536	28	9	31	140		1,971	37	19	56	2,027
1905.....	114	44	644	479	29	7	13	194	12	2,174	12	20	32	2,206
1906.....	126	39	557	477	33	7	21	269	15	2,091	15	28	43	2,134
1907.....	153	32	708	806	31	8	37	356		2,796	31	35	66	2,862
1908.....	112	44	678	572	34	8	25	625	81	2,786	18	39	57	2,843
Total...	963	366	4,924	4,294	461	272	246	2,138	339	18,457	413	226	639	19,096
Grand total..	1,845	460	14,625	6,919	627	285	464	2,887	339	35,803	497	720	1,217	37,020

* Not reported.

TABLE XXVI.—NUMBER OF EMPLOYEES IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908.

[From reports of state mine inspectors. Figures are given only for those years for which the number of fatalities was available.]

Year.	Employees in coal mines.									
	Ala- bama.	Arkan- sas.	Colo- rado.	Illinois.	Indi- ana.	Iowa.	Kan- sas.	Ken- tucky.	Mary- land.	Michi- gan.
1866.....										
1867.....										
1868.....										
1869.....										
Total.....										
1870.....										
1871.....										
1872.....										
1873.....										
1874.....										
1875.....										
1876.....										
1877.....										
1878.....										
1879.....										
Total.....										
1880.....										
1881.....					4,567					
1882.....										
1883.....				23,939	5,403					
1884.....			2,122	25,575	5,716		4,000			
1885.....			2,154	25,446	6,502		4,175			
1886.....			2,085	25,846	6,406					
1887.....			3,138	26,804		5,000	4,903			
1888.....			5,570	29,410	6,685	11,115	6,186			
1889.....			5,690	30,076		10,970	5,956	6,153		
Total.....			20,759	187,096	35,279	22,085	19,131	17,242		
1890.....			7,052	28,574	6,550	9,903	4,523	7,314	3,842	
1891.....			6,822	32,951	6,975	9,130	6,201	5,942	3,891	
1892.....			7,578	33,632	7,600	9,307		6,625	3,959	
1893.....	8,993		7,286	35,390	7,431	10,486	9,891	8,539	4,071	
1894.....	8,930		6,212	33,477		10,258	10,088	8,079	4,147	
1895.....	8,246		7,354	33,630	7,885	10,992	9,021	7,865	3,921	
1896.....	9,884		6,716	37,057	7,112	11,451	8,807	7,550	3,800	
1897.....	11,101		7,018	33,788	7,984	11,678	8,699	7,749	4,276	
1898.....	9,900		7,425	35,026	8,355	10,550	8,122	7,253	4,571	
1899.....	12,881		7,321	36,991	7,366	11,029	10,198	8,445	4,627	819
Total.....	69,935		70,784	350,516	67,258	104,784	75,550	75,361	41,105	819
1900.....	14,282		7,271	39,384	8,858	13,041	10,673	9,065	5,304	1,638
1901.....	14,143	3,144	8,000	44,143	12,096	13,175	9,506	9,783	5,373	1,838
1902.....	17,909	3,595	9,000	46,005	13,139	13,002	9,315	12,036	5,827	1,415
1903.....	19,356		10,296	49,814	15,128	13,192	9,972	13,514	5,673	3,149
1904.....	17,626		10,769	54,774	17,838	16,315	5,173	13,906	5,680	2,714
1905.....	17,205	4,192	11,891	59,230	17,856	17,624	12,109	15,038	6,230	3,696
1906.....	18,348	4,298	12,030	62,283	19,562	16,825	10,175	16,718	6,201	2,119
1907.....	20,241	5,085	12,900	66,714	19,009	17,045	11,957	17,892	5,880	2,881
1908.....	18,783	5,337	14,354	70,841	19,092	17,312	11,334	18,611	5,996	3,087
Total.....	157,893	25,651	96,511	493,188	142,578	137,531	90,214	126,263	52,164	22,537
Grand total.....	227,828	25,651	188,054	1,030,800	245,115	264,400	184,895	218,866	93,269	23,356

TABLE XXVI.—NUMBER OF EMPLOYEES IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908—Continued.

[From reports of state mine inspectors. Figures are given only for those years for which the number of fatalities was available.]

Year.	Employees in coal mines.								
	Mis-souri.	Mon-tana.	New Mex-ico.	North Da-kota.	Ohio.	Okla-homa.	Pennsylvania.		Tennes-see.
							Anthra-cite.	Bitumi-nous.	
1866									
1867									
1868									
1869									
Total									
1870							35,600		
1871							37,488		
1872							44,745		
1873							48,199		
1874							53,402		
1875							69,966		
1876							70,474		
1877							66,842	16,627	
1878							63,964	25,787	
1879							68,847	27,286	
Total							559,527	69,700	
1880					16,972		73,373	33,391	
1881					19,939		76,031	35,530	
1882					22,909		82,200	42,393	
1883					21,636		91,421	35,091	
1884					20,101		101,073	39,904	
1885					19,704		100,320	44,145	
1886					20,437		103,044	52,364	
1887					22,237		106,517	57,868	
1888					21,801		122,218	61,565	
1889					23,295		119,964	62,084	
Total					209,031		976,161	464,335	
1890	5,971	1,251			22,192		119,919	67,383	
1891	6,879	1,119			23,997		123,308	74,135	5,097
1892	8,059	1,158			26,972		130,300	78,805	4,926
1893	7,767	1,401			28,810		138,069	81,872	4,976
1894	7,644	1,782			31,493	3,290	139,939	86,118	5,542
1895	7,245	2,184	1,659		28,998	3,648	143,705	84,976	5,120
1896	6,588		1,438		28,446	3,686	150,088	83,801	6,531
1897	6,557	2,337	1,365		28,785	3,470	149,557	86,553	6,337
1898	7,391	2,359	1,888		28,365	3,529	142,420	87,803	7,820
1899	7,792	2,373	1,880		28,028	4,005	140,604	91,505	7,694
Total	71,893	15,969	8,230		276,086	21,628	1,377,909	822,951	54,043
1900	7,650	2,376	2,015		31,702	5,272	143,824	108,735	8,691
1901	9,226	2,158	1,870		33,505	5,272	147,651	117,501	8,418
1902	9,162	1,938	1,682		37,421	6,234	148,139	135,611	8,759
1903	9,177	2,155	2,341		41,396	6,091	151,827	151,745	9,673
1904	10,134	2,505	1,972		45,834	8,260	161,330	155,747	9,972
1905	10,415	2,181	2,132		44,193	7,637	168,254	164,941	10,517
1906	9,679	2,394	2,354		46,501	8,110	166,175	172,923	10,736
1907	4,717	2,735	3,059		47,876	7,710	168,774	183,121	11,098
1908	9,391	3,146	3,670	631	50,267	14,560	174,503	181,840	11,122
Total	79,551	21,588	21,095	631	378,695	69,146	1,430,477	1,372,169	88,986
Grand total	151,444	37,557	29,325	631	863,812	90,774	4,344,074	2,729,155	143,029

TABLE XXVII.—NUMBER OF EMPLOYEES IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908—Concluded.

[From reports of state mine inspectors. Figures are given only for those years for which the number of fatalities was available.]

Year.	Employees in coal mines.								Total.	
	Utah.	Wash- ington.	West Vir- ginia.	Wyo- ming.	Total United States.	British Colum- bia.	Nova Scotia.	Total British Colum- bia and Nova Scotia.		
1866.....								3,043	3,043	3,043
1867.....								2,984	2,984	2,984
1868.....								2,639	2,639	2,639
1869.....								2,458	2,458	2,458
Total.....								11,124	11,124	11,124
1870.....					35,600			2,600	2,600	38,200
1871.....					37,488			2,469	2,469	39,957
1872.....					44,745			3,522	3,522	48,267
1873.....					48,199			4,362	4,362	52,561
1874.....					53,402			4,282	4,282	57,684
1875.....					69,966			3,777	3,777	73,743
1876.....					70,474			3,229	3,229	73,703
1877.....					83,469			3,180	3,180	86,649
1878.....					89,751			3,135	3,135	92,886
1879.....					96,133			3,034	3,034	99,167
Total.....					629,227			33,590	33,590	662,817
1880.....					123,736			3,332	3,332	127,068
1881.....					136,067			3,567	3,567	139,634
1882.....					147,502			4,235	4,235	151,737
1883.....			6,394		183,884			4,635	4,635	188,519
1884.....					198,491			5,013	5,013	203,504
1885.....			7,292		209,738			4,446	4,446	214,184
1886.....			7,262		217,444			4,585	4,585	222,029
1887.....			8,974		226,467			4,367	4,367	230,834
1888.....			9,006		273,524			4,651	4,651	278,175
1889.....					273,194			5,167	5,167	278,361
Total.....			38,928		1,990,047			43,998	43,998	2,034,045
1890.....			11,497		295,971			5,324	5,324	301,295
1891.....			11,397		317,844	3,094		5,746	8,840	326,684
1892.....		2,960	13,023		334,904	2,854		5,806	8,660	343,564
1893.....	576	2,828	17,129		375,515	2,844		5,890	8,734	384,249
1894.....	671	3,380	19,771		385,821	2,929		5,396	8,325	394,146
1895.....	670	2,828	20,889		395,836	2,924		5,793	8,717	404,553
1896.....	690	2,683	24,227		400,555	2,753		6,012	8,765	409,320
1897.....	720	2,826	21,422		402,222	2,433		5,175	7,608	409,830
1898.....	685	3,337	23,262		400,061	2,988		4,487	7,475	407,536
1899.....	1,118	3,308	25,108		413,097	3,780		5,612	9,392	422,489
Total.....	5,130	24,150	187,725		3,721,826	26,599		55,241	81,840	3,803,666
1900.....	1,504	4,238	28,055		453,578	4,031		6,626	10,657	464,235
1901.....	1,780	4,826	32,386	5,151	490,945	3,974		7,663	11,637	502,582
1902.....	2,468	4,342	35,147	5,250	527,396	4,011		8,062	12,073	539,469
1903.....	2,182	4,876	39,452		561,009	4,264	11,092	15,356	576,365	
1904.....	2,215	4,633	45,492		592,889	4,453	11,659	16,112	609,001	
1905.....	1,963	4,976	49,950	5,977	635,207	4,407	10,780	15,187	653,394	
1906.....	1,895	5,150	51,769	5,934	652,184	4,805	12,123	16,928	669,112	
1907.....	2,607	6,113	56,265		673,379	6,059	12,107	18,166	691,545	
1908.....	2,680	5,341	60,397	6,915	709,210	6,095	12,933	19,023	728,238	
Total.....	19,294	44,405	396,913	29,227	5,298,797	42,099	93,045	135,144	5,433,941	
Grand total.....	24,424	68,645	625,566	29,227	11,639,897	68,698	236,998	305,696	11,945,593	

TABLE XXVII.—NUMBER OF TONS OF COAL PRODUCED IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908.

[Figures for the United States, from Part II, Mineral Resources of the United States. Figures are given for the individual States only for those years for which the number of fatalities was available. One ton=2,000 pounds.]

Year.	Tons of coal produced.						
	Alabama.	Arkansas.	Colorado.	Illinois.	Indiana.	Iowa.	Kansas.
1866.....							
1867.....							
1868.....							
1869.....							
Total.....							
1870.....							
1871.....							
1872.....							
1873.....							
1874.....							
1875.....							
1876.....							
1877.....							
1878.....							
1879.....							
Total.....							
1880.....							
1881.....					1,984,120		
1882.....							
1883.....				12,123,456	2,560,000		
1884.....			1,130,024	12,208,075	2,280,000		1,100,000
1885.....			1,356,062	11,834,459	2,375,000		1,212,057
1886.....			1,368,338	11,175,241	3,000,000		
1887.....			1,791,735	12,423,066			1,596,879
1888.....			2,185,477	14,328,181	3,140,979	4,952,440	
1889.....			2,597,181	12,104,272		4,095,358	2,221,043
Total.....			10,428,817	86,196,750	15,320,099	9,047,798	6,129,979
1890.....			3,077,003	15,292,420	3,305,737	4,021,739	2,259,922
1891.....			3,512,632	15,660,698	2,973,474	3,825,495	2,716,705
1892.....			3,510,830	17,862,276	3,345,174	3,918,491	
1893.....	5,136,935		4,102,389	19,949,564	3,791,851	3,972,229	2,652,546
1894.....	4,397,178		2,831,409	17,113,576		3,967,253	3,388,251
1895.....	5,693,775		3,082,982	17,735,864	3,995,892	4,156,074	2,926,870
1896.....	5,748,697		3,112,400	19,786,626	3,905,779	3,954,028	2,884,801
1897.....	5,893,770		3,361,703	20,072,758	4,151,169	4,611,865	3,054,012
1898.....	6,535,283		4,076,347	18,599,299	4,920,743	4,618,842	3,406,555
1899.....	7,593,416		4,776,224	24,439,019	6,006,523	5,177,479	3,852,267
Total.....	40,999,054		35,443,919	186,512,100	36,396,342	42,223,495	27,141,929
1900.....	8,394,275		5,244,364	25,767,981	6,484,086	5,202,939	4,467,870
1901.....	9,099,052	1,816,136	5,700,015	27,331,552	6,918,225	5,617,499	4,900,528
1902.....	10,354,570	1,943,932	7,401,343	32,939,373	9,446,424	5,904,766	5,266,065
1903.....	11,654,324		7,423,602	36,957,104	10,794,692	6,419,811	5,839,976
1904.....	11,262,046		6,658,355	36,475,060	10,842,189	6,519,933	6,333,307
1905.....	11,866,069	1,934,673	8,826,429	38,434,363	11,895,252	6,798,609	6,423,979
1906.....	13,107,903	1,864,268	10,111,218	41,480,104	12,092,560	7,266,224	6,024,775
1907.....	14,250,454	2,670,438	10,790,236	51,317,146	13,985,713	7,574,322	7,322,449
1908.....	11,604,593	2,078,357	9,634,973	47,659,690	12,314,890	7,161,310	6,245,508
Total.....	101,593,346	12,307,804	71,790,535	338,362,373	94,774,031	58,465,413	52,824,457
Grand total.....	142,592,400	12,307,804	117,663,271	611,071,223	146,490,472	109,736,706	86,096,365

TABLE XXVII.—NUMBER OF TONS OF COAL PRODUCED IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908—Continued.

[Figures for the United States, from Part II, Mineral Resources of the United States. Figures are given for the individual States only for those years for which the number of fatalities was available. One ton=2,000 pounds.]

Year.	Tons of coal produced.						
	Kentucky.	Maryland.	Michigan.	Missouri.	Montans.	New Mexico.	North Dakota.
1866.....							
1867.....							
1868.....							
1869.....							
Total.....							
1870.....							
1871.....							
1872.....							
1873.....							
1874.....							
1875.....							
1876.....							
1877.....							
1878.....							
1879.....							
Total.....							
1880.....							
1881.....							
1882.....							
1883.....							
1884.....							
1885.....							
1886.....							
1887.....	1,933,185						
1888.....	2,570,000						
1889.....	2,399,755						
Total.....	6,902,940						
1890.....	2,701,496	3,357,813		2,735,221	517,477		
1891.....	2,916,069	3,820,239		2,674,696	541,861		
1892.....	3,025,313	3,419,962		2,733,949	564,648		
1893.....	3,007,179	3,716,041		2,897,442	892,309		
1894.....	3,111,192	3,501,428		2,245,039	927,365		
1895.....	3,357,770	3,915,585		2,372,393	1,504,193	720,654	
1896.....	3,333,478	4,143,936		2,331,542		622,626	
1897.....	3,602,097	4,442,128		2,665,626	1,647,882	716,981	
1898.....	3,887,908	4,674,884		2,688,321	1,479,803	982,288	
1899.....	4,607,255	4,807,396	624,708	3,025,814	1,496,451	1,050,714	
Total.....	33,549,757	39,799,412	624,708	26,369,953	9,572,019	4,103,263	
1900.....	5,328,964	4,024,688	849,475	3,540,103	1,661,775	1,299,299	
1901.....	5,469,986	5,113,127	1,241,241	3,802,088	1,396,081	1,086,546	
1902.....	6,766,984	5,271,609	964,718	3,890,154	1,562,853	1,048,763	
1903.....	7,538,032	4,846,165	1,367,619	4,238,586	1,493,060	1,541,781	
1904.....	7,576,482	4,813,622	1,342,840	4,168,308	1,362,399	1,452,325	
1905.....	8,432,523	5,108,539	1,473,211	3,983,373	1,649,714	1,649,933	
1906.....	9,653,647	5,435,453	1,346,338	3,755,008	1,829,921	1,964,713	
1907.....	10,753,124	5,532,628	2,035,858	3,997,936	2,016,857	2,628,959	
1908.....	10,246,553	4,377,093	1,835,019	3,317,315	1,920,190	2,467,937	320,742
Total.....	71,766,295	44,522,924	12,456,319	34,695,876	14,892,850	15,140,256	320,742
Grand total.....	112,218,992	84,322,336	13,081,027	61,065,829	24,464,869	19,243,519	320,742

TABLE XXVII.—NUMBER OF TONS OF COAL PRODUCED IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908—Continued.

[Figures for the United States, from Part II, Mineral Resources of the United States. Figures are given for the individual States only for those years for which the number of fatalities was available. One ton=2,000 pounds.]

Year.	Tons of coal produced.						
	Ohio.	Okla-homa.	Pennsylvania.		Tennes-see.	Utah.	Washing-ton.
			Anthracite.	Bituminous.			
1866							
1867							
1868							
1869							
Total							
1870			15,664,275				
1871			19,342,057				
1872			24,233,166				
1873			26,152,837				
1874	3,267,585		24,818,790				
1875	4,804,259		22,488,708				
1876	3,500,000		22,793,245				
1877	5,250,000		25,660,316	14,000,000			
1878	5,500,000		21,689,682	15,120,000			
1879			30,207,793	16,240,000			
Total	22,381,844		233,047,927	45,360,000			
1880	6,008,598		28,649,812	18,425,163			
1881	9,240,000		31,920,018	22,400,000			
1882	9,450,000		35,121,256	24,640,000			
1883	8,229,429		38,456,845	26,880,000			
1884	7,640,062		37,156,847	28,000,000			
1885	7,816,179		38,335,974	26,000,000			
1886	8,435,211		39,035,446	27,094,501			
1887	10,300,708		42,088,197	31,516,856			
1888	10,910,951		46,619,564	33,796,727			
1889	9,976,787		45,546,970	36,174,089			
Total	88,007,922		382,930,929	274,927,336			
1890	11,494,506		46,468,641	42,302,173			
1891	12,868,683		50,665,451	42,788,490	2,413,678		
1892	13,562,927		52,472,504	46,694,576	2,082,064		1,213,427
1893	13,253,646		53,967,643	44,070,724	1,902,253	413,205	1,264,877
1894	11,909,856	909,606	51,921,121	39,912,463	2,180,879	431,550	1,106,470
1895	13,355,806	1,211,185	57,999,337	50,217,228	2,535,644	471,830	1,191,410
1896	12,875,202	1,306,646	54,346,081	49,557,453	2,663,106	418,627	1,195,504
1897	12,196,942	1,336,380	52,611,080	54,417,974	2,888,849	521,560	1,434,112
1898	14,516,867	1,381,466	53,382,644	65,165,133	3,022,896	593,709	1,884,571
1899	16,500,270	1,537,427	60,418,005	74,150,175	3,330,659	786,049	2,029,881
Total	132,534,705	7,802,710	534,252,987	509,276,389	23,030,033	3,636,536	11,320,252
1900	18,988,150	1,922,298	57,367,915	79,842,326	3,509,562	1,147,027	2,474,093
1901	20,943,807	2,421,781	67,471,667	82,305,946	3,633,290	1,322,614	2,578,217
1902	23,519,894	2,820,666	41,373,595	98,574,367	4,382,968	1,574,521	2,681,214
1903	24,338,103	3,517,383	74,607,068	103,117,178	4,798,004	1,681,409	3,193,273
1904	24,400,220	3,046,539	73,156,709	97,938,287	4,782,211	1,493,027	3,137,681
1905	25,552,950	2,924,427	77,659,850	118,413,637	5,963,396	1,332,372	2,864,926
1906	27,731,640	2,860,200	71,282,411	129,293,206	6,259,275	1,772,551	3,276,184
1907	32,142,419	3,642,653	85,604,312	150,143,127	6,810,243	1,947,607	3,680,532
1908	26,270,639	2,948,116	83,268,754	117,179,577	6,199,471	1,846,792	3,024,943
Total	224,387,822	26,104,073	631,792,281	976,807,651	46,338,120	14,117,920	26,911,063
Grand total	467,312,293	33,906,783	1,782,024,124	1,806,371,376	69,368,153	17,754,456	38,231,315

TABLE XXVII.—NUMBER OF TONS OF COAL PRODUCED IN COAL MINES OF NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1908—Concluded.

[Figures for the United States, from Part II, Mineral Resources of the United States. Figures are given for the individual States only for those years for which the number of fatalities was available. One ton=2,000 pounds.]

Year.	Tons of coal produced.						
	West Virginia.	Wyoming.	Total United States.	British Columbia.	Nova Scotia.	Total British Columbia and Nova Scotia.	Total.
1866.....					601,301	601,301	601,301
1867.....					542,127	542,127	542,127
1868.....					462,188	462,188	462,188
1869.....					500,000	500,000	500,000
Total.....					2,105,616	2,105,616	2,105,616
1870.....			33,035,580		635,242	635,242	33,670,822
1871.....			46,885,080		673,242	673,242	47,558,322
1872.....			51,453,399		890,950	890,950	52,334,349
1873.....			57,602,490		1,051,467	1,051,467	58,653,947
1874.....			52,605,920		872,720	872,720	53,478,640
1875.....			52,348,320		781,165	781,165	53,129,485
1876.....			53,290,000		709,646	709,646	53,999,646
1877.....			60,501,760		757,496	757,496	61,259,256
1878.....			57,935,600		770,603	770,603	58,706,203
1879.....			68,105,799		788,271	788,271	68,894,070
Total.....			533,753,938		7,920,802	7,920,802	541,674,740
1880.....			71,481,570		1,032,710	1,032,710	72,514,280
1881.....			85,881,030		1,124,270	1,124,270	87,005,300
1882.....			103,551,189		1,365,811	1,365,811	104,917,000
1883.....	2,335,833		115,707,525		1,422,553	1,422,553	117,130,078
1884.....	3,369,062		120,155,551		1,389,295	1,389,295	121,544,846
1885.....	4,005,796		113,180,295		1,352,205	1,352,205	114,537,500
1886.....	4,881,620		113,680,427		1,502,611	1,502,611	115,183,038
1887.....	5,498,800		130,650,511		1,670,838	1,670,838	132,321,349
1888.....	6,231,880		148,659,657		1,776,128	1,776,128	150,435,785
1889.....	6,231,880		141,229,513		1,756,279	1,756,279	142,985,792
Total.....	26,322,991		1,142,157,268		14,392,700	14,392,700	1,156,549,968
1890.....	7,394,654		157,770,963		1,984,001	1,984,001	159,754,964
1891.....	9,220,665		168,566,669	1,029,097	2,044,784	3,073,881	171,640,550
1892.....	9,738,755		179,329,071	826,335	1,942,780	2,769,115	182,098,186
1893.....	10,708,578		182,352,774	978,294	1,682,713	2,661,007	185,013,781
1894.....	11,627,757		170,741,526	1,012,953	2,200,235	3,213,188	173,954,714
1895.....	11,337,961		193,117,530	939,654	2,089,245	3,028,899	196,146,429
1896.....	12,876,296		191,986,357	896,222	2,235,472	3,131,694	195,118,051
1897.....	14,248,159		200,229,199	882,854	2,320,916	3,203,770	203,432,969
1898.....	16,700,999		219,976,267	1,135,865	2,281,454	3,417,319	223,393,586
1899.....	19,252,995		253,741,192	1,306,324	2,642,333	3,948,657	257,689,849
Total.....	123,156,819		1,917,811,548	9,007,598	21,423,933	30,431,531	1,948,243,079
1900.....	22,647,207		269,684,027	1,439,895	3,238,245	4,677,840	274,361,867
1901.....	24,068,402	4,485,374	293,299,810	1,460,331	3,625,365	5,085,696	298,385,512
1902.....	24,570,826	4,429,491	301,590,439	1,397,394	4,366,869	5,764,263	307,354,702
1903.....	29,337,241		357,356,416	1,168,194	5,245,247	6,413,441	363,769,857
1904.....	32,406,752		351,816,398	1,259,628	5,247,135	6,506,763	358,317,161
1905.....	37,791,550	5,602,021	392,722,635	1,384,312	5,050,420	6,434,732	399,157,367
1906.....	43,290,350	6,133,994	414,157,278	1,517,303	5,866,605	7,383,908	421,541,186
1907.....	48,091,583		480,363,424	1,800,067	5,730,660	7,530,727	487,894,151
1908.....	41,897,843	5,489,902	415,842,698	1,677,849	6,299,282	7,977,131	423,819,829
Total.....	304,101,784	26,140,782	3,276,833,131	13,098,673	44,669,828	57,768,501	3,334,601,632
Grand total.....	453,581,594	26,140,782	6,870,555,885	22,106,271	90,512,879	112,619,150	6,983,175,035

TABLE XXVIII.—NUMBER OF TONS OF COAL PRODUCED IN COAL MINES OF THE UNITED STATES, 1814 TO 1908, AND OF CANADA, 1874 TO 1908.

[Figures for the United States from reports of the United States Geological Survey on the Mineral Resources of the United States.]

Year.	United States.	Canada.	Total.
1814.....	22		
1815.....	50		
1816.....	75		
1817.....	100		
1818.....	200		
1819.....	350		
Total.....	797		
1820.....	3,450		
1821.....	1,322		
1822.....	58,583		
1823.....	68,563		
1824.....	80,725		
1825.....	117,988		
1826.....	147,914		
1827.....	172,151		
1828.....	195,908		
1829.....	240,086		
Total.....	1,086,690		
1830.....	320,072		
1831.....	337,942		
1832.....	594,050		
1833.....	734,657		
1834.....	600,515		
1835.....	824,854		
1836.....	984,832		
1837.....	1,253,651		
1838.....	1,355,527		
1839.....	1,560,360		
Total.....	8,566,460		
1840.....	2,070,039		
1841.....	2,291,141		
1842.....	2,610,057		
1843.....	3,060,874		
1844.....	3,681,252		
1845.....	4,309,904		
1846.....	4,865,522		
1847.....	5,286,067		
1848.....	5,773,974		
1849.....	6,448,831		
Total.....	40,397,661		
1850.....	7,018,181		
1851.....	8,734,525		
1852.....	9,816,664		
1853.....	10,570,288		
1854.....	11,977,102		
1855.....	12,926,673		
1856.....	13,546,925		
1857.....	13,340,189		
1858.....	13,974,478		
1859.....	15,633,175		
Total.....	117,538,200		
1860.....	14,610,042		
1861.....	16,488,012		
1862.....	17,485,835		
1863.....	21,319,062		
1864.....	23,605,123		
1865.....	23,792,173		
1866.....	29,003,583		
1867.....	30,724,422		
1868.....	32,861,960		
1869.....	32,904,360		
Total.....	242,794,572		

TABLE XXVIII.—NUMBER OF TONS OF COAL PRODUCED IN COAL MINES OF THE UNITED STATES, 1814 TO 1908, AND OF CANADA, 1874 TO 1908—Concluded.

[Figures for the United States from reports of the United States Geological Survey on the Mineral Resources of the United States.]

Year.	United States.	Canada.	Total.
1870.....	33,035,580	.....	33,035,580
1871.....	46,885,080	.....	46,885,080
1872.....	51,453,399	.....	51,453,399
1873.....	57,602,480	.....	57,602,480
1874.....	52,605,920	1,063,742	53,669,662
1875.....	52,348,320	1,039,974	53,388,294
1876.....	53,280,000	994,762	54,274,762
1877.....	60,501,760	1,036,670	61,538,430
1878.....	57,935,600	1,089,744	59,025,344
1879.....	68,105,799	1,126,497	69,232,296
Total.....	533,753,938	6,351,389	540,105,327
1880.....	71,481,570	1,482,714	72,964,284
1881.....	85,881,030	1,537,106	87,418,136
1882.....	103,551,189	1,848,148	105,399,337
1883.....	115,707,525	1,818,684	117,526,209
1884.....	120,155,551	1,984,959	122,140,510
1885.....	111,160,295	1,920,977	113,081,272
1886.....	113,680,427	2,116,653	115,797,080
1887.....	130,650,511	2,429,330	133,079,841
1888.....	148,659,657	2,602,552	151,262,209
1889.....	141,229,513	2,658,303	143,887,816
Total.....	1,142,157,268	20,399,426	1,162,556,694
1890.....	157,770,963	3,084,682	160,855,645
1891.....	168,566,669	3,577,749	172,144,418
1892.....	179,329,071	3,287,745	182,616,816
1893.....	182,352,774	3,783,499	186,136,273
1894.....	170,741,526	3,847,070	174,588,596
1895.....	193,117,530	3,478,314	196,595,844
1896.....	191,986,357	3,745,716	195,732,073
1897.....	200,229,199	3,786,107	204,015,306
1898.....	219,976,267	4,173,108	224,149,375
1899.....	253,741,192	4,925,051	258,666,243
Total.....	1,917,811,548	37,689,041	1,955,500,589
1900.....	269,684,027	5,777,319	275,461,346
1901.....	293,299,816	6,486,325	299,786,141
1902.....	301,590,439	7,466,681	309,057,120
1903.....	357,356,416	7,960,364	365,316,780
1904.....	351,816,398	8,254,595	360,070,993
1905.....	392,722,635	8,667,948	401,390,583
1906.....	414,157,278	9,762,601	423,919,879
1907.....	480,363,424	10,511,426	490,874,850
1908.....	415,842,698	10,904,486	426,747,184
Total.....	3,276,833,131	75,791,745	3,352,624,876
Grand total.....	7,280,940,265	140,231,601	7,421,171,866

TABLE XXIX.—FATAL ACCIDENT RATE PER 1,000 EMPLOYEES AND NUMBER OF LIVES LOST PER MILLION TONS OF COAL MINED IN NORTH AMERICA, BY STATES AND PROVINCES, 1866 TO 1938.

State or Province.	Years considered.	Tons of coal produced.	Employees.	Fatal accidents.		Lives lost per 1,000,000 tons of coal mined.
				Number.	Per 1,000 employees.	
Alabama.....	16	142,592,400	227,828	1,037	4.55	7.27
Arkansas.....	6	12,307,804	25,651	76	2.96	6.17
Colorado.....	25	117,663,271	188,054	1,074	5.71	9.13
Illinois.....	26	611,071,223	1,030,800	2,407	2.34	3.94
Indiana.....	24	146,490,472	245,115	547	2.23	3.73
Iowa.....	21	109,736,706	264,400	573	2.17	5.22
Kansas.....	22	86,096,365	184,896	415	2.24	4.82
Kentucky.....	22	112,218,992	218,866	375	1.71	3.34
Maryland.....	19	84,322,336	93,269	165	1.77	1.96
Michigan.....	10	13,081,027	23,356	68	2.91	5.20
Missouri.....	19	61,065,829	151,444	261	1.72	4.27
Montana.....	18	24,464,869	37,557	138	3.67	5.64
New Mexico.....	14	19,243,519	29,325	212	7.23	11.02
North Dakota.....	1	320,742	631	4	6.34	12.47
Ohio.....	34	467,312,293	863,812	1,845	2.14	3.95
Oklahoma.....	15	33,906,783	90,774	460	5.07	13.67
Pennsylvania:						
Anthracite.....	39	1,782,024,124	4,344,074	14,625	3.37	8.21
Bituminous.....	32	1,806,371,376	2,729,155	6,919	2.54	3.83
Tennessee.....	18	69,368,153	143,029	627	4.38	9.04
Utah.....	16	17,754,456	24,424	285	11.67	16.05
Washington.....	17	38,231,315	68,645	464	6.76	12.14
West Virginia.....	25	453,581,594	625,566	2,887	4.62	6.36
Wyoming.....	5	26,140,782	29,227	339	11.60	12.97
Total.....		6,235,366,431	11,639,897	35,803	3.08	5.74
British Columbia.....		22,106,271	68,698	497	7.23	22.48
Nova Scotia.....		90,512,879	236,998	720	3.04	7.95
Total.....		112,619,150	305,696	1,217	3.98	10.81
Grand total.....		6,347,985,581	11,945,593	37,020	3.10	5.83

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RECENT ACTION RELATING TO EMPLOYERS' LIABILITY AND WORKMEN'S COMPENSATION.

BY LINDLEY D. CLARK, A. M., LL. M.

NATURE OF LIABILITY AND COMPENSATION SYSTEMS.

The past few years have been marked by a rapid increase of interest in the question of the adjustment and distribution of the burden of the results of industrial accidents, the doctrine of compensation as distinguished from that of liability coming for the first time in the United States to any widespread support. Where the idea of employers' liability controls, the employee is given a right of action against the employer in cases where injury from accident results as a consequence of the negligence of the employer or of some one charged with the performance of his nondelegable duties; with this, however, the rule must be considered that where the injured employee contributed by his own negligence to cause the accident, such contributory negligence bars recovery. Ordinary risks, not due to the employer's negligence, but incidental to the employment, are held to be assumed by the employee, and for injuries resulting therefrom no recovery of damages can be had; these risks include the acts, negligent or otherwise, of ordinarily carefully selected and ordinarily skillful and competent fellow-workmen. It is obvious that the only right allowed to an injured employee under this doctrine is the right to sue, which experience has shown to involve uncertainty, delay, expense, and the ultimate acquisition by the workman of only a fraction of the money actually expended by the employer in the way of defense and of payments on judgments.

The idea of compensation is that of an award of a fixed sum for injuries for which the employment is responsible, without the necessity of litigation or the endeavor to determine the question of fault. It is frequently provided, however, that where an employer is apparently grossly negligent, damages will be recoverable, and if the employee is willfully or grossly negligent he shall take nothing either by way of compensation or otherwise.

The common-law doctrine of employers' liability has been dominant in the United States to the present time, though modified in many particulars by statutes, both state and federal.^(a) In most other industrial countries the idea of compensation has superseded that of liability, Germany having led the way in 1884, followed by Austria in

^a See Bulletin No. 74, pp. 1 to 120.

1889. Great Britain placed a compensation law of limited application on her statute books in 1897, giving the right of compensation thereunder as alternative to the right to sue under either the common law or the liability act of 1880. The British act last mentioned has furnished the pattern for statutes in several States of the Union, laws of this general type and varying scope having been enacted in five States in the single year 1909. One State (Colorado) has abrogated entirely the defense of fellow-service, while in a number of jurisdictions this defense is not allowed in the case of accidents on railroads. The other defenses named, i. e., of assumed risks and contributory negligence, are also modified or abolished under certain conditions in a number of States. In all these cases, however, the underlying idea of liability is not changed.

FEDERAL EMPLOYERS' LIABILITY LAW.

Federal legislation on the subject of employers' liability has been restricted to employees of common carriers, and necessarily to such of these as are engaged in interstate commerce, though two liability bills, one restricted to the Isthmian Canal and one applying to all laborers, mechanics, and other civilian employees of the United States Government, were introduced into Congress during the recent regular session. It was owing to failure to restrict the provisions of the statute of 1906 to interstate operations that that act was declared unconstitutional, except in the District of Columbia and the Territories, as to which the powers of Congress are plenary.^(a)

The liability law of April 22, 1908 (35 Stat., 65), was adopted with a view to correcting the defects of the earlier law, but was promptly declared unconstitutional by the supreme Court of Connecticut^(b) on the ground that it involved the administration of the law in state courts beyond either the intention or the power of Congress, and because its provisions affected matters beyond the scope of interstate commerce, and therefore also without the power of Congress. The result of this ruling was in any case a denial of the right of the state courts to administer the law, which view would be controlling on the subordinate courts of Connecticut. An appeal to the Supreme Court of the United States was taken in the Mondou case, the question of the constitutionality as well as of the application of the law being raised. This appeal has not yet been acted upon.

Another decision that, if sustained, would prove destructive to the value of this act was one in a federal court to the effect that actions under the law could be brought only in the district of which the de-

^a Employers' Liability Cases, 207 U. S., 463, 28 Sup. Ct., 141; El Paso & Northeastern R. Co. v. Gutierrez, 215 U. S., 87, 30 Sup. Ct., 21.

^b Hoxie v. New York, etc., R. R. Co., 82 Conn., 352, 73 Atl., 754. (See Bull. No. 86, pp. 322-328.) Mondou v. Same, 82 Conn., 373, 73 Atl., 762.

defendant company was an inhabitant.^(a) In the case in question this ruling would require the plaintiff, a brakeman injured in New Mexico, to bring his suit in the city of Topeka, Kans., of which the defendant corporation was an inhabitant. A third decision pointed out the limitations of the law in so far as death claims are concerned, ruling that it gave no survival of the employee's personal right to recover damages were the injury was fatal.^(b)

The points raised in these decisions were made the subject of a variety of bills in Congress, whose object it was to cure the defects disclosed by them, though it was brought out in the debates and reports in connection with the proposed amendments that not all the points against the law were considered as well taken. Amendments were adopted giving to state and federal courts concurrent jurisdiction in all cases arising under the act, and allowing actions to be brought in the place where the injury occurred or in any place in which the defendant company was doing business at the time of the commencement of the action. Cases brought in state courts of competent jurisdiction can not be removed to a federal court. A section was added providing that the right of action of an injured person should, in case of death, survive to the personal representative for the benefit of dependents. The act as amended is reproduced below.^(c) The question of survival may still be open in some cases, however, in view of the construction placed upon a similar statute^(d) by the supreme court of Montana.^(e) In the case cited this court held that where death was instantaneous no right of action accrued, hence none could survive, though a less rigid construction of the Federal law seems possible, at least in view of the very clearly expressed intention of Congress in debate to provide for the accrual of a right to sue for the personal injuries of the employee as well as for the loss suffered by the dependents by reason of the death of the wage-earner, as set forth in the first section of the act.^(f)

STATUTES PROVIDING INSURANCE.

The first absolute departure in the United States from the doctrine of liability and proved fault was the cooperative insurance law of Maryland, passed in 1902, and applicable only to mining, quarrying,

^a *Cound v. Atchison, T. & S. F. R. Co.*, 173 Fed. 527.

^b *Fulgham v. Midland Valley R. R. Co.*, 167 Fed. 660. (See also *Walsh v. New York, etc., R. Co.*, 173 Fed., 494.)

^c See pp. 707 and 708.

^d *Mont.*, Acts, 1905, ch. 1, sec. 2.

^e *Dillon v. Great Northern R. R. Co.*, 38 *Mont.*, 485, 100 *Pac.* 960.

^f *Duke v. St. Louis & S. F. R. R. Co.*, 172 Fed. 684; *Watson v. St. Louis, I. M. & S. R. R. Co.*, 169 Fed. 942.

and steam and street railways.^(a) This law provided for contributions at fixed rates by employers who might recoup themselves to the amount of one-half of such contributions from the wages paid employees. Payment on death was absolute, and the law was administered in all its details by the state insurance commissioner. After about two years' operations the law was declared unconstitutional as depriving parties of the right of trial by jury and conferring on an executive officer judicial or at least quasi judicial functions. A second law was passed by the legislature of this State in 1910 (ch. 153, p. 489), establishing cooperative insurance funds for the coal and clay miners of Allegany and Garrett counties. Employers and employees are to make equal contributions to a fund to be collected and held by the treasurers of the counties. Administration devolves on the county commissioners. The maximum award of \$1,500 is for the death of a person leaving dependents; while for maiming injuries a schedule of awards is provided, the maximum being \$750, though medical relief in the amount of \$1 per working day for not more than 26 weeks may also be allowed. For injuries without maiming, \$1 per working day may be allowed for not more than 52 weeks. Suit may be brought, but doing so bars compensation rights, and conversely the acceptance of benefits bars the right to sue.

A cooperative insurance fund for miners and mine laborers is contemplated by a statute of Montana (ch. 67, 1909), payments by employers to be computed on the basis of the tonnage mined and shipped, held for shipment, or sold locally; and by the employees on the basis of gross monthly earnings. Insurance is compulsory, and the funds are administered by state officials. Death benefits in the amount of \$3,000 are provided for, besides payments of various sums for total or partial disability. The right to sue is not taken away, but bringing suit forfeits all rights under the insurance scheme, while acceptance of insurance benefits is to operate as a waiver of the right to sue. This law becomes operative October 1, 1910, payments to begin 4 months thereafter.

STATUTES PROVIDING FOR COMPENSATION.

The idea of compensation for injuries, using the term in its strict sense, found its first legislative expression in any jurisdiction of the United States in a statute enacted by the United States Philippine Commission in 1906^(b) and applicable to employees of the insular government, including laborers. This law continues the regular

^aFor an account of the operations of this law and the opinion declaring it unconstitutional, see Bulletin No. 57, pp. 645-648, 689, 690. The law itself is given in Bulletin No. 45, pp. 406-408.

^bAct No. 1416.

wages or other compensation during disability resulting from injury in line of duty for not more than 90 days.

The next legislation of this character was by the Federal Congress,^(*) and applies to artisans and laborers employed by the United States in any of its manufacturing establishments, arsenals, or navy-yards, or in the construction of river and harbor or fortification work, or in hazardous employment on construction work in the reclamation of arid lands or the management and control of the same, or in hazardous employment under the Isthmian Canal Commission. Compensation for disabling or fatal injuries incurred in the course of employment is fixed at an amount equal to 1 year's earnings, to be paid as if the employee had continued in service. Injuries must continue more than 15 days to entitle to compensation, and if they are due to the negligence or misconduct of the employee no payment is to be made. Claims for injuries must be submitted within a reasonable period, in cases of fatal injuries within 90 days after the death of the injured person. The administration of this law is committed to the Secretary of Commerce and Labor, who determines all questions of negligence or misconduct and who may require recipients of compensation to submit to medical examination to determine their right to a continuance of the compensation. Examination at least once in 6 months is directed.

In administering this law it was found that, on account of distance and for other reasons, a number of claims, chiefly those arising from deaths of employees in the Canal Zone, were submitted after the expiration of the 90-day limit and could not therefore be considered. An amendment was introduced in Congress to allow these rejected claims to be considered on their merits, waiving the limitation, but the provision causing the difficulty was not touched upon. This bill also proposed to authorize the President to provide for the adjustment of claims for injuries received by employees of the Isthmian Canal Commission between May 1, 1904, and August 1, 1908, when the present law took effect. Other amendments to the same law proposed the extension of its benefits to all civilian employees of the United States whose earnings or wages are less than \$3,000 per annum, including employees of the Isthmian Canal Commission and the Panama Railroad and Steamship Line. Injuries continuing more than 5 days would be compensated, and persons permanently disabled would receive 7 years' wages, but not less than \$3,500 nor more than \$7,500. Death benefits to dependents are set at an amount equal to 5 years' wages, but not less than \$2,000 nor more than \$5,000. If persons only partly dependent survive, these sums are to be reduced proportionately, but may not exceed 2 years' earnings, or \$1,800. Where no dependents survive, burial expenses not exceeding \$150

^{*}Act of May 30, 1908, 35 Stat. 556.

are the only payment contemplated. None of the proposed amendments passed except one giving the Isthmian Canal Commission the right to arrange by its own action for compensating cases of injury of an aggregate duration of not more than 30 days in any one year.^(a)

PROPOSED FEDERAL LEGISLATION.

The first bill introduced into the House at the convening of the Sixty-first Congress was one providing for compensation to be paid to all injured employees of persons carrying on occupations and trades subject to the regulative power of Congress, and changing the general law for injuries received on mail routes. No action was taken on this bill beyond committee reference and some hearings. A substitute bill was introduced under practically the same title toward the latter part of the second session. This bill proposes the establishment of a federal commission of injury awards, consisting of three members to be appointed by the President and confirmed by the Senate. This commission is to establish regulations and make orders for carrying into effect the proposed law and have general charge of administration. Employees coming within the scope of the bill are to be compensated for injuries causing disability for two weeks or more, unless such injuries are caused by their own wanton and willful action. Where the injury is the result of the wanton and willful act of the employer, the proposed law leaves the injured party or his representative free to prosecute a suit for damages; otherwise indemnities are to be paid according to a schedule which states in detail the percentage of the injured employee's earnings that shall be paid according to the rate of earnings and to the number of dependents, when the injury results fatally, and according to the nature and degree of the disability where the injury is not fatal. Provisions are made for review, appeals and the determination of disputes, and for recoupment where the person primarily liable is not the one to whom the injured party had recourse in securing compensation.

UNITED STATES WORKMEN'S COMPENSATION COMMISSION.

While this bill did not become a law, a joint resolution was passed and approved by the President^(b) providing for the appointment of a commission for the purpose of making a thorough investigation of the subject of employers' liability and workmen's compensation.

In the House report accompanying the bill, as submitted to that body by its Committee on the Judiciary, it was said that—

One of the most pressing problems of interstate commerce that to-day demands the attention of Congress is that of wisely and

^a Act of February 24, 1909, 35 Stat. 645.

^b House joint resolution No. 127, approved June 25, 1910.

equitably adjusting the loss to workmen of life and earning power which is the certain and inevitable consequence of modern methods of transportation.

The existing system, based upon the common law, circumscribed by the rigorous limitation placed upon it by judicial decisions, is entirely inadequate and had its origin in conditions of employment and methods of operation long since outgrown and abandoned.

The basis of that system, briefly stated, is to place a legal liability upon the employer to the workman for the loss of life or for disabling injury wholly upon the ground of negligence of the employer, and to put upon the person injured the burden of establishing that negligence by competent legal proof.

Judicial decision has specially limited the common law of negligence when it is applied to employees by the fellow-servant doctrine and the assumed-risk doctrine. Under these doctrines accidents caused by fellow-servants, though necessarily numerous under modern conditions, are uncompensated; and accidents caused by dangers inherent in the occupation itself are likewise uncompensated, although such dangers steadily increase as the industry develops.

The general principle of liability is seriously and sometimes fatally restricted by the superadded limitation of contributory negligence.

Finally, as the burden of legal proof rests on the injured, even where the decisions entitle him to a "right of recovery," he is unable to "secure his proofs," and so frequently redress is lost.

A large percentage of accidents are not due to negligence at all. Even in those cases in which negligence does exist, if redress is sought, it must be sought by suit against the employer.

The law of negligence itself, as applied to industrial accidents, has developed into an intricate mass of technicalities and subtleties, so that even the most experienced personal-injury lawyer can seldom know with certainty beforehand the outcome of a suit.

Lamentable uncertainty as to rights and obligations results whenever an accident happens.

Employees to-day bear both the physical and financial loss in a large percentage of accidents, with disastrous effect upon their families. Employers, though endeavoring to conduct their business with care, are harassed by a constant succession of suits for negligence, being subjected to great waste of energy and money in defending them, and being mulcted with large verdicts when they have no real moral blame.

Brief accounts of the federal laws as to employees of interstate common carriers and of the compensation act of May 30, 1908, were then given. As to the latter law, the report said:

This legislation demonstrates that in the opinion of Congress the existing common-law system of employers' liability in industrial employment is fundamentally wrong and needs a radical change.

This conclusion is neither novel nor untried. When railways were first introduced in Prussia, as far back as 1838, it was at once seen that common-law actions, requiring the injured to prove negligence, offered a totally inadequate remedy, and the railroad law of 1838 was passed, treating the accident as an occupation product and discarding the negligence basis.

Practically every civilized industrial nation in the world has since discarded the old system based on fault and submitted a system under which the industry bears the burden of relieving the distress of its injured workers practically without litigation.

That this question is of transcendent importance and one wholly connected with the advanced policies of the Government respecting the rights of labor and the proper equitable relations between the employer and the workman is evidenced by the utterance of President Taft in a recent address at Worcester, Mass., speaking before the joint committee of brotherhoods in train service:

"I am hopeful, indeed, that before many years have passed we shall be able to adopt a system * * * by which there shall be settled promptly, on rules specified with the same degree of certainty that they are specified in an insurance policy, how much a man shall receive for an injury, proportionate to the wages that he gets and proportionate to the disabling character of the injury. * * * In other words, I think we ought to have a uniformity of award, a dispatch and quickness in award, so that the lawyers may be eliminated, and that the money may go directly to the object to which it ought to be devoted. It will rid the courts of litigation with which they are now loaded down. It will make the awards reasonable but quick, and there will be no division in the money paid to the widow and the orphans or to the helpless cripple. That system is forcing its way in Europe, and I hope we may have it here. In that way the good feeling between the company and the employee will be facilitated and justice will be done. The railroads can calculate with the utmost accuracy, by statistical reference, how much money they will have to devote to that sort of liability, and I think everybody will be in better condition. The middleman will be eliminated and only the employee, on the one hand, and the treasury of the railroad, on the other, will be affected."

And by President Roosevelt's address at Jamestown:

"As a matter of fact there is no sound economic reason for distinction between accidents caused by negligence and those which are unavoidable, and the law should be such that the payment of those accidents will become automatic instead of being a matter for a lawsuit. Workmen should receive a certain definite and limited compensation for all accidents in industry, irrespective of negligence. It is neither just, expedient, nor humane, it is revolting to judgment and sentiment alike, that the financial burden of accidents occurring because of the necessary exigencies of their daily occupation should be thrust upon the sufferers who are least able to bear it."

Taking up the subject of the proposed measure for the enactment of provisions for compensation for employees in such undertakings as are under federal control, the result of the hearings on this bill was summarized as follows:

Notice was given to the leading common carriers throughout the country and to the representatives of the employees. They appeared before the committee, and it was frankly stated by the representatives of the carriers and of the locomotive engineers that in their judgment the time was rapidly approaching when some method of the kind proposed by the pending bill, if a proper and equitable basis could be found, would be the best possible solution of the problem.

The objections urged before the committee against the present system of liability were in substance—

(1) That uncertainty of rights and obligations involves suffering to the workmen and hardship upon the employers.

(2) That only a small proportion of the workmen injured by accidents of employment get small compensation, and that as a result they and their dependents are forced into a lower standard of living, and often become burdens upon the State through public or private charity.

(3) That the system is wasteful, being costly to employers and the State and of small benefit to the victims of accidents, as a very large proportion of amounts recovered is paid for costs of litigation and for attorneys' fees.

(4) That the system is slow in operation, involving of necessity great delay in the settlement of cases, and that delay is fatal to families dependent on daily earnings.

(5) That the operation of the law breeds antagonism between employers and employees.

(6) That antagonism of interests retards development of prevention of accident measures.

As a result of these hearings the committee and the parties directly interested, the common carriers and the employees, were of the opinion that it was important that more information of a definite, tangible, and thorough character should be obtained before a scheme could be devised which would be satisfactory to employers and employees.

This report was incorporated bodily into the Senate report accompanying the resolution as submitted to the upper House. The commission consists of two Members of each House, together with two persons to be selected by the President of the United States. It is authorized to employ persons familiar with the subject, to issue subpoenas, administer oaths, summon witnesses, require the production of books and papers, and receive testimony taken before any proper officer in any State or Territory of the United States. Expenditures not to exceed \$15,000 are authorized. The commission is to report to Congress through the President not later than the 1st Monday in December, 1911, and shall recommend such legislation as seems advisable.

ATTITUDE OF STATE LEGISLATURES TOWARD THE COMPENSATION SYSTEM.

The attitude of the state legislatures toward the doctrine of compensation may be said to be at least receptive, since not less than eight have recently passed laws or resolutions providing for commissions with the object of making investigations and proposing legislation of a nature suited to better meet the conditions of industrial operations than does the present system; while the governors of Montana and Washington have recently appointed commissions, apparently without special legislative authorization.

MASSACHUSETTS.

Probably the first State to move in this direction was Massachusetts, which in 1903 provided by a resolution adopted by the state legislature for a committee of five citizens of the Commonwealth to be known as a committee on the relations between employer and employee. The question of the liability of the employer for injuries to employees was mentioned as to be especially considered. The report of this committee supported "the theory that, where a man receives injury while in the course of his employment, society should recoup him in some measure without resorting to charity. * * * As the deterioration of a plant is paid for by being added to the cost of production, the deterioration of the man should also be added to the cost of production. The theory is also—and this has determined the acts of foreign countries in this respect—that society ultimately pays all such costs through consumption." The conclusion was reached that the liability theory was not satisfactory, and the committee recommended a compensation law, applicable to employment on, in, or about railroads, street railways, factories, workshops, warehouses, mines, quarries, engineering work, and work in the construction, alteration, or repair of a building where scaffolding, staging, or ladders are used, on buildings being demolished, or in work about the construction, repair, or destruction of buildings where steam, water, or other mechanical power is used in the work.

The commission was unanimous in the opinion that the compensation law should operate exclusively in its field, but would reserve to an injured employee the right to sue in cases where the employer's gross negligence was the cause of the injury. The bill provided that proceedings instituted under either the compensation or the liability law barred the employee from action under the other. Medical inspection at the option and cost of the employer was provided for, with reference in disputed cases to medical referees to be appointed by the governor and paid by the county. Disputes as to facts were to be settled by a committee representing the employer and the employee, by an arbitrator agreed upon by the parties, or by a referee appointed by a justice of the superior court. Appeals were to be permitted on questions of law to the supreme judicial court, pending which any justice of the superior court might order compensation to be paid on proper and adequate representations. The maximum compensation for death was 3 years' earnings, not less than \$1,000 nor more than \$2,000; for disability, 50 per cent of the daily earnings to amount to not more than \$10 weekly, and to be allowed for not more than 4 years.

This bill was rejected, and no further action was taken until by an order of the senate, concurred in by the house, a committee of

8 members of the house and 3 of the senate was appointed in 1907 to report to the next legislature (among other matters) as to the expediency of legislation providing for "compensating workmen who are accidentally injured in the course of their employment." The majority of this committee felt that a compensation law of general application was at least not feasible at the time, though 5 members renewed the recommendation of the earlier committee. What was actually done by the legislature was to enact a law (acts of 1908, ch. 489; see acts of 1909, ch. 514, secs. 136-142, Bull. No. 85, p. 626) authorizing employers to submit to the state board of conciliation and arbitration schemes of compensation, which, if approved by the board, might form a basis of contracts between such employers and their employees by virtue of which the provisions of the compensation scheme should be substituted for the liability of the employer under the common law or the employers' liability act.

That such tentative and permissive legislation has not satisfied the demands of the parties in interest in the State of Massachusetts is evidenced by the adoption of a resolution by the legislature of that State (approved June 7, 1910) to the effect that "the public good requires a change in the present system of determining the compensation of employees for injuries sustained in industrial accidents, and that the Commonwealth ought to provide different and more suitable relief." The governor was therefore authorized to appoint, with the advice and consent of the council, a commission of 5 persons for the purpose of investigating the present laws of the State on the subject of employers' liability, and the laws and systems of other States and countries, and to "draft an act for the compensation of employees for industrial accidents." A printed report of data and statistics and a draft of an act are to be submitted on or before the second Wednesday in January, 1911. Expenditures by the committee may not exceed \$10,000.

ILLINOIS.

In the State of Illinois a committee appointed in 1905 reported a bill to the legislature of 1907 intended to provide a system of insurance of employees against the consequences of industrial accidents and authorizing contracts between employers and employees on the basis of an insurance scheme embodied in the bill. This bill failed of enactment. At an extra session of the legislature in 1910 an act was passed providing for a commission of 12 members, to be appointed by the governor, 6 of whom should be employers of labor, and 6 "either employees or persons known to represent the interests of workmen." The duties of this commission are to investigate the problems of industrial accidents, and especially the present condition of the law of liability for injuries or death suffered in the course of

industrial employment, both in Illinois and in other States and countries; to inquire into the most equitable and effectual method of providing for compensation for such losses, and to report its conclusions with a draft of such bill or bills as may be deemed appropriate, on or before September 15, 1910. Cooperation with similar commissions of other States, so far as practical, is directed; and the sum of \$10,000 appropriated for the expenses of the commission.

CONNECTICUT.

A senate joint resolution of the State of Connecticut (No. 228, approved February 27, 1907) directed the appointment by the governor of a committee to make investigations and recommendations with reference to laws for the regulation of the liability of employers for injuries to employees. This committee consisted of 1 employer, 1 employee, and a lawyer, and was to report on or before April 2 following, but the time was extended to May 20, 1907, and subsequently to the early part of January, 1909. This committee considered the subject of compensation, and while unanimously recognizing the high authority of the indorsements of the system and agreeing that the future relations of employer and employee will very probably be settled by legislation along this line, they were not able to agree in the matter of recommending such an act at that time. The existing law of the State of Connecticut is a bare restatement of some of the principles of common law applicable to this subject, and the committee reported a bill modifying the fellow-servant doctrine to some extent, and particularly in the matter of employment on railroads, the bill being of the general type of the British liability law of 1880, as adopted by the neighboring States of Massachusetts and New York. The bill failed of adoption.

WISCONSIN.

The legislature of Wisconsin in 1907 considered a bill embodying the idea of compensation somewhat as represented in the British act, but without adopting such a measure. In 1909 a resolution was passed looking to the appointment of a committee, consisting of 4 members of the assembly and 3 of the senate, "to thoroughly investigate the subject of industrial insurance and to report a bill or bills covering that subject." The line of investigation mentioned was not to limit the field of the committee's inquiries and it was empowered to enter upon such others in connection therewith as it should deem expedient. Expenditures for stenographers, clerks, assistants, and experts, and the reimbursement of personal expenses of the committee were authorized.

MINNESOTA AND NEW YORK.

Two other commissions were appointed in 1909, the legislature of New York, by an act of May 27 (ch. 518), and that of Minnesota, by its act of April 20 (ch. 286), providing such bodies. The New York commission consists of 14 persons, of whom 6 were to be appointed by the governor, 3 by the president of the senate from the senate, and 5 by the speaker of the assembly from the assembly. The working of the New York law was to be investigated as well as "the comparative efficiency, cost, justice, merits, and defects of the laws of other industrial States and countries relative to the same subject." The sum of \$10,000 was put at the disposal of this commission, and the commissioner of labor directed to cooperate with it. The commission was to report to the legislature of 1910, if practicable; otherwise, to that of 1911.

The Minnesota commission consists of 3 persons appointed by the governor, by and with the consent of the senate, and was by the act creating it given the name of "The Minnesota Employees' Compensation Commission." By the terms of the act 1 employer, 1 employee, and 1 member learned in the law were to be selected, each of them to be known to possess knowledge of and training in the subject of compensation of employees for injuries received in the course of employment. The laws of other States and foreign countries were to be studied, with a view to discovering whether or not they were successfully adapted to the needs of the jurisdictions in which they are operative, and sufficient data and information furnished to indicate the practical adaptability of such laws to the industrial and constitutional conditions controlling in the State. The report of information collected and the bill or bills drafted by the commission are to be in readiness at the opening of the legislative session of 1911. This commission is allowed only its expenses, in an amount not to exceed \$5,000.

NEW JERSEY AND OHIO.

Two other legislatures besides that of Massachusetts provided in 1910 for commissions of the same nature as those above mentioned. In New Jersey the governor in his annual message recommended the appointment of a commission "to consider the provisions of the employers' liability acts of Great Britain, Germany, and other foreign countries, and to report to the next session of the legislature a draft of an act with relation to compensation for accidents to employees." Joint resolution No. 2, approved April 9, 1910, called for the appointment by the governor of two representatives of the labor interests of the State, two who are representative of the employers' interests, together with one member of the senate named by its president and

one member of the house named by its speaker, these persons to constitute a commission to make inquiry into the subject-matter recited in the above quotation from the preamble of the resolution. The legislation of the various States and of foreign countries is to be considered, as well as the results of the same, and a bill is to be reported to the next session of the legislature, with the reasons therefor. The expenses of this commission are limited to \$1,000. The other legislature to take action in this direction is that of Ohio, which enacted a law (senate bill No. 250, approved May 17, 1910) authorizing the appointment by the governor of a commission to be composed of persons known to possess knowledge and training in the subject of employers' liability laws and compensation of employees for injuries. Two of these persons are to represent employers, 2 to represent labor, and the fifth to be an attorney at law. This commission is to conduct an "investigation into the subject of a direct compensation law or a law affecting the liability of employers to employees for industrial accidents." The commission is authorized to visit different States and localities, to investigate the laws of other States and countries, and to employ and pay all necessary assistants. Actual and necessary expenses are authorized, no amount being specified. A full report of the work and findings of the committee is directed to be made at the opening of the next regular session of the general assembly, "together with such bill or bills providing for the speedy remedy for employees for injuries received in the course of their employment as will be fair, just, and reasonable to both employers and employees." This legislature passed a very advanced employers' liability law before adjournment.

CONFERENCES OF COMMISSIONS.

Members of the three commissions appointed in 1909—i. e., of Minnesota, New York, and Wisconsin—with other persons interested in the subject, met, at the invitation of the Minnesota commission, in a conference on workmen's compensation acts at Atlantic City, N. J., in July, 1909. Constitutional and economic considerations were presented in this conference, and a permanent organization provided for, to be known as the "National Conference upon Compensation for Industrial Accidents." The second meeting of this body was held at Washington in January, 1910, a third at Chicago in June, and a fourth arranged for at St. Louis in December, 1910. At the Washington conference the same state commissions were represented as at Atlantic City, while at Chicago the programme called for reports from these three and from the Illinois, New Jersey, and Ohio commissions, the Massachusetts commission having been appointed too late to be mentioned in the programme, though it was represented at the meeting.

MINNESOTA BILL.

The subject announced for discussion at the Chicago conference of June, 1910, was the "Workers' compensation code," this being the name given to the draft of a bill proposed for submission to the legislature of the State of Minnesota. This draft proposes to substitute for liability under the common law and state statute law a provision for compensation to apply to all dangerous employments, such employments being defined as all those in which hereafter occurs any bodily injury to an employee arising out of and in the course of such employment.

The sections of the bill providing for and defining the compensation to be paid are as follows:

SECTION 2. That every such employer shall be liable to pay to every such employee so injured, or in case of his death, to the legal representatives, as hereinafter defined and apportioned for all bodily injuries received by such employee arising out of, and in the course of, such employment in this State disabling such employee from the regular services in such employment for more than ten days and according to the schedule of rates contained in section three of this act, on the condition precedent only, that, in case of dispute as to the amount to be paid for such injuries, or the failure or refusal to agree upon or to pay same, such employee or the legal representatives thereof shall comply with the provisions of this act.

SEC. 3. The compensation herein and hereby allowed, if established as herein provided, having arisen out of and in the course of such dangerous employment within this State, shall be on the following basis:

(a) For immediate death or for death accruing within five years as a result of such injuries, or for injuries causing total incapacity for that service for five years or more, sixty per cent of the amount of wages the injured was receiving at the time of the accident for a period of five years, provided, such payment shall not continue longer than to aggregate three thousand dollars.

(b) For total or partial disability for less than five years, sixty per cent of the wages the injured was receiving at the time of the injury so long as there is complete disability for that service and that proportion of the said percentage which the depleted earning capacity for that service bears to the total disability when the injury is only partial or after it becomes only partial.

(c) In addition to the foregoing payments, if the injured loses both feet or both hands, or one foot and one hand, or both eyes, or one eye and one foot or one hand, he shall receive, during the full period of five years, forty per cent of the wages which he was receiving at the time of such accident; or if he loses one foot, one hand, or one eye, the additional compensation therefor shall be fifteen per cent of his wages; or if he be otherwise maimed or disfigured, then, for such maiming or disfigurement, during the time it shall continue, he shall receive therefor such proportion of forty per cent as such maiming or disfigurement bears in depleted ability in the employment to the relative loss of the members specified herein: *Provided,*

That in no case shall all of the payments received herein exceed in any month the whole wages earned when the injury occurs, nor shall the said forty per cent when all received, or any portion thereof, and the said sixty per cent when all received, or any portion thereof, continue longer than to make all sums aggregate five thousand dollars.

The determination of claims is to be effected by a "board of awards" to consist of three members from each judicial district of the State. The risk may be insured, and a percentage (not fixed in the draft) of the cost of such insurance may be deducted from the employee's wages. Provisions for rehearing are contemplated, but not provided for in this draft of the bill. A provision that is necessary and common to all bills on the subject is that injured employees shall submit themselves to medical examination from time to time at the expense of the employer, refusal to submit thereto suspending payments during the continuance of such refusal.

WISCONSIN BILL.

The Wisconsin commission in March, 1910, presented two tentative bills to the public, one modifying the law as to employers' liability, and the other proposing a compensation law proper. Public hearings were held on these bills in April, after which the bills were redrawn and again printed, while a third draft, embodying a number of changes, was presented in midsummer. The compensation bill provides for a choice by private employers between its provisions and those of the proposed liability bill, but is compulsory on the State and its municipalities in their capacity as employers. Employees may reserve their rights to sue under common or statute law by contracts in writing at the time of hiring, though it will be presumed that both employer and employee have accepted the compensation law as governing their rights in case of accident. Principal contractors are liable for injuries to employees of subcontractors, but may be indemnified by such subcontractors if the board of arbitration provided for in the act so awards. The provisions of this bill as to compensation are contained in sections 12 to 15, which are as follows:

SEC. 12. Any employee injured while performing duties growing out of and incidental to his employment, or his legal representative if death results therefrom, shall, without regard to negligence, receive compensation from his employer as herein provided, except for injuries or death caused by the willful misconduct or intoxication of such employee.

SEC. 13. So far as preference or lien is concerned, the compensation herein provided shall stand exactly upon the same basis as the wages of such employee.

SEC. 14. The compensation payable according to this act shall be as provided in the following schedule:

(1) In case of disability the compensation shall be:

(a) Free medical treatment at the time of the injury and as long thereafter as necessary, not to exceed ninety days, medicine and other means of treatment, also the facilities (crutches, supporting apparatus, etc.) to aid in the success of the treatment and to diminish the effects of the injury.

(b) An indemnity, payable as wages on the first day of the second week after the injured employee leaves work as the result of the injury, and at the same intervals thereafter as long as the disability lasts, or until the amount of the indemnity paid equals the amount of compensation payable as a death benefit.

(c) If the period of disability does not last more than one week from the day the injured employee leaves work as the result of the injury, no indemnity shall be paid.

(d) The amount of the indemnity shall be:

First. In the case of total disability, 65 per cent of the annual earnings.

Second. In the case of partial disability, 65 per cent of the loss in wages.

(e) If the injury causes the irrecoverable loss of one or both eyes, or the immediate severing of hand or foot at or above the wrist or ankle, the following benefits, which shall be in lieu of an indemnity, shall be paid:

First. In the case of the total and irrecoverable loss of the sight of one eye, three-fourths of the average annual earnings; of both eyes, four times the average annual earnings, but not less than two thousand dollars.

Second. In the case of the loss of one hand or one foot, one and one-half times the annual earnings, but in any event not less than five hundred dollars nor more than two thousand dollars; of both hands or both feet, or of one hand and one foot, four times the average annual earnings, but not less than two thousand dollars.

(f) If in consequence of the accident the injured person is rendered not only entirely incapable of work, but also sufficiently helpless to require the assistance and care of a nurse, the indemnity shall be increased to one hundred per cent of the annual earnings as long as this condition lasts, or until the indemnity paid equals the amount of compensation payable as a death benefit.

(g) If the injured person was at the time of the injury already suffering from partial or permanent disability, and is also receiving compensation therefor, compensation shall be paid in accordance with subsection five of section fifteen in the same manner and to the same extent as though the former injury had not been sustained.

(2) In case the injury results in death, the compensation shall include the benefits provided in subsection one of this section for the period before death, and an additional amount sufficient to make the whole compensation equal to the following:

(a) If the injured person leaves any person or persons wholly dependent upon his earnings at the time of his death, a sum equal to three times his annual earnings, computed according to the provisions of section fifteen, in the employment of the same employer during the year next preceding the injury, but not less than one thou-

sand dollars nor more than three thousand dollars; this sum, with interest at six per cent per annum, shall be paid as wages and at the same intervals until the whole amount has been paid, unless the county judge of the county in which said dependent or dependents reside, upon application made to him for that purpose, shall determine that such compensation should be paid in a lump sum.

(b) If the injured person leaves no one wholly dependent upon his earnings, but leaves any person or persons partially dependent thereof, a sum equal to the same proportion of the payments provided for the benefit of persons wholly dependent as the amount contributed to said partial dependents bears to the annual earnings of the deceased at the time of his injury.

(c) If the injured person leaves no dependents, a reasonable sum for his burial, which shall not exceed one hundred dollars.

Sec. 15. The basis for computing the compensation specified in section fourteen shall be as follows:

(1) The compensation is to be computed on the basis of the annual earnings which the injured employee received as salary or wages in that employment during the year next preceding the injury. Wages or salary in excess of one thousand dollars shall not be considered.

(2) The annual earnings, if not otherwise determined, are to be regarded as three hundred times the average daily earnings. In such computation wages in excess of three dollars and thirty-three and one-third cents a day shall not be considered. For persons in employments in which it is the custom to operate for a part of the whole number of working days, such number shall be used instead of three hundred as the basis on which to reckon the daily earnings.

(3) If the injured person has not been employed in the employment for a full year immediately preceding the accident, compensation shall be reckoned according to the annual earnings which persons of the same class of the same or neighboring employments of the same kind have earned during this period. If this is impossible, three hundred times the amount which the injured person earned on an average on those days when he was working during the year next preceding the accident is to be used as a basis for the computation.

(4) In the case of injured persons who earned either no wage or less than three hundred times the usual daily wage of the adult day laborers of that locality, the yearly wage shall be reckoned as three hundred times this average local daily wage in the same or similar employments.

(5) In computing the compensation in the case considered in subdivision "g" of subsection one of section fourteen for persons who before the injury were already suffering from partial or permanent disability, the yearly earnings shall be reckoned as three hundred times the average daily wage received at the time of the last injury.

The bill provides for notice of injury, medical examinations at the option and cost of the employer, and for a board of arbitration for the adjustment of disputes. Appeals may be had from the findings of this board to the circuit court of Dane County, in which the state capital is located. Insurance of the risks under the law is contemplated, the compensation for each workman to constitute an individual risk.

NEW YORK STATUTES.

Of the commissions appointed in 1909, that of New York achieved the distinction of first results in so far as the enactment of a recommended bill is concerned, due in part, perhaps, to the fact that the legislature of that State meets annually, while those of Minnesota and Wisconsin meet biennially. The commission recommended legislation along two lines—one a compulsory compensation act applicable to specified dangerous employments, and one an elective compensation plan of general availability, coupled with amendments to the existing laws on liability. In accordance with these views, bills were drafted and introduced into the legislature covering both the proposed fields. Laws were enacted practically in accord with the proposals of the commission, the elective bill having become a law on May 24 as chapter 352 of the session laws of 1910. The compulsory bill became a law June 25 and is chapter 674 of the session laws. On account of the special interest attaching to the enactment of laws of this character by an American legislature, the first act is reproduced in full at pages 709 to 712, including the amended form of the liability law, which must be taken in connection with the compensation law, since its provisions are to be considered by employers and employees in their determination of the choice of remedies, i. e., of liability or compensation. The second or compulsory act is reproduced only in so far as its provisions differ from those of the elective law. The provisions as to notice, scale of compensation, medical examinations, mental incompetence of injured workmen, the settlement of disputes, preferences of compensation claims and exemptions from levy, execution, or attachment, and attorneys' fees are practically identical in the two laws. The distinctive sections, Nos. 215, 216, 217, 218, and 219-g, are given on pages 713 and 714.

REPORT OF NEW YORK COMMISSION.

ECONOMIC REASONS FOR A COMPENSATION SYSTEM.

The New York commission, in connection with the performance of the duties of its appointment, submitted to the state legislature, March 19, 1910, a report of 271 quarto pages, with a companion volume of 470 pages, containing minutes of evidence. Fourteen executive sessions of the commission were held, besides numerous meetings of committees and subcommittees; there were also 11 public hearings in the principal cities of the State, from November, 1909, to January, 1910, at which representatives of employers, of labor unions, and of various interested businesses and organizations were present, as well as individuals qualified to speak of particular phases of the subject in question, witnesses to the number of 121 having been examined during these sessions.

Special reports were prepared on the liability system of New York, the compensation systems of principal European countries and their adaptability to conditions prevalent in the State, and the relief associations of the State. Several statistical studies were also made to discover the economic and legal outcome of accidents; the cost of industrial accidents to employers and the distribution of such cost to hospitals, for fees, insurance premiums, settlements, and as damages; and the proportion of claims to accidents, of insured losses paid to amount of premiums, and the relation of cost of liability insurance to that of collective insurance in different dangerous trades. Another line of investigation was by means of inquiries to employers reporting accidents to the state department of labor (1,942 in number), to employers reporting accidents to the public-service commissions (975 in number), and to the presidents of 2,331 labor organizations in the State, to obtain an expression of opinion as to the justice of the existing liability system and the advisability of a change in the law. Letters were sent to the judges of the supreme court and court of appeals of the State and to the federal judges in the State as to the practical operation of the liability law; to 226 prominent lawyers of the State, asking opinions as to the constitutionality of certain proposed changes in the law; and to the commissioner of labor, the chairmen of the public-service commissions, and the superintendent of insurance as to the scope and methods of the investigation. The subject of the causes of industrial accidents was turned over to a special committee, which visited a number of factories and buildings in course of erection, besides holding one public hearing. By this means a large amount of suggestive material and of facts as to existing conditions was brought together, much of which is presented in the report and its 21 appendixes, and in the minutes of evidence already mentioned.

The first recommendation of the commission is directed to the question of the prevention of accidents, to effect which it urges the extension of the powers and activities of the public-service commissions in this particular direction, especially in regard to steam railroads, the enlargement of the factory-inspection force in the department of labor, and the organization of a branch of the inspection work to supervise building operations. The need of a better method of securing reports of accidents is also touched upon.

As to the principal subject of its investigation the commission says that it "is strongly of opinion that the present legal system of employers' liability in force in this State, and practically everywhere else in the United States, in industrial employments is fundamentally wrong and unwise and needs radical change." "It is, of course, a grave and serious matter for the State of New York to contemplate an entire change in its system of employers' liability, yet the most

enlightened thought, both of employers and workmen, is in favor of such changes in the law as shall tend toward the substitution for the present vicious system of a new system of workmen's accident compensation." "In the last 10 years the conclusion has been slowly but surely generating in the public mind that present conditions as to employers' liability are intolerable. We are firmly of the opinion that the time has come for the enactment of laws on this subject which shall be at least the first step to a satisfactory solution of the difficulties of the present system."

The report then reviews under separate heads and with some detail of discussion—

1. The present law of the State.
2. The laws of the United States and other States.
3. The operation of the present legal system and its economic results.
4. The laws of foreign countries.
5. Recommendations for immediate action and the grounds therefor.

The first and second topics are briefly discussed, reference being made to Bulletin No. 74 of the United States Bureau of Labor for a summary of the laws of the various States. Under the third head four principal objections against the present system are developed:

(a) That only a small proportion of the workmen injured by accidents of employment get substantial compensation, and therefore, as a rule, they and their dependents are forced to a lower standard of living, and often become burdens upon the State through public or private charity.

(b) That the system is wasteful, being costly to employers and the State, and of small benefit to the victims of accidents.

(c) That the system is slow in operation, involving of necessity great delay in the settlement of cases.

(d) That the operation of the law breeds antagonism between employers and employees.

The report furnished these objections by the results of the investigations conducted by the commission, and by other facts, was regarded by it as conclusive. In connection with the first objection, the commission investigated 181 cases in which married men lost their lives in industrial accidents in 1907 and 1908 in Erie County and in the Borough of Manhattan. Of this number it was found that the families received nothing in 56 cases, that they received \$100 or less in 12 cases; from \$101 to \$500 in 52 cases, from \$501 to \$2,000 in 19 cases, more than \$2,000 in 12 cases, while suits were pending in 30 cases, so that in 79 per cent of the closed cases the families received \$500 or less, and in only 7.9 per cent of such cases did they receive

more than \$2,000, or an amount equal to three times the average yearly earnings of the workmen considered. An investigation of 1,040 work accidents by the State labor department, in which total losses and payments were ascertained, showed that in 404 of the 902 cases of temporary disability (lasting from one week to more than one year) nothing was received by the injured person, not even medical expenses; while in 304 cases the amount recovered from the employer was less than one-half the loss of wages and expenses of the injury. In 71 cases there was permanent partial disability, reducing the earning capacity of the employee in varying amounts. Of this number 18 received nothing, 22 received \$100 or less, 14 received from \$101 to \$500, 5 received from \$501 to \$2,000, while 1 person received more than \$2,000; suits were still pending in 11 cases. In 902 cases of temporary disability there was a wage loss of \$66,800, besides medical expenses amounting to \$20,000, while all payments by employers amounted to but \$25,339, or less than 30 per cent of the losses and costs. Payments in cases of permanent partial disability make a somewhat better showing, approximating 34 per cent of the actual losses, though this omits from consideration the depreciated earning power; while in 10 cases of permanent total disability, computed on a basis of 3 years' wage loss, the payments by employers amounted to but 9.7 per cent of the losses and costs. Data obtained from other sources indicate the same general condition of inadequate compensation for losses suffered.

That the system of liability and damage suits entails waste is shown by the fact that the expenditures of 327 firms in the State in 1907, employing 125,995 men, amounted to \$192,538 on account of accidents, accident insurance, legal expenses, etc., of which the amount paid to the persons injured was but \$104,643, or 54 per cent of the employers' outgo in this connection. Premium receipts and payments of losses by nine insurance companies that keep separate accounts of their employers' liability business show that during 1906, 1907, and 1908 they took in as premiums \$23,523,585 and paid out in insurance \$8,559,795, or but 36 per cent of the premiums received. In connection with attorney's fees, which are frequently contingent on recoveries, it was shown that in 14 of the 51 cases investigated the fee was less than 25 per cent of the recovery, in 14 cases it was 50 per cent or more, while in the remaining 23 cases it was more than 25 per cent and less than 50 per cent.

The question of the cost to the employer of a compensation system as compared with the cost of the present system received consideration, the investigation of this phase of the question being conducted by the state bureau of labor statistics. Data were secured from 52 firms, employing above 29,000 persons, from which a comparative

study was made showing the actual cost of accidents during the year 1907, and the cost under a compensation scheme which allowed 3 years' earnings in case of death and half earnings during disability, making up the loss of wages where partial disability reduced the earning capacity. From the results of this investigation the report concludes that "even with the most liberal allowance for possible understatement on the cost of compensation side, it is impossible to interpret the figures as affording anything but very strong evidence that large manufacturing firms could pay compensation on such a scale as that here used, which is fully equal to the present English system, at no greater cost than many of them are now actually incurring for accidents, and probably in some cases for less." It is assumed that this conclusion should not be made to apply to small employers.

The objections that recovery, if any, is delayed, and that suits breed antagonism and result in loss of position, are founded on conditions too generally known to require an enumeration, though the evidence in this connection was both full and conclusive.

ATTITUDE OF EMPLOYERS AND EMPLOYEES.

One of the most interesting features of the report is the presentation therein of resolutions and briefs by bodies of employers and employees and of the opinions of representative employers and of officials of organized labor favoring the introduction of the compensation system. Of 146 employers replying, 98 are opposed to a compensation system that disregards the employee's negligence, while but 48 favor it; while, of 100 unions, 64 favor such a system and 36 oppose it. Of 116 employers replying to the question of whether or not they regard the employers' liability law fair, less than one-half, or but 53, answered in the affirmative, 63 stating that they did not so regard it; while of 129 employers giving their opinions as to the system of fixing damages by a jury trial but 30 thought it satisfactory, 99 holding a contrary opinion. Of 91 unions answering this inquiry, 44 thought it satisfactory, 47 expressing dissatisfaction. The replies of the judges to the inquiries addressed to them, mentioned on a foregoing page, were practically unanimous in favor of a change in the system of dealing with industrial accidents.

CONCLUSIONS OF THE NEW YORK COMMISSION.

In concluding its report the commission presented the drafts of the bills and amendments already referred to, together with explanation and comment. One member of the commission felt himself unable to join in the recommendations of the commission since, although it was clearly developed "that the employer as well as the employee realized that some just and fair plan should be worked out,"

he did not believe that the remedy to meet the situation had been yet found. The summary concurred in by the other members is as follows:

First. That the present system in New York rests on a basis that is economically unwise and unfair, and that in operation it is wasteful, uncertain, and productive of antagonism between workmen and employers.

Second. That it is satisfactory to none, and tolerable only to those employers and workmen who practically disregard their legal rights and obligations and fairly share the burden of accidents in industries.

Third. That the evils of the system are most marked in hazardous employments where the trade risk is high and serious accidents frequent.

Fourth. That as a matter of fact workmen in the dangerous trades do not, and practically can not, provide for themselves adequate accident insurance, and therefore the burden of serious accidents falls on the workmen least able to bear it, and brings many of them and their families to want.

These results can, we think, be best avoided by compelling the employer to share the accident burden in intrinsically dangerous trades, since by the fixing of the price of his product the shock of the accident may be borne by the community. In those employments which have not so great an element of danger, in which, speaking generally, there is no such imperative demand for the exercise of the police power of the State for the safeguarding of its workers from destitution and its consequences, we recommend as the first step in this change of system such amendment of the present law as will do away with some of its unfairness in theory and practice and increase the workman's chance of recovery under the law. With such changes in the law we couple an elective plan of compensation which, if generally adopted, will do away with many of the evils of the present system. Its adoption will, we believe, be profitable to both employer and employee and prove to be the simplest way for the State gradually to change its system of liability without disturbance of industrial conditions.

Not the least of the motives moving us is the hope that by these means a source of antagonism between employer and employed, pregnant with danger for the State, may be eliminated.

ACTION BY EMPLOYERS AND ASSOCIATIONS OF EMPLOYERS AND OF WORKMEN.

Besides work along these lines of legislative action or suggestion, there is a hardly less important and influential force at work from the side of the employer and the employed, acting through the channels of their own organizations and in connection with individual establishments, industries, or associations. The actual attainments up to 1907 made in the direction of compensation and relief benefits are set forth in the Twenty-third Annual Report of the Commissioner of Labor, the subject of which is workmen's insurance and benefit funds in the

United States. Labor organizations, railroads, factories, mines, and industrial and mercantile undertakings of all sorts are represented in the movement whose object is to alleviate the hardships and distress following on disability caused by industrial accidents.

UNITED STATES STEEL CORPORATION.

A striking recent illustration of this form of action is found in the case of the United States Steel Corporation which put a new accident relief system into operation in May of this year for a trial year. This corporation has a pay roll of nearly a quarter of a million men, and while many of its branches of work involve what are called hazardous employments, all classes of employment are on the same basis as to the benefits of the relief system. The question of negligence is put entirely aside, the only condition for the receipt of relief being that there shall be disabling accidental injury in the course of employment. The injury must be such as to prevent the employee from following "his usual or any other occupation." The bringing of a suit at law bars all benefits under the scheme. The employee is called on for no contribution, all funds being supplied by the corporation.

The amount of benefits paid begins with 18 months' earnings as death benefits for married men living with their families, the scale increasing with the number of children under 16 years of age and with length of service, the maximum limit being \$3,000. Unmarried employees are entitled to no death benefits other than funeral expenses, and the limitation as to married men, i. e., "living with their families," apparently cuts off nonresident families of alien workmen from all compensation under this scheme. Considerable discretion is allowed in the administration of both death and disability features of the scheme, and provision is made for medical and hospital treatment. Temporary disability is relieved according to a sliding scale, the amount not to exceed \$1.50 per day for single men and \$2 per day for married men. Permanent-disability cases are generally to be dealt with according to their nature, but stated rates are announced for the loss of a hand (12 months' wages), the loss of an arm (18 months' wages), the loss of a foot (9 months' wages), the loss of a leg (12 months' wages), and the loss of an eye (6 months' wages). This system connects itself essentially and naturally with measures of the company to safeguard its workmen from accidental injury.

INTERNATIONAL HARVESTER COMPANY.

Another corporation taking an important step in the same direction is the International Harvester Company and associated companies, the system becoming effective May 1, 1910. This scheme, affecting

approximately 30,000 employees, also ignores the customary defenses of negligence, assumed risks, and fellow-service, only intoxication and willful disregard of the use of safety appliances cutting employees off from the benefit of the scheme. No distinction is made between employees having resident and those having nonresident families. Dependents of employees dying as the result of accident and within 16 weeks of its occurrence receive 3 years' average earnings, but not less than \$1,500 nor more than \$4,000. For injury causing "inability to work at any gainful occupation whatsoever," the pay is one-quarter of the average earnings for the first 30 days and half pay thereafter for not more than 104 weeks from the date of the accident, compensation not to exceed \$20 a week. If total disability continues after 104 weeks, the workman shall receive during such continuance an annual pension equal to 8 per cent of the death benefit which would have been payable in case of his death, but not less than \$10 per month, payments to be made monthly. The loss of a hand or foot calls for the payment of one and one-half years' wages, not less than \$500 nor more than \$2,000; the loss of both hands or both feet, or one hand and one foot, four years' average wages, but not less than \$2,000; the loss of one eye, three-fourths of a year's wages; and of both eyes the same as for both hands or feet. By the contribution of small sums—6 cents per month from employees earning \$50 or less per month, 8 cents from those earning more than \$50 and not more than \$100, and 10 cents from those earning more than \$100—the one-fourth pay for the first 30 days' disability may be increased to one-half pay for workmen making such contributions. No part of such contributions is to go for operating expenses. Lump-sum payments may be arranged for in lieu of weekly payments, and the acceptance of benefits is to operate as a release from all claims against the company.

NATIONAL ASSOCIATIONS OF EMPLOYERS.

The National Metal Trades Association announced in the spring of this year a mutual insurance scheme in which employees in shops managed by its members may procure insurance covering sickness as well as accidents at a cost of \$1 per month. No initial deposit or membership fee is required. No benefits are paid for disability lasting not more than 7 days, but if it lasts for 30 days full benefits are paid for the whole period. The rates of benefit vary from \$20 to \$60 per month according to the class of employment. The president of the National Cotton Manufacturers' Association advocates the establishment of a contributory accident insurance system for the cotton industry, and the National Manufacturers' Association has had a committee at work

since early in the current year investigating the question of compensation with the idea of drafting measures to be submitted to that body. The report of this committee to the fifteenth annual convention of that body in May last shows 67 per cent of the manufacturers in membership with the association to be in favor of a voluntary mutual insurance system among the membership, while 90 per cent are dissatisfied with the workings of the present employers' liability laws and liability insurance systems. The association adopted resolutions very much in agreement with the findings of the New York commission set forth above as to the inadequacy and unsatisfactory results of the present liability system, the fourth resolution being: "That we recommend to our members the inauguration with the least possible delay of a system of voluntary, mutually contributory industrial accident indemnity insurance, this system to be elastic enough to provide for voluntary, contributory sickness, old age, and death insurance, if later deemed advisable." The association expressed its desire "to cooperate with state legislators in promoting uniform, sound industrial indemnity legislation," while opposing unsound legislation. The president and directors of the association were authorized to arrange for the establishment of a suitable plan.

NATIONAL CIVIC FEDERATION.

The National Civic Federation, representing employers, employees, and the public at large, at its tenth annual meeting in November, 1909, made the matter of compensation for injured wage-earners the principal subject of consideration, carrying the discussion forward to its conference on uniform state legislation in January last. At this latter meeting it was resolved to recommend "that workmen's compensation acts, fair to the employer and employee and just to the State, be uniformly substituted for the present system of employers' liability for injuries received in and arising out of the course of employment."

AMERICAN FEDERATION OF LABOR.

Organized labor, as represented by the American Federation of Labor, is also strongly committed to the idea of compensation, the proceedings of the conventions showing the growth of this sentiment to be rapid in recent years. The executive council of the federation has prepared four bills embodying compensation provisions, and applicable to employment generally, to employées of the Federal Government, to dangerous employments in jurisdictions subject to federal control, and to persons employed in interstate and foreign commerce. These bills were indorsed by the annual convention of the federation of 1909, and activity of agitation in their behalf was encouraged.

The desirability of uniform enactments was dwelt upon in this connection—a feature of the case that was also emphasized in the discussions by the National Civic Federation noted above.

LEGAL PRINCIPLES INVOLVED.

The present system of employers' liability is admittedly a development along the lines of established legal ideas and principles, the occasion for the changes urged in the system being found in the alleged inadequacy of these ideas and principles to meet the industrial conditions of the present; i. e., the demand is fundamentally economic. It is none the less essential that the new system shall comport with the constitutional principles by which all legislation must be tested, so that after the economic desirability of a change is proved, the question of constitutionality remains for consideration. This phase of the question was presented at length at the Atlantic City conference and is discussed in the report of the New York commission, as must be the case whenever the subject is seriously considered. The relations of employer and employee and the conditions under which business and industrial undertakings can be carried on have been so extensively and particularly regulated by statute that the principal question lying open in this case is apparently that of sufficient justification to warrant the exercise by the legislatures of the police power in respect of this particular subject.

What the police power is, is not capable of exact definition, since it is subject to growth and change with changing industrial and social conditions.^(a) Under it a government may preserve and promote the public welfare by establishing such rules and regulations for the conduct of persons and the management of business and property as may be conducive to the comfort, welfare, and safety of society.^(b) Both property and liberty are held on such reasonable conditions as may be imposed by the governing power of the State in the exercise of this power, and with such conditions the provisions of the fourteenth amendment of the Federal Constitution, declaring that no State shall "deprive any person of life, liberty, or property without due process of law, nor deny to any person within its jurisdiction the equal protection of the laws," were not designed to interfere; but every exercise of the police power is none the less subject to inquiry as to whether it is fair, reasonable, and appropriate; or whether, on the other hand, it is an unreasonable, unnecessary, and arbitrary interference with the right of individuals to their personal liberty.^(c)

^a *Atkin v. Kansas*, 191 U. S. 207, 24 Sup. Ct. 124; *Holden v. Hardy*, 169 U. S. 366, 18 Sup. Ct. 383.

^b *Am. and Eng. Cyc. of Law*, vol. 22, p. 916.

^c *Lochner v. New York*, 198 U. S. 45, 25 Sup. Ct. 539.

The police power is therefore flexible and adaptable to the needs of the public welfare as they develop. The idea expressed by the words of the fourteenth amendment, "due process of law," is hardly less broad. Though the words differ, the same idea is expressed in the phrase, "law of the land."^(a)

It is not restricted to the test of conformity to process or jurisprudence in use at some fixed past time, since to so construe it would unduly restrict and hamper procedure and deny every quality of the law but its age and render it incapable of progress or improvement.^(b) Any legal proceeding enforced by public authority, whether sanctioned by age and custom or newly devised in the discretion of the legislative power, in furtherance of the general public good, which regards and preserves the principles of liberty and justice must be held to be due process of law.^(c) The State is not tied down by any provision of the Federal Constitution to the practice and procedure which existed at the common law.^(d) Due process of law is secured if the laws operate on all persons alike.^(e)

The provision guaranteeing to all persons the equal protection of the laws is satisfied when all persons or classes in like conditions and circumstances enjoy like privileges under the law.^(f) It does not limit, nor was it intended to limit, the subjects upon which the police power of a State may be exerted, but simply requires that legislation shall treat alike all persons affected by it.^(g) "The greater part of all legislation is special, either in the objects sought to be ascertained by it, or in the extent of its application. Such legislation does not infringe upon the clause of the fourteenth amendment requiring equal protection of the laws, because it is special in its character. When legislation applies to particular bodies or associations, imposing upon them additional liabilities, it is not open to the objection that it denies to them the equal protection of the laws, if all persons brought under its influence are treated alike under the same conditions. The hazardous character of the business of operating a railway would seem to call for special legislation with respect to railroad corporations, having for its object the protection of their employees as well as the safety of the public. The business of other corporations is not subject to similar dangers to their employees, and no

^a *Dartmouth College v. Woodward*, 17 U. S. 513, 4 L. Ed. 629; *Missouri P. R. Co. v. Humes*, 115 U. S. 512, 6 Sup. Ct. 110.

^b *Twining v. New Jersey*, 211 U. S. 78, 29 Sup. Ct. 14.

^c *Hurtado v. California*, 110 U. S. 516, 4 Sup. Ct. 111.

^d *Brown v. New Jersey*, 175 U. S. 172, 20 Sup. Ct. 77.

^e *Duncan v. Missouri*, 152 U. S. 377, 14 Sup. Ct. 570.

^f *Missouri v. Lewis*, 101 U. S. 22, 25 L. ed. 989.

^g *Minneapolis and St. L. R. Co. v. Beckwith*, 129 U. S. 26, 9 Sup. Ct. 207.

objections, therefore, can be made to the legislation on the ground of its making an unjust discrimination."^(a)

The hazardous nature of an industry is therefore an adequate reason for legislation applying to its conduct, superseding in greater or less degree the right of contract as between the employer and his workmen;^(b) and, as already indicated, it is in part on this fact that the New York statute providing for compulsory compensation in specified dangerous employments relies. Laws abrogating the defense of common employment either generally or in designated industries are constitutional;^(c) so of laws modifying the defense of assumption of risks^(d) and of contributory negligence;^(e) and in general it is no objection to a law that it imposes a measure of liability on an employer that is unknown at common law. The defenses of assumed risks and contributory negligence are frequently abrogated outright in cases where injury results from the failure of an employer to conform to a standard of safety fixed by statute. In other statutes the employee is declared to have, in the defined circumstances, the same rights of action and recovery as if he had not been an employee.

The extent to which such a declaration carries the matter appears from a consideration of statutes that make the proprietors of an undertaking responsible for injuries resulting from its conduct without personal fault. Thus a Nebraska statute makes railroad companies liable for injuries to passengers unless the injury is the result of the criminal negligence of the person injured or of his violation of some known rule. The supreme court of the State in upholding this statute said: "The legislation is justified under the police power of the State. It was enacted to make railroad companies insurers of the safe transportation of their passengers, as they were of baggage and freight."^(f) The Supreme Court of the United States sustained this view, quoting the above with approval, and adding: "Our jurisprudence affords examples of legal liability without fault, and the deprivation of property without fault being attributable to its owner. The law of deodands was such an example. The per-

^a *Missouri P. R. Co. v. Mackey*, 127 U. S. 205, 8 Sup. Ct. 1161; *Tullis v. R. Co.*, 175 U. S. 348, 20 Sup. Ct. 136.

^b *Holden v. Hardy*, 169 U. S. 366, 18 Sup. Ct. 333.

^c *Missouri P. R. Co. v. Mackey*, supra; *Tullis v. R. Co.*, supra; *Powell v. Sherwood*, 162 Mo. 605, 63 S. W. 485; *Mining Co. v. Firstbrook*, 36 Colo. 499, 86 Pac. 313.

^d *El Paso & S. W. R. Co. v. Foth*, 45 Tex. Civ. App. 275, 100 S. W. 171; *Thomas v. Quartermaine*, L. R. 18 Q. B. Div. 685, 56 L. J. Q. B. N. S. 340; *Narramore v. Cleveland*, etc., R. Co., 96 Fed. 298, 37 C. C. A. 499; *Greenlee v. R. Co.*, 122 N. C. 977, 30 S. E. 115; *Valjago v. Steel Co.*, 226 Pa. 514, 75 Atl. 723.

^e *Kiley v. Chicago*, etc., R. Co., 138 Wis. 215, 119 N. W. 309; *Missouri P. R. Co. v. Castle*, 172 Fed. 841 (C. C. A.).

^f *Chicago, R. I. & P. R. Co. v. Zerneck*, 59 Nebr. 689, 82 N. W. 26.

sonification of the ship in admiralty law is another. Other examples are afforded in the liability of the husband for the torts of the wife, the liability of a master for the acts of his servant."^(a) It is obviously only necessary to place on the statute books of the same State the two provisions last cited—i. e., the one giving the employee the status of a third person and the one making the undertaker responsible for damages resulting from the conduct of his business—to attain the full extent of the protection proposed by compensation legislation.

A text writer discussing this subject says:

If the rule of absolute liability is held to be unconstitutional, it must be on the ground that justice and equality forbid that a person be required to make good the loss of another unless some fault or culpability can be imputed to him. * * * The principle that inevitable loss should be borne, not by the person on whom it may happen to fall, but by the person who profits by the dangerous business to which the loss is incident, embodies a very intelligent idea of justice and which seems to be in accord with modern social sentiment. Moreover, the rule of absolute liability is established in our law in the case of fires caused by locomotives and has been sanctioned by the United States Supreme Court. (165 U. S., 180. [See *St. Louis & S. F. R. Co. v. Mathews*, 165 U. S., 1]) It also underlies the rule of respondeat superior, since the employer can not relieve himself from liability for the act done by the servant within the scope of his employment by proof of the greatest possible care in the selection of the servant. Logic and consistency therefore demand that liability irrespective of negligence should not be denounced as unconstitutional. The required element of causation may readily be found in the voluntary employment of dangerous instruments or agencies.^(b)

In connection with the above quotation, the construction of the federal employers' liability law of 1906 (and in respect of the points involved the provisions of the act of 1908 are the same) may be considered, as it was discussed in the case *Howard v. Illinois C. R. Co.* (207 U. S. 463; 28 Sup. Ct. 141). Justice White, delivering the opinion of the court, said:

Besides, the statute, it is urged, discriminates against all who engage as common carriers in interstate commerce, since it makes them responsible, without limit as to the amount, to one servant for an injury suffered by the acts of a coservant, even in a case where the negligence of the injured servant has contributed to the result, hence placing all employers who are common carriers in a disfavored and all their employees in a favored class. Indeed, it is insisted that the statute proceeds upon contradictory principles, since it imposes the increased responsibility just stated upon the master presumably

^a *Chicago, etc., R. Co. v. Zerneck*, 183 U. S. 582; 22 Sup. Ct. 229. See also *Chicago, B. & Q. R. Co. v. Wolfe*, 187 U. S. 638; 23 Sup. Ct. 847.

^b Freund, "The police power," sec. 634.

in order to make him more careful in the selection of his servants, and yet minimizes the necessity for care on the part of the servant by allowing recovery although he may have been negligent.

But without, even for the sake of argument, conceding the correctness of these suggestions, we at once dismiss them from consideration as concerning merely the expediency of the act and not the power of Congress to enact it.

And Justice Moody in discussing the substantial provisions of the statute in his dissenting opinion pointed out that "the remedy afforded by it is more generous to the employee than that given by the common law in several respects"—first, in allowing recovery of damages for death resulting from negligence; second, in abrogating the defense of fellow-service; third, in exacting a provision as to comparative negligence, by virtue of which the contributory negligence of the injured person does not bar recovery, if the employer's negligence is greater, but only serves to reduce the amount of damages recoverable; and, fourth, by making void all contracts relieving the employer from liability for injuries received by the employee in the course of employment; concluding, "Thus four doctrines of the common law restrictive of the employee's rights are supplanted by others more favorable to him."

Justice Moody then said:

There can be no doubt of the right of a legislative body, having jurisdiction over the subject, to modify the first three of these rules of the common law in the manner in which this act of Congress does it. They are simply rules of law, unprotected by the Constitution from change, and like all other such rules must yield to the superior authority of a statute. They have so generally been modified by statute that it may well be doubted if they exist in their integrity in any jurisdiction. * * * Whenever the legislative power to change any of these rules of the common law has been drawn in question in this court it has been sustained.

It may be recalled in this connection that the statute in question has been declared constitutional in the Territories and the District of Columbia;^(a) while in respect of the fourth point, relating to contracts of waiver, a decision of the court of appeals of the District of Columbia held this provision to be constitutional.^(b) This provision of the law of 1908 was referred to in a very recent case as intended to prevent the evasion of the other provisions of the act.^(c)

That compensation legislation prescribes the conditions of contracts between employer and employee and changes largely the legal consequences and incidents of such contracts is indisputable. It seeks to

^a *El Paso & N. E. R. Co. v. Gutierrez*, 215 U. S. 87, 30 Sup. Ct. 21, referring with approval to the ruling of the court of appeals of the District of Columbia to the same effect, *Hyde v. R. Co.*, 31 App. D. C. 466; 36 Wash. Law Rep. 582.

^b *McNamara v. Washington Terminal Co.*, 38 Wash. Law Rep. 343.

^c *Watson v. St. Louis, I. M. & S. R. Co.*, 169 Fed. 942.

improve the status of the employee, and in doing so devolves upon the employer the duty of administering the benefits provided, whether met at his own cost and expense or made a part of the cost of production and distributed among the consumers of his goods or the public served by his undertaking. But even granting that there is as the result of such legislation a shifting of relationships, it does not follow that it discriminates unfairly between employer and employee. Thus a statute regulating the payment of wages in store orders was said to have a tendency to place the employer and the employee upon equal ground,^(a) suggesting a previously existing recognizable inequality; in another case the Supreme Court speaks of it as an established and recognized fact that, in the making of contracts, employers and employees do not stand upon an equality.^(b) Such inequality is easily a result of the growth of corporations and the centralization of business management employing numerous and widely scattered employees, which fact legislatures may recognize in providing remedial legislation.^(c)

Many of the points of statutory enactment and of judicial construction noted above, together with other legal considerations, were embodied in the brief presented to the Atlantic City conference and in the report of the New York commission, the latter expressing its conclusion in the following language:

It is on these judicial statements and the authorities which follow them that we base our contention as to the power of the legislature to deal with the question of employers' liability on a basis other than fault. That the matter is clear beyond peradventure we do not assert, but that the legislature, on examining its power to enact the legislation we are about to recommend, will agree that such action is within its constitutional powers, we confidently expect.

STATUTES.

ACTS OF UNITED STATES CONGRESS, 1907-8.

CHAPTER 149.—*Liability of railroad companies for injuries to employees.*

SECTION 1. Every common carrier by railroad while engaging in commerce between any of the several States or Territories, or between any of the States and Territories, or between the District of Columbia and any of the States or Territories, or between the District of Columbia or any of the States or Territories and any foreign nation or nations, shall be liable in damages to any person suffering injury while he is employed by such carrier in such commerce, or, in case of the death of such employee, to his or her personal representative, for the benefit of the surviving widow or husband and children of such employee; and, if none, then of such employee's parents; and, if none, then of the next of kin dependent upon such employee, for such injury or death resulting in whole or in part from the negligence of any of the officers, agents, or employees of

^a Knoxville Iron Co. v. Harbison, 183 U. S. 13, 22 Sup. Ct. 1. See also Wilson v. State, 7 Kans. App. 428, 53 Pac. 371.

^b Holden v. Hardy, 169 U. S. 366, 18 Sup. Ct. 383.

^c New York Central & H. R. R. v. Williams, 92 N. E. 404 (N. Y.) 15; Commonwealth v. Hillside Coal Co., 22 Ky. L. R. 559, 58 S. W. 441.

such carrier, or by reason of any defect or insufficiency, due to its negligence, in its cars, engines, appliances, machinery, track, roadbed, works, boats, wharves, or other equipment.

Sec. 2. Every common carrier by railroad in the Territories, the District of Columbia, the Panama Canal Zone, or other possessions of the United States shall be liable in damages to any person suffering injury while he is employed by such carrier in any of said jurisdictions, or, in case of the death of such employee, to his or her personal representative, for the benefit of the surviving widow or husband and children of such employee; and, if none, then of such employee's parents; and, if none, then of the next of kin dependent upon such employee, for such injury or death resulting in whole or in part from the negligence of any of the officers, agents, or employees of such carrier, or by reason of any defect or insufficiency, due to its negligence, in its cars, engines, appliances, machinery, track, roadbed, works, boats, wharves, or other equipment.

Sec. 3. In all actions hereafter brought against any such common carrier by railroad under or by virtue of any of the provisions of this act to recover damages for personal injuries to an employee, or where such injuries have resulted in his death, the fact that the employee may have been guilty of contributory negligence shall not bar a recovery, but the damages shall be diminished by the jury in proportion to the amount of negligence attributable to such employee: *Provided*, That no such employee who may be injured or killed shall be held to have been guilty of contributory negligence in any case where the violation by such common carrier of any statute enacted for the safety of employees contributed to the injury or death of such employee.

Sec. 4. In any action brought against any common carrier under or by virtue of any of the provisions of this act to recover damages for injuries to, or the death of, any of its employees, such employee shall not be held to have assumed the risks of his employment in any case where the violation by such common carrier of any statute enacted for the safety of employees contributed to the injury or death of such employee.

Sec. 5. Any contract, rule, regulation, or device whatsoever, the purpose or intent of which shall be to enable any common carrier to exempt itself from any liability created by this act, shall to that extent be void: *Provided*, That in any action brought against any such common carrier under or by virtue of any of the provisions of this act, such common carrier may set off therein any sum it has contributed or paid to any insurance, relief benefit, or indemnity that may have been paid to the injured employee or the person entitled thereto on account of the injury or death for which said action was brought.

Sec. 6 (as amended by act of April 5, 1910). No action shall be maintained under this act unless commenced within two years from the day the cause of action accrued.

Under this act an action may be brought in a circuit court of the United States, in the district of the residence of the defendant, or in which the cause of action arose, or in which the defendant shall be doing business at the time of commencing such action. The jurisdiction of the courts of the United States under this act shall be concurrent with that of the courts of the several States, and no case arising under this act and brought in any state court of competent jurisdiction shall be removed to any court of the United States.

Sec. 7. The term "common carrier" as used in this act shall include the receiver or receivers or other persons or corporations charged with the duty of the management and operation of the business of a common carrier.

Sec. 8. Nothing in this act shall be held to limit the duty or liability of common carriers or to impair the rights of their employees under any other act or acts of Congress, or to affect the prosecution of any pending proceeding or right of action under the act of Congress entitled "An act relating to liability of common carriers in the District of Columbia and Territories, and to common carriers engaged in commerce between the States and between the States and foreign nations to their employees," approved June eleventh, nineteen hundred and six.

Sec. 9 (added by act of April 5, 1910). Any right of action given by this act to a person suffering injury shall survive to his or her personal representative, for the benefit of the surviving widow or husband and children of such employee, and, if none, then of such employee's parents; and, if none, then of the next of kin dependent upon such employee, but in such cases there shall be only one recovery for the same injury.

Approved, April 22, 1908.

LAWS OF NEW YORK, 1910.

CHAPTER 352.—*Liability of employers for injuries to employees. Compensation for injuries.*

SECTION 1. Sections two hundred, two hundred and one and two hundred and two of chapter thirty-six of the laws of nineteen hundred and nine, entitled "An act relating to labor, constituting chapter thirty-one of the consolidated laws, are hereby amended to read, respectively, as follows:

"SEC. 200. When personal injury is caused to an employee who is himself in the exercise of due care and diligence at the time:

"1. By reason of any defect in the condition of the ways, works, machinery, or plant, connected with or used in the business of the employer which arose from or had not been discovered or remedied owing to the negligence of the employer or of any person in the service of the employer and intrusted by him with the duty of seeing that the ways, works, machinery, or plant, were in proper condition;

"2. By reason of the negligence of any person in the service of the employer intrusted with any superintendence or by reason of the negligence of any person intrusted with authority to direct, control or command any employee in the performance of the duty of such employee. The employee, or in case the injury results in death, the executor or administrator of a deceased employee who has left him surviving a husband, wife or next of kin, shall have the same right of compensation and remedies against the employer as if the employee had not been an employee of nor in the service of the employer nor engaged in his work. The provisions of law relating to actions for causing death by negligence, so far as the same are consistent with this act, shall apply to an action brought by an executor or administrator of a deceased employee, suing under the provisions of this article. If an employer enters into a contract, written or verbal, with an independent contractor to do part of such employer's work, or if such contractor enters into a contract with a subcontractor to do all or any part of the work comprised in such contractor's contract with the employer, such contract or subcontract shall not bar the liability of the employer for the injuries to the employees of such contractor or subcontractor, caused by any defect in the condition of the ways, works, machinery, or plant, if they are the property of the employer or are furnished by him, and if such defect rose, or had not been discovered or remedied, through the negligence of the employer, or of some person intrusted by him with the duty of seeing that they were in proper condition.

"SEC. 201. No action for recovery of compensation for injury or death under this article shall be maintained unless notice of the time, place and cause of the injury is given to the employer within one hundred and twenty days and the action is commenced within one year after the occurrence of the accident causing the injury or death. The notice required by this section shall be in writing and signed by the person injured or by some one in his behalf, but if from physical or mental incapacity it is impossible for the person injured to give notice within the time provided in this section, he may give the same within ten days after such incapacity is removed. In case of his death without having given such notice, his executor or administrator may give such notice within sixty days after his appointment, but no notice under the provisions of this section shall be deemed to be invalid or insufficient solely by reason of any inaccuracy in stating the time, place or cause of the injury if it be shown that there was no intention to mislead and that the party entitled to notice was not in fact misled thereby. If such notice does not apprise the employer of the time, place or cause of injury, he may, within eight days after service thereof, serve upon the sender a written demand for a further notice, which demand must specify the particular in which the first notice is claimed to be defective, and a failure by the employer to make such demand as herein provided shall be a waiver of all defects that the notice may contain. After service of such demand as herein provided, the sender of such notice may at any time within eight days thereafter serve an amended notice which shall supersede such first notice and have the same effect as an original notice hereunder. The notice required by this section shall be served on the employer, or if there is more than one employer, upon one of such employers, and may be served by delivering the same to or at the residence or place of business of the person on whom it is to be served. The notice or demand may be served by post by letter addressed to the person on whom it is to be served, at his last known place of residence or place of business, and if served by post shall be deemed to have been served at the

time when the letter containing the same would be delivered in the ordinary course of the post. When the employer is a corporation, notice shall be served by delivering the same or by sending it by post addressed to the office or principal place of business of such corporation.

"Sec. 202. An employee by entering upon or continuing in the service of the employer shall be presumed to have assented to the necessary risks of the occupation or employment and no others. The necessary risks of the occupation or employment shall, in all cases arising after this article takes effect, be considered as including those risks, and those only, inherent in the nature of the business which remain after the employer has exercised due care in providing for the safety of his employees, and has complied with the laws affecting or regulating such business or occupation for the greater safety of such employees. In an action brought to recover damages for personal injury or for death resulting therefrom received after this act takes effect, owing to any cause, including open and visible defects, for which the employer would be liable but for the hitherto available defense of assumption of risk by the employee, the fact that the employee continued in the service of the employer in the same place and course of employment after the discovery by such employee, or after he had been informed of the danger of personal injury therefrom shall not be, as matter of fact or as matter of law, an assumption of the risk of injury therefrom, but an employee, or his legal representative, shall not be entitled under this article to any right of compensation or remedy against the employer in any case where such employee knew of the defect or negligence which caused the injury and failed, within a reasonable time, to give, or cause to be given, information thereof to the employer, or to some person superior to himself in the service of the employer, or who had intrusted to him some superintendence, unless it shall appear on the trial that such defect or negligence was known to such employer, or superior person, prior to such injuries to the employee; or unless such defect could have been discovered by such employer by reasonable and proper care, tests or inspection."

Sec. 2. Such chapter is hereby amended by inserting therein a new section to be section two hundred and two-a, to read as follows:

"Sec. 202-a. On the trial of any action brought by an employee or his personal representative to recover damages for negligence arising out of and in the course of such employment, contributory negligence of the injured employee shall be a defense to be so pleaded and proved by the defendant."

Sec. 3. Such chapter is hereby amended by adding at the end of article four-teen thereof seven new sections, to read as follows:

"Sec. 205. When and if any employer in this state and any of his employees shall consent to the compensation plan described in sections two hundred and six to two hundred and twelve, inclusive, of this article, hereinafter referred to as the plan, and shall signify their consent thereto in writing signed by each of them or their authorized agents, and acknowledged in the manner prescribed by law for taking the acknowledgment of a conveyance of real property, and such writing is filed with the county clerk of the county in which it is signed by the employee, then so long as such consent has not expired or been canceled as hereinafter provided, such employee, or in case injury to him results in death, his executor or administrator, shall have no other right of action against the employer for personal injury or death of any kind, under any statute or at common law, save under the plan so consented to, except where personal injury to the employee is caused in whole or in part by the failure of the employer to obey a valid order made by the commissioner of labor or other public authority authorized to require the employer to safeguard his employees, or where such injury is caused by the serious or willful misconduct of the employer. In such excepted cases thus described, no right of action which the employee has at common law or by any other statute shall be affected or lost by his consent to the plan, if such employee, or in case of death his executor or administrator, commences such action before accepting any benefit under such plan or giving any notice of injury as provided in section two hundred and six hereof. The commencing of any legal action whatsoever at common law or by any statute against the employer on account of such injury, except under the plan, shall bar the employee, and in the event of his death his executors, administrators, dependents and other beneficiaries, from all benefit under the plan. This section and sections two hundred and six to two hundred and twelve, inclusive, of this article shall not apply to a railroad corporation, foreign or domestic, doing business in this state, or a receiver thereof, or to any person employed by such corporation or receiver.

"SEC. 206. If personal injury by accident arising out of and in the course of the employment is caused to the employee, the employer shall, subject as hereinafter mentioned, be liable to pay compensation under the plan at the rates set out in section two hundred and seven of this article: provided that the employer shall not be liable in respect of any injury which does not disable the employee for a period of at least two weeks from earning full wages at the work at which he was employed, and that the employer shall not be liable in respect of any injury to the employee which is caused by the serious and willful misconduct of that employee. No proceedings for recovery under the plan provided hereby shall be maintained unless notice of the accident has been given to the employer as soon as practicable after the happening thereof and before the employee has voluntarily left the employment in which he was injured and during such disability, and unless claim for compensation with respect to the accident has been made within six months from the occurrence of the accident, or in the case of death of the employee, or in the event of his physical or mental incapacity within six months after such death or removal of such physical or mental incapacity, or in the event that weekly payments have been made under the plan, within six months after such payments have ceased; but no want of or defect or inaccuracy of a notice shall be a bar to the maintenance of proceedings under the plan unless the employer proves that he is prejudiced by such want, defect or inaccuracy. Notice of the accident shall apprise the employer of the claim for compensation under this plan and shall state the name and address of the employee injured, the date and place of the accident and in simple language the cause thereof. The notice may be served personally or by sending it by mail in a registered letter addressed to the employer at his last known residence or place of business.

"SEC. 207. The amount of compensation under the plan shall be: 1. In case death results from injury:

"(a) If the employee leaves a widow or next of kin at the time of his death wholly dependent on his earnings, a sum equal to twelve hundred times the daily earnings of the employee at the rate at which he was being paid by the employer at the time of the accident, but not more in any event than three thousand dollars. Any weekly payments previously made under the plan shall be deducted in ascertaining such amount payable on death.

"(b) If such widow or next of kin or any of them are in part only dependent upon his earnings, such sum not exceeding that provided in subdivision a as may be determined to be reasonable and proportionate to the injury to such dependents.

"(c) If he leaves no widow, or next of kin so dependent in whole or in part, the reasonable expenses of his medical attendance and burial, not exceeding one hundred dollars. Whatever sum may be determined to be payable under the plan, in case of death of the injured employee, shall be paid to his legal representative for the benefit of such dependents, or if he leaves no such dependents, for the benefit of the person to whom the expenses of medical attendance and burial are due.

"2. Where total or partial incapacity for work at any gainful employment results to the employee from the injury, a weekly payment commencing at the end of the second week after the injury and continuing during incapacity, subject as herein provided, not exceeding fifty per centum of his average weekly earnings when at work on full time during the preceding year during which he shall have been in the employment of the same employer, or if he shall have been employed less than a year, then a weekly payment of not exceeding three times the average daily earnings on full time for such less period.

"In fixing the amount of the weekly payment, regard shall be had to any payment, allowance or benefit which the workman may have received from the employer during the period of his incapacity, and in the case of partial incapacity the weekly payment shall in no case exceed the difference between the amount of the average weekly earnings of the workman before the accident and the average amount which he is earning or is able to earn in some suitable employment or business after the accident but shall amount to one-half of such difference. In no event shall any weekly payment payable under the plan exceed ten dollars per week or extend over more than eight years from the date of the accident. Any person entitled to receive weekly payments under the plan is required, if requested by the employer, to submit himself for examination by a duly qualified medical practitioner or surgeon provided and paid for by the employer, at a time and place reasonably convenient for the employee, within three weeks after the injury, and thereafter at intervals not oftener than once in six weeks. If the workman refuses so to submit or ob-

structs the same, his right to weekly payments shall be suspended until such examination shall have taken place, and no compensation shall be payable under the plan during such period. In case an injured employee shall be mentally incompetent at the time when any right or privilege accrues to him under the plan, a committee or guardian of the incompetent appointed pursuant to law may, on behalf of such incompetent, claim and exercise any such right or privilege with the same force and effect as if the employee himself had been competent and had claimed or exercised any such right or privilege; and no limitation of time herein provided for shall run so long as said incompetent employee has no committee or guardian.

"SEC. 208. Any question of law or fact arising in regard to the application of the plan in determining the compensation payable thereunder or otherwise shall be determined either by agreement or by arbitration as provided in the code of civil procedure, or by an action at law as herein provided. In case the employer shall be in default in any of his obligations to the employee under the plan, the injured employee or his committee or guardian, if such be appointed, or his executor or administrator, may then bring an action to recover compensation under the plan in any court having jurisdiction thereof as on a written contract. Such action shall be conducted in the same manner as an action at law for the recovery of damages for breach of a written contract, and shall for all purposes, including the determination of jurisdiction, be deemed such an action. The judgment in such action, in favor of the plaintiff, shall be for a lump sum equal to the amount of the payments then due and prospectively due under the plan. In such action by an executor or administrator the judgment may provide the proportions of the award or the costs to be distributed to or between the several dependents. If such determination is not made it shall be determined by the surrogate's court by which such executor or administrator is appointed, in accordance with the terms of this article on petition of any party on such notice as such court may direct.

"SEC. 209. Any person entitled to weekly payments under the plan against any employer shall have the same preferential claim therefor against the assets of the employer as now allowed by law for a claim by such person against such employer for unpaid wages or personal services. Weekly payments due under the plan shall not be assignable or subject to attachment, levy or execution. No claim of an attorney for any contingent interest in any recovery under the plan for services in securing such recovery shall be an enforceable lien thereon, unless the amount of the same be approved in writing by a justice of the supreme court, or in case the same is tried in any court, before [by] the justice presiding at such trial.

"SEC. 210. When a consent to the plan shall have been filed in the office of the county clerk as herein provided, it shall be binding upon both parties thereto as long as the relation of employer and employee exists between the parties, and expire at the end of such employment, but it may at any time be canceled on sixty days' notice in writing from either party to the other. Such notice of cancellation shall be effective only if served personally or sent by registered letter to the last known post-office address of the party to whom it is addressed, but no notice of cancellation shall be effective as to a claim for injury occurring previous thereto.

"SEC. 211. Each employer who shall sign with any employee a consent to the plan shall, within thirty days thereafter, filed with the commissioner of labor a statement thereof, signed by such employer, which shall show (a) the name of the employer and his post-office address, (b) the name of the employee and his last known post-office address, (c) the date of and office where the original consent is filed, (d) the weekly wage of the employee at the time the consent is signed; unless such statement is duly filed, such consent of the employee shall not be a bar to any proceeding at law commenced by the employee against the employer.

"SEC. 212. Each employer of labor in this State who shall have entered into the plan with any employee shall, on or before the first day of January, nineteen hundred and eleven, and thereafter and at such times as may be required by the commissioner of labor, make a report to such commissioner of all amounts, if any, paid by him under such plan to injured employees, stating the name of such employees, and showing separately the amounts paid under agreement with the employees, and the amounts paid after proceedings at law, and the proceedings at law under the plan then pending. Such reports shall be verified by the employer or a duly authorized agent in the same manner as affidavits."

SEC. 4. This act shall take effect September one, nineteen hundred and ten.

Became a law May 24, 1910.

CHAPTER 674.—*Compensation for injuries to employees in certain dangerous employments.*

SECTION 215. This article shall apply only to workmen engaged in manual or mechanical labor in the following employments, each of which is hereby determined to be especially dangerous, in which from the nature, conditions or means of prosecution of the work therein, extraordinary risks to the life and limb of workmen engaged therein are inherent, necessary or substantially unavoidable, and as to each of which employments it is deemed necessary to establish a new system of compensation for accidents to workmen.

1. The erection or demolition of any bridge or building in which there is, or in which the plans and specifications require, iron or steel framework.

2. The operation of elevators, elevating machines or derricks or hoisting apparatus used within or on the outside of any bridge or building for the conveying of materials in connection with the erection or demolition of such bridge or building.

3. Work on scaffolds of any kind elevated twenty feet or more above the ground, water, or floor beneath in the erection, construction, painting, alteration or repair of buildings, bridges or structures.

4. Construction, operation, alteration or repair of wires, cables, switchboards or apparatus charged with electric currents.

5. All work necessitating dangerous proximity to gunpowder, blasting powder, dynamite or any other explosives, where the same are used as instrumentalities of the industry.

6. The operation on steam railroads of locomotives, engines, trains, motors or cars propelled by gravity or steam, electricity or other mechanical power, or the construction or repair of steam railroad tracks and roadbeds over which such locomotives, engines, trains, motors or cars are operated.

7. The construction of tunnels and subways.

8. All work carried on under compressed air.

SEC. 216. The words, "employer," "workman" and "employment," or their plurals, used in this article, shall be construed to apply to all the employments above described.

SEC. 217. If, in the course of any of the employments above described, personal injury by accident arising out of and in the course of the employment after this article takes effect is caused to any workman employed therein, in whole or in part, or the damage or injury caused thereby is in whole or part contributed to by—

(a) A necessary risk or danger of the employment or one inherent in the nature thereof; or

(b) Failure of the employer of such workman or any of his or its officers, agents or employees to exercise due care, or to comply with any law affecting such employment; then such employer shall, subject as hereinafter mentioned, be liable to pay compensation at the rates set out in section 219a of this title; provided that the employer shall not be liable in respect of any injury which does not disable the workman for a period of at least two weeks from earning full wages at the work at which he was employed, and provided that the employer shall not be liable in respect of any injury to the workman which is caused in whole or in part by the serious and willful misconduct of the workman.

SEC. 218. The right of action for damages caused by any such injury, at common law or under any statute in force on January 1, 1910, shall not be affected by this article, and every existing right of action for negligence or to recover damages for injuries resulting in death is continued, and nothing in this article shall be construed as limiting such right of action, but in case the injured workman, or in event of his death his executor or administrator, shall avail himself of this article, either by accepting any compensation hereunder in accordance with section 219a hereof or by beginning proceedings therefor in any manner on account of any such injury, he shall be barred from recovery in and deemed thereby to have released every other action at common law or under any other statute on account of the same injury after this article takes effect. In case after such injury the workman, or in the event of his death his executor or administrator, shall commence any action at common law or under any statute other than this article against the employer therefor he shall be barred from all benefit of this article in regard thereto.

SEC. 219g. If an employer who shall be the principal enters into a contract with an independent contractor to do part of such employer's work, or if such contractor enters into a contract with a subcontractor to do all or any part

of the work comprised in such contractor's contract with the employer, the said principal shall be liable to pay to any workman employed in the execution of the work any compensation under this article which he would have been liable to pay if that workman had been immediately employed by him; and where compensation is claimed from or proceedings are taken against the principal then, in the application of this article, references to the principal shall be substituted for references to the employer, except that the amount of compensation shall be calculated with reference to the earnings of the workman under the contractor or employer by whom he is immediately employed. Where such principal is liable to pay compensation he shall be entitled to be indemnified by any person who would have been liable to pay compensation to the workman independently of this section. Nothing in this section shall be construed as preventing a workman from recovering compensation under this article from the contractor or subcontractor, instead of the principal; nor shall this section apply in any case where the accident shall occur elsewhere than on, or in, or about the premises on which the principal has undertaken to execute the work or which are otherwise under his control or management.

Became a law June 25, 1910.

**ESSENTIAL FEATURES OF A COMPENSATION LAW; CHICAGO
CONFERENCE OF NOVEMBER, 1910.**

An important conference of commissioners on compensation for industrial accidents was held at Chicago, Ill., November 10, 11, and 12, 1910. This conference was not a meeting of the National Conference upon Compensation for Industrial Accidents, which had met at Atlantic City, Washington, and Chicago, but met in response to a call of the Massachusetts commissioners, who desired the opinion of the commissioners of the various States as to certain specific questions that were under consideration by the Massachusetts commission in preparing a bill for the January, 1911, meeting of the state legislature.

Commissions of eight States—Illinois, Massachusetts, Minnesota, Montana, New Jersey, New York, Ohio, and Wisconsin—were represented, and Connecticut was represented by a special delegate. The United States Employers' Liability Commission and the United States Bureau of Labor were represented, and there was present a special committee of commissioners on uniform state laws charged with the preparation of a uniform workmen's compensation law.

The conference comprised large employers, small employers, representatives of labor, legislators, and special students of workmen's compensation legislation. As stated above, the subject of the conference was a series of questions proposed by the Massachusetts commission, and it is an evidence of marked progress toward a common understanding and acceptance of the principles underlying the system of compensation for industrial accidents that such a representative body could come to an agreement with reference to the more important features which compensation laws should contain.

Following is a list of the questions submitted, together with the answers thereto as agreed upon by a majority of the conference:

1. What employments shall the act cover? All employments.
2. Shall all injuries be covered—
 - a. Irrespective of employers' negligence? Yes.
 - b. Irrespective of employees' negligence? Yes; except where injury is self-inflicted for the purpose of recovery. Burden of proof that injury was self-inflicted to be placed on the employer.
3. Shall all persons engaged in such employments be included? Yes.

4. Shall compensation be paid in a lump sum or in installments:
 - a. Temporary disability? Installments.
 - b. Permanent disability or death? Installments with right to commute after given time with approval of some public official.
5. Amount and duration of compensation:
 - a. Temporary disability? Fifty per cent of the impairment of wages; maximum of \$10 per week, minimum of \$5 per week; or if wages less than \$5, then full wages (or $66\frac{2}{3}$ per cent of wages up to \$7.50 of wages per week, then 50 per cent of balance until compensation amounts to the maximum of \$10 per week, maximum). Payments not to extend beyond period of 300 weeks.
 - b. Permanent disability? Same as temporary disability.
 - c. Partial permanent disability? Fifty per cent of impairment of wages; maximum of \$10 per week; payments not to extend beyond period of 300 weeks.
 - d. Death?
 - (1) Total dependents?

If orphans, 50 per cent of wages of deceased.
If widow alone, 25 per cent of wages.
If widow and one child, 40 per cent of wages.
If widow and two children, 45 per cent of wages.
If widow and three children, 50 per cent of wages.
If widow and four children, 55 per cent of wages.
If widow and five children or more, 60 per cent of wages.
If widow, father, or mother, 50 per cent of wages.
Children under 16 years of age only to be included and only during period they are under 16 years of age.
Maximum of \$10 per week, minimum of \$5 per week, or if full wages less than \$5 their full wages (or $66\frac{2}{3}$ per cent of wages up to \$7.50 of wages per week, then 50 per cent of balance until compensation amounts to \$10 per week, maximum). Payments not to extend beyond period of 300 weeks.
 - (2) Partial dependents? Fifty per cent of the portion of the wages contributed by the deceased to the partial dependents.
 - (2) No dependents? Expenses of last sickness and burial, not exceeding \$200.
6. Length of waiting period? Two weeks, during which period employer shall furnish medical treatment or hospital care to an amount not exceeding \$100 in value.

7. Shall dependents include aliens and illegitimate relations? Shall not include aliens residing outside the country. Illegitimate children not to be mentioned.
8. Shall employees contribute? No.
9. Shall it be permissible for employers to substitute voluntary schemes? Yes, provided the voluntary scheme covers all points covered by the law and is approved by some public official to be determined in the law.
10. Method of determination of controversies? A system of board of arbitration approved.
11. Nature of scheme: Compensation, insurance, or state insurance.
(a) Voluntary, (b) Compulsory? Compulsory insurance, state insurance. If these not possible, then compulsory compensation, providing that the employer may transfer his liability by insuring in companies approved by a legally constituted public body or official.
12. Repeal of other laws? All other laws should be repealed.
13. Constitutionality. General discussion; no definite agreement reached.

SUMMARY OF FOREIGN WORKMEN'S COMPENSATION ACTS.

To distinguish them from employers' liability laws, the term "workmen's compensation laws" is used to designate those acts which provide for the award of fixed sums to employees injured by industrial accidents, without the necessity of litigation and without reference to the question of negligence upon which employers' liability acts are based. It is provided in most such laws, however, that gross negligence on the part of the injured person will bar his right to compensation, while on the other hand such negligence on the part of the employer sometimes gives rise to a right to increased compensation. Usually the injuries must cause disablement for a specified number of days or weeks before compensation becomes due.

The industries usually covered by the acts are manufacturing, mining and quarrying, transportation, building and engineering work, and in some countries agriculture, forestry, and navigation. In two countries they are limited to mining. In Belgium and Great Britain the laws apply to practically all employments. In Austria, Belgium, Denmark, Finland, Germany, Italy, Luxemburg, Netherlands, Norway, Russia, Spain, and Sweden only wage-earners, and in some cases those exposed to the same risks, such as overseers and technical experts, come within the scope of the law. On the other hand, in France, Great Britain, the British colonies, and Hungary the laws apply to salaried employees and workmen equally. Overseers and technical experts earning more than a prescribed amount are excluded in Belgium, Denmark, Germany, Great Britain, Italy, Luxemburg, and Russia. Employees of the state, provincial, and local administrations usually come within the provisions of the acts.

The entire burden rests upon the employer in all but six countries, Austria, Germany, Greece, Hungary, Luxemburg, and New South Wales, where the employees bear part of the expense. The laws in every case fix the compensation to be paid, and with but one or two unimportant exceptions the compensation is based upon the wages received by the injured person. It consists of allowances for temporary disability, and annual pensions or lump-sum payments for permanent disability or death, to which are added frequently the expenses of medical and surgical treatment and a funeral benefit.

The acts of nearly all of the countries are framed with the view of obviating the necessity for instituting legal proceedings. If disputes arise the acts specify the necessary procedure for settlement by special arbitration tribunals or by ordinary law courts.

In most countries the adoption of the law carried with it the abrogation of all rights under liability laws for the persons concerned;

in some countries the injured employee retains the right to sue under the general liability laws in cases of gross negligence on the part of the employer; while in a few cases the older liability laws are left undisturbed with the right to choose either method of compensation.

So far as the method of organization of insurance is concerned, the countries may be divided into two large groups, according to whether insurance is compulsory or voluntary.

I. COMPULSORY INSURANCE.

Two forms of compulsory insurance are differentiated—compulsory insurance and compulsion to insure; one enforcing compulsory insurance in prescribed institutions, the other enforcing the obligation to insure, but leaving free the choice of the insurance institution.

A. Compulsory insurance in prescribed institutions.

1. In a government institution with a monopoly of insurance:

Norway, one state insurance bureau for all industries.

This is the only country where the entire insurance is concentrated in one government office.

2. In employers' compulsory mutual associations, controlled by the State.

a. Organized on territorial lines.

(1) Luxemburg, one institution, for all industries.

(2) Hungary, two institutions—one for Hungary and one for Croatia-Slavonia, including all industries.

(3) Austria, seven institutions, the whole country being divided into seven districts for all industries, in addition to which there are separate institutions for railroads and mining.

b. Organized on industry lines.

(1) Germany, 66 industrial institutions, each covering the entire country for one group of industries, except that some industries have several associations, each covering a specified area; in addition there are 48 agricultural institutions.

(2) Greece and New South Wales, where the laws apply to mining only; each country has a special miners' fund.

B. Compulsory insurance with choice of insurance institutions.

1. Private companies or mutual associations with state institutions competing.

a. Italy has the National Industrial Accident Insurance Institution; except that for navigation and for the Sicilian sulphur mines, compulsory mutual associations have been created by special legislation.

- b. Netherlands has the Royal Insurance Bank. The employers may insure in private insurance companies or may be permitted to carry their own insurance, but all compensation is paid by the Royal Insurance Bank which deals with the employer or insurance company.
2. Private companies or mutual associations without state institution competing.
- Finland, except that for seamen a special compulsory employers' mutual association under strict government control has been established by special law.

II. VOLUNTARY INSURANCE.

- A. Private companies or mutual associations with state institution competing.
1. Sweden, with State Insurance Institute.
 2. France, with National Accident Insurance Fund, which, however, is not permitted to provide insurance against temporary disability. Compulsory insurance is provided for seamen in a special government institution.
- B. Private companies or mutual associations without state competition.
1. Belgium, while the law specifies that the National Retirement Fund must provide accident insurance, this provision of the law has never been put into operation.
 2. Denmark, where insurance is voluntary, except that the law requires compulsory insurance of seamen either in mutual associations or in insurance companies, and where a state institution exists for voluntary insurance of fishermen and seamen not covered by the compulsory law.
 3. Great Britain and the British colonies.
 4. Russia, except for compulsory insurance of miners employed by the State or the Crown.
 5. Spain.

Wherever there is compulsory insurance in prescribed institutions controlled by the state, there is of course no question as to the security of payments. Such is the case in Norway, where a government bureau provides the insurance. In Germany, Austria, Hungary, Luxemburg, and Netherlands the law either specifically states or implies the guarantee of the solvency of the institutions providing the insurance. In Netherlands the injured workman is protected by the equivalent of insurance in the Royal Insurance Bank, irrespective of the institution in which the employer carries the insurance; the uninsured employer and the private insurance companies are required to give satisfactory guarantees to the Royal Insurance Bank. In Greece the payments are guaranteed by the national miners' fund.

The second method of state guarantee is by a special national fund, from which the compensation is paid in cases of insolvency either of the employer or of the insurance carrier. The sources of revenue of these funds show considerable differences. In Italy, notwithstanding the system of compulsory insurance, a fund has been organized under the supervision of the Government Bank of Deposits and Loans, supported by fines for noncompliance with requirement to insure, or other fines, and by the compensation due in fatal cases but not paid because of absence of survivors. In France the guarantee fund is managed by the National Old Age Retirement Fund and is supported by special taxes upon all employers covered by the act, but this fund guarantees pension payments only while compensation for temporary disability is secured by a preferred claim on the assets of the employer. In Belgium the guarantee fund is managed by the National Retirement Fund and is supported by a tax levied only upon those employers who do not carry insurance.

Where no state guarantee exists guarantees must be exacted from insurance companies or from the individual employer. Wherever insurance is either voluntary or there is a choice of insurance institutions, the Government protects the insured employee by requiring the insurance company to maintain proper reserves or to make guarantee deposits with the Government, or by both methods combined.

In the case of uninsured employees, their interests are usually protected by giving them a preferred claim upon the assets of the employer. In certain countries, where there is no compulsory insurance, the employer is not permitted to carry the liability for continuous payment of pensions in cases of death or permanent disability, but must provide for such payments through insurance institutions.

In Belgium both reserves and guarantee deposits are exacted; in addition the capitalized value of pensions must be deposited in the National Retirement Fund. There is, therefore, no necessity for giving the injured employee a preferred claim on the assets of the employer.

Finland requires the payment of the capitalized value of the pension to an insurance company in cases where no insurance has been taken. The guarantee of the pension payments of the uninsured employer is limited to a preferred claim upon his assets in case of insolvency in the following countries: Denmark, Great Britain, Russia, Sweden, and the British colonies.

In Spain both reserves and deposits are required from insurance carriers, but in case of uninsured employers no especial provision is made in case of insolvency.

Compensation laws have been enacted in 26 foreign States, and are summarized in the following pages. The laws of Switzerland and of New Brunswick covering compensation for industrial

accidents are not here included because, while very much broader than the former laws of negligence, they are still employers' liability laws rather than workmen's compensation laws.

ALBERTA.

Date of enactment. March 5, 1908, in effect January 1, 1909.

Injuries compensated. Injuries by accident arising out of and in the course of the employment which cause death or disable a workman for at least two weeks from earning full wages at the work at which he was employed. Compensation is not paid when injury is due to serious and willful misconduct of the workman, unless the injury results in death or permanent disablement.

Industries covered. Railways, factories, mines, quarries, engineering work, construction, repair and demolition of buildings, either over 30 feet in height, or with the use of mechanical power.

Persons compensated. Any person employed in manual labor, and other employees whose remuneration does not exceed \$1,200 a year.

Government employees. Government employees are covered by this act if employed in establishments or undertakings to which the law applies.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death:

- (a) To those entirely dependent on earnings of deceased, a sum equal to three years' earnings, but not less than \$1,000, nor more than \$1,800.
- (b) To those partially dependent on earnings of deceased, a sum less than above amount, to be agreed upon by the parties or fixed by arbitration.
- (c) Temporary payments previously made to be deducted from the above amounts.
- (d) If deceased leaves no dependents, reasonable expenses of medical attendance and burial, but not to exceed \$200.

Compensation for disability. (1) A weekly payment of not more than 50 per cent of employee's weekly earnings, but not exceeding \$10 a week, for employees 21 years and over, or earning \$10 a week and over; (2) 100 per cent of employee's earnings, but not exceeding \$7.50 a week for employees under 21 years of age and earning less than \$10.

For partial disability, such weekly payment "as may appear proper" with regard to the difference between employee's average weekly earnings before the accident and average weekly amount which he is earning or able to earn after the injury, but not to exceed the amount of that difference.

A lump sum may be substituted for the weekly payments after six months, on the application of the employer, the amount to be settled by agreement or by the courts.

Revision of compensation. Weekly payments may be revised at request of either party.

Insurance. Employers may make contracts with employees for substitution of a scheme of compensation benefit or insurance in place of the provisions of the act, if the attorney-general certifies that the scheme is not less favorable to the workmen and their dependents than the provisions of the act, and that a majority of the workmen are favorable to the substitute. The employers are then liable only in accordance with the provisions of the scheme.

Security of payments. In case of employer's bankruptcy the amount of compensation due under this act, up to \$500 in any individual case, is classed as a preferred claim, or when an employer has entered into a contract with insurers in respect of any liability under the act to any workman, such rights of the employer, in case he becomes bankrupt, are transferred to and vested in the workman.

Settlement of disputes. (33) Disputes arising under the act are settled by arbitration, either by an arbitration committee representing employer and employees, or by an arbitrator, or in absence of agreement by the court. The attorney-general may confer upon such arbitration committee any or all of the powers of courts in connection with the act.

AUSTRIA.

Date of enactment. December 28, 1887, in effect November 1, 1889. Amendatory acts, March 30, 1888, April 4 and July 28, 1889, January 17, 1890, December 30, 1891, September 17, 1892, July 20, 1894, and July 12, 1902.

Injuries compensated. All injuries causing death or disability for more than three days received in the course of employment, unless caused intentionally.

Industries covered. Mining, quarrying, stonecutting, manufacturing, building trades, railways, transportation on inland waters, storage, theaters, chimney sweeping, street cleaning, building, cleaning, sewer cleaning, dredging, well digging, structural iron working, etc.; agricultural and forestry establishments using machinery.

Persons compensated. All workmen and technical officials regularly employed, but in agriculture and forestry only employees exposed to machinery.

Government employees. Act applies to government employees unless an equal or more favorable compensation is provided by other laws.

Burden of payment. Medical and surgical treatment for twenty weeks and compensation for four weeks of disability paid by sick funds, to which employers contribute one-third and employees two-thirds. Compensation for disability after fourth week, and for death, paid by territorial insurance associations, to which employees contribute 10 per cent and employers 90 per cent.

Compensation for death:

(a) Funeral expenses not to exceed 25 florins (\$10.15).

(b) Pensions to members of family, not to exceed 50 per cent of earnings of deceased, to—

Widow, 20 per cent until death or remarriage; in the latter case a lump sum equal to three annual payments; to dependent widower, 20 per cent during disability.

Each legitimate child, 15 years of age or under, 15 per cent when one parent survives and 20 per cent when neither survives; to each illegitimate child, 15 years of age or under, 10 per cent; pensions of widow (or widower) and children reduced proportionately if they aggregate over 50 per cent.

(c) When pensions to above heirs do not reach 50 per cent, dependent heirs in ascending line receive pensions, not to exceed 20 per cent of earnings of deceased, parents taking precedence over grandparents.

(d) In computing pensions, the excess of the annual earnings over 1,200 florins (\$487.20) is not considered.

Compensation for disability:

(a) Medical and surgical attendance for 20 weeks, paid by sick benefit fund.

(b) For total temporary or permanent disability, 60 per cent of average daily wages of insured workmen in the locality, paid by sick benefit funds, from first to twenty-eighth day; and 60 per cent of average annual earnings of injured person, after twenty-eighth day, paid by territorial accident insurance institutions.

(c) For partial temporary or permanent disability, benefits consist of a portion of above allowance, but may not exceed 50 per cent of average annual earnings.

(d) In computing payments, the excess of annual earnings over 1,200 florins (\$487.20) is not considered.

Revision of compensation. Reconsideration of the case may be undertaken by the insurance association of its own will, or upon petition.

Insurance. Payments are met by mutual insurance associations of employers in which all employees are required to be insured. The country is divided into districts, with a separate association for each district.

Security of payments. Operations of the insurance associations are conducted under the supervision of the minister of interior, who may increase the assessments.

Settlement of disputes. Disputes are settled by arbitration courts composed of a judicial officer appointed by the minister of justice, two experts appointed by the minister of the interior, and one representative each of the employers and the employees.

BELGIUM.

Date of enactment. December 24, 1903, in effect July 1, 1905.

Injuries compensated. All injuries by accident to employees in the course of and by reason of the execution of the labor contract, causing death or disability for over one week, unless intentionally brought on by the person injured.

Industries covered. Practically all establishments in mining, quarrying, forestry work, manufacturing, building and engineering work, transportation, and telephone and telegraph services; establishments using mechanical motive power; industrial establishments employing five or more persons; agricultural and commercial establishments employing three or more persons; industries designated by royal decree as dangerous. Other industries at option of employer.

Persons compensated. Workmen and apprentices, and salaried employees exposed to the same risks as workmen whose annual salaries do not exceed 2,400 francs (\$463.20).

Government employees. Act covers employees of any public establishment engaged in industries enumerated above.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death:

(a) Funeral benefit of 75 francs (\$14.48).

(b) A sum representing value of an annuity of 30 per cent of annual earnings of deceased, calculated upon basis of his age at death, to be distributed to—

Dependent widow or widower, whole amount if no other heirs, four-fifths if one child under 16 years of age or one or more dependent heirs, three-fifths if two or more children.

Children under 16 years of age, the residue.

Dependent heirs in ascending line and descending line under 16 years of age, in absence of widow or widower or children under 16 years of age.

Dependent brothers and sisters under 16 years of age in absence of heirs above enumerated.

(c) Allowances in case of annual wages of 2,400 francs (\$463.20) or more, or of 365 francs (\$70.45) or less, are based upon those amounts, respectively.

(d) Payments to widow and heirs in ascending line are converted into life pensions, those to other heirs into pensions expiring at age of 16 years. Heirs may require one-third of capital value of life pensions to be paid in cash and pension reduced accordingly.

Compensation for disability:

(a) Expense of medical and surgical treatment for not over six months.

(b) If totally disabled, an allowance of 50 per cent of daily wages, beginning with day after accident.

(c) If partially disabled, an allowance of 50 per cent of loss of earning power, beginning with day after accident.

(d) If, after three years, disability is permanent, temporary allowance is replaced by life annuity. Victim may require one-third of capital value of pension to be paid in cash and pension reduced accordingly.

(e) Allowances in case of annual wages of 2,400 francs (\$463.20) or more, or of 365 francs (\$70.45) or less, are based upon these amounts respectively.

Revision of compensation. Revision of compensation because of aggravation or diminution of disability, or death of victim, may be made within three years.

Insurance. Employers may transfer burden of payment of compensation to establishment funds or approved insurance companies or to general savings and retirement fund. They may also transfer burden of payment of temporary allowances to mutual aid societies.

Security of payments. Employers who have not relieved themselves of liability by insurance must make deposits of cash or securities or give real-estate mortgages to secure pension payments. To secure temporary disability payments of uninsured employers a state guaranty fund is maintained by a tax levied upon such employers.

Settlement of disputes. The local justice of the peace has sole jurisdiction as a court of first resort over disputes arising under the act, and his judgment is final in all cases involving 300 francs (\$57.90) or less.

BRITISH COLUMBIA.

Date of enactment. June 21, 1902, in effect May 1, 1903.

Injuries compensated. Injuries by accident arising out of and in the course of the employment which cause death or disable a workman for at least two weeks from earning full wages at the work at which he was employed, unless the injury is "attributable solely to the serious and willful misconduct or serious neglect" of the injured workman.

Industries covered. Railways, factories, mines, quarries, engineering work, and buildings which exceed 40 feet in height and are being constructed or repaired by means of a scaffolding or being demolished or on which machinery driven by mechanical power is used for construction, repair, or demolition.

Persons compensated. All persons engaged in manual labor or otherwise.

Government employees. Act applies to civilian employees in the service of the Crown, to whom it would apply if the employer were a private person.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death:

- (a) A sum equal to three years' earnings, but not less than \$1,000 nor more than \$1,500, to those wholly dependent on earnings of deceased.
- (b) A sum less than above amount if workman leaves persons partially dependent on his earnings, the amount to be agreed upon by the parties or to be fixed by arbitration.
- (c) Reasonable expenses of medical attendance and burial not exceeding \$100, if deceased leaves no dependents.

Compensation for disability:

- (a) A weekly payment during disability after second week, not exceeding 50 per cent of employee's average weekly earnings during the previous twelve months, such weekly payments not to exceed \$10, and total liability not to exceed \$1,500.
- (b) A weekly payment during partial disability after second week to be fixed with regard to the difference between employee's average weekly earnings before the accident and average weekly amount which he is earning or able to earn after the injury.
- (c) A lump sum may be substituted for the weekly payments, after six months, on the application of the employer, the amount to be settled, in default of agreement, by arbitration under the act.

Revision of compensation. Weekly payments may be revised at request of either party.

Insurance. Employers may contract with their employees for the substitution of a scheme of compensation, benefit, or insurance in place of the provisions of the act if the attorney-general certifies that the scheme is on the whole not less favorable to the general body of employees and their dependents than the provisions of the act. In such case the employer is liable only in accordance with this scheme.

Security of payments. When an employer becomes liable under the act to pay compensation and is entitled to any sum from insurers on account of the amount due to a workman under such liability, then in the event of the employer becoming bankrupt, such workman has a first claim upon the amount so due, and a judge of the supreme court may direct the insurers to pay such sum into any chartered bank of Canada to be invested or applied to payment of compensation.

Settlement of disputes. Disputes arising under the act are settled by arbitration of existing committees representative of employers and employees, or if either party objects, by a single arbitrator agreed upon by the parties, or, in the absence of agreement, by an arbitrator appointed by a judge of the supreme court. An arbitrator appointed by a judge of the supreme court has all the power of a judge of the supreme court. Questions of law may be submitted by the arbitrator for the decision of a judge of the supreme court.

CAPE OF GOOD HOPE.

Date of enactment. June 6, 1905, in effect September 1, 1905.

Injuries compensated. All injuries to employees arising out of and in the course of the employment causing death or necessitating absence from work for more than three days and not being caused by or through the gross carelessness of the injured employee.

Industries covered. Any trade, business, or public undertaking, on land or upon or within the territorial waters of the colony, except domestic, messenger, or errand service or employment in agriculture.

Persons compensated. Employees, whether engaged in manual work or otherwise.

Government employees. Act applies to civilian persons employed by or under the Crown to whom it would apply if employer were a private person.

Burden of payment. Employer and every principal are jointly and severally liable for the compensations required under the act.

Compensation for death. When death results from an injury for which a lump sum has not already been paid on account of permanent disability—

- (a) A lump sum not exceeding three years' wages of deceased, nor more than £400 (\$1,946.60), to those wholly dependent upon the workman's earnings.
- (b) A lump sum not exceeding £200 (\$973.30) to those partially dependent upon the workman's earnings; in the absence of persons totally dependent, the sum not to exceed the value of the support which they were receiving from the deceased, calculated for two years.
- (c) Temporary payments previously made not to be deducted from above sums unless they have continued longer than three months.
- (d) Reasonable expenses of medical attendance and burial not exceeding £40 (\$194.66) in case deceased leaves no dependents.

Compensation for disability:

- (a) A sum not exceeding three years' wages, less any payments received under a provisional order of court, but not exceeding £600 (\$2,919.90) in case of permanent total disability, and a smaller sum in proportion to loss of earning power and not exceeding £300 (\$1,459.95) in case of permanent partial disability.
- (b) A payment made, by order of the local magistrate, at the same intervals as the customary wage payments, not exceeding 50 per cent of wages received at time of the injury, nor £2 (\$9.73) per week if the injury causes temporary disability lasting more than three days.

Revision of compensation. The provisional order may be set aside or altered by the magistrate, upon request of either party, if justified by a further examination of the injured person or by production of additional evidence.

Insurance. Employers may insure in a company or association against personal injury to the workmen employed by them or in their behalf. If the employer contributes toward a benefit society of which the injured or deceased person is a member, allowance is made for such contribution by the court in its order or judgment fixing amount of compensation to be paid.

Security of payments. When an employer or principal is adjudged or admits liability under the act and is entitled to any sum from any insurers on account of such liability, then, in the event the employer becomes insolvent, the worker or his dependents have a first claim upon such sum.

Settlement of disputes. Compensation in cases of disability is fixed provisionally for not more than six months by the local magistrate after receiving a physician's certificate of disability and holding an inquiry. No appeal can be taken from this preliminary order except against a finding on the question of gross carelessness and then only upon leave granted by the superior court. In case the injury results in death or permanent disability, the claimants have a right of action in the local magistrate's court for the amounts due under the law. In fixing the amount, the court is required in every case to have regard to the workman's or the dependent's necessities.

DENMARK.

Date of enactment. January 7, 1898, in effect January 15, 1899; amended May 15, 1903.

Injuries compensated. All injuries by accident occasioned by the trade or its conditions, and causing either death or disability lasting over thirteen weeks, unless brought on intentionally or through gross negligence of the victim.

Industries covered. Practically all establishments in mining, quarrying, manufactures, building and engineering work, transportation, telephone and telegraph services, diving and salvage; establishments using mechanical power which makes them subject to factory inspection; other industrial establishments designated by the minister of interior.

Persons compensated. All workmen in mechanical and technical departments, including those in supervisory capacity whose annual earnings do not exceed 2,400 crowns (\$643.20).

Government employees. Act applies to all employees of state and the communal governments in industries above indicated.

Burden of payment. Entire burden of payment rests upon employer.

Compensation for death:

(a) Funeral benefit of 50 crowns (\$13.40).

(b) A lump sum equal to four times annual earnings of deceased, but not over 3,200 crowns (\$857.60) nor less than 1,200 crowns (\$321.60), to—
Widow whole amount, if she survives.

Child whole amount, if it be the only heir.

Children, according to decision of insurance council, when there is no widow.

If neither widow nor children, insurance council decides whether and how far other heirs receive compensation.

Compensation for disability:

(a) From end of thirteenth week after accident until end of treatment, or until disability is declared permanent, a daily compensation of 60 per cent of earnings, but not less than 1 crown (27 cents) nor over 2 crowns (54 cents) for total disability, and a proportionate compensation for partial disability.

(b) In case of permanent disability an indemnity of six times annual earnings, but not less than 1,800 crowns (\$482.40) nor over 4,800 crowns (\$1,286.40) for total permanent disability, and proportionate payments for partial permanent disability.

(c) If employee suffering from permanent disability is a male between 30 and 55 years of age, he may demand purchase of an annuity. For men of other ages, or of unsound mind, or women and children, the insurance council may substitute an annuity.

Revision of compensation. Determination of degree of permanent disability must be made as soon as possible after one year from date of injury. If this be not possible, a temporary determination may be made, but a redetermination may be demanded within two years following.

Insurance. Employers may transfer obligation imposed by the law, by insuring their employees in authorized insurance companies or mutual employers' insurance associations.

Security of payments. Where liability under the law has not been transferred by insurance, indemnity for disability is a preferred claim upon assets of employer.

Settlement of disputes. Disputes concerning compensation, unless settled by mutual consent, must be referred to insurance council. Appeals may be had to the minister of interior.

FINLAND.

Date of enactment. December 5, 1895, in effect January 1, 1898.

Injuries compensated. All injuries by accident during work, causing death or disability for more than six days, except when brought on intentionally or through gross negligence of victim, intentionally by any other person than the one charged with supervision of the work, or caused by some other occurrence utterly independent of the nature or conditions of work.

Industries covered. Mines, quarries, metallurgical establishments, factories, sawmills, industrial establishments using mechanical power, construction of churches and buildings over one story high; construction and operation of water, gas, electric power plants, and operation of railroads.

Persons compensated. All persons actually employed at work, but not those supervising only.

Government employees. Act applies to employment on the state and communal construction works and state railways.

Burden of payment. Entire burden of payment rests upon employer.

Compensation for death. In addition to any prior payments on account of disability, pensions to dependent heirs, from day of death, not exceeding 40 per cent of annual earnings of deceased, to—

- (a) Widow, 20 per cent, until death or remarriage; in latter case a final sum equal to two annual payments.
- (b) Each child until the age of 15 years, 10 per cent, if one parent survives, and 20 per cent if neither parent survives.
- (c) In computing pension, earnings of workman to be considered not over 720 marks (\$133.96) nor under 300 marks (\$57.90); but no adult employee to receive a pension greater than his actual earnings.

Compensation for disability:

- (a) A pension equal to 60 per cent of employee's earnings for total disability, or a pension proportionate to the degree of incapacity for partial disability, to be paid from day of recovery from illness due to injury, or after 120 days have elapsed since injury.
- (b) Pension may by mutual consent be replaced by single payment, if it does not exceed 20 marks (\$3.86) annually.
- (c) In computing pension, earnings of workman to be considered not over 720 marks (\$133.96) nor under 300 marks (\$57.90); but no adult employee to receive a pension greater than his actual earnings.
- (d) In cases of temporary disability (including all cases of disability for 120 days after injury) daily compensation of 60 per cent of earnings, beginning with seventh day after accident, for complete temporary disability, and a proportionate compensation for partial disability; but not more than 2.50 marks (48 cents) per diem.
- (e) Until recovery, injured employee may be given treatment in a hospital in lieu of other compensation; during such treatment his wife and children get a compensation equal to pension in case of death.

Revision of compensation. Demands for revision of compensation may be made by either party before proper court.

Insurance. Employers are required to transfer the burden of payment of compensation to a governmental insurance office, private insurance company, mutual employers' insurance association, or approved foreign insurance company, unless unable to obtain such insurance or released from this obligation on presentation of satisfactory guarantees.

Security of payments. When exempted from the duty of insuring his employees, or unable to obtain insurance, the employer must guarantee payment of pension to the injured workman or his family by arrangement with a private insurance company.

Settlement of disputes. In case of absence of insurance or dissatisfaction with decision of insurance company, injured employee or his dependent may carry the case into the inferior court of the locality.

FRANCE.

Date of enactment. April 9, 1898, in effect July 1, 1899; amendatory and supplementary acts March 22, 1902, March 31, 1905, April 12, 1906, and July 17, 1907.

Injuries compensated. All injuries by accident to workmen or salaried employees during or on account of labor causing death or disability for five or more days, unless produced intentionally by the victim. If due to inexcusable fault of victim or of employer, compensation may by a court order be decreased or increased, but not exceeding actual earnings of victim.

Industries covered. Building trades, factories, workshops, shipyards, transportation by land and water, public warehouses, mining and quarrying, manufacture or handling of explosives, agricultural and other work using mechanical power, and mercantile establishments; other industries on request of both parties.

Persons compensated. All workmen and salaried employees.

Government employees. Law applies to state, departmental, and communal establishments when engaged in industries enumerated above.

Burden of payment. Entire cost of compensation falls upon employer.

Compensation for death:

(a) Funeral expenses not exceeding 100 francs (\$19.30).

(b) Pensions to dependent heirs not exceeding 60 per cent of annual wages of deceased, distributed to—

Widow or widower, 20 per cent until death or remarriage, in which latter case a final sum equal to three annual payments.

Children under 16 years of age if one parent survives—15 per cent if there is but one child; 25 per cent if there are two children; 35 per cent if there are three children; 40 per cent if there are four or more children.

Each child under 16 years of age if neither parent survives, 20 per cent. Each ascendant and each descendant under 16 years of age dependent upon deceased, if no widow or children survive, 10 per cent, the aggregate not to exceed 30 per cent.

(c) If annual wages exceed 2,400 francs (\$463.20), only one-fourth of the excess is considered in computing pensions.

Compensation for disability:

(a) Expenses of medical or surgical treatment.

(b) If permanently disabled, a pension of 66⅔ per cent of annual wages for total disability and of one-half loss of earning capacity for partial disability; or, if demanded, one-fourth the capital value of pension in cash, the pension to be reduced accordingly.

(c) If temporarily disabled, an allowance of 50 per cent of daily wages, beginning with fifth day, and including Sundays and holidays, unless disability lasts more than ten days, when payments become due from the first day.

(d) If annual wages exceed 2,400 francs (\$463.20), only one-fourth of the excess is considered in computing pensions.

(e) Payments of pensions of not over 100 francs (\$19.30) per annum may, by mutual consent when beneficiary is of age, be replaced by a cash payment.

Revision of compensation. Revision of compensation because of aggravation or diminution of disability of victim may be made within three years.

Insurance. Employers may transfer burden of payment of compensation to approved mutual aid, accident insurance, or guaranty associations, or in case of pensions, to national accident insurance or national old-age pension funds.

Security of payments. The State guarantees against loss of pension payments on account of insolvency of employers or insurance organizations, and is reimbursed by a special tax on employers within scope of the act. For temporary disability payments, medicines and medical or surgical attendance, and funeral expenses the victim, his creditors, or representatives have a preferred claim on property of employer.

Settlement of disputes. Disputes as to pensions or involving more than 300 francs (\$57.90) may be carried into higher civil courts. Judgment of local justice of the peace is final in other cases.

GERMANY.

Date of enactment. July 6, 1884, in effect October 1, 1885. Supplementary acts of May 28, 1885, May 5, 1886, July 11 and 13, 1887. A codification enacted June 30, 1900.

Injuries compensated. Injuries by accident in the course of the employment, causing death or disability for more than three days, unless caused intentionally. Compensation may be refused or reduced if injury was received while committing an illegal act.

Industries covered. Mining, salt works, quarrying and allied industries, ship-yards, factories, smelting works, building trades, chimney sweeping, window cleaning, butchering, transportation and handling, agriculture, forestry, and fisheries.

Persons compensated. All workmen, and those technical officials whose annual earnings are less than 3,000 marks (\$714). With the approval of the Imperial Insurance Office the law may be extended to other classes.

Government employees. Act covers government employees in postal, telegraph, and railway services and in industrial enterprises of army and navy, unless otherwise provided for.

Burden of payment. Medical and surgical treatment for ninety-one days and benefit payments from third to ninety-first days are provided by sick-benefit funds to which employers contribute one-third and employees two-thirds; from twenty-eighth to ninety-first day payments are increased by one-third at expense of employer in whose establishment accident occurred; after ninety-first day, and in case of death from injuries, expense is borne by employers' associations supported by contributions of employers.

Compensation for death:

- (a) Funeral benefits of one-fifteenth of annual earnings of deceased, but not less than 50 marks (\$11.90).
- (b) Pensions to dependent heirs not exceeding 60 per cent of annual earnings of the deceased, as follows: Widow, 20 per cent of annual earnings until death or remarriage; in latter case a final sum equal to three annual payments; dependent widower, 20 per cent of annual earnings; each child 15 years of age or under, 20 per cent; payments to consort and to children to be reduced proportionately if the total would exceed 60 per cent; dependent heirs in ascending line, 20 per cent or less, if there is a residue after providing for above heirs; orphan grandchildren, 20 per cent or less, if there is a residue after providing for above heirs.
- (c) If annual earnings exceed 1,500 marks (\$357), only one-third of excess is considered in computing pensions.

Compensation for disability:

- (a) Free medical and surgical treatment paid first thirteen weeks by sick benefit funds, and afterwards by employers' associations.
- (b) For temporary or permanent total disability, 50 per cent of daily wages of persons similarly employed, but not exceeding 3 marks (71 cents), paid by sick benefit funds from third day to end of fourth week; from fifth to end of thirteenth week, above allowance by sick benefit fund, plus 16½ per cent contributed by employer direct; after thirteen weeks, 66½ per cent of average annual earnings of injured person paid by employers' associations.
- (c) For complete helplessness necessitating attendance, payments may be increased to 100 per cent of annual earnings.
- (d) For partial disability, a corresponding reduction in payments.
- (e) If annual earnings exceed 1,500 marks (\$357), only one-third of excess is considered in computing pensions.

Revision of payments. Whenever a change in condition of injured person occurs, a revision of benefits may be made.

Insurance. Payments are met by mutual insurance associations of employers, in which all employees are required to be insured at the expense of employers. Separate associations have been organized for each industry.

Security of payments. Solvency of employers' association is guaranteed by the State.

Settlement of disputes. Disputes are settled by "arbitration courts for workmen's insurance," composed of one government official, two representatives of workmen, and two of employers.

GREAT BRITAIN.

Date of enactment. December 21, 1906, in effect July 1, 1907, replacing acts of August 6, 1897, and July 30, 1900.

Injuries compensated. Injuries by accident arising out of and in the course of the employment which cause death or disable a workman for at least one week from earning full wages at the work at which he was employed. Compensation is not paid when injury is due to serious and willful misconduct, unless it results in death or serious and permanent disablement.

Industries covered. "Any employment."

Persons compensated. Any person regularly employed for the purposes of the employer's trade or business whose compensation is less than £250 (\$1,216.63) per annum; but persons engaged in manual labor only are not subject to this limitation.

Government employees. Act applies to civilian persons employed under the Crown to whom it would apply if the employer were a private person.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death:

- (a) A sum equal to three years' earnings, but not less than £150 (\$729.98) nor more than £300 (\$1,459.95), to those entirely dependent on earnings of deceased.
- (b) A sum less than above amount if deceased leaves persons partially dependent on his earnings, amount to be agreed upon by the parties or fixed by arbitration.
- (c) Reasonable expenses of medical attendance and burial, but not to exceed £10 (\$48.67) if deceased leaves no dependents.

Compensation for disability:

- (a) A weekly payment during incapacity of not more than 50 per cent of employee's average weekly earnings during previous twelve months, but not exceeding £1 (\$4.87) per week; if incapacity lasts less than two weeks no payment is required for the first week.
- (b) A weekly payment during partial disability, not exceeding the difference between employee's average weekly earnings before injury and average amount which he is earning or is able to earn after injury.
- (c) Minor persons may be allowed full earnings during incapacity, but weekly payments may not exceed 10 shillings (\$2.43).
- (d) A sum sufficient to purchase a life annuity through the Post-Office Savings Bank of 75 per cent of annual value of weekly payments may be substituted, on application of the employer, for weekly payments after six months; but other arrangements for redemption of weekly payments may be made by agreement between employer and employee.

Revision of benefits. Weekly payments may be revised at request of either party, under regulations issued by the secretary of state.

Insurance. Employers may make contracts with employees for substitution of a scheme of compensation, benefit, or insurance in place of the provisions of the act, if the registrar of friendly societies certifies that the scheme is not less favorable to the workmen and their dependents than the provisions of the act, and that a majority of the workmen are favorable to the substitute. The employer is then liable only in accordance with the provisions of the scheme.

Security of payments. In case of employer's bankruptcy, the amount of compensation due under the act, up to £100 (\$486.65) in any individual case, is classed as a preferred claim; or where an employer has entered into a contract with insurers in respect of any liability under the act to any workman, such rights of the employer, in case he becomes bankrupt, are transferred to and vested in the workman.

Settlement of disputes. Questions arising under the law are settled either by a committee representative of the employer and his workmen, by an arbitrator selected by the two parties, or, if the parties can not agree, by the judge of the county court, who may appoint an arbitrator to act in his place.

GREECE.

Date of enactment. February 21 (March 6), 1901, in effect (retroactively) December 20, 1900 (January 2, 1901).

Injuries compensated. All injuries by accidents during or because of the employment and causing death or disability lasting more than four days, unless brought on intentionally by the injured person.

Industries covered. Mines, quarries, and metallurgical establishments.

Persons compensated. All workmen and subordinate salaried persons.

Government employees. No mention of government employees is made in the law.

Burden of payment. Employer carries full burden of payment of indemnities during first three months; after three months, half the payments of pensions are contributed by the miners' fund, which is mainly supported by a tax on the mines and metallurgical establishments, but partly by contributions from the workmen's mutual aid societies in these establishments and some minor sources.

Compensation for death:

- (a) If death occurs immediately or within three months: (1) Funeral expenses amounting to 60 drachmas (\$11.58); (2) pensions to heirs aggregating pension paid for total disability.
- (b) If death occurs three months after injury or later, pensions to heirs aggregating 75 per cent of pension paid during life of the injured.
- (c) All pensions to heirs are distributed as follows: Equal share to widow and children, or, in absence of widow and children, equal share to father and mother.
- (d) Pension to widow ceases on her remarriage; to male children at 16 years of age; to female children on their marriage, with payment of one year's pension as a dowry.
- (e) If only one heir survives he is entitled to only one-half of original pension.

Compensation for disability:

- (a) Free medical and surgical treatment.
- (b) An allowance of 50 per cent of earnings of injured employee during first three months.
- (c) If permanently disabled, a pension of 50 per cent of earnings in case of total disability (including loss of a hand or foot); in case of partial disability, a pension of 33 $\frac{1}{3}$ per cent of earnings, pension payments to begin after end of third month.
- (d) Pension may not exceed 100 drachmas (\$19.30) per month plus 25 per cent of the excess of computed pension over 100 drachmas (\$19.30).
- (e) In computing pension of apprentices and children, no wage is to be considered less than 2.50 drachmas (48 cents) per day.

Revision of compensation. Injured employee may present a new petition, or the council of the miners' fund may order a new examination, whenever there is reason to believe that changes have occurred in the degree of disability.

Insurance. No provision is made by the law for the transfer of the burden of payment of compensation by insurance.

Security of payments. The miners' fund guarantees payment of pensions and other allowances, and has preferred claim upon employer's assets in cases of dissolution or forced sale of establishments, and also in case of voluntary transfer, unless the new proprietor assumes the obligations under the law.

Settlement of disputes. Amount of pension is settled by the council of the miners' fund, and appeals against its decisions may be carried into the ordinary courts.

HUNGARY.

Date of enactment. April 9, 1907, in effect July 1, 1907.

Injuries compensated. Injuries by accident in the course of the employment causing death or disability for more than three days. Injuries caused intentionally are not compensated unless fatal.

Industries covered. All factories subject to inspection, mines, quarries, metallurgical establishments, building trades, lumbering, construction work, ship-building, slaughterhouses, pharmacies, sanatoria, theaters, institutes of art and science.

Persons compensated. All employees in industries enumerated.

Government employees. Act covers government employees in state, municipal, and communal industries enumerated above.

Burden of payment. All benefits and cost of treatment for first ten weeks provided by sick funds to which employers and employees contribute equally. Beginning with eleventh week entire cost is defrayed by employers through the accident fund.

Compensation for death:

(a) Funeral benefit of twenty times average daily wages.

(b) Pensions to heirs not exceeding 60 per cent of annual earnings of deceased, as follows—

Widow, 20 per cent of annual earnings until death or remarriage; in latter case a final sum equal to 60 per cent of annual earnings; or to dependent widower 20 per cent during disability.

Each child 16 years of age or under, 15 per cent if one parent survives, 30 per cent if neither survives; payments to consort and children reduced proportionately if they aggregate more than 60 per cent.

Dependent parents and grandparents if there is a residue after providing for above heirs, 20 per cent or less.

Dependent orphan grandchildren 15 years of age or under, if there is a residue after providing for above heirs, 20 per cent or less.

(c) In computing pensions the excess of annual earnings above 2,400 crowns (\$487.20) is not considered.

Compensation for disability:

(a) Free medical and surgical treatment provided first ten weeks by sick fund, and afterward by accident fund.

(b) For temporary or permanent total disability, 50 per cent of average daily wages but not exceeding 4 crowns (81 cents) for first ten weeks, provided by sick fund; beginning with eleventh week, 60 per cent of average annual earnings, provided by accident fund.

(c) For complete helplessness necessitating attendance payments may be increased to 100 per cent of annual earnings.

(d) For partial disability a corresponding portion of full pension.

(e) In computing pensions the excess of annual earnings above 2,400 crowns (\$487.20) is not considered.

Revision of compensation. Whenever a change in condition of injured person occurs the accident fund or the injured person may ask for a revision of the benefits.

Insurance. Payments are met by a state insurance institution, in which all employees are required to be insured at the expense of employers.

Security of payment. Guaranteed by the State.

Settlement of disputes. Disputes are settled by arbitration courts, consisting of a presiding judge and an equal number of representatives of workmen and employers.

ITALY.

Date of enactment. March 17, 1898, in effect September 17, 1898. Amended June 29, 1903. Promulgated in codified form January 31, 1904.

Injuries compensated. All injuries sustained by workmen or salaried employees during or on account of labor. If due to willful misconduct, employer may be reimbursed through criminal action.

Industries covered. Mines, quarries, building trades; light, heat, and power plants; arsenals; maritime construction work; transportation; industries requiring the use or handling of explosives; all industrial or agricultural work in proximity to power machinery; where more than five persons are employed in engineering construction work; operation for protection against landslides, floods, hailstorms; logging and timber rafting, and shipbuilding.

Persons compensated. All workmen and apprentices and overseers receiving not more than 7 lire (\$1.35) per day and paid at intervals of one month or less.

Government employees. Act applies to employment in state, provincial, and communal industries enumerated above unless specially provided for, and to work performed for a government institution under contract or concession.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death. If within two years after the accident, five times annual wages of deceased workman, with a maximum of 10,000 lire (\$1,930), distributed to—

- (a) Surviving consort two-fifths of indemnity if there are children; one-half of indemnity if there are dependent ascendants; three-fifths of indemnity if only dependent brothers or sisters; entire indemnity in absence of heirs enumerated.

Children, amounts sufficient to purchase an annuity of equal amount for each child under 12 years of age, and one-half of such annuity for each child from 12 to 18 years of age.

Each dependent parent or grandparent, if there are no children, annuity of equal amount for life.

Dependent brothers or sisters less than 18 years of age or incapable of performing labor by reason of a mental or physical defect, if there are no children or dependent ascendants, annuities distributed upon same principle as in case of children.

- (b) In absence of heirs indemnity is turned into a special fund for immediate aid to injured, payment of indemnities for insolvent employers, and prevention of accidents.

Compensation for disability.

- (a) Cost of first medical and surgical treatment.

(b) An indemnity in case of permanent disability of six times annual earnings, but not less than 3,000 lire (\$579) if totally disabled, and six times the loss of annual earning capacity if partially disabled, earnings in latter case to be considered as not less than 500 lire (\$96.50).

- (c) A daily allowance in case of temporary disability of one-half the wages of injured workman, payable for not more than three months, if totally disabled, and equal to one-half the reduction in wages occasioned by the injury, if partially disabled.

Revision of compensation. Both workman and insurer may ask for a revision of compensation within two years after accident.

Insurance. Employers must insure their employees in (a) the National Accident Insurance Fund, (b) an authorized insurance company, (c) an association of employers for mutual insurance against accidents, or (d) a private employers' insurance fund.

Security of payments. Payments are guaranteed by State.

Settlement of disputes. In cases of dispute concerning temporary disability payments, the council of prudhommes or the pretor of the locality in which the accident occurred has authority to sit in final judgment if amount involved does not exceed 200 liras (\$38.60). Disputes involving larger amounts are referred for settlement to the local magistrates.

LUXEMBURG.

Date of enactment. April 5, 1902, in effect April 15, 1903. Sick insurance law enacted July 31, 1901.

Injuries compensated. All injuries by accident during or because of the employment resulting in death or disability for more than three days, unless caused intentionally by the victim or during the commission of an illegal act.

Industries covered. Mines, quarries, manufactories, metallurgical establishments; gas and electric works; transportation and handling; building and engineering construction; and certain artisans' shops having at least five employees regularly and using mechanical motive power. By administrative order other establishments may become subject to the law if regarded dangerous.

Persons compensated. Workmen and those supervising and technical officials whose annual earnings are less than 3,000 francs (\$579). Certain other classes of persons may be voluntarily insured.

Government employees. Act applies to government telegraph and telephone services, public works conducted by public agencies, and other governmental industrial establishments, unless other provisions are made for pensioning employees. Penal institutions are not included.

Burden of payment. Benefits and cost of treatment first thirteen weeks provided by sick benefit funds, to which employers contribute one-third and employees two-thirds, if injured person is insured against sickness; if not, because employed less than one week, by an accident insurance association, supported by contributions of employers; if not insured for other reasons, by the employer direct; all benefits and treatment after thirteen weeks paid by accident insurance association.

Compensation for death:

- (a) Funeral expenses, one-fifteenth of the annual earnings, but not less than 40 francs (\$7.72) nor more than 80 francs (\$15.44).
- (b) Pensions, not to exceed 60 per cent of earnings of deceased, to—
 - Widow 20 per cent until death or remarriage; in the latter case a lump sum equal to 60 per cent; same payment to a dependent widower.
 - Each child 20 per cent until 15 years of age, even if father survives, provided he abandoned them, or the mother who was killed was their main support.
 - Dependent heirs in an ascending line, 20 per cent.
 - Dependent orphan grandchildren, 20 per cent until 15 years of age.
 - Widow and children have the preference over other heirs.
- (c) In computing pensions only one-third of excess of annual earnings over 1,500 francs (\$289.50) is considered.

Compensation for disability:

- (a) Entire cost of medical and surgical treatment.
- (b) For temporary or permanent total disability, from third day to end of fourth week, 50 per cent, and from fifth to end of thirteenth week, 60 per cent of wages of persons similarly employed; after thirteen weeks, 66 $\frac{2}{3}$ per cent of annual earnings of injured person.
- (c) For partial disability a portion of above (depending upon degree of disability), which may be increased to full amount, as long as injured employee is without employment.
- (d) Lump sum payments may be substituted for pensions when degree of disability is not greater than 20 per cent.
- (e) In computing pensions only one-third of excess of annual earnings over 1,500 francs (\$289.50) is considered.

Revision of compensation. Demands for change of amount of compensation may be made within three years.

Insurance. Payments are met by mutual accident insurance association of employers, in which all employees must be insured at expense of employers.

Security of payments. Insurance association conducted under state supervision.

Settlement of disputes. Appeals from the decisions of the association may be carried within forty days to a justice of the peace, who is required to invite two delegates, representing employer and employee, to assist in an advisory capacity. Further appeals may be taken to the higher courts.

NETHERLANDS.

Date of enactment. January 2, 1901, in effect June 1, 1901. Other acts February 3 and December 8, 1902, and July 24, 1903.

Injuries compensated. All injuries caused by accident in the course of the employment and causing death or disability for over two days, unless brought on intentionally. If due to intoxication, compensation is reduced one-half, and if death results no compensation is paid.

Industries covered. Practically all manufacturing, mining, quarrying, building, engineering construction, and transportation; fishing in internal waters; establishments using mechanical motive power, or explosive or inflammable materials, and mercantile establishments handling such materials.

Persons compensated. All workmen, including apprentices.

Government employees. All state, provincial, and communal employees are included when engaged in any of the industries enumerated.

Burden of payment. The entire expense rests upon the employer.

Compensation for death:

- (a) Funeral benefit of thirty times average daily earnings of deceased.
- (b) Pensions to heirs of not over 60 per cent of earnings of deceased, distributed to—

Widow, 30 per cent of earnings, until death or remarriage, in latter case two years' payments as a settlement; or to dependent widower, a pension equal to cost of support, but not over 30 per cent of earnings of deceased.

Each child under 16 years of age, 15 per cent if one parent survives, and 20 per cent if both are dead.

Dependent parents, and in their absence to grandparents, not over 30 per cent.

Orphan grandchildren, not over 20 per cent.

Dependent parents-in-law, not over 30 per cent.

Widow and children to be preferred over all other heirs, and their respective shares to be reduced proportionately when aggregating over 60 per cent.

- (c) In computing pensions, wages higher than 4 florins (\$1.61) per day are to be considered as of that amount.

Compensation for disability:

- (a) Free medical and surgical treatment, or its cost.
- (b) From day after injury until forty-third day, an allowance of 70 per cent of daily earnings, excluding Sundays and holidays.
- (c) From forty-third day a pension of above amount during total disability and a smaller pension in proportion to loss of earning power if partially disabled.
- (d) In computing pensions, wages higher than 4 florins (\$1.61) per day are to be considered as of that amount.

Revision of compensation. An examination of condition of victim may be made whenever the Royal Insurance Bank so desires.

Insurance. Employers may insure their employees in the Royal Insurance Bank (a state institution), in a private company or association operating under State supervision, or they may carry the burden themselves. If not insured in the Royal Insurance Bank a sufficient guarantee must be deposited with the latter. Employers must bear a proportionate share of the expense of administration of the Royal Insurance Bank, whether they insure in it or not.

Security of payments. Compensation payments are guaranteed by the State.

Settlement of disputes. Appeals may be taken from decisions of the Royal Insurance Bank to local arbitration councils, in which employers and employees are equally represented, and from them to a central arbitration council whose decisions are final.

NEW SOUTH WALES.

Date of enactment. November 5, 1900, in effect January 1, 1901. Amended on December 28, 1901. Scale of compensation increased by governor on July 28, 1905, in accordance with power given by the act.

Injuries compensated. Injuries caused primarily by accident while at work and resulting in death or incapacity to attend to ordinary occupation.

Industries covered. Any mine, or works adjoining such mine, in or about which (including the works) 15 or more persons are employed.

Persons compensated. Persons employed in or about a mine, or works adjoining.

Government employees. No mention of government employees is made in the law.

Burden of payments. Distributed equally between employees on one hand and employers and State on the other: Workmen pay 4½ pence (9 cents) per week, employers pay 50 per cent of workmen's contributions, and State grants subsidy of an amount equal to employers' contribution.

Compensation for death:

- (a) Funeral benefit of £12 (\$58.40).
- (b) Weekly pensions: to widow, 10 shillings (\$2.43), until death or remarriage, and for each child under 14 years, additional 3 shillings (73 cents); to motherless children, 10 shillings (\$2.43) until no child is below 14 years.
- (c) If deceased was unmarried, weekly pensions of 10 shillings (\$2.43) to dependent father and mother, each, and additional 3 shillings (73 cents) for each child under 14 years of dependent mother.
- (d) In absence of dependent parents, 10 shillings per week (\$2.43) to dependent sister or sisters (sharing equally) and additional 3 shillings (73 cents) for each child under 14 years.

Compensation for disability:

- (a) Weekly allowance of 15 shillings (\$3.65) until able to resume work.
- (b) In case of permanent total disability, additional 3 shillings (73 cents) weekly for each child under 14.

Revision of compensation. Made under rules promulgated by a board consisting of members representing workmen, employers, and State.

Insurance. Payments are met by miner's accident relief fund administered by the board above mentioned.

Security of payment. Governor must revise scale of benefits to correspond with financial condition of fund.

Settlement of disputes. Controversies are settled by the board which administers the fund, except that fines and arrears of contributions may be collected through regular courts.

NEW ZEALAND.

Date of enactment. October 18, 1900, to take effect at a date fixed by the governor by order in council. Amended October 3, 1902, November 23, 1903, November 8, 1904, October 31, 1905, and October 29, 1906.

Injuries compensated. All injuries to workmen arising out of and in the course of the employment causing death or disability for at least one week, except when due to serious and willful misconduct of the workman injured.

Industries covered. Industrial, commercial, manufacturing, building, agricultural, pastoral, mining, quarrying, engineering, and hazardous work carried on by or on behalf of the employer as a part of his trade or business.

Persons compensated. All persons under contract with an employer.

Government employees. Act applies to work carried on by or on behalf of the Government or any local authority if it would, in case of a private employer, be an employment to which the act applies.

Burden of payment. Entire cost of compensation rests upon employer; but if there are contractors, then on such contractors and the principal, jointly and severally.

Compensation for death:

- (a) A sum equal to three years' earnings, but not less than £200 (\$973.30) nor more than £400 (\$1,946.60), to those wholly dependent upon earnings of deceased.
- (b) A sum less than above amount if dependents were partly dependent upon deceased, to be agreed upon by the parties or fixed by a magistrate or by the arbitration court.
- (c) Reasonable expenses of medical attendance and burial, not exceeding £30 (\$146.00), in case deceased leaves no dependents.

Compensation for disability:

- (a) A weekly payment during disability not exceeding 50 per cent of employee's average weekly earnings during the previous twelve months, but not to exceed £2 (\$9.73) nor to fall below £1 (\$4.87) where employee's ordinary rate of pay at time of accident was not less than 30 shillings (\$7.30) per week. Total liability of employer is limited to £300 (\$1,459.95). No payment is made for first week if disability does not continue for a longer period than two weeks.
- (b) A lump sum may be substituted for weekly payments for permanent total or partial disability, to be agreed on by the parties or, in default of agreement, determined by the court of arbitration.

Revision of benefits. Weekly payments may be revised at request of either party.

Insurance. Employers may contract with their employees for substitution of a scheme of compensation, benefit, or insurance in place of the provisions of the act if the scheme is shown to be not less favorable to the general body of employees and their dependents than the provisions of the act. In such case the employer is liable only in accordance with the scheme.

Security of payments. When an employer becomes liable under this act to pay compensation, and is entitled to any sum from insurers on account of the amount due to a workman under such liability, then in the event of his becoming insolvent such workman has a first claim upon this sum. Compensation for injuries sustained in the course of employment in or about a mine, factory, building, or vessel is deemed a charge upon the employer's interest in such property and has priority over all charges other than those lawfully existing at the time of the commencement of the act.

Settlement of disputes. Disputes arising under the act are settled by the court of arbitration under the industrial arbitration act. Where claim for compensation does not exceed £200 (\$973.30) proceedings may be instituted before a magistrate whose decision is final, except that in cases where amount involved does not exceed £50 (\$243.33) either party may, with the consent of the magistrate, and in cases where the claim exceeds £50 (\$243.33), without such consent, appeal from his decision on any point of law.

NORWAY.

Date of enactment. July 23, 1894, in effect July 1, 1895.

Injuries compensated. All injuries by industrial accidents, causing death, or disability for more than four weeks, or requiring treatment after that period, unless intentionally brought about by the injured person.

Industries covered. Practically all factories and workshops using other than hand power; mines and quarries; the handling of ice, explosives, or inflammable wares; building and engineering construction, electric work, transportation, salvage and diving, chimney sweeping, and fire extinguishing. Employees in other industries may avail themselves of this insurance system.

Persons compensated. All workmen and overseers.

Government employees. Act covers employees in government or communal service, when engaged in any of the industries enumerated above, unless at least equal compensation is provided by special regulation.

Burden of payment. Cost of compensation rests upon employer.

Compensation in case of death:

(a) Funeral benefit of 50 crowns (\$13.40).

(b) Pensions to heirs not exceeding 50 per cent of earnings, to be distributed to—

Widow, 20 per cent of earnings, until death or remarriage; in the latter case a lump sum equal to three annual payments; or dependent widower, 20 per cent of annual earnings of deceased while disability lasts.

Each child 15 per cent of annual earnings till age of 15 years, if one parent survives, or 20 per cent if neither survives; 15 per cent for each parent to each child, when both parents have died as result of injuries.

Dependent relatives in ascending line, if there is a residue after providing for above-mentioned heirs, a pension of 20 per cent of earnings until death or cessation of need, to be divided equally; but living parents exclude grandparents from participation.

(c) In computing pensions, the excess of annual earnings over 1,200 crowns (\$321.60) is not considered.

(d) Pension payments are in addition to prior allowances granted for disability.

Compensation for disability:

(a) Free medical and surgical treatment, or cost of same, after four weeks.

(b) If employee is totally disabled for more than four weeks an allowance of 60 per cent of the earnings, but not less than 0.50 crown (13 cents) per diem or 150 crowns (\$40.20) per annum; and a proportionate allowance in case of partial disability.

(c) If injured employee is forced to stay in a hospital, dependents receive allowances during that time equal to the pensions granted in cases of death.

(d) If injured employee is not a member of a sick insurance fund he is entitled to receive from employer directly sick benefits and free medical treatment from first day of injury.

(e) In computing allowances the excess of annual earnings over 1,200 crowns (\$321.60) is not considered.

Revision of compensation. Compensation is subject to revision upon demand of either the beneficiary or the insurance office.

Insurance. A state central insurance office is established for the entire Kingdom, in which all employees subject to the law must be insured by employer, unless he is, for special reasons, relieved by royal order from the obligation of insurance.

Security of payments. Insurance office is guaranteed by the State.

Settlement of disputes. Appeals from decisions of insurance office may be entered within six weeks with the special insurance commission.

QUEBEC.

Date of enactment. May 29, 1909, in effect January 1, 1910.

Injuries compensated. All injuries happening to workmen by reason of or in the course of their work causing death or disability lasting over seven days. Injuries intentionally caused by the person injured are not compensated.

Industries covered. Building, manufacturing, transportation, engineering and construction work, mining, quarrying; stone, wood, and coal yards; any industrial enterprise using machinery operated by power. Agriculture and sailing vessels are excluded.

Persons compensated. Workmen, apprentices, and employees earning not more than \$1,000 per annum. Foreign workmen or their representatives are compensated only if and so long as they reside in Canada.

Government employees. Government employees are not mentioned in the act.

Burden of payment. The entire expense rests upon the employer.

Compensation for death:

- (a) Medical and funeral expenses not in excess of \$25, unless same are provided by an association of which the deceased was a member;
- (b) Four times average yearly wages, but not less than \$1,000 nor more than \$2,000, payable to surviving consort, to children under 16 years of age, and dependent ascendants, shares to be agreed upon or determined by court.

All amounts may be decreased or increased by court on account of inexcusable fault of employee or employer.

Payments made for disability before death are deducted.

Compensation for disability:

- (a) For permanent total disability, a pension equal to 50 per cent of the yearly wages (including the maximum and minimum amounts).
- (b) For permanent partial incapacity, a pension equal to 50 per cent of the amount by which the wages have been reduced because of the injury.
- (c) For temporary incapacity lasting over seven days, compensation equal to one-half the daily earnings received at the time of the accident, beginning with the eighth day.
- (d) In computing pensions only one-fourth the excess of the annual earnings between \$600 and \$1,000 is considered; the capital of any pension shall not exceed \$2,000, unless higher because of accidents due to inexcusable fault of the employer.

Revision of compensation. Demands for change of amount of compensation may be made within four years.

Insurance. No reference concerning the insurance of risks under the law is contained in the act, except as to the payment of pensions due, which may be transferred to insurance companies. No release from liability is obtained by the employer by such transfer.

Security of payments. Claims for compensation or pensions form a lien on the real and personal property of the employer so long as they remain unpaid.

Settlement of disputes. Superior and circuit courts have jurisdiction over all disputes arising under this act. All proceedings are summary, no trial by jury being allowed.

QUEENSLAND.

Date of enactment. December 20, 1905, in effect March 31, 1906.

Injuries compensated. All injuries by accident, arising out of and in the course of the employment, which cause death or disable a workman for at least two weeks from earning full wages at the work at which he was employed, except when the injury is directly attributable to his serious and willful misconduct or when it occurs while proceeding to or from his place of work.

Industries covered. Industrial, commercial, manufacturing, building, agricultural, pastoral, mining, quarrying, engineering, or hazardous work carried on by or on behalf of the employer as a part of his trade or business.

Persons compensated. All persons under contract with an employer.

Government employees. Act applies to any work carried on by or on behalf of the government or any local authority if it would, in case of a private employer, be an employment to which the act applies.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death:

- (a) A sum equal to three years' earnings, but not less than £200 (\$973.30) nor more than £400 (\$1,946.60), to those wholly dependent upon earnings of deceased; but aged and infirm employees may agree in advance to accept a reduced amount.
- (b) A sum less than above if heirs are only partly dependent.
- (c) Reasonable expenses of medical attendance and burial, not exceeding £30 (\$146), if deceased leaves no dependents.

Compensation for disability:

- (a) A weekly payment during disability after second week, not exceeding 50 per cent of employee's average weekly earnings during the previous twelve months, such weekly payments not to exceed £1 (\$4.87), and total liability not to exceed £400 (\$1,946.60); except that aged and infirm employees may agree in advance to accept a reduced amount.
- (b) A weekly payment during partial disability after second week, not exceeding one-half of difference between the employee's average weekly earnings before the accident and the average weekly amount which he is earning or able to earn after injury.
- (c) Minors may be allowed full earnings during incapacity, not exceeding 10 shillings (\$2.43) weekly.
- (d) A lump sum may be substituted for weekly payments after three months, on application of employer, the amount to be agreed upon or, in default of agreement, to be determined by a police magistrate.

Revision of compensation. Weekly payments may be revised by a police magistrate at request of either party.

Insurance. Employers may contract with their employees for substitution of a scheme of compensation, benefit, or insurance in place of the provisions of the act if the scheme is officially certified to be not less favorable to the employees and their dependents than the provisions of the act. In such case the employer is liable only in accordance with the scheme.

Security of payments. When an employer becomes liable under the act to pay compensation, and is entitled to any sum from insurers on account of the amount due to a worker under such liability, then in the event of his becoming insolvent, such workman has a first claim upon this sum for the amount so due.

Settlement of disputes. Disputes arising under the act are heard and determined by a police magistrate, whose decision is final, except that either party may appeal from this decision on any point of law with the latter's leave if the claim does not exceed £50 (\$243.33), or without his leave if it exceeds that amount.

RUSSIA.

Date of enactment. June 2 (15), 1903, in effect January 1 (14), 1904.

Injuries compensated. All injuries by accident occasioned by or on account of the work and causing death or disability for more than three days, unless brought on intentionally by the victim or due to gross imprudence.

Industries covered. Metallurgical and mining establishments and factories and workshops using other than hand power, but exclusive of shops of private railroad and steamship companies and certain rural industrial establishments.

Persons compensated. Workmen and those technical officials whose annual earnings do not exceed 1,500 rubles (\$772.50).

Government employees. Act applies to mining, metallurgical and manufacturing establishments of municipal and zemstvo governments, but not to national government employees, for whom special regulations exist.

Burden of payment. Entire burden of payment rests upon employer.

Compensation for death:

(a) Funeral expenses not exceeding 30 rubles (\$15.45) for an adult and 15 rubles (\$7.73) for a child under 15 years of age.

(b) Pensions to dependent heirs not exceeding 66 $\frac{2}{3}$ per cent of annual earnings of victim, distributed to—

Widow 33 $\frac{1}{3}$ per cent until death or remarriage; in the latter case a lump sum equal to three annual payments.

Each child until age of 15 years 16 $\frac{2}{3}$ per cent if one parent survives and 25 per cent if neither parent survives.

Dependent heirs in ascending line, 16 $\frac{2}{3}$ per cent.

Each dependent orphan brother and sister until 15 years of age, 16 $\frac{2}{3}$ per cent.

Widow and children take precedence over other dependent heirs, who share the remainder in equal parts.

(c) Pension may, by mutual consent of employer and beneficiary, be replaced by single payment of ten times amount of annual pension and, in case of children, pension multiplied by the number of years remaining for pension payments, but not exceeding ten.

Compensation for disability:

(a) Free medical and surgical treatment or reimbursement of expense of same.

(b) If permanently disabled, a pension of 66 $\frac{2}{3}$ per cent of annual earnings of victim in case of total disability, and a pension proportionate to degree of incapacity in case of partial disability, to be paid from time when degree of permanent disability was determined; if amount of pension exceeds that of previous allowance for temporary disability, difference between the two during the period of disability is paid to permanently injured employee.

(c) Pension may, by mutual consent of employer and beneficiary, be replaced by a single payment of ten times amount of annual pension.

(d) If temporarily disabled, an allowance of 50 per cent of actual wages of victim from day of accident until complete recovery from disability or the determining of degree of permanent disability.

Revision of compensation. Demands for revision of payments or to secure a pension previously refused may be made by either party within three years.

Insurance. Employers may transfer burden of payment of compensation by insuring their employees in authorized insurance companies or societies.

Security of payments. On retiring from business employer must guarantee payments by insurance or by deposit with a state bank. In case of insolvency, payments constitute a preferred claim.

Settlements of disputes. Disputes may be carried into courts as other civil cases. Such cases are exempt from court fees, the documents are free from stamp tax, and attorney's fees are fixed by law.

SOUTH AUSTRALIA.

Date of enactment. December 5, 1900, in effect not earlier than June 1, 1901.

Injuries compensated. All injuries to workmen arising out of and in the course of the employment causing death or disability for at least one week, except when due to serious and willful misconduct of the workman injured.

Industries covered. Railways, waterworks, tramways, electric-lighting works, factories, mines, quarries, engineering and building work, employments declared by a proclamation of the governor upon addresses from both houses of parliament to be dangerous or injurious to health or dangerous to life or limb, and agricultural pursuits where mechanical motive power is used.

Persons compensated. All persons engaged in manual labor or otherwise.

Government employees. Act applies to civilian persons employed under the Crown to whom it would apply if the employer were a private person.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death:

- (a) A sum equal to three years' earnings, but not less than £150 (\$729.98) nor more than £300 (\$1,459.95), to those wholly dependent upon earnings of deceased.
- (b) A sum less than above amount if dependents were partly dependent upon deceased, to be agreed upon by the parties or fixed by arbitration.
- (c) Reasonable expenses of medical attendance and burial not exceeding £50 (\$243.33), if deceased leaves no dependents.

Compensation for disability:

- (a) A weekly payment during disability after first week, not exceeding 50 per cent of employee's average weekly earnings during the previous twelve months, such weekly payments not to exceed £1 (\$4.87) nor, in case of total incapacity, to be less than 7s. 6d. (\$1.83) per week, and total liability not to exceed £300 (\$1,459.95).
- (b) A weekly payment during partial disability after first week to be fixed with regard to difference between employee's average weekly earnings before the accident and average weekly amount which he is earning or able to earn after injury.
- (c) A lump sum not exceeding £300 (\$1,459.95) may be substituted for weekly payments, after six months, on application of either party, the amount to be settled by arbitration under the act in default of agreement.

Revision of benefits. Weekly payments may be revised at request of either party.

Insurance. Employers may contract with their employees for substitution of a scheme of compensation, benefit, or insurance in place of the provisions of the act, if the public actuary certifies that the scheme is on the whole not less favorable to general body of employees and their dependents than the provisions of the act. In such case employer is liable only in accordance with the scheme.

Security of payments. When an employer becomes liable under the act to pay compensation, and is entitled to any sum from insurers on account of the amount due to a workman under such liability, then in the event of his becoming insolvent such workman has a first claim upon this sum, and any special magistrate may direct its payment into the savings bank to be applied to payment of compensations due.

Settlement of disputes. Disputes arising under the act are settled by the arbitration of existing committees representative of employers and employees, or, if either party objects, by a single arbitrator agreed on by the parties, or, in absence of agreement, by a special magistrate. An arbitrator appointed by the magistrate has all the powers of a local court.

SPAIN.

Date of enactment. January 30, 1900, in effect July 28, 1900.

Injuries compensated. All injuries by accidents to employees in the course of and by reason of the employment causing death or disability. Compensation may be reduced if injured person was engaged in an illegal act.

Industries covered. Manufacturing, mines, quarries, metallurgical establishments, construction work, industries injurious to health, transportation, gas and electric works, street cleaning, theaters, and agricultural and forestry establishments using power machinery.

Persons compensated. Workmen performing manual labor, including helpers and apprentices.

Government employees. Act applies to employees of state factories and other government establishments, to labor accidents in war and naval departments, and to establishments of provincial and communal governments.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death. In addition to any prior benefits paid for disability—

(a) Funeral expenses not exceeding 100 pesetas (\$19.30).

(b) A lump sum equal to two years' earnings, if widow, and children or dependent orphan grandchildren under 16 years survive; eighteen months' earnings if only children or orphan grandchildren survive; one year's earnings if only widow survives; ten months' earnings to dependent parents or grandparents over 60 years of age, in absence of widow or children, if two or more survive; seven months' earnings if only one parent or grandparent survives.

(c) For these lump sum payments, by mutual consent, the following pensions may be substituted: 40 per cent of annual earnings when widow and children or grandchildren survive; 20 per cent of annual earnings when only widow survives; 10 per cent to each dependent parent or grandparent over 60 years of age, when no widow or children survive, but not over 30 per cent in the aggregate; compensation to widow ceases on her remarriage, and to children on their attaining the age of 16 years.

(d) In these cases, the daily earnings to be considered as not less than 1.50 pesetas (29 cents).

(e) All of these compensations are increased by 50 per cent if the establishment is lacking in the required safety provisions.

Compensation for disability:

(a) Free medical and surgical treatment during disability.

(b) Fifty per cent of daily earnings, including Sundays and holidays, from day of injury to day of recovery from disability, but not over one year, after which case is treated as one of permanent disability.

(c) In case of permanent disability, in addition to the foregoing, a sum equal to two years' earnings for total disability.

Eighteen months' earnings, if total disability extends only to former trade.

One year's earnings in cases of partial permanent disability for usual employment, unless the employer agrees to employ injured workmen at some other work at old rate of wages.

(d) In these cases, the daily earnings to be considered as not less than 1.50 pesetas (29 cents).

(e) Compensations are increased by 50 per cent if the establishment is lacking in the required safety provisions.

Revision of compensation. No special provision is made in the law.

Insurance. Employers may contract with authorized insurance companies to assume obligations imposed by law.

Security of payments. No special provision is made in the law.

Settlement of disputes. Disputes concerning compensation under the law may be carried to special permanent labor tribunals consisting of representatives of the State, employers, and employees.

SWEDEN.

Date of enactment. Approved July 5, 1901, in effect January 1, 1903; amended June 3, 1904.

Injuries compensated. Injuries by accidents to workmen resulting from the employment, and causing death or disability for more than sixty days, unless due to the willful act or gross negligence of the victim or to the willful act of a third person who has neither the supervision nor the direction of the work.

Industries covered. Practically all establishments engaged in forestry work, mining, quarrying, turf and ice cutting and handling, manufacturing, chimney sweeping, rafting, railway and tramway service, handling goods, building trades, conduit, road and other construction work, and electricity, gas, and water distribution. Employers in other industries may insure their employees in the State Insurance Institute and thereby be placed under provisions of the act. Employees in other industries may secure the protection of the act by insuring themselves in the State Insurance Institute.

Persons compensated. Workmen and foremen.

Government employees. Act applies to employees in the state and communal services when engaged in any of the industries enumerated above.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death. When death results from the injury within two years—

- (a) Funeral benefit of 60 crowns (\$16.08).
- (b) Annual pensions not exceeding in the aggregate 300 crowns (\$80.40), to be distributed to widow, until remarriage 120 crowns (\$32.16); each child under 15 years of age 60 crowns (\$16.08).

Compensation for disability.

- (a) If permanently disabled, annual pension of 300 crowns (\$80.40) in case of total disability, and a smaller sum corresponding to loss of earning power in case of partial disability, pension to begin with sixty-first day of disability, or later if permanent character of the disability was not then established.
- (b) If temporarily disabled for more than sixty days, 1 crown (27 cents) per day beginning with sixty-first day.

Revision of compensation. Suit may be brought in a court of first instance by injured employee for a revision of compensation within two years from the date of the fixing of the same.

Insurance. If an injured person receives an allowance or pension from an organization which is supported entirely or in greater part by the employer, or if the victim is insured in a private organization by his employer, the amounts received from such a source may be deducted from payments required of employer under the act. Employers may transfer burden of payment of compensation by insuring in the State Insurance Institute, created for this purpose by the act, or in individual cases purchase annuities for pensioners from this institution. Other arrangements may be made between employers and employees if the State Insurance Institute finds upon examination that they are not unfavorable to the employees.

Security of payments. An employer may be required to furnish adequate security for the payment of the pension to cover the contingency of his neglecting to pay the same, of his retiring from business or leaving the country, or of his becoming insolvent. If he fails to furnish security he may be required to pay a lump sum equal to the capital value of the pension plus the payments and interest due, which amount, in the case of an injured employee, must be invested in the purchase of an annuity from the State Insurance Institute.

Settlement of disputes. Disputes may be settled either by arbitration or by bringing suit in a court of first instance. The demand for arbitration must be made or the suit brought within two years after the accident or in case of fatal accidents within two years after the death of the victim. If the action is against the State Insurance Institute, one year more is allowed.

TRANSVAAL.

Date of enactment. August 20, 1907, in effect April 1, 1908.

Injuries compensated. Injuries by accident arising out of and in the course of the employment which cause the workman's death or necessitate his absence from work for over one week. Compensation is not paid when injury is due to serious and willful misconduct.

Industries covered. Employment at or about any trade, industry, business, or public undertaking, including agriculture, but excluding domestic service.

Persons compensated. Any white person regularly employed for the purposes of the employers' trade or business whose annual earnings do not exceed £500 (\$2,433.25), but exclusive of home workers and subcontractors.

Government employees. All civil government employees are covered by this act if employed in establishments or undertakings to which the law applies, provided that when other pension provisions have been made the injured employee or his surviving dependents have the right to choose between the two methods of compensation.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death:

- (a) A sum equal to two years' wages, but not more than £500 (\$2,433.25), to those dependent upon earnings of the deceased, to be distributed among the dependents, either by agreement or by order of the local courts.
- (b) Temporary payments previously made for over three months shall be deducted from the above amounts.
- (c) If deceased left no dependents, reasonable expenses of medical attendance and burial, not exceeding £60 (\$291.99).

Compensation for disability:

- (a) A weekly payment during disability of 50 per cent of the wages at the time of injury.
- (b) In case of total permanent disability, an amount equal to three years' wages, minus the amount paid in weekly compensation, but not over £750 (\$3,649.88).
- (c) In case of partial disability, an amount equal to probable loss of earning power for three years, minus the amount paid out in weekly compensation, but not over £375 (\$1,824.94).
- (d) In case of minors suffering total permanent disability the court may increase the compensation to £300 (\$1,459.95) if three years' wages are less than this amount, and if suffering from partial permanent disability the court may increase the compensation to £150 (\$729.98).

Revision of benefits. Employer may apply for revision or setting aside of order to pay weekly compensation on the ground of recovery of the employee or his willful retardation of recovery or refusal to undergo medical examinations or if lack of notice of accident or subsequent proof of serious and willful misconduct. Injured employee has right to make a new application if compensation is denied and injury subsequently proves more serious than expected.

Insurance. Right of insurance against the obligations of this act is not regulated. No release from liability is affected by such insurance.

Settlement of disputes. Orders for granting benefits are given by local magistrates, after holding an inquiry. Appeals may be had to the magistrate himself and from him to the supreme court.

WESTERN AUSTRALIA.

Date of enactment. February 19, 1902, in effect on a date fixed by the governor by order in council.

Injuries compensated. All injuries caused to a workman arising out of and in the course of the employment causing death or disability for at least two weeks, except when due to serious and willful misconduct of the workman injured.

Industries covered. Railways, waterworks, tramways, electric-light plants, factories, mines, quarries, engineering and building work, and employments declared by a proclamation of the governor, issued pursuant to addresses from both houses of parliament, to be dangerous or injurious to health or dangerous to life or limb.

Persons compensated. All persons engaged under contract in any employment.

Government employees. Act applies to all persons employed under the Crown to whom it would apply if employer were a private person.

Burden of payment. Entire cost of compensation rests upon employer.

Compensation for death:

- (a) A sum equal to three years' earnings, but not less than £200 (\$973.30) nor more than £400 (\$1,946.60), to those wholly dependent upon earnings of deceased.
- (b) A sum less than above amount if dependents were partly dependent upon deceased, to be agreed upon by the parties or fixed by local court.
- (c) Reasonable expenses of medical attendance and burial not to exceed £100 (\$486.65), if deceased leaves no dependents.

Compensation for disability:

- (a) A weekly payment during disability after second week, not exceeding 50 per cent of injured person's average weekly earnings during the previous twelve months, such weekly payment not to exceed £2 (\$9.73) and total liability not to exceed £300 (\$1,459.95).
- (b) In case of partial disability, regard is to be had to the difference between average weekly earnings before and after the accident, and to any payment other than wages made by employer on account of the injury.
- (c) A lump sum may be substituted for weekly payments, after six months, on the application of the employer, the amount to be determined by the court in default of agreement.

Revision of benefits. Weekly payments may be revised by the court at request of either party.

Insurance. Employers may contract with their employees for substitution of a scheme of compensation, benefit, or insurance in place of the provisions of the act, if the registrar of friendly societies certifies that the scheme is on the whole not less favorable to the general body of employees and their dependents than the provisions of the act. In such case employer is liable only in accordance with this scheme.

Security of payments. When an employer becomes liable under the act to pay compensation, and is entitled to any sum from insurers on account of the amount due to a workman under such liability, then in the event of his becoming insolvent such workman has a first charge upon this sum for the amount so due. Compensation for injuries sustained in the course of employment in or about a mine, factory, building, or vessel is deemed a charge on the employer's interest in such property.

Settlement of disputes. Disputes arising under the act are settled by the local court of the district in which the injury is received.

COST OF EMPLOYERS' LIABILITY AND WORKMEN'S COMPENSATION INSURANCE.^(a)

BY MILES M. DAWSON.

The primary purpose of the study the results of which are here presented was to ascertain, so far as possible, the cost to the employer of insurance covering industrial accidents under the systems of employers' liability and workmen's compensation at present in operation in various foreign countries. It was the intention to secure also for purposes of comparison the rates in use under the employers' liability systems in force before the enactment of the present compensation laws.

The most careful study of the systems in operation in the various countries and of the cost to employers of insurance covering industrial accidents under these systems as shown in the tables of this report does not permit any very definite conclusions as to what the increase in rates would be in any State of the United States if such laws and provisions in regard to compensation as are to be found in the respective countries were introduced, and this is true even though the kinds of insurance institutions in which the protection was carried were identically the same. There would still be variations, due to the following:

First, differences in accident rates, according to the development of industries, according to how accustomed the workmen were to the work in which they are engaged, according to various conditions

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in regard to safety devices, hygiene, sanitation, personal health, vigor, nourishment, etc., and according to the vigilance, or otherwise, of public officials in enforcing efficient factory and industry inspection.

Second, there are large variations in the rates of expenses in the different countries with which institutions, even though of the same general type and character, are conducted or perhaps can be conducted. Thus, for example, stock companies are conducted in Sweden and in France, to name certain instances, at a rate of expense of about 20 per cent to 22 per cent of the premiums. The expenses in Great Britain, on the other hand, absorb at least 40 per cent of the premiums, including payments to examining physicians and for legal and other expenses in adjustment. There are very considerable differences in the rates of expenditure when the insurance is voluntary and institutions for this purpose are in competition with others. On the other hand, there is a remarkable similarity in the expenses of state insurance institutions and mutual insurance institutions when they have a monopoly of the business and insurance is compulsory. Thus, the expense rates in Norway, Austria, and Germany are about the same, viz, 11 per cent of the premium receipts.

The information in regard to premium rates in the various countries will be of interest and perhaps of much utility, however, in furnishing some indication of what increases of rates would probably be made. Thus, for instance, it is possible to study the increases which were made in a transition from a liability system to a compensation system in Great Britain, different provinces in Canada, and the State of New York when such legislation was placed upon the statute books.

As to Great Britain, the great caution with which the courts administered the employers' liability act of 1880 resulted in extremely low rates for employers' liability insurance. Consequently the increase was very considerable, when the employers were rendered liable by the compensation law for virtually all of the accidents, instead of only about 7 per cent as formerly, though, of course, the average amount may have been materially lower per person injured or killed.

On the other hand, in Switzerland, according to the estimate of the government actuary, the increase in rates as compared with the rates charged by the employers' liability companies under the extremely liberal negligence laws would have been little or nothing had the scheme for government insurance contained in the bill passed in 1899 gone into effect. The rates for the government scheme, however, were net, and therefore with expenses added according to the experience under government schemes would have been increased about 12 per cent, and, of course, had the same benefits been obtained through private insurance, by at least 25 per cent.

The special significance of this comparison is that where either by reason of liberal interpretation by the courts or by the enactment of more liberal liability laws, or by both of these, the rates for insurance against employers' liability have been greatly increased, the additional increase which takes place when a workmen's compensation act is adopted is relatively slight.

This may again be seen by reference to New York, in which State the manual rates for liability insurance, less the schedule discount of 55 per cent, as in use by the insurance companies, were, on the average, somewhat less than half the rate now charged in industries to which the workmen's compensation act applies in its entirety. These new rates for compensation insurance, however, are not higher than the full manual rates for insurance of the employer against his liability for negligence, which are, according to the schedule of discounts, charged in a number of the States of the United States. It would therefore seem to follow that workmen's compensation acts in these States might not result in any considerable increase in rates, and that the increase in rates which would take place in States where the rates have been exceptionally low would, perhaps, not be much more than would equalize the cost of employers' liability insurance with rates in other States.

This has a very material bearing on the question of the effect of these rates on competition between manufacturers in various States. It is obvious that there is already a difference at times of at least 200 per cent, and perhaps extending to 300 per cent, in the rates in one State over those in another. This study of rates in foreign countries and in provinces of Canada and in New York indicates that the general adoption of workmen's compensation acts, if approximately uniform in their terms, might be likely to equalize rates of premiums rather than to render them more variant than at present.

An examination of the summary of foreign workmen's compensation acts, which immediately precedes this report, will show clearly the variety and extent of the differences in the scope and methods of organization and administration, as well as in the conditions under which compensation for industrial accidents is paid and in the amounts of compensation in the various countries. For an explanation of the various systems this summary should be consulted, and only such detail will be repeated in connection with the tables of premium rates as seems necessary to make clear the meaning of the figures.

In the following pages are given the premium rates, showing the cost to employers of insurance covering industrial accidents under the laws in operation in the various countries. These rates are usually in the form of percentages of the pay roll. Such explanation as seems necessary to make clear the significance of the rates is given immediately preceding them in the case of each country.

The many blanks in the columns of the rate tables in the countries where there is voluntary insurance are of themselves significant. They do not indicate, by any means, that insurance is refused to all of these industries. In some cases there was merely a failure to furnish rates. But in a good many instances where the hazard is deemed great the industries are refused insurance. And it must also be said, first, that there are some industries, even within the classes for which rates are given, which are refused insurance or are offered insurance only at prohibitive rates, either because of special perils of the plant or because of high claim experience in the past, and, second, that a large proportion, ranging from 10 per cent to as high as 40 per cent of the employees of their own choice do not insure when insurance is entirely voluntary.

The countries and states for which rates are given are, in order, Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Italy, Netherlands, Norway, Sweden, Switzerland, Canada, New York, and United States.

AUSTRIA.

In Austria the system of insurance in force requires all employers to insure their employees against the consequences of industrial accidents, in state institutions, covering particular districts, and composed of all the employers in that district who come within the terms of the law. The mining and railroad industries are, however, organized into separate institutions. These district institutions are under the control of representatives of the employers, of their employees, and of the State. Compensation for disability after the fourth week and for death is paid by these institutions. During the first four weeks of disability the compensation for sickness and non-industrial as well as industrial accidents is paid by sickness insurance societies to which the employers contribute one-third and the employees two-thirds, and in the management of which they are represented in proportion to the rates of their contributions.

The employers pay the entire premiums covering such compensation, but they may deduct from the pay of the employees 10 per cent, leaving the net cost to themselves 90 per cent.

The district institutions were intended, when the law was originally enacted in 1887, to maintain themselves solvent by setting aside reserves on a capitalized value basis each year for the pensions payable thereafter by reason of deaths and disabilities incurred through the accidents of the year. This, however, has not been realized, and instead, the financial condition of these institutions is that in six of the seven the reserves are inadequate, and in two of them they fall short approximately 50 per cent.

The rates given show the average premium charged in the various industries named in each of the seven district institutions in the year 1909. The second group of columns shows the results of the reclassification which took effect on January 1, 1910.

The Austrian method of rating consists of gradations based upon a foundation figure arrived at with reference to the highest class and this figure may be altered, in which case all the rates go up or down with it. In addition to this there are changes of classification which take a particular sort of hazard out of one class and rank it in another, thereby increasing or decreasing the rate charged. Every five years there are investigations of the experience, and revision is made of the basic rates and of the classifications.

These rates in the table which follows do not include what the employers pay for the indemnities for the first four weeks. Neither have any deductions been made for the one-tenth which they may and usually do deduct from the wages of the employee.

Notwithstanding that a great deal of expert attention has been given to the rating question during the repeated investigations on behalf of the Austrian Government, it is not generally believed that the rates are sufficient even now to provide for adequate reserves, and to prevent the existing deficiencies from increasing in amount. This should be taken into account in comparing these rates with those which are charged in some other countries where adequate reserves covering capitalized values have actually been maintained.

In Austria, as elsewhere, it is found that in the districts where the largest establishments, working under pressure and employing a very large number of persons, are situated, the rates for those classes of establishments are higher than in the other districts. This is generally true and merely illustrates what is found to be the case among other nations. It is also to be taken into account that, notwithstanding these larger rates, it is precisely in the districts where such large scale industries are concentrated that the rates have so far been insufficient and the largest impairments of reserves have taken place. These large scale industries are also relatively new.

It is also noteworthy that the chief increases in rates for the next five-year period, which are based upon the experience of the last five years, are in these districts where large scale industries are concentrated and are chiefly in the rates for these industries themselves.

The average expense of management of the Austrian district associations is about 10 per cent of the premiums received.

The rates given in the table following are from the Twenty-fourth Annual Report of the United States Commissioner of Labor.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL IN EMPLOYERS' COVERING ACCIDENTS CAUSING DISABILITY FOR

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions establishments "with power."]

Industry.	Premium rates, 1905 to 1909, in—						
	Prague.	Vienna.	Salz- burg.	Gratz.	Brünn.	Lemb- erg.	Trieste.
Agricultural-machinery works.....	2.15	2.42	1.68	1.50	1.78	1.78	1.75
Automobile factories.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Bakeries and biscuit factories.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Beer bottling and shipping.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Belt and saddlery factories.....	.77	.70	.60	.54	.64	.64	.63
Boiler-construction works:							
(a) Riveting by machinery.....	3.35	3.05	2.61	2.34	2.77	2.77	2.73
(b) Riveting by hand.....	5.07	4.61	3.95	3.54	4.19	4.19	4.13
Bookbinding (power).....	.77	.70	.60	.54	.64	.64	.63
Brewery and malt works.....	2.66	3.05	1.68	1.86	2.77	1.78	2.73
Bridge construction (other than iron).....	5.07	4.61	3.95	3.54	4.19	4.19	4.13
Brickmaking (by machinery).....	3.35	2.42	2.61	2.34	2.77	2.77	2.73
Candy factories.....	.77	.70	.60	.54	.64	.64	.63
Canning factories:							
(a) Vegetable products.....	.77	.70	.60	.54	.64	.64	.63
(b) Animal products.....	.77	.70	.60	.54	.64	.64	.63
Carpentry:							
(a) Cabinetmaking.....	5.07	3.05	3.95	3.54	4.19	4.19	4.13
(b) General contract.....	6.27	5.70	4.89	4.38	5.18	5.18	5.11
Carpet factory.....	.77	.70	.60	.54	.64	.64	.63
Carriage factory.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Casting works:							
(a) Iron.....	2.66	3.05	2.08	1.86	1.78	2.20	2.17
(b) Steel.....	4.12	3.75	3.22	2.88	3.41	3.41	3.36
Cement plants.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Celluloid factories:							
(a) Celluloid.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
(b) Articles.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Chemical works.....	2.15	1.95	1.34	1.20	1.42	1.42	1.40
Cleaning establishments (chemical).....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Cloth printing.....	.77	.70	.60	.54	.64	.64	.63
Clothing factories.....	.52	.47	.40	.36	.43	.43	.42
Coking plants.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Construction:							
(a) Railroad, excluding tunneling.....	6.27	3.75	3.22	2.34	3.41	5.18	2.73
(b) Iron bridges and boilers.....	7.47	6.79	5.83	5.22	6.18	6.18	6.09
Copper and brass works.....	2.66	3.05	2.08	1.86	2.20	2.20	2.17
Cotton and half-wool spinning, weaving, etc.....	1.03	.94	.80	.72	.85	.85	.84
Dairy-products factories.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Drayage, riggers, and heavy movers.....	7.47	6.79	5.83	4.38	6.18	6.18	6.09
Dyeing establishments (power).....	1.03	.94	.80	.72	.85	.85	.84
Electrical:							
(a) Machinery plants.....	2.66	1.95	1.68	1.50	1.78	1.78	1.75
(b) Installation of same.....	2.66	1.95	1.68	1.50	1.78	1.78	1.75
(c) Apparatus factories.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
(d) Installation lights, etc.....	3.35	3.05	2.61	2.34	2.77	2.77	2.73
(e) Lighting and power establishments.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Enameled-ware factories.....	1.37	1.25	1.07	1.20	1.42	1.14	1.12
Firearm manufacturing:							
(a) Military.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
(b) Ordinary.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Flour mills:							
(a) Water power.....	2.66	2.42	1.68	1.86	2.77	2.20	2.17
(b) Steam power.....	2.66	2.42	1.68	1.86	2.77	2.20	2.17
Furnaces:							
(a) Bessemer, Thomas & Martin (steel).....	4.12	3.75	3.22	2.88	3.41	3.41	3.36
(b) Blast.....	5.07	4.61	3.95	3.54	5.18	4.19	4.13
(c) Crucible.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
(d) Puddling.....	3.35	3.05	2.61	2.34	2.77	2.77	2.73
(e) Zinc.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Furniture factories:							
(a) Wood.....	5.07	3.05	3.95	3.54	4.19	4.19	4.13
(b) Iron and brass.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Gas works (including installation).....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Glass factories:							
(a) Except tableware.....	.77	.70	.60	.54	.64	.64	.63
(b) Table glass.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Glove factories.....	.34	.31	.27	.24	.28	.28	.28
Glue and gelatin factories.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Hat factories.....	.52	.47	.40	.36	.43	.43	.42
Hemp spinning (ropes, etc.).....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Housesmithing.....	3.35	3.05	2.61	2.34	2.77	2.77	2.73

MUTUAL ACCIDENT ASSOCIATIONS FOR THE PERIODS 1905 TO 1909 AND 1910 TO 1914, MORE THAN FOUR WEEKS, OR DEATH—AUSTRIA.

of the specified industries may vary considerably. Unless otherwise stated the rates given are for benefits, see p. 724.]

Industry.	Premium rates, 1910 to 1914, in—						
	Prague.	Vienna.	Salz- burg.	Gratz.	Brünn.	Lemb- berg.	Trieste.
Agricultural-machinery works.....	3.35	(a)	2.61	2.34	2.77	2.77	2.73
Automobile factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Bakeries and biscuit factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Beer bottling and shipping.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Belt and saddlery factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Boiler-construction works:							
(a) Riveting by machinery.....	5.07	4.61	3.95	3.54	4.19	4.19	4.13
(b) Riveting by hand.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Bookbinding (power).....	.52	.47	.40	.36	.43	.43	.42
Brewery and malt works.....	(a)	(a)	(a)	(a)	(a)	2.20	(a)
Bridge construction (other than iron).....	6.27	5.70	4.89	4.38	5.18	5.18	5.11
Brickmaking (by machinery).....	4.12	(a)	(a)	(a)	3.41	(a)	(a)
Candy factories.....	1.03	.94	.80	.72	.85	.85	.84
Canning factories:							
(a) Vegetable products.....	1.03	.94	.80	.72	.85	.83	.84
(b) Animal products.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Carpentry:							
(a) Cabinetmaking.....	6.27	4.61	4.89	4.38	5.18	5.18	5.11
(b) General contract.....	7.47	6.79	5.83	5.22	6.18	6.18	6.09
Carpet factory.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Carriage factory.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Casting works:							
(a) Iron.....	2.15	(a)	1.68	1.50	(a)	1.78	1.75
(b) Steel.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Cement plants.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Celluloid factories:							
(a) Celluloid.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
(b) Articles.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Chemical works.....	2.66	2.42	2.08	1.50	1.78	1.78	1.75
Cleaning establishments (chemical).....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Cloth printing.....	1.03	(a)	(a)	(a)	(a)	(a)	(a)
Clothing factories.....	.34	.31	.27	.24	.28	.28	.28
Coking plants.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Construction:							
(a) Railroad, excluding tunneling.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
(b) Iron bridges and boilers.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Copper and brass works.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Cotton and half-wool spinning, weaving, etc.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Dairy-products factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Drayage, riggers, and heavy movers.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Dyeing establishments (power).....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Electrical:							
(a) Machinery plants.....	(a)	2.42	2.08	1.86	2.20	2.20	2.17
(b) Installation of same.....	(a)	2.42	2.08	1.86	2.20	2.20	2.17
(c) Apparatus factories.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
(d) Installation lights, etc.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
(e) Power establishments.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Enameled-ware factories.....	(a)	(a)	(a)	.96	(a)	(a)	(a)
Firearm manufacturing:							
(a) Military.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
(b) Ordinary.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Flour mills:							
(a) Water power.....	3.35	3.05	2.08	2.34	(a)	2.77	2.73
(b) Steam power.....	3.35	3.05	2.08	2.34	(a)	2.77	2.73
Furnaces:							
(a) Bessemer, Thomas & Martin (steel).....	5.07	4.61	3.95	3.54	4.19	4.19	4.13
(b) Blast.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
(c) Crucible.....	3.35	3.05	2.61	2.34	2.77	2.77	2.73
(d) Puddling.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
(e) Zinc.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Furniture factories:							
(a) Wood.....	6.27	4.61	4.89	4.38	5.18	5.18	5.11
(b) Iron and brass.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Gas works (including installation).....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Glass factories:							
(a) Except tableware.....	1.03	.94	.80	.72	.85	.85	.84
(b) Table glass.....	2.66	2.42	2.61	1.86	2.20	2.20	2.17
Glove factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Glue and gelatin factories.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Hat factories.....	.77	.70	.60	.54	.64	.64	.63
Hemp spinning (ropes, etc.).....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Housesmithing.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)

a Same as in 1905 to 1909.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL IN EMPLOYERS' COVERING ACCIDENTS CAUSING DISABILITY FOR

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions establishments "with power."]

Industry.	Premium rates, 1905 to 1909, in—						
	Prague.	Vienna.	Salz- burg.	Gratz.	Brünn.	Lem- berg.	Trieste.
Instruments and apparatus:							
(a) Scientific, etc.	0.77	0.70	0.60	0.54	0.64	0.64	0.63
(b) Surgical, etc.	1.03	.94	.80	.72	.85	.85	.84
Knife makers	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Knit-goods factories.....	.34	.31	.27	.24	.28	.28	.28
Laundries (power).....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Leather bags, etc. (power).....	.77	.70	.60	.54	.64	.64	.63
Locomotive works.....	3.35	3.05	2.08	2.34	2.77	2.77	2.73
Loom factories.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Machine and repair shops (power).....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Masonry.....	4.12	3.05	3.22	2.34	3.41	3.41	3.36
Metal pressing, stamping, etc.	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Musical instruments, manufacturing	1.03	.94	.80	.72	.85	.85	.84
Nail factories.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Nitrocellulose and collodion factories	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Nitroglycerin.....	6.27	5.70	4.89	4.38	5.18	5.18	5.11
Oil factories (linseed and rape).....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Ordnance factories.....	4.12	3.75	3.22	2.88	3.41	3.41	3.36
Paint factories.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Painters:							
(a) Exterior, i. e., on construction only....	4.12	3.75	3.22	2.88	3.41	3.41	3.36
(b) Interior.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Paper factories:							
(a) Envelope.....	1.03	.94	.80	.72	.85	.85	.84
(b) Carton and box.....	1.03	.94	.80	.72	.85	.85	.84
(c) Pasteboard and paper.....	2.15	1.56	1.68	1.50	1.78	1.78	1.75
(d) Wall paper.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Paper hanging.....	1.03	.94	.80	.72	.85	.85	.84
Petroleum refineries.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Pharmaceutical factories.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Piano and organ factories.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Plated-ware factories.....	.77	.70	.60	.54	.64	.64	.63
Polishing and grinding factories (iron and steel).....	3.35	3.05	2.61	2.34	2.77	2.77	2.73
Powder factories (black).....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Printers, lithographers, and art printing .....	.52	.47	.40	.36	.43	.43	.42
Quarries:							
(a) Ordinary stone.....	5.07	3.75	3.22	2.88	3.41	4.19	4.13
(b) Marl and cement.....	4.12	3.75	3.22	2.88	3.41	3.41	3.36
(c) Slate.....	7.47	6.79	5.83	5.22	6.18	6.18	6.09
Railways:							
(a) Steam.....	4.12	3.75	3.22	2.88	3.41	3.41	3.36
(b) Electric.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Rendering (oleomargarine and artificial butter).....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Rolling mills:							
(a) Small iron and wire.....	3.35	3.05	2.61	2.34	3.41	2.77	2.73
(b) Coarse wire.....	3.35	3.05	2.61	3.54	4.19	2.77	2.73
(c) Thin sheet iron.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
(d) Coarse sheet iron.....	3.35	3.05	2.61	2.34	3.41	2.77	2.73
(e) Tubes.....	3.35	3.05	2.61	2.34	3.41	2.77	2.73
Rubber and gutta-percha manufacturing.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Safe factories.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Sawmills.....	6.27	4.61	3.95	3.54	4.19	4.19	4.13
Sewing-machine factories.....	1.03	.94	.80	.72	.85	.85	.84
Sheet-iron factories.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Shipbuilding plants.....	3.35	3.05	2.61	2.34	2.77	2.77	2.73
Shoe factories.....	.77	.70	.60	.54	.64	.64	.63
Silk and velvet mills.....	.34	.31	.27	.24	.28	.28	.28
Slaughterhouses.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Soap factories.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Stonecutting (shops and buildings).....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Street cleaning (exclusive of drayage).....	1.03	.94	.80	.72	.85	.85	.84
Sugar refineries.....	2.66	1.56	1.34	1.20	1.42	1.42	1.40
Tar products factories.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Tanneries.....	3.35	3.05	2.61	2.34	2.77	2.77	2.73
Terra-cotta factories.....	.34	.31	.27	.24	.28	.28	.28
Tinsmithing.....	7.47	6.79	5.83	5.22	6.18	6.18	6.09
Tobacco factories.....	.17	.16	.13	.12	.14	.14	.14

MUTUAL ACCIDENT ASSOCIATIONS FOR THE PERIODS 1905 TO 1909 AND 1910 TO 1914, MORE THAN FOUR WEEKS, OR DEATH—AUSTRIA—Continued.

of the specified industries may vary considerably. Unless otherwise stated the rates given are for For benefits, see p. 724.]

Industry.	Premium rates, 1910 to 1914, in—						
	Prague.	Vienna.	Salz- burg.	Gratz.	Brünn.	Lem- berg.	Trieste.
Instruments and apparatus:							
(a) Scientific, etc.....	1.03	0.94	0.80	0.72	0.85	0.85	0.84
(b) Surgical, etc.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Knife makers.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Knit-goods factories (power).....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Laundries (power).....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Leather bags, etc. (power).....	.52	.47	.40	.36	.43	.43	.42
Locomotive works.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Loom factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Machine and repair shops (power).....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Masonry.....	(a)	(a)	(a)	(a)	(a)	4.19	(a)
Metal pressing, stamping, etc.....	2.15	(a)	1.68	1.50	1.78	1.78	1.75
Musical instruments, manufacturing.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Nail factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Nitrocellulose and collodion factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Nitroglycerin.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Oil factories (linseed and rape).....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Ordnance factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Paint factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Painters:							
(a) Exterior, i. e., on construction only.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
(b) Interior.....	2.15	1.95	1.68	1.50	1.78	1.78	1.7
Paper factories:							
(a) Envelope.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
(b) Carton and box.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
(c) Pasteboard and paper.....	2.66	1.95	(a)	1.86	(a)	(a)	(a)
(d) Wall paper.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Paper hanging.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Petroleum refineries.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Pharmaceutical factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Piano and organ factories.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Plated-ware factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Polishing and grinding factories (iron and steel).....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Powder factories (black).....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Printers, lithographers, and art printing.....	.77	.70	(a)	(a)	(a)	(a)	(a)
Quarries:							
(a) Ordinary stone.....	(a)	4.61	3.95	3.54	4.19	(a)	(a)
(b) Marl and cement.....	5.07	4.61	3.95	3.54	4.19	4.19	4.13
(c) Slate.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Railways:							
(a) Steam.....	5.07	4.61	3.95	3.54	4.19	4.19	4.13
(b) Electric.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Rendering (oleomargarine and artificial butter).....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Rolling mills:							
(a) Small iron and wire.....	4.12	(a)	(a)	(a)	(a)	(a)	(a)
(b) Coarse wire.....	5.07	4.61	3.95	(a)	(a)	4.19	4.13
(c) Thin sheet iron.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
(d) Coarse sheet iron.....	5.07	4.51	3.95	3.54	4.19	4.19	4.13
(e) Tubes.....	3.35	2.42	2.08	1.86	2.20	2.20	2.17
Rubber and gutte-percha manufacturing.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Safe factories.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Sawmills.....	7.47	5.70	4.89	5.22	5.18	5.18	5.11
Sewing-machine factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Sheet-iron factories.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Shipbuilding plants.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Shoe factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Silk and velvet mills.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Slaughterhouses.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Soap factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Stonecutting (shops and buildings).....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Street cleaning (exclusive of drayage).....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Sugar refineries.....	3.35	1.95	1.68	1.50	1.78	1.78	1.75
Tar-products factories.....	(a)	(a)	(a)	(a)	2.77	(a)	(a)
Tanneries.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Terra-cotta factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Tinsmithing.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Tobacco factories.....	(a)	.31	(a)	(a)	(a)	(a)	(a)

a Same as in 1905 to 1909.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL IN EMPLOYERS' COVERING ACCIDENTS CAUSING DISABILITY FOR

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions establishments "with power."]

Industry.	Premium rates, 1905 to 1909, in—						
	Pragua.	Vienna.	Salz- burg.	Gratz.	Brünn.	Lem- berg.	Trieste.
Tool makers:							
(a) Hammer making.....	3.35	2.42	2.08	2.34	2.20	2.20	2.17
(b) Tool making.....	2.15	1.95	1.68	1.50	1.78	1.78	1.75
Tunneling:							
(a) Ordinary.....	3.35	3.05	2.61	2.34	2.77	2.77	2.73
(b) By machinery.....	5.07	4.61	3.95	3.54	4.19	4.19	4.13
Turning factories:							
(a) Iron.....	1.03	.94	.80	.72	.85	.85	.84
(b) Wood.....	4.12	3.75	3.22	2.88	3.41	3.41	3.36
Type foundries.....	.52	.47	.40	.36	.43	.43	.42
Warehouse and storage.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Waterworks (exclusive of installation).....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Watchmakers (exclusive of cases).....	1.03	.94	.80	.72	.85	.85	.84
Wax, leather, and waterproofing factories.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Weaving establishments.....	.52	.47	.40	.36	.43	.43	.42
Wire rope and cable manufacturing.....	1.72	1.56	1.34	1.20	1.42	1.42	1.40
Wood carving.....							
Wood-pulp factories.....	2.15	1.95	2.08	1.86	2.20	2.20	2.17
Wool spinning, weaving, and finishing.....	1.03	.94	.80	.72	.85	.85	.84
Wrecking operations.....	7.47	6.79	5.83	5.22	6.18	6.18	6.09

MUTUAL ACCIDENT ASSOCIATIONS FOR THE PERIODS 1905 TO 1909 AND 1910 TO 1914, MORE THAN FOUR WEEKS, OR DEATH—AUSTRIA—Concluded.

of the specified industries may vary considerably. Unless otherwise stated the rates given are for benefits, see p. 724.]

Industry.	Premium rates, 1910 to 1914, in—						
	Prague.	Vienna.	Salz- burg.	Gratz.	Brünn.	Lemb- berg.	Trieste.
Tool makers:							
(a) Hammer making.....	(a)	3.05	2.61	(a)	2.77	2.77	2.73
(b) Tool making.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Tunnelling:							
(a) Ordinary.....	7.47	6.79	5.83	5.22	6.18	6.18	6.09
(b) By machinery.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Turning factories:							
(a) Iron.....	1.37	1.25	1.07	.96	1.14	1.14	1.12
(b) Wood.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Type foundries.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Warehouse and storage.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Waterworks (exclusive of installation).....	1.37	1.25	1.07	.96	1.14	1.14	1.12
Watchmakers (exclusive of cases).....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Wax, leather, and waterproofing factories.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Weaving establishments.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Wire rope and cable manufacturing.....	(b)	(b)	(b)	(b)	(b)	(b)	(b)
(a) Cable.....	2.66	2.42	2.08	1.86	2.20	2.20	2.17
Wood carving.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Wood-pulp factories.....	2.66	2.42	(a)	(a)	(a)	(a)	(a)
Wool spinning, weaving, and finishing.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Wrecking operations.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)

^a Same as in 1905 to 1909.

^b Same as in 1905 to 1909 as to wire rope.

BELGIUM.

Prior to the adoption of the present compensation act, there was only the ordinary liability under the civil law on the basis of the employer's negligence. This law, like the English common law, allows the defense of assumed risk, but it does not permit that of fellow service, while the defense of contributory negligence is allowed only to the extent that the amount of damages allowed against a negligent employer is reduced proportionately where the injured employee's negligence also contributes to his injury.

The rates given in the table which follows are as furnished by a leading Belgian stock company, and are the average rates now charged under the workmen's compensation act. The rates, though given for only a small list of industries, are believed to be sufficient to afford a fair idea of the cost under the workmen's compensation act.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL CHARGED BY AN INSURANCE COMPANY UNDER THE COMPENSATION ACT—BELGIUM.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 725.]

Industry.	Stock company under compensation act.	Industry.	Stock company under compensation act.
Bookbinding (power)	0.80	Gas works (including installation)....	3.00
Breweries and malt works.....	3.60	Glass factories (except tableware)....	1.60
Brickmaking (by machinery).....	3.50	Hat factory.....	.90
Candy factories.....	1.25	Knife makers.....	2.00
Carpentry:		Masonry.....	6.50
(a) Cabinetmaking.....	5.00	Paper and pasteboard factories.....	2.50
(b) General contract.....	12.00	Printers, lithographers, and art printing.....	.80
Carpet factory.....	.90	Quarries (ordinary stone).....	5.50
Casting works (iron).....	2.00	Rolling mills:	
Chemical works.....	3.50	(a) Small iron and wire.....	4.25
Cloth printing.....	1.60	(b) Coarse wire.....	4.50
Construction (railroad, excluding tunneling).....	6.00	(c) Thin sheet iron.....	2.20
Cotton and one-half wool spinning, weaving, etc.....	1.00	(d) Coarse sheet iron.....	4.00
Dyeing establishments (power).....	1.50	Safe factories.....	3.25
Flour mills (steam power).....	4.00	Shipbuilding plants.....	5.00
Furnaces:		Shoe factories.....	.70
(a) Bessemer, Thomas & Martin (steel).....	5.25	Silk and velvet mills.....	.50
(b) Blast.....	5.50	Sugar refineries.....	2.50
		Wool spinning, weaving, and finishing.....	1.00

DENMARK.

In Denmark employers are liable for all accidents not caused intentionally or by the gross negligence of the employee, resulting either in death or in disability lasting longer than thirteen weeks. The employer is not held liable for the first thirteen weeks of any disability.

Insurance is not required, but if the employer insures in insurance companies or associations authorized by the state, this releases him entirely from liability.

The adjustment of all claims is made, not by the employers or the insurance companies, but by a state insurance council, to which immediate notice must be sent and which makes its own investigation and determines both the fact of liability and the amount thereof.

No provision is made by the law for covering damages by reason of industrial accidents which do not extend beyond the thirteenth week, nor even that portion of the damage by reason of total and permanent disability which is covered by the first thirteen weeks thereof. It is customary, though by no means universal, in Denmark for employers to take insurance which pays benefits during this period, as well as thereafter, toward the cost of which insurance they may and often do require workmen to contribute; and when this is not done, frequently the employees are members of sickness insurance associations, to which employers sometimes contribute, though by no means always. The employers carry their insurance chiefly in stock companies or in mutual associations, which do not confine their business to a single industry.

The failure to make a provision in the law to cover this period of the first thirteen weeks was due chiefly to the large activity of sickness insurance societies in Denmark and the desire to promote their further development. It has had that effect to a large extent.

The rates given in the table following are: The rates charged by a leading stock company for protection under the law, the same being the number of crowns per annum charged per workman for full time (300 days per annum) in the industries mentioned, for each 1½ crowns (44.7 cents) per diem earned by such man; that is to say, these are the rates for an indemnity of 1 crown (26.8 cents) per diem for temporary disability, and for the lump-sum payment of 1,800 crowns (\$482.40) to which the workman is entitled in event of total and permanent disability, or of 1,200 crowns (\$321.60) to which his family is entitled in event of his death.

In addition to these rates, rates are given covering the first thirteen weeks as well, together with medical attention. These are computed on the same basis.

Rates are also given showing the average charged in a leading mutual association of employers. These rates cover the legal liability only, and are based upon a careful study by the actuary of the association of the statistics of various associations of employers in Germany, under the provisions of the German law. These premiums are also in crowns per man per annum.

In addition to the rates computed in the manner stated, there is furnished a table of the percentages which the premiums of the stock company and the mutual company bear to the pay roll, on the basis of 300 working days per annum—the pay roll being “hypothetical,” i. e., taking wages at a uniform rate of 500 crowns [\$134] per annum for each employee.

The rates of the mutual company have been computed from the experience of German mutual associations of employers, and as far as possible of those which are located in North Germany and in sections which were formerly a part of Denmark. These are the rates charged, but the Danish mutual company, of course, has the power to assess more and also to return any amount which may not be required. The mutual association aims to maintain the full reserves required. As the indemnities are not paid in the form of annuities, with the exception of temporary disability benefits after the thirteenth week, it is not necessary for the company to hold so large reserves for "capitalized values." It was not stated whether there had been assessments upon the members or any return of surplus to them.

The rates given in the following table are from the rate book of a leading stock insurance company and the private rate schedules furnished by a leading mutual association of employers:

ANNUAL PREMIUM PER EMPLOYEE EARNING 500 KRONER OR LESS PER ANNUM AND COMPUTED PREMIUM RATES PER CENT OF HYPOTHETICAL PAY ROLL, ON THE ASSUMPTION OF UNIFORM EARNINGS OF 500 KRONER PER ANNUM FOR EACH EMPLOYEE—DENMARK.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 728.]

Industry.	Annual premium per employee earning 500 kroner or less per annum.			Computed premium rates per cent of pay roll charged by—		
	Stock company—			Stock company—		
	Under law.	Including first 13 weeks.	Mutual company.	Under law.	Including first 13 weeks.	Mutual company.
	Kr.	Kr.	Kr.			
Agricultural machinery works.	12.04	16.65	.....	2.408	3.33	.....
Automobile factories.	.....	.....	.....	.....	.....	.....
Bakeries and biscuit factories.	9.96	13.79	8.00	1.992	2.758	1.600
Beer bottling and shipping concerns.	10.89	15.10	.....	2.178	3.02	.....
Belt and saddlery factories (power).	6.03	8.83	3.50	1.206	1.766	.700
Boiler construction works:						
(a) Riveting by machinery	17.61	23.72	.....	3.522	4.744	.....
(b) Riveting by hand	13.45	18.20	.....	2.60	3.64	.....
Bookbinding (power).	6.03	8.83	1.89	1.206	1.766	.378
Brewery and malt works.	13.45	18.20	8.34	2.59	3.64	1.668
Bridge construction (other than iron).	36.00	.....	8.50	7.20	.....	1.700
Brickmaking (by machinery).	14.85	19.76	12.50	2.97	3.952	2.50
Candy factories.	9.73	13.54	1.75-5.00	1.946	2.708	.35-1.00
Canning factories:						
(a) Vegetable products	.....	.....	5.00	.....	.....	1.00
(b) Animal products	12.04	16.65	5.00	2.408	3.33	1.00
Carpentry:						
(a) Cabinetmaking	12.04-36.00	16.65	9.00	2.408-7.20	3.33	1.80
(b) General contract.	12.04-36.00	16.65	6.50-11.50	.....	.....	1.30-2.30
Carpet factory.	6.03	8.83	8.00	1.206	1.766	1.60
Carriage factory.	7.88	10.93	7.50-10.00	1.576	2.186	1.50-2.00
Casting works:						
(a) Iron	14.85	19.76	6.00-9.50	2.97	3.952	1.20-1.90
(b) Steel	.....	.....	9.50-18.50	.....	.....	1.90-3.70
Cement plants.	16.23	21.74	7.50	3.246	4.348	1.50
Celluloid factories.	9.73	13.54	.....	1.946	2.708	.....
Chemical works.	17.61	23.72	9.50	3.522	4.744	1.90

ANNUAL PREMIUM PER EMPLOYEE EARNING 500 KRONER OR LESS PER ANNUM AND COMPUTED PREMIUM RATES PER CENT OF HYPOTHETICAL PAY ROLL, ON THE ASSUMPTION OF UNIFORM EARNINGS OF 500 KRONER PER ANNUM FOR EACH EMPLOYEE—DENMARK—Continued.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 728.]

Industry.	Annual premium per employee earning 500 kroner or less per annum.			Computed premium rates per cent of pay roll charged by—		
	Stock company—		Mutual company.	Stock company—		
	Under law.	Including first 13 weeks.		Under law.	Including first 13 weeks.	Mutual company.
	Kr.	Kr.	Kr.			
Cleaning establishments (chemical).....						
Cloth printing.....	6.03	8.83	4.00-5.00	1.206	1.766	0.80-1.00
Clothing factories.....	6.03	8.83		1.206	1.766	
Coking plants.....	14.85	19.76		2.97	3.952	
Construction:						
(a) Railroad, excluding tunneling.....	36.00		17.00-26.50	7.20		3.40-5.30
(b) Iron bridges and boilers.....	36.00		12.50-18.50	7.20		2.50-3.70
Copper and brass works.....			11.50-12.50			2.30-2.50
Cotton and wool spinning, weaving, etc.....	6.95	9.88	3.60-6.00	1.39	1.976	.72-1.20
Dairy-products factories.....	6.00		4.00	1.20		.80
Drayage, riggers, and heavy movers.....	8.80	12.24	26.50	1.76	2.448	5.30
Dyeing establishments (power).....	7.88	10.93		1.576	2.186	
Electrical:						
(a) Machinery plants.....	12.04	16.65	8.00	2.408	3.33	1.60
(b) Installation of same.....	12.04	16.65			3.33	
(c) Apparatus factories.....			3.00			.60
(d) Installation of lights, telephones, etc.....	14.85-24.08	19.76-28.59	15.00	2.97-4.816	3.952-5.718	3.00
(e) Lighting and power establishment.....	12.04	16.65	14.50	2.408	3.33	2.90
Enameled-ware factories.....	9.73	13.54	3.50-8.00	1.946	2.708	.70-1.60
Firearm manufacturing.....			4.00			.80
Flour mills:						
(a) Water power.....	8.80	12.24	8.00	1.76	2.448	1.60
(b) Steam power.....	8.80	12.24	8.00	1.76	2.448	1.60
Furnaces:						
(a) Bessemer, Thomas & Martin (steel).....			15.50-18.50			3.10-3.70
(b) Blast.....			12.50-15.50			2.50-3.10
(c) Crucible.....			9.50			1.90
(d) Puddling.....						
(e) Zinc.....						
Furniture factories:						
(a) Wood.....			5.50			1.10
(b) Iron and brass.....	7.88	10.93	6.00	1.576	2.186	1.20
Gas works (including installation).....	14.85	19.76	7.20	2.970	3.952	1.44
Glass factories:						
(a) Except tableware.....	3.25	3.50	3.12-6.48	.65	.70	.624-1.206
(b) Table glass.....	3.25	3.50	11.28	.65	.70	2.256
Glove factories.....	6.03	8.83	.75	1.206	1.776	.15
Glue and gelatin factories.....	7.88	10.93	9.50	1.576	2.186	1.90
Hat factories.....	6.03	8.83		1.206	1.766	
Hemp spinning (ropes, etc.).....	7.88	10.93	4.40	1.576	2.186	.88
House smithing.....	12.04	16.65		2.408	3.33	
Instruments and apparatus.....			2.00			.40
Knife makers.....	9.73	13.54	3.50	1.946	2.708	.70
Knit-goods factories.....	6.03	8.83		1.206	1.766	
Laundries (power).....	17.61	23.72		3.522	4.744	
Leather bags, etc. (power).....	6.03	8.83	3.50	1.206	1.766	.70
Locomotive works.....						
Loom factories.....						
Machine and repair shops (power).....	9.73	13.54	7.00-8.00	1.946	2.708	1.40-1.60
Masonry.....	12.04-24.08	16.65-28.59	9.50-13.50	2.408-4.816	3.33-5.718	1.90-2.70
Metal pressing, stamping, etc.....	9.73	13.54	4.50-8.00	1.946	2.708	.90-1.60
Musical instruments, manufacturing.....						

a Small.

ANNUAL PREMIUM PER EMPLOYEE EARNING 500 KRONER OR LESS PER ANNUM AND COMPUTED PREMIUM RATES PER CENT OF HYPOTHETICAL PAY ROLL, ON THE ASSUMPTION OF UNIFORM EARNINGS OF 500 KRONER PER ANNUM FOR EACH EMPLOYEE—DENMARK—Continued.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 728.]

Industry.	Annual premium per employee earning 500 kroner or less per annum.			Computed premium rates per cent of pay roll charged by—		
	Stock company—		Mutual company.	Stock company—		Mutual company.
	Under law.	Including first 13 weeks.		Under law.	Including first 13 weeks.	
	Kr.	Kr.	Kr.			
Nail factories.....	9.73	13.54	5.50	1.946	2.708	1.10
Nitrocellulose and collodion factories.....			12.50			2.50
Oil factories (linseed and rape).....	9.73	13.54		1.946	2.708	
Ordinance factories.....						
Paint factories.....						
Painters:						
(a) Exterior.....	6.03	8.83	6.00	1.206	1.766	1.20
(b) Interior.....			6.00			1.20
Paper factories:						
(a) Envelope.....			2.72			5.44
(b) Carton and box.....	3.25	3.50	6.80	.65	.70	1.36
(c) Pasteboard.....	12.04	16.65	9.10	2.408	3.33	1.82
(d) Wall paper.....	6.03	8.83	4.08	1.206	1.766	.816
Paper hanging.....			3.00			.60
Petroleum refineries.....			7.50			1.50
Pharmaceutical factories.....			4.50-7.50			.90-1.50
Piano and organ factories.....	9.73	13.54		1.946	2.708	
Plated-ware factories.....			2.50			.50
Polishing and grinding factories (iron and steel).....			7.50			1.500
Powder factories (black).....	47.58	53.58	18.00	9.516	10.716	3.600
Printers, lithographers, and art printing.....	4.50	5.13	1.73-2.89	.90	1.026	.346-.578
Quarries:						
(a) Ordinary stone.....	24.08	28.59		4.816	5.718	
(b) Marland cement.....	24.08	28.59	14.00	4.816	5.718	2.80
(c) Slate.....						
Rendering (oleomargarine and artificial butter).....	9.73	13.54	5.00	1.946	2.708	1.000
Rolling mills:						
(a) Small iron and wire.....	12.04	16.65	7.00-9.00	2.408	3.330	1.40-1.80
(b) Coarse wire.....	14.85	19.76	12.50	2.970	3.952	2.50
(c) Thin sheet iron.....	12.04	16.65	9.00	2.408	3.330	1.80
(d) Coarse sheet iron.....	14.85	19.76	14.00	2.970	3.952	2.800
(e) Tubes.....	13.45	18.20		2.69	3.640	
Rubber and gutta-percha manufacturing.....	6.03	8.83		1.206	1.766	
Safe factories.....	7.88	10.93	6.00	1.576	2.186	1.20
Sawmills.....	36.00		17.50-22.00	7.20		3.50-4.40
Sewing-machine factories.....	7.88	10.93		1.576	2.186	
Sheet-iron factories.....	12.04	16.65	8.00	2.408	3.330	1.60
Shipbuilding plants.....	17.61	23.72	10.00-14.00	3.522	4.744	2.00-2.80
Shoe factories.....						
Silk and velvet mills.....						
Slaughterhouses.....	12.04	16.55	5.00-6.50	2.408	3.33	1.00-1.30
Soap factories.....	9.73	13.54	8.00	1.946	2.708	1.60
Steamships:						
(a) On lake and river.....	13.50			2.70		
(b) On sea or ocean.....	23.00			4.60		
Stonecutting (shops and buildings).....	19.36	25.35	13.00	3.872	5.07	2.60
Street cleaning (exclusive of drayage).....						
Sugar refineries.....	10.89	15.10	8.50	2.178	3.02	1.70
Tar products factories.....						
Tanneries.....	6.03	8.83	6.50	1.206	1.766	1.30
Terra-cotta factories.....	3.25	3.50		.65	.70	
Tinsmithing.....			3.50-7.00			.70-1.40
Tobacco factories.....	2.00	2.30	1.04-3.11	.40	.46	.208-.622
Tool makers.....	9.73	13.54	4.00-4.50	1.946	2.708	.80-.90
Tunneling:						
(a) Ordinary.....						
(b) By machinery.....	30.00		20.50	6.00		4.10

ANNUAL PREMIUM PER EMPLOYEE EARNING 500 KRONER OR LESS PER ANNUM AND COMPUTED PREMIUM RATES PER CENT OF HYPOTHETICAL PAY ROLL, ON THE ASSUMPTION OF UNIFORM EARNINGS OF 500 KRONER PER ANNUM FOR EACH EMPLOYEE—DENMARK—Concluded.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 728.]

Industry.	Annual premium per employee earning 500 kroner or less per annum.			Computed premium rates per cent of pay roll charged by—		
	Stock company—		Mutual company.	Stock company—		Mutual company.
	Under law.	Including first 13 weeks.		Under law.	Including first 13 weeks.	
Turning factories:	Kr.	Kr.	Kr.			
(a) Iron.....	9.73	13.54	.....	1.946	2.708	.....
(b) Wood.....	7.88	10.93	9.50	1.576	2.186	1.90
Type foundries.....	17.61	23.72	9.50-22.00	3.522	4.744	1.90- 4.40
Warehouse and storage.....	17.61	23.72	9.50-22.00	3.522	4.744	1.90- 4.40
Waterworks (exclusive of installation).....	9.73	13.54	8.28	1.946	2.708	1.656
Watchmakers (exclusive of cases).....	7.88	10.93	.....	1.576	2.186	.....
Wax, leather, and waterproofing factories.....	6.08	8.83	.....	1.206	1.766	.....
Weaving establishments.....	6.08	8.83	1.60	1.206	1.766	.32
Wire rope and cable manufacturing.....	12.04	16.65	6.50-10.00	2.408	3.33	1.30- 2.00
Wood carving.....	12.04	16.65	3.50- 8.00	2.408	3.33	.70- 1.60
Wood-pulp factories.....	12.04	16.65	10.92	2.408	3.33	2.184
Wool spinning, weaving, and finishing.....	6.08	8.83	5.50	1.206	1.766	1.10
Wrecking operations.....	a. 025	.....	34.00-31.00	15.000	.....	6.80-16.20

a Per day.

FINLAND.

In Finland employees and their dependents are entitled to indemnity for death, or disability lasting longer than six days, caused by industrial accidents, except when due to the intentional act or gross negligence of the victim, the intentional act of any other person unless charged with supervision, or caused by something entirely independent of the occupation.

Employers are required to carry insurance against this liability which may be at their option in a governmental insurance office, in a stock insurance company, in a mutual association of employers, or in an approved foreign insurance company. If unable to obtain such insurance the employer may be excused upon giving satisfactory guaranties to the government, or he may be released from the obligation to insure on similar conditions, but in such case if a pension for disability, or to widow, descendant, or ascendant is granted, the employer must purchase an annuity in a private insurance company to cover the same.

The rates of premium which are presented in the first column of the table following are percentages of the actual pay roll charged for insuring employers of the classes mentioned against liability under

the act by the leading stock and the leading mutual company of Finland. They have agreed upon these rates after careful analysis of their actual experience. The sole difference, of course, is that while the stock company is not bound to make any concessions in the way of dividends or rebates and may not levy assessments in the event the premiums prove insufficient, the mutual company may do both.

In a second column are presented the percentages charged by another mutual company which carries on its business in a somewhat different way; all wages lower in amount than the minimum compensation basis being treated as if they were equal to that minimum, and all wages in excess of the maximum set forth in the statute being treated as if they were that maximum, the maximum wages taken into account in fixing indemnities being 720 marks (\$138.96) per annum, or 2.4 marks (46.3 cents) per day, on the basis of 300 full working days per annum, and the minimum wages 300 marks (\$57.90) per annum.

In consequence of these percentages being computed in this manner, they are almost uniformly higher than the percentages named in the first column, although when distributed over the entire pay roll they would doubtless be lower in many cases, or possibly in all cases.

The rates given in the following table are as furnished for this report by the chief insurance inspector of Finland:

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES COVERING INDUSTRIAL ACCIDENTS CAUSING DISABILITY LASTING LONGER THAN SIX DAYS OR DEATH UNDER THE COMPENSATION ACT—FINLAND.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 729.]

Industry.	Premium rates charged by—	
	A leading stock company and a mutual company.	Another mutual company.
Agricultural machinery works.....	1.00	.....
Automobile factories.....	.....	.....
Bakeries and biscuit factories.....	.45	.....
Beer bottling and shipping concerns.....	1.00	.....
Belt and saddlery factories (power).....	.625	.....
Boiler construction works:		
(a) Riveting by machinery.....	1.80	2.25
(b) Riveting by hand.....	1.80	2.25
Bookbinding (power).....	1.75	.....
Brewery and malt works.....	1.00	.....
Bridge construction (other than iron).....	.....	.....
Brickmaking (by machinery).....	1.20	.....
Candy factories.....	.175-0.30	.....
Canning factories:		
(a) Vegetable products.....	.45	.....
(b) Animal products.....	.45	.....
Carpentry:		
(a) Cabinetmaking.....	1.50	.....
(b) General contract.....	1.00	.....
Carpet factories.....	.30	.....
Carriage factories.....	1.00	.....

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES COVERING INDUSTRIAL ACCIDENTS CAUSING DISABILITY LASTING LONGER THAN SIX DAYS OR DEATH UNDER THE COMPENSATION ACT—FINLAND—Continued.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 729.]

Industry.	Premium rates charged by—	
	A leading stock company and a mutual company.	Another mutual company.
Casting works:		
(a) Iron	1.00	1.80
(b) Steel	1.20	1.75
Cement plants .....	.45	
Celluloid factories	1.20	
Chemical works	0.80-1.00	
Cleaning establishments (chemical) .....	.625	
Cloth printing .....	.30	
Clothing factories .....	.30	
Coking plants .....		.90
Construction:		
(a) Railroad, excluding tunneling	1.50	
(b) Iron bridges and boilers	1.00	
Copper and brass works	1.00	1.75
Cotton and half wool, spinning, weaving, etc .....	.30	
Dairy-products factories .....	.45	
Drayage, riggers, and heavy movers		
Dyeing establishments (power) .....	.30	
Electrical:		
(a) Machinery plants	1.50	1.80
(b) Installation of same	1.50	1.80
(c) Apparatus factories		
(d) Installation lights, 'phones, etc.	1.50	1.80
(e) Lighting and power establishments	1.50	1.80
Enameled-ware factories		
Firearm manufacturing		
Flour mills:		
(a) Water power	1.00	
(b) Steam power	1.20	
Furnaces:		
(a) Bessemer, Thomas & Martin (steel)	1.20	1.75
(b) Blast	1.20	1.05
(c) Crucible	1.20	1.75
(d) Puddling	1.20	1.75
(e) Zinc	1.00	
Furniture factories:		
(a) Wood	1.50	
(b) Iron and brass	1.00	
Gas works (including installation) .....	.625	.70
Glass factories:		
(a) Except tableware .....	.625	1.20
(b) Table glass .....	.625	
Glove factories .....	.30	
Glue and gelatin factories .....	.80	
Hat factories .....	.30	
Hemp spinning (ropes, etc.) .....	.80	
House smithing		
Instruments and apparatus	1.00	
Knife makers .....	.80	
Knit-goods factories .....	.30	
Laundries (power) .....	.625	
Leather bags, etc. (power) .....	.45	
Locomotive works	1.20	
Loom factories	1.00	
Machine and repair shops (power)	1.00	
Masonry	1.00	
Metal pressing, stamping, etc	1.00	
Musical instruments, manufacturing .....	.625	
Nail factories .....	.80	1.80
Nitrocellulose and collodion factories	1.20-3.00	1.40
Oil factories (linseed and rape)		
Ordinance factories		
Paint factories .....	.625	
Painters:		
(a) Exterior .....	.625	
(b) Interior .....	.625	

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES COVERING INDUSTRIAL ACCIDENTS CAUSING DISABILITY LASTING LONGER THAN SIX DAYS OR DEATH UNDER THE COMPENSATION ACT—FINLAND—Concluded.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 729.]

Industry.	Premium rates charged by—	
	A leading stock company and a mutual company.	Another mutual company.
Paper factories:		
(a) Envelope.....	0.30	
(b) Carton and box.....	.30	
(c) Pasteboard.....	1.20	1.40
(d) Wall paper.....	.30	
(e) Paper.....	1.50	1.40
Paper hanging.....	.625	
Petroleum refineries.....		
Pharmaceutical factories.....		
Piano and organ factories.....	.625	
Plated ware factories.....		
Polishing and grinding factories (iron and steel).....	1.00	1.05
Powder factories (black).....		
Printers, lithographers, and art printing.....	.30	
Quarries:		
(a) Ordinary stone.....	3.00	2.45
(b) Marl and cement.....		
(c) Slate.....		
Railways:		
(a) Steam.....	1.20	
(b) Electric.....	1.00	
Rendering (oleomargarine and artificial butter).....	.45	
Rolling mills:		
(a) Small iron and wire.....	1.20	1.40
(b) Coarse wire.....	1.20	2.10
(c) Thin sheet iron.....	1.20	2.10
(d) Coarse sheet iron.....	1.20	
(e) Tubes.....	1.20	2.70
Rubber and gutta-percha manufacturing.....	.625	
Safe factories.....	1.00	
Sawmills.....	1.50-1.80	
Sewing-machine factories.....	1.00	
Sheet-iron factories.....		
Ship-building plants.....	1.20	
Shoe factories.....	.625	
Silk and velvet mills.....		
Slaughterhouses.....		
Soap factories.....	.45	
Steamships and steamboats:		
(a) Rivers, lakes, and bays.....	1.50	
(b) Stonecutting (shops and buildings).....	2.15	
Street cleaning (exclusive of drayage).....		
Sugar refineries.....	1.00	1.40
Tar products factories.....	.625	
Tanneries.....	.80	
Terra-cotta factories.....	.45	
Tinsmithing.....		
Tobacco factories.....	.175	
Tool makers.....	1.20	1.35
Tunneling:		
(a) Ordinary.....		
(b) By machinery.....		
Turning factories:		
(a) Iron.....	1.00	1.80
(b) Wood.....	.625	
Type foundries.....	.625	
Warehouse and storage.....		
Waterworks (exclusive of installation).....	1.00	
Watchmakers (exclusive of cases).....		
Wax, leather, and waterproofing factories.....		
Weaving establishments.....	.30	
Wire rope and cable manufacturing.....		
Wood carving.....		
Wood-pulp factories.....	1.50	1.40
Wool spinning, weaving, and finishing.....	.30	
Wrecking operations.....	1.00	

FRANCE.

Under the law of France the employer is held directly liable for the consequences of all accidents involving death, or disability continuing five days or longer, unless caused intentionally by the employee; but if due to the inexcusable fault (*a*) of the employee the compensation may be reduced, or (*b*) of the employer the compensation may be increased, but not beyond a sum equal to the actual wages.

Employers are not required to insure, but if they do insure either in establishment funds, in accident insurance companies, in mutual associations of employers, or in the national accident insurance fund (as regards the compensation for cases resulting in death or permanent disability) then the employer is entirely freed from liability.

In the event of the failure of the employer if he is uninsured, or of the insurance company if the employer is insured, the indemnities are paid out of a fund in the hands of the State, which is supported by a small special tax upon employers.

As has already been indicated, the State offers employers an opportunity to insure. The state institution, however, has only about one per cent of the business. It is not permitted to pay for cases resulting in temporary disability only.

The rates of insurance here given are as follows:

First, for a stock company, covering strictly the liability under the act.

Second, for a mutual insurance company, covering strictly the liability under the act, without deductions for dividends.

Third, for the state department, covering permanent disability and widows', orphans', and other dependents' annuities payable under the act, the permanent disability annuity commencing after the disability has been adjudged permanent.

Fourth, the rates of the state department, covering permanent disability and widows', orphans', and other dependents' annuities, the disability annuities, if determined to be permanent, dating back to the commencement of the disability, and the department also paying expenses of medical or surgical treatment and of funeral expenses in the event the workman dies.

All of these rates are on the basis of a percentage of the pay roll and are given as representative rates for the classes of industries named.

The rates of the state department can be revised only by special legislation either through parliament or through the concensus of certain department chiefs embodied in a decree by the president. The department itself may, however, vary these rates by not more than 30 per cent, and in some industries it has the special permission to increase them not more than 60 per cent, but in no case to diminish them more than 30 per cent. As the rates are in some cases higher

than are charged by mutual companies, and in a few cases nearly as high as are charged by stock companies, although the mutual and the stock companies cover the entire hazard, this must be a very serious disadvantage, especially as the stock companies and mutual companies are free to vary their rates on individual risks quite as they please.

The rates given in the following table are from the rate book of a leading French stock company, from the schedule of a leading mutual company as furnished the Minnesota commission on employers' liability, and as per printed manual of the State Insurance Fund:

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES, COVERING ACCIDENTS CAUSING DISABILITY OF OVER FOUR DAYS, OR DEATH, AND AS CHARGED BY NATIONAL INSURANCE FUND COVERING CASES OF DEATH AND PERMANENT DISABILITY ONLY—FRANCE.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power." For benefits, see p. 730.]

Industry.	Premium rates covering accidents causing disability of over 4 days, or death, as charged by—		Premium rates charged by national fund (covering cases of death and permanent disability only).	
	A stock company.	A mutual company.	Pensions only, and including legal expenses.	Including per diem benefits and medical aid for disability up to establishment of permanent disability or death, and pensions thereafter; also funeral benefits and legal expenses.
Agricultural machinery works.....	4.40		1.85	2.18
Automobile factories.....	2.75			
Bakeries and biscuit factories.....	2.75-3.45		2.09	2.49
Beer bottling and shipping concerns.....				
Belt and saddlery factories:				
(a) Belts.....	2.75		.60	.69
(b) Saddlery.....	2.15		.60	.69
Boiler-construction works.....				
Bookbinding (power).....	1.60		.63	.71
Brewery and malt works:				
(a) Malt.....	4.40		1.93	2.23
(b) Brewery.....	6.85		1.93	2.23
Bridge construction (other than iron).....			2.84	3.25
Brickmaking (by machinery):				
(a) With extraction.....		1.50-2.50	1.83	2.13
(b) Without extraction.....	2.75		1.83	2.13
Candy factories.....	1.60		.65	.75
Canning factories:				
(a) Animal products.....	3.45		.62	.73
(b) Vegetable products.....	3.45		1.09	1.27
Carpentry:				
(a) Cabinetmaking, with power.....		5.00	5.06	6.03
(b) Cabinetmaking, without power.....	2.75	2.00		
(c) General contract.....		4.50-8.00	4.73	5.52
Carpet factories.....	1.60		.52	.60
Carriage factories.....	2.75		1.67	1.96
Casting works:				
(a) Iron.....	2.15-4.40		2.02	2.38
(b) Steel.....	2.15-4.40		2.02	2.38
Cement plants:				
With extraction.....		4.50	1.50	1.75
Without extraction.....	4.40	3.00		

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES, COVERING ACCIDENTS CAUSING DISABILITY OF OVER FOUR DAYS, OR DEATH, AND AS CHARGED BY NATIONAL INSURANCE FUND COVERING CASES OF DEATH AND PERMANENT DISABILITY ONLY—FRANCE—Cont'd.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power." For benefits, see p. 730.]

Industry.	Premium rates covering accidents causing disability of over 4 days, or death, as charged by—		Premium rates charged by national fund (covering cases of death and permanent disability only).	
	A stock company.	A mutual company.	Pensions only, and including legal expenses.	Including per diem benefits and medical aid for disability up to establishment of permanent disability or death, and pensions thereafter; also funeral benefits and legal expenses.
Celluloid factories:				
(a) Articles.....	1.60		1.09	1.27
(b) Celluloid.....			1.46	1.69
Chemical works.....	3.45-4.40		2.13	2.49
Cleaning establishments (chemical).....	2.15		1.16	1.37
Cloth printing.....	2.15		.53	.60
Clothing factories.....	1.60		.52	.58
Coking plants.....	3.45		1.65	1.91
Construction:				
(a) Railroad (excluding tunneling).....			2.60	3.12
(b) Iron bridges and boilers.....		6.00	4.28	5.06
Copper and brass works.....	4.40		1.74	2.04
Cotton and half wool, weaving.....	1.20		0.52- .98	0.60-1.15
Cotton and half wool, spinning.....	2.15		1.42	1.67
Dairy products factories.....	2.15		1.05	1.23
Drayage, riggers, and heavy movers.....		12.00-15.00	6.09	7.09
Dyeing establishments (power).....	1.60		1.31	1.53
Electrical:				
(a) Machinery plants.....	2.75		1.46	1.69
(b) Installation of same.....	2.75	2.00	1.46	1.69
(c) Apparatus factories.....	2.75		1.46	1.69
(d) Installation of lights, 'phones, etc.....	2.75		1.43	1.67
(e) Lighting and power establishments.....	5.50		2.10	2.34
Enameled-ware factories.....	3.45		1.09	1.27
Firearm manufacturing.....			1.35	1.57
Flour mills (water and steam power).....	4.40		2.29	2.67
Furnaces:				
(a) Bessemer, Thomas & Martin (steel).....	4.40		2.02	2.38
(b) Blast.....	6.85		2.86	3.28
(c) Crucible.....	2.15-4.40		2.02	2.38
(d) Puddling.....	2.15-4.40		2.02	2.38
(e) Zinc.....	3.45		.87	1.01
Furniture factories:				
(a) Wood.....			2.01	2.38
(b) Iron and brass.....	4.40		1.96	2.29
Gas works:				
(a) With installation.....	3.45		2.17	2.51
(b) Without installation.....			1.19	1.37
Glass factories, including tableware and plate glass.....	2.15		.89	1.04
Glove factories.....	.85		.19	.21
Glue and gelatin factories.....	5.50		2.13	2.49
Hat factories.....	2.15		1.09	1.23
Hemp spinning (ropes, etc.).....	2.15-3.45		2.06	2.42
House smithing.....				
Instruments and apparatus.....	2.15		.74	.85
Knife makers.....	4.40		2.33	2.74
Knit-goods factories.....			1.29	1.50
Laundries (power).....	2.75		1.16	1.34
Leather bags, etc.....				
Locomotive works.....			3.35	3.97
Loom factories.....			1.69	2.00

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES, COVERING ACCIDENTS CAUSING DISABILITY OF OVER FOUR DAYS, OR DEATH, AND AS CHARGED BY NATIONAL INSURANCE FUND COVERING CASES OF DEATH AND PERMANENT DISABILITY ONLY—FRANCE—Cont'd.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power." For benefits, see p. 730.]

Industry.	Premium rates covering accidents causing disability of over 4 days, or death, as charged by—		Premium rates charged by national fund (covering cases of death and permanent disability only).	
	A stock company.	A mutual company.	Pensions only, and including legal expenses.	Including per diem benefits and medical aid for disability up to establishment of permanent disability or death, and pensions thereafter; also funeral benefits and legal expenses.
Machine and repair shop (power):				
(a) Machine.....	4.40-6.85		2.43-3.67	2.86-4.33
(b) Repair.....	3.45	3.00	1.73	2.03
Masonry.....		4.30-6.00	2.71	3.15
Metal pressing, stamping, etc.....	3.45		1.83	2.17
Musical instruments, manufacturing.....	2.15		.86	1.01
Nail factories.....	2.15		.87	1.01
Nitrocellulose and collodion factories.....			2.13-3.79	2.49-4.43
Oil factories (linseed and rape).....	3.45-4.40		1.72	2.01
Ordnance factories.....				
Paint factories.....	3.45		1.28-1.46	1.50-1.69
Painters:				
(a) Exterior.....		3.00-6.00	2.19	2.55
(b) Interior.....	2.75	1.75	2.19	2.55
Paper factories:				
(a) Envelope.....	1.60		1.09	1.27
(b) Carton and box.....	2.75-4.40		1.64	1.91
(c) Pasteboard and paper.....	1.60		1.64	1.91
(d) Wall paper.....	2.15		.98	1.16
Paper hanging.....				
Petroleum refineries.....	4.40		1.10	1.23
Pharmaceutical factories.....	2.75		.87	1.01
Piano and organ factories.....	2.75-3.45		1.88	2.23
Plated-ware factories.....	2.15			
Polishing and grinding:				
(a) Iron and steel, small.....	2.75		.87	1.01
(b) Iron and steel, large.....	5.50		2.13	2.49
Powder factories (black).....			2.03	2.25
Printers, lithographers, and art printing.....	1.20		.41	.46
Quarries:				
(a) Ordinary stone.....		4.00-5.50	2.59	2.98
(b) Cement.....		4.00-5.50	2.61-5.69	3.05-6.58
(c) Marl.....		4.00-5.50	7.86	9.11
(d) Slate.....		4.00-5.50	3.87	4.44
Railways:				
(a) Steam.....			2.61	3.05
(b) Electric.....			1.46	1.69
Rendering (artificial butter, etc.).....	3.45		2.32	2.68
Rolling mills:				
(a) Small iron and wire.....	2.75		2.47	2.91
(b) Coarse wire.....	6.85		2.47	2.91
(c) Thin sheet iron.....	2.75		.92	1.04
(d) Coarse sheet iron.....	6.85		.92	1.04
(e) Tubes.....	6.85			
Rubber and gutta-percha manufacturing.....	2.15		1.45	1.70
Safe factories.....			1.96	2.29
Sawmills.....		8.00	2.82-6.34	3.28-7.51
Sewing-machine factories.....	2.15		.94	1.10
Sheet-iron factories.....	5.50		1.98	2.34

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES, COVERING ACCIDENTS CAUSING DISABILITY OF OVER FOUR DAYS, OR DEATH, AND AS CHARGED BY NATIONAL INSURANCE FUND COVERING CASES OF DEATH AND PERMANENT DISABILITY ONLY—FRANCE—Cont'd.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power." For benefits, see p. 730.]

Industry.	Premium rates covering accidents causing disability of over 4 days, or death, as charged by—		Premium rates charged by national fund (covering cases of death and permanent disability only).	
	A stock company.	A mutual company.	Pensions only, and including legal expenses.	Including per diem benefits and medical aid for disability up to establishment of permanent disability or death, and pensions thereafter; also funeral benefits and legal expenses.
Shipbuilding plants:				
(a) Wood.....	4.40		2.47	2.95
(b) Iron.....	6.85			
Shoe factories.....	2.15		.67	.78
Silk and velvet mills.....	.85		.23	.26
Slaughterhouses.....				
Steamships on rivers and lakes.....	6.85			
Soap factories.....	3.45		1.78	2.07
Stonecutting (shops and buildings).....	4.40	4.30		
Street cleaning (exclusive of drayage).....	2.15		.60	.69
Sugar refineries.....	4.40		1.85	2.17
Tar-products factories.....	3.45-5.50		1.94	2.22
Tanneries.....	5.50		1.10-0.74	1.28-0.86
Terra-cotta factories.....			.37	.42
Tinsmithing.....	10.50		4.63-6.04	5.48-6.91
Tobacco factories.....			.16	.17
Tool makers.....	2.75-3.45	3.00	1.49-2.18	1.75-2.56
Tunneling, ordinary and by machinery.....			4.16	4.80
Turning factories:				
(a) Iron.....	2.75			
(b) Wood.....			2.39	2.82
Type foundries.....	2.15		.52	.60
Warehouse and storage.....			2.02	2.38
Waterworks:				
(a) With installation.....			1.49	1.72
(b) Without installation.....			1.72	2.01
Watchmakers (exclusive of cases).....	1.20		.69	.90
Wax, leather, and waterproofing factories.....	3.45		2.08	2.45
Weaving establishments.....	1.00		.74	.85
Wire rope and cable manufacturing.....	5.50		1.28	1.48
Wood carving.....				
Wood-pulp factories.....	6.85		2.29	2.69
Wool spinning, weaving, and finishing.....	1.20-1.60		1.11-1.42	1.30-1.62
Wrecking operations.....		15.00	5.67	6.64

GERMANY.

In Germany there is compensation for all industrial accidents to workmen who are injured and to widows, orphans, and ascendants of those who are killed, but usually no compensation (except medical treatment) is paid if the disability does not last longer than three days.

The first thirteen weeks' indemnities for disabilities are paid by sickness insurance societies to which the employer contributes one-third of the cost and the employees two-thirds, these indemnities, however, covering also disability due to sickness and to nonindustrial accidents, except that after four weeks of disability due to an industrial accident the employer must also directly contribute a sum equal to 16½ per cent of the wages up to the end of the disability, but not beyond the end of the thirteenth week.

After the thirteenth week and in all cases of death the indemnities are paid by mutual associations of employers engaged in the same general trades or industries. These associations are managed by representatives of the employers under the supervision of state officials, and are solely liable for the indemnities as they fall due. There is no liability on the part of the employer to pay the indemnity to the workman, his liability being solely to the mutual association for the premiums assessed against him. The money to pay the indemnities currently, as they fall due, is advanced to the associations out of the funds of the State, and at the end of the year the associations must apportion the cost of repaying the same among their members; this is done by collecting from them assessments sufficient in the aggregate to cover (1) payments during the year for indemnities falling due within the year, whether occasioned by accidents in that year or in previous years, (2) all expenses of administration, and (3) a surcharge fixed by the State for the purpose of establishing a contingency or equalization reserve.

Aside from this contingency or equalization reserve, therefore, the German system is purely assessment, in that it does not attempt to collect for each year a sufficient amount to set up the capitalized value reserves to meet the indemnities occasioned by the accidents of the year but to fall due thereafter.

The German Government accepts the responsibility for the continuance of the payment of the indemnities for which these associations have rendered themselves liable, by making the insurance of employers in these mutual associations compulsory, by lending its powers to enforce collection of the assessments as of taxes, and by direct affirmation of its liability in the legislation itself.

By reason of the nature of this system—which in its first year of operation was only required to collect, for the payment of claims, an amount sufficient to meet payments actually falling due within

that year because of accidents of that year, the second year to collect enough to cover payments due within that year by reason of accidents of that year, and also payments due within that year by reason of accidents occurring the first year, and so on—the current cost to employers was at the outset low, though as a matter of fact the charges were increased in order to begin the accumulation of a reserve. Since then, of course, there has been a more or less steady increase in this cost. It is estimated on theoretical grounds that, if there were no improvements in the hazards of trades and occupations, the maximum cost would not be reached in less than 50 years or even 75 years. Much the larger part of the increase, however, would be over in about 25 years, which term has already passed, and, in addition, as will be seen by inspection of the table presented, the improvements in prevention have apparently turned the tide the other way in many groups of industries, so that the costs have been decreasing, the improvement in conditions more than offsetting the increasing annual burden upon the fund because of indemnities in consequence of accidents which have taken place in previous years.

The rates which are here presented have never been published before. The German Government does not require the mutual associations of employers to make reports concerning the details of their rates of assessments. It has been a matter of very considerable labor to obtain reliable information concerning these rates, and, as the system is assessment, it was necessary to obtain them for each of the twenty-five years during which the law has been in effect, in order that a complete picture of the operation of this method of insurance to this date might be fully and fairly presented. This it has been possible to accomplish through the aid of leading experts in Germany,^(a) both official and unofficial, who have, always in an unofficial capacity, actively assisted in obtaining the information. It has been obtained at first hand from the mutual associations of employers themselves, who have taken the trouble to prepare the data because of their interest in the general subject and their conviction that the facts concerning the operation of this method of insurance will be of great value to employers and workmen in the United States in determining what system is most economical and effectual.

The premium rates given in the table which follows do not cover the entire contribution of employers. They show only the net cost, plus a provision for reserve, and do not include the special assessments for expenses and certain items for compensation for the first thirteen weeks of disability. Expenses were a much higher percentage of the total premiums at the outset, but for some years have run at about 10 per cent to 11 per cent of the premiums.

^a Especially Doctor Manes and Doctor Zacher, whose assistance, with that of their collaborators, has made it possible to supply this information.

An interesting feature of the German figures is that from year to year there have been separations and consolidations of classes of hazards, according as it has been found that there is an actual cleavage in the hazard or that they are substantially alike.

An illustration of the separation is that until the end of 1905 iron and steel casting works or foundries were grouped together. Evidently an analysis of the experience showed that the risk in iron foundries was materially lower, and a separation was made, after which in 1905 the rate for iron foundries was 1.34 and that for steel foundries 1.91, and through the three years succeeding similar differences, though not the same in amount, are discovered.

An illustration of the contrary is to be found in the rates for candy factories, where during the first four years a distinction was made between two classes, which, however, from the fifth year were consolidated and have not since been separated. Similar distinctions likewise are found in canning factories, where a consolidation took place after four years, and again in the construction of iron bridges, where a consolidation took place after five years.

A remarkable instance of such a change in classification is to be found in celluloid articles, where after 1893 there is a large drop. This is not explained, but doubtless means that there was a consolidation of the same with chemical works, as the rates run the same as chemical works for ten years up to and including 1903, when a separate classification was made, and it is shown that celluloid articles require a considerably higher rate than general chemical works. Another noteworthy instance is the rate for electrical establishments, all of them being in the same group until 1898, when, upon separation into four separate groups, it was found that the costs varied from 0.30 to 1.30. Examination of the tables will show that similar changes have taken place from time to time in other classes.

The most significant thing in the series of rates is that, although on theoretical grounds the rates should still be increasing, it is found that in a large number of the groups the rate has not been increasing for several years, and, in fact, is exhibiting in many instances a tendency to diminish. This means probably that the increased burdens cast upon the group by reason of the payment of indemnities because of accidents which occurred in each of the years before, including 1906, has been more than offset by improvements in the safety appliances and other devices for the prevention of accident. Thus in belt and saddlery factories there has been virtually no increase in the rate since 1893—that is, seven years after the laws went into effect. In bridge construction other than iron virtually no increase has occurred since 1895, and there are many other industries of which

a similar statement might be made, except that in most instances the virtual equilibrium was not reached until a later date.

On the other hand, during the last twenty-five years there have been industries which have changed from being operated on a small scale to being operated on a large scale and in which, consequently, the hazard itself has doubtless been increased. An instance of this is the construction of iron bridges, which, in direct contrast with bridges other than iron, has exhibited an almost constantly increasing cost.

It is by no means certain that the rates for 1908 are, as a class, as high as they are likely to go, and as regards some industries there is little question that they are not as high as they will eventually go. Yet at the same time they appear in many instances to be fairly representative of the probable maximum rates and comparable, therefore, with the rates which include provision for a reserve on a capitalized value basis in other countries, especially taking into account that with few exceptions these likewise are not definitely known to represent the hazards accurately. These assessment rates, when they have reached their maximum and a virtual equilibrium under a compulsory system, can be shown to be precisely the same as if rates were computed for insurance on a capitalized value basis which would enable reserves to be set up out of current premiums sufficient to meet all payments as they fall due, without counting upon earning any interest upon these reserves. In addition, therefore, to being somewhat larger on this account, the German rates would perhaps be somewhat larger because they carry a definite provision for the accumulation of a contingency or fluctuation reserve. They are, however, smaller, as has been suggested, by the omission of three items:

(1) The equivalent of about 11 per cent, because no provision is made for expenses;

(2) The omission of the amount paid by the employers on account of the first thirteen weeks of disability, this amount being included in the dues collected by the sickness insurance societies, of which the employers pay one-third; and

(3) The omission of the 16 $\frac{2}{3}$ per cent of the wages of the injured person paid by the individual employer from the beginning of the fifth to the end of the thirteenth week of disability.

PREMIUM RATES OF ASSESSMENT IN THE FORM OF PERCENTAGE OF PAY ROLL IN
DISABILITY FOR MORE THAN THIRTEEN

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions
listments "with power."]

Industry.	Years.						
	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Agricultural machinery works.....	0.32	0.70	0.82	0.71	0.80	1.12	1.32
Automobile factories.....							
Bakeries and biscuit factories.....	{From. .23	.57	.42	.44	.87	.93	.98
	{To. .30	.76	.56	.38	1.24	1.32	1.40
Beer bottling and shipping concerns.....	1.73	1.83	2.81	1.62	1.66	1.62	2.09
Belt and saddlery factories.....	.39	.49	.55	.66	.71	.77	.81
Boiler construction works:							
(a) Riveting by machinery.....	.47	1.05	1.24	1.06	1.19	1.75	2.05
(b) Riveting by hand.....	.38	.82	.97	.83	.93	1.75	2.05
Bookbinding.....	.34	.21	.20	.20	.20	.20	.22
Brewery works.....	{From. 1.37	1.96	1.67	1.66	1.64	1.75	1.90
	{To. 2.19	3.13	2.67	2.65	2.62	2.80	3.04
Bridge construction (other than iron).....	.49	1.10	1.39	1.33	1.45	1.56	1.90
Brickmaking:							
(a) By machinery.....	.61	.59	.68	.60	.75	.98	.96
(b) By hand.....	.48	.47	.29	.29	.32	.42	.41
Candy factories.....	{From. .23	.57	.42	.44	.87	.93	.98
	{To. .30	.76	.56	.58			
Canning factories:							
(a) Vegetable products.....	{From. .23	.57	.42	.44	.37	.40	.42
	{To. .30	.76	.56	.58			
(b) Animal products.....	{From. .23	.57	.42	.44	.37	.40	.42
	{To. .30	.76	.56	.58			
Carpentry:							
(a) Cabinetmaking (power).....	1.13	1.30	.77	.75	.82	.90	1.02
(b) General contract.....	.49	1.10	1.39	1.33	1.45	1.56	1.90
Carpet factories.....	.26	.42	.47	.44	.55	.57	.61
Carriage factories.....	.32	.70	.83	.71	.80	.50	.59
Casting works:							
(a) Iron (without power).....	.40	.93	1.25	1.18	1.21	1.24	1.27
(b) Steel (without power).....	.40	.93	1.25	1.18	1.21	1.24	1.27
(c) Metal.....		.24	.38	.45	.36	.39	.38
Cement plants.....	.37	.63	1.18	1.36	1.36	1.35	1.46
Celluloid factories:							
(a) Celluloid.....	.60	1.50	1.47	1.54	1.59	1.67	1.74
(b) Articles.....	.52	1.31	1.22	1.28	1.32	1.39	1.45
Chemical works.....	.22	.56	.49	.51	.53	.56	.58
Cleaning establishments (chemical).....	.25	.25	.29	.27	.34	.48	.46
Cloth printing.....	.39	.64	.70	.67	.64	.66	.71
Clothing factories.....	.19	.17	.17	.16	.20	.19	.19
Coking plants.....	1.23	2.34	2.20	2.11	2.13	2.13	2.46
Construction:							
(a) Railroad, excluding tunneling.....			1.97	2.96	4.64	3.53	3.45
(b) Iron bridges and other structural iron work—							
(1) Riveting by machinery.....	.47	1.05	1.24	1.06	1.19	1.12	1.32
(2) Riveting by hand.....	.38	.82	.97	.83	.93	1.12	1.32
Copper and brass works.....		.24	.38	.45	.36	.39	.38
Cotton and half-wool spinning, weaving, etc.....	.17	.28	.31	.30	.27	.28	.30
Dairy-products factories.....	.59	.63	.79	.83	.88	.96	1.03
Drayage, riggers, and heavy movers.....	.44	1.91	2.00	2.00	2.52	2.75	2.87
Dyeing establishments (power).....	.39	.64	.70	.67	.64	.66	.71
Electrical:							
(a) Machinery plants.....	1.31	.50	.71	.67	.52	.59	.70
(b) Installation of same.....	1.31	.50	.71	.67	.52	.59	.70
(c) Apparatus (telegraph, telephone, etc.) factories.....	1.31	.50	.71	.67	.52	.59	.70
(d) Installation telegraphs, telephones, etc.....	1.31	.50	.71	.67	.52	.59	.70
(e) Lighting and power establishments.....	1.31	.50	.71	.67	.52	.59	.70
Enameled-ware factories.....		.64	.76	.65	.73	.87	1.03
Firearm manufacturing.....	.56	.43	.59	.47	.34	.38	.45
Flour mills:							
(a) Water power.....	.80	.81	1.01	1.07	1.17	1.16	1.24
(b) Steam power.....	1.20	1.22	1.51	1.61	1.75	1.74	1.86
Furnaces:							
(a) Bessemer, Thomas & Martin (steel).....	.79	1.86	2.00	1.89	1.94	1.98	2.55
(b) Blast.....	.40	.93	1.25	1.18	1.21	1.24	1.66
(c) Crucible.....	.52	1.21	1.63	1.54	1.57	1.61	1.66
(d) Puddling.....	.52	1.21	1.63	1.54	1.57	1.61	1.66
(e) Zinc.....	.28	.65	.88	.83	.85	.87	.89
Furniture factories:							
(a) Wood.....	1.13	1.30	.77	.75	.82	.90	1.02
(b) Iron and brass.....	.21	.43	.46	.43	.48	.52	.60
Gas works, including installation.....	.63	.79	.91	.89	.97	1.05	1.05
Glass factories:							
(a) Except tableware.....	.19	.40	.43	.49	.52	.36	.45
(b) Table glass.....	.19	.40	.43	.49	.52	.80	.99

COST OF INDUSTRIAL ACCIDENT INSURANCE.

779

EMPLOYERS' MUTUAL ACCIDENT ASSOCIATIONS, COVERING ACCIDENTS CAUSING WEEKS, OR DEATH—GERMANY.

of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments for benefits, see p. 731.]

Years.															
1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
1.19	1.21	1.23	1.14	0.96	1.05	1.23	1.36	1.69	2.03	2.07	1.99	2.02	1.87	1.84	2.11
1.03	.98	.98	.60	.66	1.05	.98	1.09	1.36	1.62	1.66	1.59	1.62	1.50	1.47	1.69
1.47	1.40	1.41	2.04	2.25	2.20	2.02	1.97	1.83	1.95	1.80	1.77	1.68	1.41	1.40	1.36
1.64	1.66	1.60	1.60	1.19	1.28	1.34	1.37	1.53	1.80	1.70	1.73	1.71	1.70	1.77	1.89
.85	.81	.82	.84	.77	.75	.58	.61	.74	.84	.84	.77	.78	.74	.76	.82
2.09	2.12	2.15	1.99	1.68	1.83	1.97	2.18	2.71	3.24	3.31	3.59	3.64	3.37	3.32	3.80
2.09	2.12	2.15	1.99	1.68	1.83	1.97	2.18	2.71	3.24	3.31	3.59	3.64	3.37	3.32	3.80
.24	.29	.28	.27	.31	.30	.34	.35	.40	.33	.31	.31	.32	.32	.42	.44
2.02	1.73	1.70	1.61	1.38	1.40	1.41	1.48	1.87	2.00	2.11	2.12	2.20	2.12	2.06	2.06
3.24	2.77	2.72	2.57	2.21	2.23	2.26	2.36	2.99	3.20	3.38	3.39	3.51	3.39	3.30	3.30
2.46	2.80	3.07	2.80	2.42	2.29	2.00	1.91	2.42	2.47	2.37	2.29	2.18	2.03	2.14	2.32
1.08	1.20	1.13	1.04	.83	.86	.94	1.01	1.37	1.47	1.47	1.42	1.49	1.47	1.47	1.63
.67	.75	.71	.65	.52	.61	.67	.72	.98	1.05	.84	.81	.85	.84	.84	.70
1.03	.98	.98	.60	.66	.65	.69	.68	.61	.65	.60	.59	.56	.57	.56	.55
.44	.42	.42	.60	.66	.65	.59	.58	.85	.91	.84	.83	.79	.85	.84	.82
.44	.42	.42	.60	.66	.65	.59	.58	.85	.91	.84	.83	.79	.85	.84	.82
1.84	1.99	2.03	1.95	1.69	1.50	1.51	1.72	1.96	2.14	2.07	1.95	2.00	1.91	1.89	1.93
2.46	2.80	3.07	2.80	2.42	2.29	2.00	1.91	2.42	2.47	2.37	2.29	2.18	2.03	2.14	2.32
.60	.69	.60	.62	.60	.60	.66	.71	.94	.98	1.00	1.04	1.08	1.08	1.04	1.12
.60	.61	.62	.57	.48	.52	.86	.95	1.19	1.42	1.45	1.20	1.21	1.12	1.11	.84
1.31	1.34	1.33	1.15	.96	1.01	1.02	1.11	1.61	1.76	1.65	1.84	1.34	1.26	1.23	1.42
1.31	1.34	1.33	1.15	.96	1.01	1.02	1.11	1.61	1.76	1.65	1.84	1.91	1.81	1.76	2.03
.29	.31	.30	.30	.27	.58	.60	.76	.90	1.00	.83	.87	.94	.92	.88	.88
1.67	1.75	1.18	1.50	1.25	1.06	1.03	1.14	1.58	1.74	1.83	1.82	1.85	1.74	1.65	2.07
1.76	1.84	1.86	1.73	1.85	1.73	1.84	1.89	2.36	2.56	2.62	2.77	2.80	2.74	2.63	2.77
1.47	.61	.62	.58	.57	.53	.56	.58	.73	.79	.81	1.07	1.08	1.05	1.01	1.06
.59	.61	.62	.58	.57	.53	.56	.58	.73	.79	.81	.85	.86	.84	.81	.85
.51	.53	.49	.90	.86	.92	.99	1.14	.96	1.06	1.00	.68	.76	.67	.67	.68
.70	.81	.70	.73	.70	.70	.77	.83	1.10	1.14	1.17	1.27	1.32	1.31	1.28	1.36
.20	.21	.20	.11	.11	.11	.12	.14	.12	.13	.13	.14	.15	.13	.13	.14
2.70	2.39	2.57	2.37	1.92	1.97	1.97	1.88	2.29	2.64	2.78	2.83	3.00	2.69	2.45	2.42
2.40	2.65	3.40	3.75	3.90	3.35	2.80	2.75	2.95	3.70	4.25	3.55	3.25	2.35	2.05	2.30
1.49	1.52	1.54	1.42	1.20	1.31	1.72	1.91	2.37	2.84	2.90	3.99	4.05	3.74	3.69	4.21
1.49	1.52	1.54	1.42	1.20	1.31	1.72	1.91	2.37	2.84	2.90	3.99	4.05	3.74	3.69	4.21
.51	.54	.53	.53	.47	.82	.84	1.07	1.26	1.40	1.32	1.38	1.49	1.46	1.40	1.42
.30	.35	.30	.31	.30	.30	.33	.35	.47	.49	.50	.46	.48	.48	.46	.50
.58	.61	.62	.60	.53	.54	.55	.65	.68	.74	.80	.82	.82	.80	.78	.83
3.06	3.27	3.27	3.21	2.86	3.17	4.06	4.26	5.27	5.80	6.15	5.04	5.14	4.80	4.78	4.94
.70	.81	.70	.73	.70	.70	.77	.83	1.10	1.14	1.17	1.27	1.32	1.31	1.28	1.36
.78	.88	.76	.70	.67	.52	.57	.58	.70	.83	.92	.89	.89	.83	.76	.98
.78	.88	.76	.70	.67	1.30	1.42	1.45	1.75	2.07	1.90	1.85	1.85	1.73	1.58	1.58
.78	.88	.76	.70	.67	1.30	1.42	1.45	1.75	2.07	1.90	1.85	1.85	1.73	1.58	1.58
.78	.88	.76	.70	.67	1.30	1.42	1.45	1.75	2.07	1.90	1.85	1.85	1.73	1.58	1.58
.78	.88	.76	.70	.67	1.07	1.18	1.20	1.45	1.71	1.32	1.28	1.28	1.20	1.09	1.10
1.04	1.06	1.08	.99	.84	.91	.74	.82	1.02	1.22	1.24	1.00	1.01	.94	.92	1.05
.59	.63	.56	.53	.48	.28	.30	.31	.38	.44	.62	.60	.61	.57	.52	.72
1.30	1.38	1.50	1.53	1.47	1.86	1.93	2.12	2.62	2.76	2.90	2.94	2.98	3.03	2.86	3.05
1.95	2.07	2.25	2.29	2.20	2.23	2.31	2.54	3.14	3.31	3.48	3.53	3.57	3.64	3.43	3.66
2.63	2.68	2.66	2.30	1.92	2.01	2.04	2.21	3.22	3.52	3.30	3.67	3.06	2.89	2.82	3.25
1.71	1.74	1.73	1.50	1.25	1.31	1.33	1.44	2.09	2.29	2.14	2.39	2.45	2.35	2.29	2.64
1.71	1.74	1.73	1.50	1.25	1.31	1.33	1.44	2.09	2.29	2.14	2.39	1.34	1.26	1.23	1.42
1.71	1.74	1.73	1.50	1.25	1.31	1.33	1.77	1.13	1.23	1.15	1.29	1.34	1.21	1.23	1.42
.92	.94	.93	.81	.67	.70	.71	.55	.80	.88	.82	.92	1.34	1.26	1.23	1.42
1.84	1.99	2.03	1.95	1.69	1.50	1.51	1.72	1.96	2.14	2.07	1.95	2.00	1.91	1.89	1.93
.34	.35	.35	.31	.26	.26	.28	.28	.37	.44	.44	.44	.46	.43	.42	.44
1.05	1.09	1.16	1.12	1.01	.92	.94	1.05	1.19	1.23	1.26	1.29	1.25	1.22	1.17	1.23
.41	.42	.44	.47	.42	.46	.48	.47	.57	.57	.61	.62	.62	.63	.59	.64
.91	.92	.97	1.13	1.02	1.11	1.14	1.12	1.48	1.50	1.59	1.61	1.63	1.47	1.38	1.51

**PREMIUM RATES OF ASSESSMENT IN THE FORM OF PERCENTAGE OF PAY ROLL IN
DISABILITY FOR MORE THAN THIRTEEN**

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions
Ishments "with power."]

Industry.	Years.						
	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Glove factories.....	0.39	0.49	0.55	0.66	0.71	0.77	0.81
Glue and gelatin factories.....	.45	1.13	1.47	1.54	1.59	1.67	1.74
Hat factories.....	.15	.12	.17	.16	.20	.19	.19
{From.....	.34	.29	.29	.27	.34	.39	.39
{To.....	.56	.63	.69	.28	.54	.57	
Hemp spinning (ropes, etc.).....	.59	1.33	1.39	1.33	1.45	1.56	1.90
Housesmithing.....	.86	.37	.43	.40	.30	.34	.40
Instruments and apparatus.....	.21	.43	.46	.43	.48	.52	.60
Knife makers.....	.13	.21	.23	.22	.18	.19	.20
Knit-goods factories.....	.24	.21	.34	.32	.41	.30	.39
Laundries (power).....	.39	.49	.55	.66	.71	.77	.81
Leather bags, etc. (power).....	.38	.32	.97	.83	.93	1.12	1.32
Loom factories.....	.46	.80	.97	.92	.98	1.08	1.25
Machine and repair shops (power).....	.32	.70	.82	.71	.80	.87	1.03
Malt works (malt only).....	1.10	1.66	1.34	1.32	1.31	1.40	1.52
Masonry.....	.49	1.10	1.39	1.33	1.45	1.66	1.90
Metal pressing, stamping, etc.....	.35	.46	.53	.47	.46	.62	.58
Mines:							
(a) Coal—							
(1) Anthracite.....	.33	.60	1.03	.97	1.00	.97	1.13
{From.....	2.11	3.86	2.76	2.60	2.67	2.59	3.04
{To.....	.19	.38	.23	.24	.26	.24	.25
(2) Bituminous.....	.64	1.27	2.09	2.13	2.30	2.18	2.29
{From.....	.31	.64	.73	.71	.70	.80	.91
{To.....	.61	1.29	1.46	1.41	1.39	1.60	1.82
(b) Metal—							
Mining and smelting.....	.31	.64	.73	.71	.70	.80	.91
Musical instruments, manufacturing (not including pianos and organs).....	.42	.45	.43	.48	.53	.61	.60
Nail factories.....	.21	.43	.46	.43	.48	.52	.60
Nitrocellulose and collodion factories (same as celluloid).....	.60	1.50	1.47	1.54	1.59	1.67	1.74
Oil factories (linseed and rape).....	1.60	1.62	2.01	2.14	2.34	2.32	2.48
Ordnance factories.....	.37	.94	1.22	1.28	1.32	1.39	1.45
Paint factories (color factories).....	.37	.94	1.22	1.28	1.32	1.39	1.45
Painters:							
(a) Exterior.....	.39	.88	.93	.89	.97	1.04	1.27
(b) Interior.....	.39	.88	.93	.89	.97	1.04	1.27
Paper factories:							
(a) Envelope.....	.34	.21	.32	.32	.33	.31	.35
(b) Carton and box.....	.34	.21	.26	.25	.26	.25	.27
(c) Pasteboard and paper.....	.98	1.07	1.25	1.23	1.31	1.38	1.60
(d) Wall paper.....	.57	.35	.44	.44	.45	.43	.48
(e) Paper (same as c).....	.98	1.07	1.25	1.23	1.31	1.38	1.60
Paper hanging.....	.39	.88	.93	.89	.97	1.04	1.27
Petroleum refineries.....	.67	1.69	1.71	1.80	1.85	1.95	2.03
Pharmaceutical factories.....	.37	.94	1.22	1.28	1.32	1.39	1.45
Piano and organ factories.....	.42	.45	.43	.48	.53	.61	.60
Plated-ware factories.....	.18	.29	.34	.27	.29	.29	.29
Polishing and grinding factories (iron and steel):							
(a) Ordinary.....	.21	.43	.77	.71	.80	.86	.99
(b) Using large rapidly revolving stones.....	.21	.43	.77	.71	.80	.86	.99
Powder factories (black).....	.75	1.88	2.44	2.57	2.64	2.78	2.90
Printers:							
(a) Lithographers and art printing.....	.34	.21	.23	.23	.23	.22	.25
(b) Book printing.....	.29	.29	.38	.30	.33	.35	.34
Quarries:							
(a) Ordinary stone.....	1.12	1.88	1.97	2.27	2.26	2.25	2.43
(b) Marl and cement.....	.93	1.57	1.97	2.27	2.26	2.25	2.43
(c) Slate.....	1.12	1.88	1.97	2.27	2.26	2.25	2.43
Railways:							
(a) Steam.....	.39	.79	1.26	1.38	1.49	1.52	1.68
(b) Electric.....	.16	.55	1.22	.90	.80	.88	.96
Rendering (oleomargarine and artificial butter).....	.22	.56	.98	1.03	1.06	1.11	1.16
Rolling mills:							
(a) Small iron and wire.....	.63	1.49	2.00	1.89	1.94	1.98	2.04
(b) Heavy products.....	.28	.65	.88	.83	.85	.87	1.27
(c) Thin sheet iron.....	.52	1.21	1.63	1.54	1.57	1.61	1.66
(d) Coarse sheet iron.....	.52	1.21	1.63	1.54	1.57	1.61	1.66
(e) Tubes.....	.52	1.21	1.63	1.54	1.57	1.61	1.66
Rubber and gutta-percha manufacturing.....	.52	1.31	1.22	1.28	1.32	1.39	1.45
Safe, etc., factories:							
(a) Iron safes.....	.35	.72	.77	.71	.80	.86	.99
(b) Iron furniture.....	.21	.43	.46	.43	.48	.52	.60

EMPLOYERS' MUTUAL ACCIDENT ASSOCIATIONS, COVERING ACCIDENTS CAUSING WEEKS, OR DEATH—GERMANY—Continued.

of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishment benefits, see p. 731.]

Years.															
1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
0.85	0.41	0.41	0.42	0.39	0.37	0.15	0.15	0.19	0.21	0.21	0.15	0.16	0.15	0.15	0.16
1.76	1.23	1.24	1.16	1.28	1.20	1.13	1.16	1.45	1.58	1.61	1.71	1.72	1.68	1.62	1.70
.70	.21	.20	.11	.11	.11	.12	.14	.12	.13	.13	.10	.11	.10	.10	.10
.41	.43	.39	.45	.43	.46	.49	.57	.60	.67	.63	.68	.76	.67	.67	.68
.....	1.02	1.00	.92	.79	.93	.92	.11	1.11	1.20	1.33	1.25	1.20	1.21	1.17	1.17
1.23	1.40	1.54	1.40	1.21	1.15	1.20	1.14	1.45	1.48	1.42	1.37	1.31	1.22	1.28	1.36
.38	.41	.33	.32	.31	.26	.28	.29	.35	.41	.44	.43	.43	.40	.36	.44
.92	.93	.92	.82	.70	.69	.75	.66	.86	1.02	1.03	1.02	1.08	1.01	.98	1.03
.20	.23	.20	.21	.20	.20	.22	.24	.31	.33	.33	.35	.36	.36	.35	.37
.41	.43	.39	.79	.75	.80	.86	.90	.84	.93	.88	1.16	1.30	1.16	1.14	1.17
.85	.81	.82	.84	.77	.75	.58	.61	.74	.84	.77	.78	.74	.76	.76	.82
1.49	1.52	1.54	1.42	1.20	1.31	.98	1.09	1.36	1.62	1.66	1.59	1.62	1.50	1.47	1.69
.99	1.07	1.03	.94	.84	.88	.75	.83	1.02	1.15	1.24	1.22	1.20	1.16	1.10	1.16
1.04	1.06	1.08	.99	.84	.91	.98	1.09	1.36	1.62	1.66	1.59	1.62	1.50	1.47	1.69
1.62	1.39	1.36	1.29	1.11	1.12	1.13	1.18	1.50	1.60	1.66	1.59	1.62	1.50	1.47	1.69
2.05	2.33	2.36	2.34	2.02	1.91	2.00	1.91	2.42	2.47	2.37	2.29	2.18	2.03	2.14	2.32
.56	.52	.50	.47	.44	.44	.38	.41	.53	.64	.66	.77	.80	.82	.83	.88
1.23	.89	1.24	1.31	1.03	1.05	1.02	.97	1.25	1.42	1.51	1.53	1.66	1.51	1.33	1.32
3.29	2.88	3.02	2.63	2.06	2.09	2.05	1.93	2.32	2.62	2.79	2.83	3.07	2.60	2.29	2.28
.30	.73	.64	.68	.49	.58	.50	.69	.50	.84	.91	.91	.93	.94	.87	.87
2.68	2.74	2.30	2.33	1.95	1.94	2.00	1.99	2.29	2.78	3.01	3.02	3.09	2.68	2.49	2.49
1.02	.50	.47	.47	.38	.40	.40	.38	.59	.68	.70	.71	.74	.87	.82	.83
2.05	1.61	1.54	1.46	1.19	1.24	1.25	1.19	1.63	1.87	1.93	1.95	2.06	1.81	1.71	1.98
.67	.62	.64	.59	.55	.61	.65	.68	.79	.91	.87	.86	.87	.87	.83	.84
1.03	1.05	1.04	.92	.79	.78	.85	.60	.73	.88	.88	.88	1.08	1.01	.98	1.03
1.76	1.84	1.86	1.73	1.85	1.73	1.84	1.89	2.36	2.56	2.62	2.77	2.80	2.74	2.63	2.77
2.60	2.76	3.00	3.06	2.93	3.72	3.86	4.24	5.24	5.52	5.80	5.88	5.95	6.07	5.72	6.10
1.47	1.38	1.39	1.30	1.28	1.20	1.13	1.16	1.45	1.58	1.61	1.71	1.72	1.68	1.62	1.70
.82	.93	1.02	.93	.81	.76	.80	.76	.97	.99	.95	.92	.87	.81	.86	1.01
.82	.93	1.02	.93	.81	.76	.80	.76	.97	.99	.95	.92	.87	.81	.86	1.01
.38	.46	.44	.43	.48	.47	.45	.47	.53	.53	.50	.50	.51	.51	.42	.44
.32	.39	.38	.36	.41	.40	.45	.47	.53	.59	.57	.56	.57	.54	.57	.57
1.73	1.80	1.80	1.73	1.50	1.85	1.91	2.00	2.58	2.87	2.82	2.67	2.70	2.56	2.45	2.55
.49	.60	.58	.56	.63	.62	.68	.71	.80	.79	.75	.75	.76	.76	.72	.76
1.64	1.71	1.71	1.64	1.42	1.50	1.55	1.61	2.09	2.32	2.35	2.23	2.25	2.13	2.06	2.13
.41	.47	.51	.47	.40	.33	.40	.38	.48	.49	.47	.46	.44	.41	.43	.48
2.05	1.38	1.39	1.30	1.42	1.33	1.13	1.16	1.45	1.58	1.61	1.71	1.72	1.68	1.62	1.70
1.47	1.08	1.08	1.01	1.14	1.07	.99	1.02	1.27	1.38	1.41	1.41	1.42	1.39	1.33	1.40
.67	.62	.64	.59	.55	.61	.65	.68	.79	.86	.87	.86	.87	.87	.83	.84
.22	.23	.23	.23	.20	.19	.20	.26	.30	.33	.30	.32	.34	.33	.32	.40
.92	.93	.92	.82	.70	.69	.75	.75	.98	1.17	1.17	1.17	1.24	1.16	1.12	1.18
.92	.93	.92	.82	.70	.69	.75	.75	.98	3.21	3.22	3.22	3.71	3.47	3.35	3.53
2.93	3.84	3.87	3.61	3.27	3.06	3.11	3.20	4.00	4.34	4.44	4.05	4.09	4.00	3.84	4.04
.32	.39	.38	.36	.41	.40	.40	.41	.46	.40	.38	.37	.38	.42	.42	.44
.35	.37	.36	.35	.33	.37	.32	.32	.38	.40	.42	.43	.45	.46	.45	.47
2.71	2.84	1.91	2.45	2.03	2.13	2.07	2.28	3.15	3.48	3.14	3.11	3.17	2.98	2.83	3.18
2.92	3.06	2.62	2.63	2.18	2.27	2.21	2.43	3.36	3.71	3.92	3.89	3.96	3.72	3.64	3.82
1.67	1.75	1.18	1.50	1.25	.92	.90	.99	1.37	1.51	1.31	1.30	1.32	1.24	1.18	1.36
1.80	1.72	1.56	1.43	1.26	1.30	1.34	1.42	1.63	1.81	1.89	1.83	1.84	1.82	1.76	1.82
1.78	1.69	1.29	1.15	.71	.68	.68	.67	.80	.89	.95	1.03	1.05	1.04	1.00	1.02
1.17	1.38	1.39	1.30	1.28	1.20	1.27	1.31	1.64	1.77	1.82	1.79	1.81	1.77	1.70	1.79
2.10	2.15	2.13	1.84	1.53	1.61	1.63	1.77	2.57	2.81	2.64	2.94	3.06	2.89	2.82	3.25
1.31	1.34	1.33	1.15	.96	1.01	1.02	1.11	1.61	1.76	1.65	1.84	1.84	1.26	1.23	1.42
1.71	1.74	1.73	1.50	1.25	1.31	1.33	1.11	1.61	1.76	1.65	1.84	1.84	1.26	1.23	1.42
1.71	1.74	1.73	1.50	1.25	1.31	1.33	1.11	1.61	1.76	1.65	1.84	2.48	2.35	2.29	2.64
1.71	1.74	1.73	1.50	1.25	1.31	1.33	1.11	1.61	1.76	1.65	1.84	1.84	1.26	1.23	1.42
1.47	.92	.93	.87	.85	.80	.71	.73	.91	.99	1.01	1.07	1.08	1.05	1.01	1.06
.69	.70	.69	.61	.52	.52	.56	.84	1.10	1.31	1.32	1.32	1.08	1.01	.98	1.03
.34	.35	.35	.31	.26	.26	.28	.28	.37	.44	.44	.44	.46	.43	.42	.44

PREMIUM RATES OF ASSESSMENT IN THE FORM OF PERCENTAGE OF PAY ROLL IN
DISABILITY FOR MORE THAN THIRTEEN

(The rates here given are average rates for the industries or industry groups specified; rates in subdivisions
lishments "with power.")

Industry.	Years.						
	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Sawmills.....	1.59	1.82	2.79	2.70	2.97	3.23	3.68
Sewing-machine factories.....	.44	.33	.45	.41	.33	.36	.41
Sheet-iron wares, factories for.....	.24	.47	.34	.34	.37	.41	.48
Shipbuilding plants.....	.47	1.05	1.24	1.06	1.19	1.12	1.32
Shoe factories.....	.19	.17	.20	.19	.24	.39	.39
Silk (spinning, etc.) and velvet mills.....	.15	.13	.15	.14	.12	.19	.17
Slaughterhouses.....	.23	.57	.42	.44	1.12	1.19	1.26
Soap factories.....	.30	.76	.56	.58			
Steamships:	.52	1.31	1.22	1.28	1.32	1.39	1.45
(a) Rivers, inland lakes, and streams.....	1.83	.92	1.91	2.48	2.23	2.18	2.38
(b) Ocean.....			.76	1.14	1.37	1.45	1.74
Stonecutting (shops and buildings).....	.36	.51	.71	.64	.77	.83	.93
Street cleaning.....			.39	.59	.93	.71	.69
Sugar refineries.....	.59	.95	1.36	1.21	1.29	1.43	1.53
Tar products factories.....	.45	1.13	1.22	1.28	1.32	1.39	1.45
Tanneries.....	.79	.98	1.11	1.31	1.42	1.54	1.63
Terra-cotta factories.....	.38	.35	.39	.37	.42	.43	.50
Tinsmithing.....	.59	1.33	1.39	1.33	1.45	1.56	1.90
Tobacco factories (smoking tobacco factories with motor).....	.19	.31	.67	.69	.59	.59	.63
Tool makers.....	.21	.43	1.23	1.14	1.27	1.38	1.59
Tunneling:							
(a) Ordinary.....			5.52	8.29	8.34	6.39	6.21
(b) By machinery.....	.93	1.57	1.18	1.36	1.36	1.35	1.46
Turning factories:							
(a) Iron.....		.64	.76	.65	.73	.50	.59
(b) Wood.....	.68	.78	.93	.90	.99	1.08	1.23
Type foundries.....	.29	.29	.38	.30	.33	.35	.34
Warehouse and storage.....	1.72	1.82	2.81	1.52	1.66	1.62	2.09
Waterworks (exclusive of installation).....	.63	.79	.91	.89	.97	1.05	1.05
Watchmakers (exclusive of cases).....	.69	.38	.49	.43	.35	.38	.45
Wax, leather, and waterproofing factories.....	.39	.49	.55	.66	.71	.77	.81
Weaving establishments (curtains, etc.).....	.17	.28	.31	.30	.27	.28	.30
Wire rope and cable manufacturing.....		.70	.83	.71	.80	.50	.59
Wood carving.....	1.59	1.82	2.79	2.70	2.97	3.23	3.68
Wood-pulp factories.....	1.56	1.71	2.00	1.97	2.10	2.20	1.81
Wool spinning, weaving, and finishing.....	.26	.42	.47	.44	.55	.57	.61
Wrecking operations (demolition of buildings, etc.).....	.49	1.10	1.85	1.78	1.93	2.09	2.54

EMPLOYERS' MUTUAL ACCIDENT ASSOCIATIONS, COVERING ACCIDENTS CAUSING WEEKS, OR DEATH—GERMANY—Concluded.

of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments. For benefits, see p. 731.]

Years.															
1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.
3.06	3.31	3.38	3.26	2.82	3.01	3.02	3.44	3.92	4.28	4.32	4.07	4.19	3.99	3.95	4.19
.46	.52	.45	.41	.39	.24	.26	.27	.33	.38	.40	.39	.39	.37	.33	.35
.35	.38	.37	.35	.31	.30	.71	.78	.91	1.04	1.12	1.11	1.07	1.02	.96	1.05
1.49	1.52	1.54	1.42	1.20	1.31	1.60	1.77	2.20	2.64	2.69	2.59	2.63	2.43	2.40	2.74
.41	.43	.39	.34	.32	.34	.37	.43	.48	.53	.50	.48	.54	.48	.48	.49
.32	.35	.29	.27	.27	.24	.27	.30	.38	.40	.38	.42	.41	.49	.48	.54
1.32	1.26	1.27	.72	.69	.66	.73	.74	.85	.84	.88	1.22	1.19	1.22	1.13	1.18
1.47	1.38	1.39	1.30	1.28	1.20	1.27	1.31	1.64	1.77	1.82	1.79	1.81	1.77	1.70	1.79
2.75	2.12	2.25	2.18	1.89	1.74	1.81	1.94	2.48	2.80	2.73	3.11	2.96	3.04	2.91	3.12
1.87	1.76	2.30	2.52	2.22	2.60	2.67	2.57	2.67	2.38	2.50	2.20	2.23	2.27	2.21	2.47
.89	.94	.90	.80	.78	.71	.82	.94	1.29	1.43	1.38	1.44	1.53	1.58	1.50	1.51
.43	.48	.61	.68	.70	.54	.45	.44	.47	.59	.77	.64	.59	.42	.37	.54
1.69	1.62	1.63	1.66	1.57	1.48	1.63	1.63	2.08	2.36	2.57	2.69	2.60	2.51	2.55	2.66
1.47	1.08	1.08	1.01	1.00	.93	.99	1.02	1.27	1.38	1.41	1.41	1.42	1.39	1.33	1.40
1.71	3.25	3.27	3.37	3.10	2.98	5.83	6.14	7.42	8.39	8.37	7.70	7.77	7.41	7.61	8.23
.60	.64	.61	.69	.54	.89	.88	1.01	1.20	1.31	1.31	1.28	1.23	1.27	1.30	1.20
1.23	1.40	1.54	1.40	1.21	1.15	1.20	1.14	1.45	1.48	1.42	1.37	1.31	1.22	1.28	1.36
.67	.66	.81	.74	.68	.73	.75	1.05	1.75	1.20	1.26	1.24	1.17	1.12	1.04	1.04
1.38	1.40	1.38	1.22	1.08	1.04	1.13	1.12	1.74	1.75	1.76	1.76	1.70	1.59	1.54	1.62
4.32	4.77	6.12	6.75	7.02	4.69	3.92	3.85	4.13	5.18	5.10	4.26	3.90	2.82	2.46	2.79
3.64	3.82	3.72	3.29	2.73	1.84	1.79	1.97	2.73	3.01	3.40	3.37	3.43	3.23	3.07	3.75
.60	.61	.62	.57	.48	.52	.49	.54	.68	.81	.83	.80	.81	.75	.75	.84
1.47	1.59	1.62	1.59	1.35	1.00	1.01	1.15	1.31	1.43	1.50	1.42	1.46	1.39	1.37	1.50
.35	.37	.36	.35	.34	.37	.32	.32	.38	.40	.42	.35	.36	.37	.36	.38
1.64	1.66	1.60	1.60	1.77	1.92	2.01	2.05	2.29	2.40	2.36	2.31	2.28	2.26	2.36	2.52
1.05	1.09	1.16	1.12	1.01	1.06	1.08	1.20	1.36	1.41	1.45	1.48	1.44	1.40	1.35	1.32
.45	.51	.43	.41	.39	.20	.22	.23	.28	.32	.38	.46	.46	.43	.39	.44
.85	.81	.82	.84	.77	.75	.97	1.02	1.24	1.40	1.40	1.39	1.40	1.33	1.37	1.48
.30	.35	.30	.31	.30	.30	.33	.35	.47	.49	.50	.46	.48	.48	.46	.50
.60	.61	.62	.57	.48	.52	.49	.54	.68	.81	.83	.80	.81	.75	.74	.84
3.06	3.31	3.38	3.26	2.82	3.01	3.02	3.44	3.92	4.28	4.32	4.07	4.19	3.99	3.95	4.19
1.99	2.07	2.07	1.99	1.72	1.75	1.81	1.89	2.45	2.72	2.82	2.67	2.70	2.56	2.45	2.55
.60	.69	.60	.62	.60	.60	.66	.71	.84	.98	1.00	1.04	1.08	1.08	1.04	1.12
10.25	11.66	6.15	5.61	4.84	4.59	10.02	9.53	12.08	12.33	11.86	11.46	10.89	10.14	10.70	14.72

* Rate for cigar factories without motor 0.10 per cent, with motor 0.15 per cent.

GREAT BRITAIN.

In Great Britain the law at present in force, which was passed in 1906 and took effect July 1, 1907, provides for compensation, without regard to negligence, for disablement or death due to industrial accident, with the exception that temporary disability indemnity is not paid if the injury is due to serious and willful misconduct. The law applies to every employment in Great Britain and to every person employed unless his compensation for the service exceeds £250 (\$1,216.63) per annum, and to manual workmen, even though the compensation exceeds that sum. In addition to accidents, this law also covers the following classes of occupational diseases:

<i>Description of disease.</i>	<i>Description of process.</i>
Anthrax.....	Handling of wool, hair, bristles, hides, and skins.
Lead poisoning or its sequelæ.....	Any process involving the use of lead or its preparations or compounds.
Mercury poisoning or its sequelæ.....	Any process involving the use of mercury or its preparations or compounds.
Phosphorous poisoning or its sequelæ....	Any process involving the use of phosphorous or its preparations or compounds.
Arsenic poisoning or its sequelæ.....	Any process involving the use of arsenic or its preparations or compounds.
Ankylostomiasis.....	Mining.
Poisoning by nitro and amido derivatives of benzene (dinitro-benzol, anilin, and others), or its sequelæ.	Any process involving the use of a nitro or amido derivative of benzene or its preparations or compounds.
Poisoning by carbon bisulphide or its sequelæ.	Any process involving the use of carbon bisulphide or its preparations or compounds.
Poisoning by nitrous fumes or its sequelæ.	Any process in which nitrous fumes are evolved.
Poisoning by nickel carbonyl or its sequelæ.	Any process in which nickel carbonyl gas is evolved.
Arsenic poisoning or its sequelæ.....	Handling of arsenic or its preparations or compounds.
Lead poisoning or its sequelæ.....	Handling of lead or its preparations or compounds.
Poisoning by Gonioma Kamassi (African boxwood) or its sequelæ.	Any process in the manufacture of articles from Gonioma Kamassi (African boxwood).
Chrome ulceration or its sequelæ.....	Any process involving the use of chromic acid or bichromate of ammonium, potassium, or sodium, or their preparations.
Eczematous ulceration of the skin produced by dust or caustic or corrosive liquids, or ulceration of the mucous membrane of the nose or mouth produced by dust.	Handling or use of pitch, tar, or tarry compounds.

<i>Description of disease.</i>	<i>Description of process.</i>
Epitheliomatous cancer or ulceration of the skin or of the corneal surface of the eye, due to pitch, tar, or tarry compounds—Scrotal epithelioma (chimney-sweeps' cancer).	Chimney sweeping.
Nystagmus.....	Mining.
Glanders.....	Care of any equine animal suffering from glanders, handling the carcass of such animal.
Compressed-air illness or its sequelæ.....	Any process carried on in compressed air.
Subcutaneous cellulitis of the hand (beat hand).	Mining.
Subcutaneous cellulitis over the patella (miners' beat knee).	Mining.
Acute bursitis over the elbow (miners' beat elbow).	Mining.
Inflammation of the synovial lining of the wrist joint and tendon sheaths.	Mining.
Cataract in glassworkers.....	Processes in the manufacture of glass involving exposure to the glare of molten glass.
Telegraphists' cramp.....	Use of telegraphic instruments.
Eczematous ulceration of the skin produced by dust or liquids, or ulceration of the mucous membrane of the nose or mouth produced by dust.	

Under this act, as under the other British acts, the employer is held directly liable, and there is no provision for insurance, this being entirely voluntary. The only way in which the employer can escape direct liability is by making contracts with his employees for some scheme of compensation or insurance in lieu of the provisions of the act, which scheme must be approved by the registrar of friendly societies as "not less favorable to the workmen and their dependents than the provisions of the act," whereupon the employer becomes liable to his workmen only in accordance with the provisions of such scheme.

The act of 1906 replaced the workmen's compensation act of 1897 as amended in 1900, the amendment consisting in an extension of the existing act to cover agriculture.

The act of 1897 which, in its main provisions, was in force as to benefits until July 1, 1907, when the act of 1906 took effect, differed from the act of 1906 in regard to benefits chiefly in that no compensation was paid for disability until after two weeks, the first two weeks of disability being in no case compensated. It provided only against the results of accident, likewise, and not against occupational diseases.

The compensation legislation of Great Britain has not affected the right of an employee or his dependents to sue under the employers' liability act of 1880 or other statutes or the common law for damages by reason of the negligence of the employer, except that if compensation is accepted under the workmen's compensation act the employee may not hold the employer otherwise liable; but, on the other hand, if he does sue under the other laws and fails to recover, the judge may award him compensation under the compensation act. On account of these facts, insurance in Great Britain has, from the time the first compensation act was passed, covered not merely the liability under the same, but also the liability under the employers' liability act of 1880, all previous statutes, and the common law. It has not been the experience, however, that many suits have been brought, except under the workmen's compensation act, nor that much has been recovered except under that act.

There was, previous to the adoption of the workmen's compensation act, a considerable development in Great Britain of the establishment fund or mutual agreement between employers and employees by means of which, through the contributions of both, compensation was to be made for death or disability. This was recognized in the act, as stated, but there has been no marked increase in the development of establishment funds.

The stock insurance companies of Great Britain, insuring employers against their liability, have had a remarkable development, which was but the continuation of the success which had attended these enterprises prior to the adoption of the workmen's compensation act. Virtually all of the business has been transacted by them.

The business has not been profitable, but, on the other hand, it has not been disastrous. Immediately following the adoption of the workmen's compensation principle in 1897, the leading companies adopted tariff rates, which are given in column 2 of the table. These rates were scarcely sustained at all. A large number of the companies did not come into the tariff association, and proceeded to cut the rates sharply. In a short time all attempt to maintain them was abandoned, and the rates soon sank to the figures given in the third column, which are not lower, but probably actually higher, than the average rates obtained. At the same time there was a demand for insurance covering the first two weeks' disability as well as the liability under the law, and rates were made as presented in the fourth column. These rates on the average are nearly, if not quite, 50 per cent higher than the others, which increase does not appear to be justified by the inclusion of payments for the first two weeks alone.

At about the time of the adoption of the 1906 workmen's compensation act some of the leading companies, influenced thereto by their own experience as to the unprofitable nature of the business, again joined in a tariff association and adopted rates which, while not absolutely binding upon their members, have been more resolutely supported than theretofore. It has not been possible to obtain anything like a full statement as regards these rates, and only a few of them are given from information secured by a representative of the Wisconsin commission on employers' liability. A rather full statement of the rates charged by one of the leading nontariff companies is presented in the last column, and it is worthy of observation that they are nearly in exact correspondence with such of the rates of the tariff companies as are given and in some instances are actually higher. It must not be assumed, however, that this is uniformly the case, because nontariff companies show a larger loss upon the business, on the whole, than the tariff companies.

The following tables of the results of the operation of the British companies, tariff and nontariff offices given separately, were taken from the issue of the "Post Magazine and Insurance Monitor," of London, of November 5, 1910. The first of these shows the claims, commissions, expenses of management and profit, margin or deficit, together with the percentage of unearned premiums held at the end of the year, and shows that there was a net loss of a small fraction of 1 per cent upon the year's business by the tariff companies and of 11.46 per cent by the nontariff companies, showing a net loss upon the entire business of 2.50 per cent.

It is also worthy of note that the expenses of the tariff companies, including commissions, were 35.72 per cent of the premiums, and that the expenses of the nontariff companies were 37.24 per cent of the premiums, the average expenses of all being 36.01 per cent of the premiums. This does not include physicians' fees or adjustment expenses.

EMPLOYERS' LIABILITY INSURANCE BUSINESS OF BRITISH COMPANIES IN 1909.

The object of the following table is to set forth the profit results accruing from the employers' liability insurance business transacted during 1909, and in the majority of cases the figures relate to accounts covering the twelve months ending December 31, 1909. The figures in column 2 represent the net premiums brought into account, increased by the unearned premiums (or reserve for unexpired risks) at the end of the previous year, and diminished by the corresponding amount at the end of the year of account. No regulation has been laid down as to the proportions of this unearned premium reserve, and column 11 has accordingly been added, showing what percentage of the premiums reported is represented by such reserve at the end of the year of account. The figures in column 3 represent the scheduled item "Payments under policies, including medical and legal expenses in connection therewith, after deduction of sums reinsured," increased by the amount reserved for claims outstanding at the end of the year and diminished by that brought forward from the previous year. Columns 9 and 10 show the margin of profit or (where a minus sign appears) loss.]

Name of company.	Premiums earned.	Claims in respect of year.		Commission.		Expenses of management.		Profit margin or deficit.		Un-earned premium reserve at end of year. Per cent of premiums reported.
		Amount.	Per cent of premiums earned.	Amount.	Per cent of premiums earned.	Amount.	Per cent of premiums earned.	Amount.	Per cent of premiums earned.	
Column 1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
TARIFF COMPANIES.										
Alliance.....	£69,911	£30,260	43.29	£8,401	12.02	£17,818	25.49	£13,432	19.20	40.0
Atlas.....	15,377	7,059	45.92	1,959	12.74	3,782	24.59	2,577	16.75	40.0
British Equitable.....	993	588	59.22	172	17.32	267	26.89	— 34	- 3.43	81.1
British Law.....	5,425	2,631	48.50	1,190	21.94	1,604	29.56	—	—	180.2
Caledonian.....	4,487	2,486	55.43	829	18.47	1,302	29.01	— 130	- 2.91	70.9
Central.....	17,786	7,341	41.28	2,654	14.92	4,666	26.23	3,125	17.57	40.0
Century.....	16,189	9,209	56.89	2,231	13.78	3,923	24.24	826	5.09	40.0
Commercial Union.....	207,014	126,629	61.16	28,812	13.92	39,404	19.03	12,169	5.89	40.0
Employers' Liability.....	99,513	77,322	77.69	11,167	11.24	15,341	15.41	- 4,317	- 4.34	40.0
Guardian.....	64,642	36,919	57.12	8,921	13.80	16,103	24.91	2,699	4.17	37.2
Horse, Carriage, and General.....	1,644	1,101	66.97	223	13.56	296	18.01	24	1.46	33.3
Law Fire.....	90	—	—	21	23.33	33	36.67	36	40.00	40.0
Law Union and Rock.....	17,498	9,288	53.08	2,442	13.96	2,194	12.54	3,574	20.42	55.6
Liverpool and London and Globe.....	65,983	32,044	48.56	10,450	15.84	17,895	27.12	5,504	8.48	40.0
London Assurance.....	6,208	1,540	24.81	853	13.74	1,567	25.23	2,248	36.22	40.0
London, Edinburgh, and Glasgow.....	2,046	495	24.19	276	13.49	1,285	62.81	— 10	- .49	33.3
London and Lancashire.....	239,680	161,029	67.19	32,851	13.70	49,991	20.86	- 4,191	- 1.75	40.0
London Guarantee.....	24,569	16,189	65.89	3,350	13.63	8,825	35.91	- 3,795	- 15.43	49.8
North British and Mercantile.....	17,077	5,988	35.07	2,189	12.82	3,784	22.16	5,116	29.95	40.0
Northern.....	27,867	15,312	54.95	4,042	14.51	3,654	13.11	4,859	17.43	50.0
Norwich Union Fire.....	145,863	90,315	61.92	20,032	13.73	27,980	19.18	7,536	5.17	40.0
Ocean.....	313,076	206,747	66.04	36,982	11.81	89,816	28.69	- 20,469	- 6.54	33.3
Phoenix.....	22,437	13,828	61.63	3,984	17.76	5,007	22.31	— 382	- 1.70	40.0
Provident Clerks' and General.....	41,224	35,945	87.20	4,659	11.30	7,378	17.90	- 6,758	- 16.40	40.0
Railway Passengers.....	114,463	112,229	98.05	10,659	9.31	16,438	14.36	- 24,863	- 21.72	40.0
Royal.....	117,960	73,422	62.24	16,596	14.07	30,132	25.54	- 2,190	- 1.85	40.0
Royal Exchange.....	82,461	52,265	63.39	11,578	14.04	19,992	24.24	- 1,374	- 1.67	40.0
Scottish Accident.....	17,563	8,992	51.22	2,808	15.98	4,634	26.39	— 1,129	- 6.41	42.7
Scottish Metropolitan.....	5,762	3,140	54.48	875	13.80	1,905	33.07	— 158	- 2.74	40.0
Scottish Union and National.....	30,900	19,896	64.39	4,265	15.19	7,586	24.55	— 847	- 2.74	50.0
State.....	10,288	5,105	49.62	1,870	18.18	2,251	21.89	— 1,062	- 10.31	33.3
Sun.....	64,537	41,967	65.03	8,630	13.38	15,700	24.32	- 1,764	- 2.73	40.0
West of Scotland.....	2,382	818	34.35	363	15.23	666	27.96	535	22.46	40.0
Yorkshire.....	63,409	42,746	67.41	7,311	11.53	14,762	23.28	- 1,410	- 2.22	40.0
Total.....	1,936,324	1,250,845	64.60	253,645	13.10	437,985	22.62	- 6,151	- .32	.....

EMPLOYERS' LIABILITY INSURANCE BUSINESS OF BRITISH COMPANIES IN 1909—Concluded.

Name of company.	Premiums earned.	Claims in respect of year.		Commission.		Expenses of management.		Profit margin or deficit.		Un-earned premium reserve at end of year. Per cent of premiums reported.
		Amount.	Per cent of premiums earned.	Amount.	Per cent of premiums earned.	Amount.	Per cent of premiums earned.	Amount.	Per cent of premiums earned.	
Column 1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
NON-TARIFF COMPANIES.										
British General.....	£11,845	£8,845	74.68	£1,492	12.60	£2,686	22.66	-£1,178	-9.94	33.3
Cooperative.....	10,666	5,338	50.05	1,430	13.41	1,347	12.62	2,551	23.92	40.0
Essex and Suffolk...	23,464	11,042	47.03	3,221	13.73	7,112	30.33	2,089	8.91	40.8
Federated Employers'.....	17,297	27,484	158.90	2,445	14.14	3,106	17.96	-15,738	-91.00	NIL.
Fine Art and General.....	51,422	43,072	83.78	7,449	14.49	8,442	16.42	-7,551	-14.69	40.0
General Accident....	175,405	137,701	78.50	22,955	13.08	54,020	30.81	-39,271	-22.39	31.3
Glasgow Assurance...	2,076	75	3.60	415	20.00	428	20.62	1,158	55.78	50.0
Hearts of Oak Life and General.....	1,463	317	21.67	237	16.20	334	22.83	575	39.30	34.0
Imperial Accident....	7,032	3,152	44.82	1,385	19.71	1,568	22.29	927	13.18	40.0
Irish Catholic Church Property..	499	54	10.82	.....	.....	248	49.70	197	39.48	50.0
King.....	704	820	116.47	139	19.74	144	20.46	-399	-56.67	9.0
Law Car and General.....	118,345	85,362	72.13	20,860	17.63	9,778	8.26	2,345	1.98	40.0
Legal.....	7,036	2,148	30.53	1,479	21.02	3,270	46.47	139	1.98	33.3
Local Government Mutual.....	4,321	3,304	76.46	449	10.39	796	18.42	-228	-5.27	54.1
National General....	11,243	6,683	59.46	1,659	14.75	2,273	20.21	628	5.58	33.3
National of Great Britain.....	3,343	1,670	49.97	497	14.87	662	19.81	514	15.35	33.3
Northern Equitable...	13,023	4,830	37.09	2,403	18.45	6,265	48.11	-478	-3.65	34.5
Primitive Methodist.	482	104	21.62	25	5.20	128	26.62	225	46.56	50.0
Royal Scottish.....	12,699	8,759	68.97	1,379	10.86	3,258	25.66	-697	-5.49	8.5
Traders and General.	323	56	17.34	90	27.86	177	54.80	.....	.....	54.9
Total.....	472,678	350,816	74.22	70,009	14.81	106,042	22.43	-54,189	-11.46	.....
Grand total....	2,409,022	1,601,661	66.49	323,654	13.43	544,027	22.58	-60,340	-2.50	.....

The editor of the "Post Magazine and Insurance Monitor" comments upon the fact that even the tariff offices have underestimated their liabilities, the liability which they returned in 1908 of £703,657 (\$3,424,346.79) turning out already to be £842,499 (\$4,100,021.38), of which £322,044 (\$1,567,227.13) is still represented by reserve. Too much emphasis, however, should not be placed upon this, in view of the fact that it is unquestionable that British companies have improved their condition as regards reserve requirements from year to year, which indicates that, on the whole, the reserves can not have been materially too low, taking into account the privilege which is granted them of effecting compromises of annuity payments for lump sums. It seems probable, however, from this last year's experience that the tide has turned and that the stiffening of reserves has not come too soon.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES UNDER NEGLIGENCE LAW AND UNDER WORKMEN'S COMPENSATION LAWS—GREAT BRITAIN.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power." For benefits, see p. 732.]

Industry.	1897.	1898.	1900.(c)		After 1906.	
	Negligence.(a)	Compensation law of 1897 and negligence.(b)	Compensation law of 1897 and negligence.	Compensation law of 1897 and negligence, with indemnity for first two weeks.	Tariff.(d)	Nontariff.(e)
Agricultural machinery works.	0.100	.....	0.450	0.750	.....	.....
Automobile factories	.....	.....	.....	.....	.....	.....
Bakeries and biscuit factories.	.075-.125	1.125	.450	.750	.....	0.375-1.250
Beer bottling and shipping	.100	.....	.....	.....	.....	.....
Belt and saddlery factories (power)	.....	.....	.....	.....	.....	.750
Boiler construction works:	.....	.....	.....	.....	.....	.....
(a) Riveting by machinery	.....	.....	.500	.750	.....	1.25-2.00
(b) Riveting by hand	.....	.....	.500	.750	.....	1.25-2.00
Bookbinding (power)	.075	.750	.300	.450	.....	.325
Brewery and malt works.	.125	1.250-1.750	.500	.750	.....	.75-.875
Bridge construction (other than iron)	.....	.....	.....	.....	.....	.75-1.25
Brickmaking (by machinery)	.10-.125	1.50	.625	.875	.....	.50-2.50
Candy factories	.075-.125	1.125	.375	.50	.....	.....
Canning factories:	.....	.....	.....	.....	.....	.....
(a) Vegetable products	.....	1.000	.....	.....	.....	.....
(b) Animal products	.....	1.000	.....	.....	.....	.....
Carpentry:	.....	.....	.....	.....	.....	.....
(a) Cabinetmaking	.10	1.00-1.625	.45-.75	.75-1.125	.....	.75-2.50
(b) General contract	f.15	.....	.45-.75	.75-1.00	0.75-2.00	.75-2.50
Carpet factories	.05	.75	.375	.555	.....	.25-.75
Carriage factories	.10	.....	.625	.75	.....	2.50
Casting works:	.....	.....	.....	.....	.....	.....
(a) Iron	.10-.20	.....	.475-.875	.550-1.125	.625-2.500	.625-3.000
(b) Steel	.10-.20	.....	.....	.....	.....	.625-3.000
Cement plants	.100-.150	.....	.500	.750	.....	1.000
Celluloid factories	.....	.....	.....	.....	.....	.....
Chemical works	.125	1.500	.625	.875	.....	1.500
Cleaning establishments (chemical)	.125	.....	.....	.....	.....	.250
Cloth printing	.050	.500	.250	.350	.....	.500
Clothing factories	.050	.....	.....	.....	.....	.200
Coking plants	.125	.....	.....	.....	.....	1.25
Construction:	.....	.....	.....	.....	.....	.....
(a) Railroad, excluding tunneling	.....	2.50	.....	.....	.....	.....
(b) Iron bridges and boilers	.....	.....	.....	.....	.....	.....
Copper and brass works	.10-.20	.....	.50	.75	.....	.750-.875
Cotton and half wool spinning, weaving, etc.	.05	.50	.20-.30	.35-.40	.....	{.50-.1.00 .2.25
Dairy products, factories	.125	.....	.....	.....	.....	.20-.375
Drayage, riggers, and heavy movers	.....	.....	.375	.75	1.00	.....
Dyeing establishments (power)	.05	.50	.25	.40	.....	.25
Electrical:	.....	.....	.....	.....	.....	.....
(a) Machinery plants	.....	.....	.....	.....	.....	.....
(b) Installation of same	.....	.....	.....	.....	.....	.....
(c) Apparatus factories	.....	.....	.....	.....	.....	.625
(d) Installation lights, etc.	.....	.....	.....	.....	.....	.50-1.50
(e) Lighting and power establishments	.....	.....	.....	.....	.....	1.00-1.50

^a Rates supplied by a leading British company.

^b From the rate book of a leading British company.

^c From the report of the departmental committee appointed to inquire into the law relating to compensation for injuries to workmen, quoted in the Twenty-fourth Annual Report of the Commissioner of Labor.

^d Rates in use at the present time by companies which are members of the tariff association, obtained from a report of Mr. C. McCarthy, to the Wisconsin industrial insurance commission.

^e Rates at present in use by companies which do not belong to the tariff association, supplied by a leading British nontariff company.

f And over.

g Spinning.

h Weaving.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES UNDER NEGLIGENCE LAW AND UNDER WORKMEN'S COMPENSATION LAWS—GREAT BRITAIN—Continued.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power." For benefits, see p. 732.]

Industry.	1897.	1898.	1900.		After 1906.	
	Negli- gence.	Compensa- tion law of 1897 and negli- gence.	Compensa- tion law of 1897 and negli- gence.	Compensa- tion law of 1897 and negli- gence, with in- demnity for first two weeks.	Compensation laws of 1897, 1900, and 1908, including negligence and certain occupa- tion diseases.	
					Tariff.	Nontariff.
Enameled-ware factories	0.075- .100					0.625
Firearm manufacturing		1.00				
Flour mills:						
(a) Water power .....	.10	1.50	0.50	0.75		.75
(b) Steam power .....	.10	1.50	.50	.75		.75
Furnaces:						
(a) Bessemer, Thomas & Martin (steel).....	.10 - .200	1.500	.750	1.000	0.625-2.000	.625-2.500
(b) Blast .....	.100- .200	1.500	.750	1.000	.625-2.000	.625-2.500
(c) Crucible .....	.10 - .20	1.500	.750	1.000	.625-2.000	.625-2.500
(d) Puddling.....	.100- .200	1.875	.750	1.000	.625-2.000	.625-2.500
(e) Zinc		1.250				1.250
Furniture factories:						
(a) Wood .....			.750	1.125		
(b) Iron and brass.....	.100- .200		.450	.750		
Gas works (including instal- lation) .....	.100	1.250	.450	.550		.750
Glass factories:						
(a) Except tableware.....	.100	.850	.500	.625		.75 -1.00
(b) Table glass.....	.100	.850	.500	.625		.375- .500
Glove factories.....						.20
Glue and gelatin factories.....						.50
Hat factories.....			.30	.375		.25
Hemp spinning (ropes, etc.) ..	.15	1.50	.45	.75		.875
House smithing.....						
Instruments and apparatus.....		1.00				.30 - .75
Knife makers.....	.10 - .20	1.50	.45	.625		
Knit-goods factories.....	.05					1.00
Laundries (power).....	.15	1.50	1.125	1.25		.375
Leather bags, etc. (power).....						.875-1.50
Locomotive works.....						.625
Loom factories.....						.75 -2.00
Machine and repair shops (power).....						.75 -1.50
Masonry.....	.175					
Metal pressing, stamping, etc. ..	.10 - .20					
Musical instruments, manu- facturing .....	.15					.25
Nail factories.....	.10 - .20	1.25	.375	.50		.25
Nitrocellulose and collodion factories.....						
Oil factories (linseed and rape) ..	.150	1.500				.750
Ordnance factories.....						
Paint factories.....	.125	1.000				
Painters:						
(a) Exterior.....	a. 200	1.875			1.00 -2.50	1.00 -3.00
(b) Interior.....	a. 200	1.750			1.00 -2.50	1.00 -3.00
Paper factories:						
(a) Envelope.....	.075					
(b) Carton and box.....	.075		.450	.600		
(c) Pasteboard and paper		1.250	.450	.625		6.50
(d) Wall paper.....						
Paper hanging.....	.20					
Petroleum refineries.....	.15					
Piano and organ factories.....	.15		.75	1.00		.50
Plated-ware factories.....		.75	.375	.50		.20
Polishing and grinding facto- ries (iron and steel).....	.10 - .20					1.00
Powder factories (black).....						
Printers, lithographers, and art printing.....	a. 075	.75	.30	.45	.325	.325
Quarries:						
(a) Ordinary stone.....	.15 - .20	2.25	.75	1.50	2.00 -3.00	2.00 -3.50
(b) Marl and cement.....	.15 - .20	2.25	.75	1.50	2.00 -3.00	2.00
(c) Slate.....	.15 - .20	1.75	.75	1.50	2.00 -3.00	2.00 -2.50

a And over.

b Handmade only.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES UNDER NEGLIGENCE LAW AND UNDER WORKMEN'S COMPENSATION LAWS—GREAT BRITAIN—Concluded.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power." For benefits, see p. 732.]

Industry.	1897.	1898.	1900.		After 1906.	
	Negligence.	Compensation law of 1897 and negligence.	Compensation law of 1897 and negligence.	Compensation law of 1897 and negligence, with indemnity for first two weeks.	Compensation laws of 1897, 1900, and 1908, including negligence and certain occupation diseases.	
					Tariff.	Nontariff.
Rendering (oleomargarine and artificial butter).....	0.125					
Rolling mills:						
(a) Small iron and wire...	.10 - .20	1.50-1.875	0.75	1.00		0.625-2.50
(b) Coarse wire.....	.10 - .20	1.50-1.875	.75	1.00		.625-2.50
(c) Thin sheet iron.....	.10 - .20	1.50-1.875	.75	1.00		.625-2.50
(d) Coarse sheet iron.....	.10 - .20	1.50-1.875	.75	1.00		.625-2.50
(e) Tubes.....	.10 - .20	1.50-1.875	.75	1.00		.625-2.50
Rubber and gutta-percha manufacturing.....	.125					.625
Safe factories.....	.100-200					1.250
Sawmills.....	a.175	3.000	1.500	2.000		1.250-2.500
Sewing-machine factories.....						.375
Sheet-iron factories.....	.100-.200					
Shipbuilding plants.....	a.100	1.875	1.000	1.250		1.250-2.250
Shoe factories.....	.075	.75	.30	.45		.175-.200
Silk and velvet mills.....	.05	.50	.25	.375		.20-.25
Slaughterhouses.....		2.00				2.50
Soap factories.....	.125	1.00	.40	.55		.75
Stonecutting (shops and buildings).....			.375-.625	.50-.875	2.50	
Street cleaning (excluding drayage).....						
Sugar refineries.....	.15	1.50	.375	.50		.75
Tar products factories.....	.175					
Tanneries.....	.10	1.25	.50	.75		.75
Terra-cotta factories.....						
Tinsmithing.....						
Tobacco factories.....	.10	.75	.35	.50		.25-.375
Tool makers.....		1.25				.75-2.00
Tunneling, including other contract work:						
(a) Ordinary.....		3.50				
(b) By machinery.....		3.50				
Turning factories:						
(a) Iron.....	.10 - .20		.75	1.00		.625-2.500
(b) Wood.....						.40
Type foundries.....	.10 - .20	.875				1.00
Warehouse and storage.....						
Waterworks (exclusive of installation).....	.075		.375	.50		.75
Watchmakers (exclusive of cases).....			.30	.45		.30
Wax, leather, and waterproofing factories.....						.375
Weaving establishments.....	.050					.225-.250
Wire rope and cable manufacturing.....	.150		.750	1.000		
Wood carving.....						
Wood-pulp factories.....						1.25
Wool spinning, weaving, and finishing.....	.050	.500	.175	.350		.250-.375
Wrecking operations.....						

a And over.

ITALY.

In Italy compensation is given for injuries or deaths due to accident while at work, unless the same are due to willful misconduct.

Insurance is compulsory, but the employer has free choice to insure in (a) the National Accident Insurance Fund, an insurance

institution organized by cooperation of a number of savings banks and conducted under the supervision of the State, (b) an authorized stock insurance company, (c) an authorized employers' mutual association, or (d) an establishment fund. In any event the payment of the indemnities is guaranteed by the State.

The rates here given are those which are charged by the National Accident Insurance Fund. It was not found feasible to obtain, in time for this report, the rates of either stock companies or voluntary mutual companies.

The rates given in the following table are from the Twenty-fourth Annual Report of the United States Commissioner of Labor:

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY THE NATIONAL ACCIDENT INSURANCE FUND—ITALY.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 735.]

Industry.	Premium rates as charged by the National Accident Insurance Fund.	Industry.	Premium rates as charged by the National Accident Insurance Fund.
Agricultural machinery works.....	2.20	Enameled-ware factories.....	1.40
Automobile factories.....	2.50	Firearm manufacturing.....	2.00
Bakeries and biscuit factories.....	2.30	Flour mills:	
Beer bottling and shipping concerns.....		(a) Water power.....	2.60
Belt and saddlery factories (power).....	.80	(b) Steam power.....	2.60
Boiler construction works:		Furnaces:	
(a) Riveting by machinery.....	4.50	(a) Bessemer, Thomas & Martin (steel).....	3.00-5.00
(b) Riveting by hand.....	4.50	(b) Blast.....	4.50
Bookbinding (power).....	.90	(c) Crucible.....	3.00-5.00
Brewery and malt works.....	2.60	(d) Puddling.....	3.00-5.00
Bridge construction.....	3.50-4.00	(e) Zinc.....	2.00
Brickmaking (by machinery).....	2.30	Furniture factories:	
Candy factories.....	1.00	(a) Wood.....	1.80
Canning factories:		(b) Iron and brass.....	1.80
(a) Vegetable products.....	.90	Gas works (including installation).....	1.20
(b) Animal products.....		Glass factories:	
Carpentry:		(a) Except tableware.....	1.00-1.80
(a) Cabinetmaking.....	3.00-4.50	(b) Table glass.....	1.00-1.80
(b) General contract.....	4.50	Glove factories.....	.70
Carpet factories.....	2.30	Glue and gelatin factories.....	1.20
Carriage factories.....	2.30	Hat factories.....	.50
Casting works:		Hemp spinning (ropes, etc.).....	1.00
(a) Iron.....	3.00-5.00	House smithing.....	3.50-6.50
(b) Steel.....	3.00-5.00	Instruments and apparatus.....	1.20
Cement plants.....	1.00	Knife makers.....	1.60
Celluloid factories.....	1.60	Knit-goods factories.....	.50
Chemical works.....	1.40-2.50	Laundries (power).....	1.40
Cleaning establishments (chemical).....	.80	Leather bags, etc. (power).....	.70
Cloth printing.....	.50	Locomotive works.....	
Clothing factories.....	.70	Loom factories.....	1.60
Coking plants.....	1.80	Machine and repair shops (power).....	1.60-3.00
Construction:		Masonry.....	2.60-6.50
(a) Railroad, excluding tunneling.....	2.60	Metal pressing, stamping, etc.....	1.40
(b) Iron bridges and boilers.....	4.00	Mines, coal, hard or soft.....	3.50
Copper and brass works.....	1.40-1.80	Musical instruments manufacturing.....	1.40
Cotton and one-half wool:		Nail factories.....	1.40
(a) Spinning.....	.80	Nitrocellulose and collodion factories.....	9.00
(b) Weaving.....	.60	Oil factories (linseed and rape).....	1.40
Dairy products factories.....	1.20	Ordinance factories.....	3.00
Drayage, riggers, and heavy movers.....	5.50	Paint factories.....	1.60
Dyeing establishments (power).....	.80	Painters:	
Electrical:		(a) Exterior.....	4.50
(a) Machinery plants.....	2.60	(b) Interior.....	.90-2.00
(b) Installation of same.....	2.60	Paper factories:	
(c) Apparatus factories.....	1.40	(a) Envelope.....	1.00
(d) Installation lights, telephones, etc.....	2.30-7.50	(b) Carton and box.....	1.20
(e) Lighting and power establishments.....	2.60	(c) Pasteboard and paper.....	1.20-1.80
		(d) Wall paper.....	1.20

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY THE NATIONAL ACCIDENT INSURANCE FUND—ITALY—Concluded.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 735.]

Industry.	Premium rates as charged by the National Accident Insurance Fund.	Industry.	Premium rates as charged by the National Accident Insurance Fund.
Paper hanging.....	0.90-2.00	Slaughterhouses.....	5.50
Petroleum refineries.....	1.60	Soap factories.....	1.60
Pharmaceutical factories.....	1.00	Stonecutting (shops and buildings)....	3.00-4.00
Piano and organ factories.....	2.30	Street cleaning (exclusive of dray- age).....	1.00
Plated-ware factories.....	1.00	Sugar refineries.....	3.00
Polishing and grinding factories (iron and steel).....	1.80	Tar products factories.....	2.60
Powder factories (black).....	9.00	Tanneries.....	1.80
Printers, lithographers, and art printing	.60	Terra-cotta factories.....	.60
Quarries:		Tinsmithing.....	2.30
(a) Ordinary stone.....	3.50-5.00	Tobacco factories.....	.30
(b) Marl and cement.....	3.00	Tool makers.....	1.60
(c) Slate.....	3.50	Tunneling:	
Railroads:		(a) Ordinary.....	7.50
(a) Steam.....	2.60	(b) By machinery.....	7.50
(b) Electric.....	2.30	Turning factories:	
Rendering (oleomargarine and artificial butter).....	1.60	(a) Iron.....	2.30
Rolling mills:		(b) Wood.....	2.30
(a) Small iron and wire.....	3.50	Type foundries.....	1.00
(b) Coarse wire.....	3.50	Warehouse and storage.....	3.00
(c) Thin sheet iron.....	3.50	Waterworks (exclusive of installa- tion).....	.60
(d) Coarse sheet iron.....	3.50	Watchmakers (exclusive of cases).....	.60
(e) Tubes.....	3.50	Wax, leather, and waterproofing fac- tories.....	1.10
Rubber and gutta-percha manufactur- ing.....	1.80	Weaving establishments.....	.60
Safe factories.....	1.80	Wire rope and cable manufactur- ing.....	1.40
Sawmills.....	5.50	Wood carving.....	1.00
Sewing-machine factories.....	1.20	Wood-pulp factories.....	2.60
Sheet-iron factories.....		Wool spinning, weaving, and finish- ing:	
Shipbuilding plants.....	7.50	(a) Spinning.....	.80
Shoe factories.....	.80	(b) Weaving.....	.60
Silk and velvet mills:		Wrecking operations.....	6.50
(a) Spinning.....	.30		
(b) Weaving.....	.60		

NETHERLANDS.

In the Netherlands compensation is paid to workmen if injured by occupational accident and disabled for over two days, and to the dependents of workmen who are killed by occupational accident. All accidents are covered unless intentional; but if due to intoxication compensation for disability is reduced one-half, and in the event of death due to intoxication nothing is paid.

A State insurance institution, the Reijksverzekeringsbank, adjusts and pays all claims and sets up reserves in its own custody, estimated by it to be sufficient to provide for all indemnities in the form of annuities payable in future because of accidents which take place during the year. It also has the right to enforce the collection of premiums at rates fixed by it.

The employer may, however, insure in a private company or association if he prefers, provided, first, such company or association is authorized by the State; second, it has deposited a sufficient guaranty with the bank; and, third, it shall promptly deposit with the bank from time to time sums required to pay indemnities currently falling due, and also the capitalized value of annuities falling due in future by reason of accidents taking place within the year. Employers may also, upon notice to the bank and upon obtaining its consent, carry their own insurance, provided they give sufficient guarantees to the bank and also respond to all calls made upon them for the deposit of money to pay indemnities and to set up capitalized values. The employers and the private insurance companies must also, in any event, respond for a proportionate share of the expense of carrying on the business of the bank.

The rates which are given are the average rates in percentages of the pay roll which are charged by the Reijksverzekeringsbank, according to its latest revised rate schedule, for insurance covering employers against their liability under the act.

A leading Dutch stock insurance company furnishes the following information concerning rates and methods for covering the employer's liability under the act:

In response to the question, What premiums are charged by us for the undertaking of the risk of the legal insurance for liability in the trades (of which there are only 493), it is to be observed that * * * as a matter of necessity we are obliged to follow the premiums which are fixed by the Reijksverzekeringsbank.

Our rates are usually less by 10 per cent than the official premiums; but there are many industries which, according to our opinion, are given too low and indeed insufficient rates by the bank. In such cases we do not undertake to compete; we decline the business. The conclusion is obvious; a company which insures employers can only discriminate as to costs through investigating the experience of reputable enterprises in industries where the rates of the bank allow a certain latitude.

Some of the big employers who would like to carry their own risks, but are unwilling or unable to do so on account of the heavy cash security which is demanded by the bank, transfer, as a matter of form, their risks to us. In this case we forward a monthly bill, covering all damages charged us by the bank because of the accidents which have taken place in their establishments, and our profits come out of an allowance made for the administration of their business.

There are companies which have covered large groups of employers, who in this manner carry their aggregate risk. Such companies actually incur no risk.

The rates as here given are from the manual of Reijksverzekeringsbank containing the latest revised rates and classifications.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL CHARGED BY STATE INSURANCE BANK UNDER COMPENSATION LAW—NETHERLANDS.

The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 737.]

Industry.	Premium rates in the form of percentage of pay roll, as charged by state insurance bank under compensation law.	Industry..	Premium rates in the form of percentage of pay roll, as charged by state insurance bank under compensation law.
Agricultural machinery works.....	6.20	Glass factories:	
Automobile factories.....	1.70	(a) Except tableware.....	1.00-2.70
Bakeries and biscuit factories.....	1.20-2.70	(b) Table glass.....	4.80
Beer bottling and shipping concerns.....		Glove factories.....	1.10
Belt and saddlery factory (power).....	1.10	Glue and gelatin factories.....	2.90
Boiler construction works:		Hat factories.....	
(a) Riveting by machinery.....	10.10	Hemp spinning (ropes, etc.).....	1.90-2.50
(b) Riveting by hand.....	10.10	House smithing.....	3.40
Bookbinding (power).....	1.10	Instruments and apparatus.....	.90-3.40
Brewery and malt works.....	2.10-3.60	Knife makers.....	.90
Bridge construction (other than iron).....	1.10-5.60	Knit goods factories.....	1.50
Brickmaking (by machinery).....	2.00	Laundries (power).....	
Candy factories.....	1.10-2.70	Leather bags, etc. (power).....	1.10
Canning factories:		Locomotive works.....	
(a) Vegetable products.....	1.70	Loom factories.....	1.40
(b) Animal products.....	1.20-2.20	Machine and repair shops (power).....	2.10-3.40
Carpentry:		Masonry.....	3.00-6.80
(a) Cabinetmaking.....	3.20-5.90	Metal pressing, stamping, etc.....	2.60
(b) General contract.....	2.20-5.30	Mines:	
Carpet factories.....	.80	(a) Coal.....	6.20
Carriage factories.....	2.90	(b) Iron.....	3.80
Casting works:		Musical instruments, manufacturing.....	.90
(a) Iron.....	4.00	Nail factories.....	5.00
(b) Steel.....	3.40	Nitrocellulose and collodion factories.....	4.60
Cement plants.....	2.70	Oil factories (linseed and rape).....	2.00
Celluloid factories.....	3.40	Ordnance factories.....	3.40
Chemical works.....	2.20	Paint factories.....	2.20
Cleaning establishments (chemical).....	1.50	Painters:	
Cloth printing.....	1.00-1.50	(a) Exterior.....	1.30-3.20
Clothing factories.....		(b) Interior.....	1.30-3.20
Coking plants.....		Paper factories:	
Construction:		(a) Envelope.....	1.10
(a) Railroad, excluding tunneling.....	5.60	(b) Carton and box.....	3.40
(b) Iron bridges and boilers.....	12.30	(c) Pasteboard and paper.....	3.40
Copper and brass works.....	1.10	(d) Wall paper.....	
Cotton and half wool spinning, weaving, etc.....	1.20	Paper hanging.....	.60
Dairy products factories.....	.70	Petroleum refineries.....	2.20
Drayage, riggers, and heavy movers.....	5.60	Pharmaceutical factories.....	1.90
Dyeing establishments (power).....	1.50	Piano and organ factories.....	1.90
Electrical:		Plated-ware factories.....	
(a) Machinery plants.....	2.10	Polishing and grinding factories (iron and steel).....	1.90
(b) Installation of same.....	5.00	Powder factories (black).....	4.60
(c) Apparatus factories.....	1.90	Printers, lithographers, and art printing.....	.70-1.30
(d) Installation lights, telephones, etc.....	5.00	Quarries:	
(e) Lighting and power establishments.....	2.40	(a) Ordinary stone.....	3.80
Enameled-ware factories.....	2.00	(b) Marl and cement.....	3.80
Firearm manufacturing.....	1.20	(c) Slate.....	3.80
Flour mills.....	2.80	Railways:	
Furnaces:		(a) Steam.....	1.90
(a) Bessemer, Thomas & Martin.....	5.90	(b) Electric.....	1.40
(b) Blast.....	7.50	Rendering (oleomargarine and artificial butter).....	1.80
(c) Crucible.....	7.50	Rolling mills:	
(d) Puddling.....		(a) Small iron and wire.....	1.40
(e) Zinc.....		(b) Coarse wire.....	
Furniture factories:		(c) Thin sheet iron.....	
(a) Wood.....	3.60	(d) Coarse sheet iron.....	
(b) Iron and brass.....	1.90	(e) Tubes.....	
Gas works:		Rubber and gutta-percha manufacturing.....	1.90
Without installation.....	1.10	Safe factories.....	2.80
With installation.....	3.40		

[PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL CHARGED BY STATE INSURANCE BANK UNDER COMPENSATION LAW—NETHERLANDS—Concluded.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 737.]

Industry.	Premium rates in the form of percentage of pay roll, as charged by state insurance bank under compensation law.	Industry.	Premium rates in the form of percentage of pay roll, as charged by state insurance bank under compensation law.
Sawmills.....	3.60	Tunneling:	
Sewing-machine factories.....		(a) Ordinary.....	
Sheet-iron factories.....	2.10	(b) By machinery.....	
Shipbuilding plants.....	5.00	Turning factories:	
Shoe factories.....		(a) Iron.....	
Silk and velvet mills.....		(b) Wood.....	4.60
Slaughterhouses.....	1.50	Type foundries.....	.70
Soap factories.....	2.00	Warehouse and storage.....	5.00
Steamboats on canals or rivers.....	4.20	Waterworks (exclusive of installation).....	.90
Stonecutting (shops and buildings)....	2.30	Watchmakers (exclusive of cases).....	.90
Street cleaning (exclusive of drayage)..	1.10	Wax, leather, and waterproofing factories.....	1.90
Sugar refineries.....	2.60	Weaving establishments.....	1.20
Tar products factories.....		Wire rope and cable manufacturing.....	
Tanneries.....	3.20	Wood carving.....	
Terra-cotta factories.....		Wood-pulp factories.....	7.10
Tinsmithing.....	2.20-5.00	Wool spinning, weaving, and finishing.....	1.10
Tobacco factories.....	.60	Wrecking operations.....	24.40
Tool makers.....	3.40		

NORWAY.

In Norway compensation is given to practically all workmen, except seamen and agricultural laborers, who are injured in the course of their employment and whose disability lasts for longer than four weeks, and also to the widows, children, and the dependents in a direct ascending line of workmen who are killed by accident occurring in the course of their employment, unless injury or death has been intentionally self-inflicted.

All employers must insure their employees in a state central insurance institution, the management of which is vested in officers appointed by the State.

This institution, which is known as the Riksforsikringsanstalt, has authority to fix its own rates of premiums for the various industries and to enforce the collection of the same. The premiums for the next five years are determined by revising the schedule of rates according to the actual experience of the previous five years or more. The Anstalt adjusts all claims, though an appeal as regards the same is allowed to a commission appointed by the Government; the decision of this commission is final in matters of opinion, while in other matters a further appeal may be made to the courts.

This public insurance institution aims at maintaining itself entirely solvent on the basis of paying each year out of the premiums of the year the indemnities occasioned by accidents during that year, and

also setting aside out of the same reserves sufficient to enable all annuity and other deferred payments falling due thereafter by reason of such accidents to be met when due. This purpose has been practically realized, so that it has been but once necessary to make good a deficiency, this deficiency being due to inaccurate knowledge regarding the costs in the earlier years of operation; the sum required to make good the same was only about \$100,000.

The Anstalt is at present showing a moderate margin each year over and above the actual costs and is applying the larger portion of these apparent gains to strengthen its reserves, especially in the matter of the capitalized values held, it having been found that in Norway persons who are permanently disabled, exhibit after the first few months of disability, a death rate not in excess of the average mortality of the Norwegian population, which is one of the very lowest of all population experiences. Consequently, the calculations as to the required capitalized values, which were based upon a table of mortality among the disabled, deduced from Austrian experience, are not likely to prove reliable, and funds are now being set aside annually to bring the reserves for capitalized values up to the standard of the Norwegian population mortality table.

At the time the Norwegian law was adopted, it was desired to make use of existing sickness-insurance societies to take care of the first four weeks and also strongly to encourage the formation of new societies to which employees at least, and in many cases employers also, would contribute. This was not fully realized, and it afterwards proved that employers usually had to supply medical and surgical treatment from the outset.

A law has now been enacted which takes effect in 1911, setting up a system of sickness insurance which will cover the first four weeks in the event of accident as well as of sickness, and to the support of which employers, employees, the commune, and the State are all to contribute.

The table following gives the average rates charged in the year 1910 for the industries named, and side by side with these the actual cost during the five years ending December 31, 1909, also expressed in a percentage of the pay roll. This actual cost embraces the setting up of capitalized values. Revised rates will go into effect in 1912. This revision of the rates will be based upon the experience of these five years with reference to the experience in previous periods, where the more recent experience, in the judgment of the manager and actuaries, should be influenced by the previous experience as well. One thing which especially deserves comment is that, while in many of the industries the actual cost has been close to the rate, and while in some cases of wide fluctuations they are doubtless due to the small number of employees, in most cases in those industries which have been developing most rapidly along modern industrial lines the costs

during the five-year period just completed have materially increased, and this is particularly true of some classes of industries which must have been but recently introduced, such as chemical cleaning establishments. The large increase, for instance, in tinsmithing is doubtless due to the development of the construction of larger buildings, and the large increase in cost in tunneling to the building of the Bergen railroad, which has required the most extraordinary series of tunneling operations, perhaps, in the history of railroad building.

The expense of operation of the Norwegian state department is under 11 per cent of the premiums received.

The first two columns of the table show the premiums per employee for benefits of 1 crown per day while disabled by accidents, and 1,000 crowns in the event of death by accident, this being the system in use, though not very general, before the compulsory insurance law was adopted. The rates were furnished by a leading stock company.

The following table is based on the rates and costs furnished by manager and actuary of the Anstalt and rates furnished by a leading private stock company:

PREMIUM RATES PER EMPLOYEE CHARGED BY A STOCK COMPANY FOR COLLECTIVE INSURANCE UNDER NEGLIGENCE LAW, AND RATES IN THE FORM OF PERCENTAGE OF PAY ROLL CHARGED BY STATE INSURANCE INSTITUTION UNDER COMPENSATION LAW, TOGETHER WITH ACTUAL COST TO THE STATE INSTITUTION—NORWAY.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 740.]

Industry.	Premium rates per employee charged by stock company for collective insurance under negligence law.		Premium rates in the form of percentage of pay roll charged by state insurance institution (Riksforsikringsanstalt) under compensation law.	
	Earliest.	Latest.	Premium charged.	Actual cost to state institution.
	Kr.	Kr.		
Agricultural machinery works.....			1.36	1.07
Automobile factories.....				
Bakeries and biscuit factories.....	2.80-3.60	3.80-4.60	.57	.55
Beer bottling and shipping concerns.....			1.43	1.01
Belt and saddlery factories (power).....			.40	
Boiler-construction works:				
(a) Riveting by machinery.....			2.31	2.53
(b) Riveting by hand.....			2.31	2.53
Bookbinding (power).....	2.80-3.70	3.80-9.70	.57	.51
Brewery and malt works.....			1.43	1.01
Bridge construction (other than iron).....			2.16	1.49
Brickmaking (by machinery).....			1.06	1.26
Candy factories.....			.81	.28
Canning factories:				
(a) Vegetable products.....			.85	.96
(b) Animal products.....				
Carpentry:				
(a) Cabinetmaking.....			1.90	3.22
(b) General contract.....	7.70-14.00	8.70-15.00	2.18	4.15
Carpet factory.....			.63	.73
Carriage factory.....			1.54	.67
Casting works:				
(a) Iron.....	ø5.50-ø8.70	ø6.50-ø9.70	1.47	.74
(b) Steel.....			1.47	.74
(c) Other metals.....			.61	.08

a Small.

b Large.

PREMIUM RATES PER EMPLOYEE CHARGED BY A STOCK COMPANY FOR COLLECTIVE INSURANCE UNDER NEGLIGENCE LAW, AND RATES IN THE FORM OF PERCENTAGE OF PAY ROLL CHARGED BY STATE INSURANCE INSTITUTION UNDER COMPENSATION LAW, TOGETHER WITH ACTUAL COST TO THE STATE INSTITUTION—NORWAY—Continued.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 740.]

Industry.	Premium rates per employee charged by stock company for collective insurance under negligence law.		Premium rates in the form of percentage of pay roll charged by state insurance institution (<i>Riksforsikringsanstalt</i>) under compensation law.	
	Earliest.	Latest.	Premium charged.	Actual cost to state institution.
	Kr.	Kr.		
Cement plants.....			1.59	1.19
Celluloid factories.....	7.70	8.70		
Chemical works.....			1.18	1.34
Cleaning establishments (chemical).....			.73	2.84
Cloth printing.....			.64	.73
Clothing factories.....			.41	
Coking plants.....			1.50	1.29
Construction:				
(a) Railroad, excluding tunneling.....			a 2.91	a 2.42
(b) Iron bridges and boilers.....			b 3.01	b 2.77
Copper and brass works.....			2.31	2.53
Cotton and wool spinning, weaving, etc.....	2.80-3.60	3.80-4.60	1.53	1.78
Dairy products factories.....			.62	.41
Drayage, riggers, and heavy movers.....			.55	.74
Dyeing establishments (power).....	5.50	6.50	.64	.73
Electrical:				
(a) Machinery plants.....			1.22	1.05
(b) Installation of same.....			1.22	1.05
(c) Apparatus factories.....			.94	.48
(d) Installation lights, telephones, etc.....			.94	.48
(e) Lighting and power establishments.....			1.34	2.23
Enameled-ware factories.....			1.34	1.47
Firearm manufacturing.....			.71	.03
Flour mills:				
(a) Water power.....	7.70	8.70	1.18	1.03
(b) Steam power.....	7.70	8.70	1.18	1.03
Furnaces:				
(a) Bessemer, Thomas & Martin (steel).....				
(b) Blast.....			1.47	.74
(c) Crucible.....			1.47	.74
(d) Puddling.....			1.47	.74
(e) Zinc.....				
Furniture factories:				
(a) Wood.....				
(b) Iron and brass.....			.83	.26
Gas works (including installation).....			1.03	1.61
Glass factories:				
(a) Except tableware.....			.63	.27
(b) Table glass.....			.63	.27
Glove factories.....			.43	
Glue and gelatin factories.....			.91	3.93
Hat factories.....	4.50	5.50	.43	.29
Hemp spinning (ropes, etc.).....			.83	.59
House smithing.....			1.05	.62
Instruments and apparatus.....			.56	.19
Knife makers.....			.80	1.34
Knit-goods factories.....			.49	.44
Laundries (power).....			.73	2.84
Leather bags, etc. (power).....			.40	.05
Locomotive works.....			1.36	1.07
Loom factories.....			1.36	1.07
Machine and repair shops (power).....	6.50	7.50	1.36	1.07
Masonry.....	7.70-14.00	8.70-15.00	2.20	2.23
Metal pressing, stamping, etc.....			1.25	1.03
Musical instruments, manufacturing.....				
Nail factories.....			.76	.37
Nitrocellulose and collodion factories.....			2.88	4.23
Oil factories (linseed and rape).....			1.04	2.07
Ordnance factories.....				
Paint factories.....			.90	1.37
Painters:				
(a) Exterior.....			1.41	.79
(b) Interior.....			1.41	.79

^a State.

^b Private.

PREMIUM RATES PER EMPLOYEE CHARGED BY A STOCK COMPANY FOR COLLECTIVE INSURANCE UNDER NEGLIGENCE LAW, AND RATES IN THE FORM OF PERCENTAGE OF PAY ROLL CHARGED BY STATE INSURANCE INSTITUTION UNDER COMPENSATION LAW, TOGETHER WITH ACTUAL COST TO THE STATE INSTITUTION—NORWAY—Concluded.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see p. 740.]

Industry.	Premium rates per employee charged by stock company for collective insurance under negligence law.		Premium rates in the form of percentage of pay roll charged by state insurance institution (Riksforsikringsanstalt) under compensation law.	
	Earliest.	Latest.	Premium charged.	Actual cost to state institution.
	Kr.	Kr.		
Paper factories:				
(a) Envelope.....			.45	.33
(b) Carton and box.....			.57	.04
(c) Pasteboard and paper.....	8.70	9.70	1.42	1.15
(d) Wall paper.....			.70	.27
Paper hanging.....			1.41	.79
Petroleum refineries.....			1.40	.....
Pharmaceutical factories.....			.63	.50
Piano and organ factories.....	5.50	6.50	.69	.40
Plated-ware factories.....			1.34	1.47
Polishing and grinding factories (iron and steel).....			1.36	1.07
Powder factories (black).....			2.88	4.23
Printers, lithographers, and art printing.....	2.80	3.80	.40	.27
Quarries:				
(a) Ordinary stone.....			2.51	2.37
(b) Marl and cement.....			1.59	1.19
(c) Slate.....			1.98	2.40
Rendering (oleomargarine and artificial butter).....	4.50	5.50	.57	.43
Railways:				
(a) Steam.....			1.81	.83
(b) Electric.....			1.28	.79
Rolling mills:				
(a) Small iron and wire.....			.95	.01
(b) Coarse wire.....			1.92	2.95
(c) Thin sheet iron.....			.....	.....
(d) Coarse sheet iron.....			1.92	2.95
(e) Tubes.....			1.92	2.95
Rubber and gutta-percha manufacturing.....			.....	.....
Safe factories.....			.83	.26
Sawmills.....	8.70-14.00	9.70-15.00	1.99	1.64
Sewing-machine factories.....			.....	.....
Sheet-iron factories.....			.....	.....
Shipbuilding plants.....	11.00	12.00	1.64	1.61
Shoe factories.....			.58	.37
Silk and velvet mills.....			.....	.....
Slaughterhouses.....			1.20	.66
Soap factories.....			.68	.96
Stonecutting (shops and buildings).....			2.40	2.53
Street cleaning (exclusive of drayage).....			.....	.....
Sugar refineries.....			.....	.....
Tar products factories.....			.....	.....
Tanneries.....			.76	.63
Terra-cotta factories.....			.52	.15
Tinsmithing.....			1.98	3.58
Tobacco factories.....	2.80-3.60	3.80-4.60	.44	.19
Tool makers.....			.80	1.34
Tunneling:				
(a) Ordinary.....			.....	.....
(b) By machinery.....			2.62	7.90
Turning factories:				
(a) Iron.....			1.47	.74
(b) Wood.....			1.44	2.28
Type foundries.....			.43	.....
Warehouse and storage.....			1.17	1.03
Waterworks (exclusive of installation).....			.....	.....
Watchmakers (exclusive of cases).....			.....	.....
Wax, leather, and waterproofing factories.....			.73	.07
Weaving establishments.....			.63	.73
Wire rope and cable manufacturing.....			.95	.01
Wood carving.....			.....	.....
Wood-pulp factories.....			1.57	1.34
Wool spinning, weaving, and finishing.....			.63	.73
Wrecking operations.....			3.20	4.28

SWEDEN.

In Sweden the compensation payable in the event of death or injury by industrial accident, unless the accident is due to the willful act or gross negligence of the victim or the willful act of a third person who is neither in direction nor supervision of the work, is not fixed as a percentage of the wages, but at so much per head.

Insurance is voluntary and the employer may, if he chooses, carry his own risk, or he may insure in the Riksförsäkringsanstalt, a state institution which must accept all who apply and which, in addition to furnishing insurance to those who apply, must also sell annuities to employers or other insurance companies covering permanent disability or widows' pensions. The employer may also insure in a private stock company or in a mutual company or by means of an establishment fund. If he elects to carry his own risk, he may, in any individual case in which a pension accrues to one of his employees, purchase an annuity from the State and thereby free himself from further obligation.

The management expenses of the Riksförsäkringsanstalt are borne by the Government. This applies to all of its expenses of whatsoever nature, including the commission which it pays to agents, which commissions at the present time are at the rate of 6 per cent upon the premiums. Its collections and payments are made through the postal savings banks and the post-offices and all of its mail is franked.

The management of this department has from the outset been in the hands of an experienced casualty insurance man, and the rates were fixed at a figure which has enabled the Anstalt to maintain the full capitalized reserves from the beginning.

Stock companies which were already transacting an employers' liability business and a collective-insurance business when this law went into effect have not retired from business; but, making use of their more accurate knowledge of the statistics, have competed for the best risks, and notwithstanding that they have a management expense rate of more than 20 per cent have been able in some instances to make a small profit, although on a constantly diminishing volume of business, due to their steadily dropping lines which have proved unprofitable. Mutual companies have also achieved a considerable measure of success, in some cases being operated at a very low expense. There are also mutual companies or "inter-insurance" associations formed by groups of large enterprises which make no pretense of maintaining solvency on a "capitalized value" basis, but instead leave each employer directly liable as before but under contract to pool his liability with the others and bear his share. These are operating on an assessment plan, similar to that which is in use under the compulsory system of Germany, but without the element of compulsion to assure solvency.

The employer can escape liability altogether only by insuring with the Riksförsäkringsanstalt. If any other insurance company by which he is protected should fail, his personal liability for all unpaid claims against him and for all amounts falling due in future because of accidents which have already occurred would continue, notwithstanding. On this account and also to get themselves rid of a continuing liability, some of the companies have purchased annuities from the Riksförsäkringsanstalt to cover pensions because of permanent disability, widows' and children's pensions, etc., usually reserving, however, the cases where the disability is of such a character that the workman is not likely to live long.

Since in Sweden the indemnities are so much per head and are not dependent upon the wages, the rates of all the insurance institutions are given in crowns per employee. Accordingly, they are here presented in that form. In addition they are transformed into percentages of a hypothetical pay roll on the basis of 450 crowns (\$120.60) per annum for each workman, which makes the 1 crown (26.8 cents) per diem equal to two-thirds of a wage of $1\frac{1}{2}$ crowns (40.2 cents) per diem for 300 days per annum. The percentages of a hypothetical pay roll computed by this basis are also given in the table.

The rates which are here given are as follows:

Rates of the Riksförsäkringsanstalt, covering liability under the law, which means, in the event of disability, only after 60 days have elapsed.

Rates of the Riksförsäkringsanstalt covering the liability under the law, and also a per diem payment of 1 crown (26.8 cents) from the third day, to and including the sixtieth day of disability.

The average rates of a leading mutual company during seven years.

The medium rates of the same mutual company in use in 1910, according to its manual, and the actual average rates realized by it during 1910.

The last two columns are deemed of considerable importance because the medium rates for various countries have been taken from rate manuals. It is obvious that there are considerable deviations in actual practice, and that the medium rates are not by any means always the average rates realized. This is due to many circumstances, such as that of the risks offered an undue proportion have been deemed especially good or especially bad.

The insurance for which the rates of the mutual company are quoted covers only the legal liability.

It is noteworthy that the Riksförsäkringsanstalt has made fewer classifications than is usually the case in state institutions, grouping many risks of the same general character together, rather than making fine distinctions.

PREMIUM RATES PER PERSON EMPLOYED UNDER COMPENSATION ACT, AS CHARGED
COMPUTED PREMIUM RATES IN THE FORM OF PERCENTAGE OF HYPOTHETICAL
ANNUM—SWEDEN.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivi-
establishments "with power."]

Industry.	Premium rates per person employed under compensation act, as charged by—				
	State insurance institution (<i>Riksförsäkringsanstalt</i>).		Mutual company: Legal liability.		
	Legal liability.	Covering period from third day.	Seven- year average.	Book- rate average 1910.	Actual average rate 1910.
	Kr.	Kr.	Kr.	Kr.	Kr.
Agricultural machinery works.....	4.80	7.10			
Automobile factories.....	3.90-4.80	5.95-7.10			
Bakeries and biscuit factories.....	3.00	4.10	1.81	2.50	1.67
Beer bottling and shipping concerns.....					
Belt and saddlery factories (power).....	2.10	3.00			
Boiler-construction works:					
(a) Riveting by machinery.....	4.80	71.0			
(b) Riveting by hand.....					
Bookbinding (power).....	2.10	3.00		1.00-1.50	
Brewery and malt works.....	5.40	7.20	4.03	2.50-3.75	4.00
Bridge construction (other than iron).....	9.00	11.30		6.50-7.00	
Brickmaking (by machinery).....	6.00	7.80	4.24	3.75	4.17
Candy factories.....			1.81		1.67
Canning factories:					
(a) Vegetable products.....			5.42		5.17
(b) Animal products.....			5.42		5.17
Carpentry:					
(a) Cabinetmaking.....			5.28		5.14
(b) General contract.....	4.80	6.35	5.28	4.75-8.75	5.14
Carpet factories.....					
Carriage factories.....	3.90-4.80	5.95-7.10			
Casting works:					
(a) Iron.....	4.80	7.10	5.83		5.55
(b) Steel.....	3.00	5.70			5.55
Cement plants.....	4.80	6.35	5.21		5.03
Celluloid factories.....					
Chemical works.....	3.90	5.20	4.97	4.75	4.82
Cleaning establishments (chemical).....	3.00	4.10		2.50	
Cloth printing.....	1.50	2.35		1.25	
Clothing factories.....	2.10	3.00			
Coking plants.....	3.00	5.70			
Construction:					
(a) Railroad, excluding tunneling.....	9.00	11.30	5.50	5.75	5.04
(b) Iron bridges and boilers.....	9.00	11.30		6.50-7.00	
Copper and brass works.....	3.90	5.95		2.50	
Cotton and half wool:					
(a) Weaving.....	.90	1.70	2.18	1.25	2.23
(b) Spinning.....	3.00	4.10	2.18	1.25	2.23
Dairy products factories.....	2.10	3.00	3.10	2.50	3.00
Drayage, riggers, and heavy movers.....	6.00	7.80			
Dyeing establishments (power).....	3.00	4.10		2.50	
Electrical:					
(a) Machinery plants.....	3.90-6.00	5.95-7.80		3.75	
(b) Installation of same.....	3.90-6.00	5.95-7.80		3.75	
(c) Apparatus factories.....	3.90-6.00	5.95-7.80		3.75	
(d) Installation lights, telephones, etc. (e) Lighting and power establish- ments, etc.....	3.90-6.00 6.00	5.95-7.80 7.80	5.39	4.75	4.65
Enameled-ware factories.....				1.25	
Firearm manufacturing.....	3.90-4.80	5.95-7.10			
Flour mills:					
(a) Water power.....	4.80	6.35	4.68	4.75	4.55
(b) Steam power.....	4.80	6.35	4.68	4.75	4.55
Furnaces:					
(a) Bessemer, Thomas & Martin (steel) (b) Blast..... (c) Crucible..... (d) Puddling..... (e) Zinc.....	3.00 3.00 3.00 3.00	5.70 5.70 5.70 5.70	5.83 5.83 5.83 5.83	5.75 5.75 5.75 5.75	5.55 5.55 5.55 5.55

BY STATE INSURANCE INSTITUTION AND BY A MUTUAL COMPANY, TOGETHER WITH PAY ROLL, ON THE ASSUMPTION OF UNIFORM EARNINGS OF 450 KRONER PER

sions of the specified industries may vary considerably. Unless otherwise stated the rates given are for For benefits, see p. 746.]

Industry.	Computed premium rates in the form of percentage of hypothetical pay roll, on the assumption of uniform earnings of 450 kroner per annum.				
	State insurance institution (Riksförsäkringsanstalt).		Mutual company: Legal liability.		
	Legal liability.	Covering period from third day.	Seven-year average	Book-rate average 1910.	Actual average rate 1910.
	Kr.	Kr.	Kr.	Kr.	Kr.
Agricultural machinery works.....	1.07	1.58			
Automobile factories.....	0.87-1.07	1.32-1.58			
Bakeries and biscuit factories.....	.67	.91	0.40	0.56	0.37
Beer bottling and shipping concerns.....					
Belt and saddlery factories (power).....	.47	.67			
Boiler-construction works:					
(a) Riveting by machinery.....	1.07	1.58			
(b) Riveting by hand.....					
Bookbinding (power).....	.47	.67		.22-.33	.89
Brewery and malt works.....	1.20	1.60	.90	.56-.83	
Bridge construction (other than iron).....	2.00	2.51		.44-1.56	
Brickmaking (by machinery).....	1.33	1.73	.94	.83	.93
Candy factories.....			.40		.37
Canning factories:					
(a) Vegetable products.....			1.20		1.15
(b) Animal products.....			1.20		1.15
Carpentry:					
(a) Cabinetmaking.....			1.17	1.06	1.14
(b) General contract.....	1.07	1.41	1.17	1.94	1.14
Carpet factories.....					
Carriage factories.....	.87-1.07	1.32-1.58			
Casting works:					
(a) Iron.....	1.07	1.58	1.30		1.23
(b) Steel.....	.67	1.27			1.23
Cement plants.....	1.07	1.41	1.16		1.12
Celluloid factories.....					
Chemical works.....	.87	1.16	1.10	1.06	1.07
Cleaning establishments (chemical).....	.67	.91		.56	.67
Cloth printing.....	.33	.52		.28	
Clothing factories.....	.47	.67			
Coking plants.....	.67	1.27			
Construction:					
(a) Railroad, excluding tunneling....	2.00	2.51	1.22	1.28	1.12
(b) Iron bridges and boilers.....	2.00	2.51		1.44-1.56	
Copper and brass.....	.87	1.32		.56	
Cotton and half wool:					
(a) Weaving, etc.....	.20	.38	.48	.28	.52
(b) Spinning.....	.66	.91	.48	.28	
Dairy products factories.....	.47	.67	.69	.56	.67
Drayage, riggers, and heavy movers.....	1.33	1.73			
Dyeing establishments (power).....	.67	.91		.56	
Electrical:					
(a) Machinery plants.....	.87-1.33	1.32-1.73		.83	
(b) Installation of same.....	.87-1.33	1.32-1.73		.83	
(c) Apparatus factories.....	.87-1.33	1.32-1.73		.83	
(d) Installation lights, telephones, etc.	.87-1.33	1.32-1.73		1.94	
(e) Lighting and power establishments.....	1.33	1.73	1.20	1.06	1.03
Enameled-ware factories.....				.28	
Firearm manufacturing.....	.87-1.07	1.32-1.58			
Flour mills:					
(a) Water power.....	1.07	1.41	1.04	1.06	1.01
(b) Steam power.....	1.07	1.41	1.04	1.06	1.01
Furnaces:					
(a) Bessemer, Thomas & Martin (steel)	.67	1.27	1.30	1.28	1.23
(b) Blast.....	.67	1.27	1.30	1.28	1.23
(c) Crucible.....	.67	1.27	1.30	1.28	1.23
(d) Puddling.....	.67	1.27	1.30	1.28	1.23
(e) Zinc.....					

PREMIUM RATES PER PERSON EMPLOYED UNDER COMPENSATION ACT, AS CHARGED
COMPUTED PREMIUM RATES IN THE FORM OF PERCENTAGE OF HYPOTHETICAL
ANNUM—SWEDEN—Continued.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions
establishments "with power."]

Industry.	Premium rates per person employed under compensation act, as charged by—				
	State insurance institution (<i>Riksförsäkringsanstalt</i>).		Mutual company: Legal liability.		
	Legal liability.	Covering period from third day.	Seven- year average.	Book- rate average 1910.	Actual average rate 1910.
	Kr.	Kr.	Kr.	Kr.	Kr.
Furniture factories:					
(a) Wood.....					
(b) Iron and brass.....	3.90	5.95			
Gas works (including installation).....	4.80	6.35	4.12	3.75	4.00
Glass factories:					
(a) Except tableware.....	3.90	5.20	3.51	2.50	3.72
(b) Table glass.....	2.10	3.00	3.51	2.50	3.72
Glove factories.....	1.50	2.35		1.25	
Glue and gelatin factories.....				4.75	
Hat factories.....	3.00	4.10		2.50	
Hemp spinning (ropes, etc.).....				1.25	
House smithing.....	4.80	6.35			
Instruments and apparatus.....	2.10	3.65			
Knife makers.....	3.00	4.80		2.50	
Knit-goods factories.....				1.25	
Laundries (power).....	3.00	4.10	3.20	2.50	3.00
Leather bags, etc. (power).....					
Locomotive works.....	4.80	7.10			
Loom factories.....	3.90-4.80	5.95-7.10			
Machine and repair shops (power).....	3.90-4.80	5.95-7.10	4.18	4.75	3.90
Masonry.....	4.80	6.35		4.75	
Metal pressing, stamping, etc.....				2.50	
Miners.....			8.55		8.36
Musical instruments, manufacturing.....					
Nail factories.....	3.90	5.95			
Nitrocellulose and collodion factories.....			8.71	8.75	8.56
Oil factories (linseed and rape).....					
Ordnance factories.....	3.90-4.80	5.95-7.10			
Paint factories.....	4.80	6.35			
Painters:					
(a) Exterior.....	4.80	6.35	3.36	2.50	2.90
(b) Interior.....	4.80	6.35	3.36	2.50	2.90
Paper factories:					
(a) Envelope.....	2.10-3.00	3.00-4.10			
(b) Carton and box.....	2.10-3.00	3.00-4.10		2.50	
(c) Pasteboard and paper.....	6.00	7.80	4.50	4.75	4.65
(d) Wall paper.....	3.90	5.20			
Paper hanging.....	4.80	6.35			
Petroleum refineries.....				2.50	
Pharmaceutical factories.....					
Piano and organ factories.....	6.00	7.80	3.18		3.22
Plated-ware factories.....	2.10	3.65			
Polishing and grinding factories (iron and steel).....			8.71	8.75	
Powder factories (black).....			2.06	1.00-1.50	2.11
Printers, lithographers, and art printing.....	2.10	3.00			
Quarries:					
(a) Ordinary stone.....	11.40	13.95			
(b) Marl and cement.....					
(c) Slate.....	9.00-11.40	11.30-13.95			
Railways:					
(a) Steam.....	4.80	6.35	5.50	4.75	
(b) Electric.....	3.90	5.20		2.50	
Rendering (oleomargarine and artificial butter).....	3.90	5.20		2.50	
Rolling mills:					
(a) Small iron and wire.....	3.00	5.70	5.83	5.75	
(b) Coarse wire.....	3.00	5.70	5.83	5.75	
(c) Thin sheet iron.....	3.00	5.70	5.83	5.75	
(d) Coarse sheet iron.....	3.00	5.70	5.83	5.75	
(e) Tubes.....	3.00	5.70	5.83	5.75	

BY STATE INSURANCE INSTITUTION AND BY A MUTUAL COMPANY, TOGETHER WITH PAY ROLL, ON THE ASSUMPTION OF UNIFORM EARNINGS OF 450 KRONER PER

of the specified industries may vary considerably. Unless otherwise stated the rates given are for For benefits, see p. 746.]

Industry.	Computed premium rates in the form of percentage of hypothetical pay roll, on the assumption of uniform earnings of 450 kroner per annum.				
	State insurance institution (Riksforsäkringsanstalt).		Mutual company: Legal liability.		
	Legal liability.	Covering period from third day.	Seven-year average.	Book-rate average 1910.	Actual average rate 1910.
	Kr.	Kr.	Kr.	Kr.	Kr.
Furniture factories:					
(a) Wood.....					
(b) Iron and brass.....	0.87	1.32			
Gas works (Including installation).....	1.07	1.41	0.92	0.83	0.89
Glass factories:					
(a) Except tableware.....	.87	1.16	.78	.56	.83
(b) Table glass.....	.47	.67	.78	.56	.83
Glove factories.....	.33	.52		.28	
Glue and gelatin factories.....				1.06	
Hat factories.....	.67	.91		.56	
Hemp spinning (ropes, etc.).....				.28	
House smithing.....	1.07	1.41			.69
Instruments and apparatus.....	.47	.81			
Knife makers.....	.67	1.07		.56	
Knit-goods factories.....				.28	
Laundries (power).....	.67	.91	.72	.56	
Leather bags, etc. (power).....					
Locomotive works.....	1.07	1.58			
Loom factories.....	.87-1.07	1.32-1.58			
Machine and repair shops (power).....	.87-1.07	1.32-1.58	.93	1.06	.89
Masonry.....	1.07	1.41		1.06	
Metal pressing, stamping, etc.....				.56	
Miners.....			1.90		
Musical instruments, manufacturing.....					
Nail factories.....	.87	1.32			
Nitrocellulose and collodion factories.....			1.94	1.94	1.90
Oil factories (linseed and rape).....					
Ordnance factories.....	.87-1.07	1.32-1.58			
Paint factories.....	1.07	1.41			
Painters:					
(a) Exterior.....	1.07	1.41	.75	.56	.64
(b) Interior.....	1.07	1.41	.75	.56	.64
Paper factories:					
(a) Envelope.....	.47-.67	.67-.91			
(b) Carton and box.....	.47-.67	.67-.91		.56	
(c) Pasteboard and paper.....	1.33	1.73	1.00	1.06	
(d) Wall paper.....	.87	1.16			
Paper hanging.....	1.07	1.41			
Petroleum refineries.....				.56	
Pharmaceutical factories.....					
Piano and organ factories.....	1.33	1.73	.71		.72
Plated-ware factories.....	.47	.81			
Polishing and grinding factories (iron and steel).....					
Powder factories (black).....			1.94	1.94	
Printers, lithographers, and art printing.....	.47	.67	.46	.22-.33	.47
Quarries:					
(a) Ordinary stone.....	2.53	3.10			
(b) Marl and cement.....					
(c) Slate.....	2.00-2.53	2.51-3.10			
Railways:					
(a) Steam.....	1.07	1.41	1.22	1.06	
(b) Electric.....	.87	1.16		.56	
Rendering (oleomargarine and artificial butter).....	.87	1.16		.56	
Rolling mills:					
(a) Small iron and wire.....	.67	1.27	1.30	1.28	
(b) Coarse wire.....	.67	1.27	1.30	1.28	
(c) Thin sheet iron.....	.67	1.27	1.30	1.28	
(d) Coarse sheet iron.....	.67	1.27	1.30	1.28	
(e) Tubes.....	.67	1.27	1.30	1.28	

PREMIUM RATES PER PERSON EMPLOYED UNDER COMPENSATION ACT, AS CHARGED
COMPUTED PREMIUM RATES IN THE FORM OF PERCENTAGE OF HYPOTHETICAL
ANNUM—SWEDEN—Concluded.

(The rates here given are average rates for the industries or industry groups specified; rates in subdivisions establishments "with power.")

Industry.	Premium rates per person employed under compensation act, as charged by—				
	State insurance institution (<i>Riksförsäkringsanstalt</i>).		Mutual company: Legal liability.		
	Legal liability.	Covering period from third day.	Seven- year average.	Book- rate average 1910.	Actual average rate 1910.
	Kr.	Kr.	Kr.	Kr.	Kr.
Rubber and gutta-percha manufacturing.....	3.90	5.10			
Safe factories.....	3.90	5.95			
Sawmills:					
Less than 100 men.....	15.00	17.85	5.63	4.75-5.75	5.21
100 men or more.....	6.30	8.35	5.63	4.75-5.75	5.21
Sewing-machine factories.....	3.90-4.80	5.95-7.10			
Sheet-iron factories.....				2.50	
Shipbuilding plants.....	3.90-4.80	5.95-7.10		4.75	
Shoe factories.....	2.10	3.00		2.50	
Silk and velvet mills.....					
Slaughterhouses.....	9.00	11.30	5.00		4.87
Soap factories.....	3.90	5.20	2.00	2.50	2.00
Steamships on rivers and lakes.....	9.00	11.20			
Stonecutting (shops and buildings).....	11.40	13.95	6.57	6.75	6.84
Street cleaning (exclusive of drayage).....	3.90	5.20			
Sugar refineries.....	3.00	4.10		3.75	
Tar products factories.....					
Tanneries.....	4.80	6.35		3.75	
Terra-cotta factories.....	3.00	4.10		2.50	
Tinsmithing.....	4.80	6.35	4.22		4.10
Tobacco factories.....	1.50	2.35	1.59	1.25	1.39
Tool makers.....	3.90	5.95			
Tunneling:					
(a) Ordinary.....				11.50	
(b) Machinery.....				11.50	
Turning factories:					
(a) Iron.....					
(b) Wood.....	6.00	7.80			
Type foundries.....	3.90	5.95			
Warehouse and storage.....	3.90-6.00	5.20-7.80			
Waterworks (exclusive of installation).....	4.80	6.35	4.12	3.75	
Watchmakers (exclusive of cases).....	2.10	3.65	1.50		1.50
Wax, leather, and waterproofing factories.....					
Weaving establishments.....	.90	1.70	2.18	1.25	2.23
Wire rope and cable manufacturing.....	2.10	3.00			
Wood carving.....					
Wood-pulp factories.....	6.00	7.80	4.81-5.13	4.75	4.79-4.94
Wool weaving and finishing.....	.90	1.70	2.18	1.25	2.23
Wool spinning.....	3.00	4.10	2.18	1.25	2.23
Wrecking operations.....					

BY STATE INSURANCE INSTITUTION AND BY A MUTUAL COMPANY, TOGETHER WITH PAY ROLL, ON THE ASSUMPTION OF UNIFORM EARNINGS OF 450 KRONER PER

of the specified industries may vary considerably. Unless otherwise stated the rates given are for For benefits, see p. 746.]

Industry.	Computed premium rates in the form of percentage of hypothetical pay roll, on the assumption of uniform earnings of 450 kroner per annum.				
	State insurance institution (Riksförsäkringsanstalt).		Mutual company: Legal liability.		
	Legal liability.	Covering period from third day.	Seven-year average	Book-rate average 1910.	Actual average rate 1910.
	Kr.	Kr.	Kr.	Kr.	Kr.
Rubber and gutta-percha manufacturing.	0.87	1.15			
Safe factories.....	.87	1.32			
Sawmills:					
Less than 100 men.....	3.33	3.97		1.06	
100 men or more.....	1.40	1.86	1.25	1.28	1.16
Sewing-machine factories.....	.87-1.07	1.32-1.58			
Sheet-iron factories.....				.56	
Shipbuilding plants.....	.87-1.07	1.32-1.58		1.06	
Shoe factories.....	.47	.67		.56	
Silk and velvet mills.....					
Slaughterhouses.....	2.00	2.51	1.11		1.08
Soap factories.....	.87	1.16	.44	.56	.44
Steamships on rivers and lakes.....	2.00	2.49			
Stonecutting (shops and buildings).....	2.53	3.10	1.46	1.50	1.52
Street cleaning (exclusive of drayage).....	.87	1.16			
Sugar refineries.....	.67	.91		.83	
Tar products factories.....					
Tanneries.....	1.07	1.41		.83	
Terra-cotta factories.....	.67	.91		.56	
Tinsmithing.....	1.07	1.41	.94		.91
Tobacco factories.....	.33	.52	.35	.28	.31
Tool makers.....	.87	1.32			
Tunneling:					
(a) Ordinary.....				2.56	
(b) By machinery.....				2.56	
Turning factories:					
(a) Iron.....					
(b) Wood.....	1.33	1.73			
Type foundries.....	.87	1.32			
Warehouse and storage.....	.87-1.33	1.16-1.73			
Waterworks (exclusive of installation).....	1.07	1.41	.92	.83	
Watchmakers (exclusive of cases).....	.47	.81	.33		.33
Wax, leather, and waterproofing factories.....					
Weaving establishments.....	.20	.38	.48	.28	.50
Wire rope and cable manufacturing.....	.47	.67			
Wood carving.....					
Wood-pulp factories.....	1.33	1.73	1.07-1.14	1.06	1.06-1.10
Wool weaving and finishing.....	.20	.38	.48	.28	.50
Wool spinning.....	.67	.91	.48	.28	
Wrecking operations.....					

SWITZERLAND.

In Switzerland no workmen's compensation act has actually gone into effect, though one providing for compulsory insurance was enacted in 1899, but upon being submitted to a referendum it was defeated. The Swiss Parliament is under instructions, by reason of a mandate of the people, to report and pass a law providing for insurance of workmen against the results of accident; and one house has recently passed a new act, which also provides for compulsory insurance.

The laws of Switzerland relating to the liability of employers in case of negligence, however, have been so broadened as to render the financial cost to the employers nearly or perhaps quite as large as would be the case under a workmen's compensation act, such as is to be found in other countries. Under the statute the presumption of liability rests upon the employer, and he can escape therefrom partially by establishing contributory negligence and completely only by establishing that the injury or death by accident was entirely due to the negligence of the employee injured or killed.

This leaves him in fact, although perhaps not in theory, liable for all the damages arising out of the negligence of coemployees and out of the hazards of the occupation, and also leaves him liable to a very large degree for accidents arising in part from the negligence of the employee himself.

The compulsory insurance law which was enacted by the Swiss Parliament in 1899 and defeated by referendum, provided as follows:

Covering all disabilities, whether due to accident or disease, through the means of sickness insurance societies, which should be self-governing, and to which the state as well as the workmen and the employers would contribute. This insurance was to cover the first six weeks of disability caused by accident. Beyond that period the cost of indemnities, because of disability and death by accident, was to be covered by insurance in a state insurance department, to which also the state, the workmen, and the employers were to contribute.

The contributions were to be as follows:

To the sickness insurance societies, by the state, 1 centime per diem for each member; by the workmen, one-half of the remaining cost; and by the employer, one-half. Under certain circumstances the state was to pay more, and under certain circumstances the workmen might pay more; but the contribution of workmen could under no circumstances exceed 2 per cent of their wages, and should more be required the state was to make it good.

The state was to contribute a sum sufficient to meet all the expenses of the state insurance department and also certain expenses connected

with prevention and cure. It was also to pay the entire cost of insurance of persons engaged in the militia, and likewise 1 centime per diem as a subsidy toward the insurance of agricultural workmen and also of persons who were self-employed in small industries. If it made an increase, also, in the scales of pensions for invalidity or for widows, orphans, and other dependents, it was itself to make this increase as to all to whom such pensions had already been awarded. In addition to this, it was to meet itself 20 per cent of the net premiums as regards all excepting the soldiers of the Swiss army, for whom, as stated, it was to pay the entire cost.

The employer was to pay 80 per cent of the net premium only, and he was permitted to reimburse himself for one-fourth of this—that is, 20 per cent of the net premium—by deducting the same from the wages of the workmen. He could also deduct the workmen's contribution for sickness insurance and turn it over to the society.

The workman, as stated, was to contribute toward the accident insurance, if his employer required it, not more than 20 per cent of the net premium.

It was the intention that the Swiss state insurance department should meet, out of the premiums of each year, the indemnities payable during the year by reason of the accidents of that year and also set up "capitalized values" for payments falling due in future by reason of the accidents of that year.

In connection with this bill the Government caused a special investigation to be made covering the accidents from April 1, 1888, to March 31, 1891, together with a census of the population on December 1, 1888, showing the numbers engaged in the various industries for which the accident statistics were furnished. From these statistics computations were made showing what the average net premiums would be if the experience should permanently prove to accord precisely with the experience for the period mentioned.

An investigation was also made by the Government as to the actual premiums paid by employers for insurance under the then and now existing law in private stock and mutual companies in the year 1899, this insurance covering only liability for negligence as defined, however, by the exceedingly liberal and broad statutes of Switzerland.

The compensation proposed to be paid under the law of 1899, rejected by the people in 1900, was as follows:

Death: Expenses of burial and medical treatment not exceeding 40 francs (\$7.72).

Pensions to dependent relatives not exceeding in the aggregate 50 per cent of the yearly earnings.

Disability: First six weeks not less than 50 per cent of the wages as per the conditions of the sickness insurance society of which the workman was compulsorily a member.

After six weeks, during the entire incapacity, 60 per cent of the full wages in event of total disability and 60 per cent of the impairment of his earning power in event of partial disability, to be increased if wholly destitute or requiring a nurse or attendant.

The tables of rates herewith presented are as follows:

First. The average rates charged in the year 1910 by a leading stock company of Switzerland for each of the industries named covering the liability of employers under the existing Swiss negligence laws.

Second. The average rates of premium paid by the Swiss employers of each of the industries named to mutual or stock companies during the year 1899 for insurance against their liability under the Swiss negligence laws, as stated.

Third. The average net rates of premium, covering the entire liability, including payments for accidents during the first six weeks, computed by the government actuary, to be sufficient for the compulsory insurance in a state insurance institution of the compensations proposed to be given by the Swiss law of 1899, which was rejected by the people on referendum.

The government actuary estimated from calculations which he made that if the first six weeks of disability were not compensated this cost would be reduced by 13 per cent. On the other hand, however, the employer would have been liable for one-half of the cost of the sickness insurance. He would also have had the right to charge 20 per cent of the net premium for the accident insurance against the workmen, which would probably have more than offset this. Therefore, the cost to employers (the same being confined to the net premiums, as the State was to pay all expenses as well as 20 per cent of the net premium) would probably not have exceeded 80 per cent of the rates named if in actual practice they had been found to measure the liability correctly.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY A SINGLE IMPORTANT INSURANCE COMPANY IN 1910, AS CHARGED BY INSURANCE COMPANIES IN 1899 (AVERAGE), AND UNDER COMPENSATION BILL OF 1899 AS ESTIMATED BY GOVERNMENT ACTUARY—SWITZERLAND.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power."]

Industry.	Premium rates charged under negligence law.		Government estimate of cost, under bill defeated in 1900, of—	
	A single insurance company, 1910.	Average for all companies, 1899.	Industrial and non-industrial accidents.	Industrial accidents only.
Agricultural machinery works.....	4.00	3.75		
Automobile factories.....		3.50		
Bakeries and biscuit factories.....	1.60	2.75	1.33	0.96
Beer bottling and shipping concerns.....		4.75		
Belt and saddlery factories (power).....		1.65		
Boiler-construction works:				
(a) Riveting by machinery.....		7.50	5.13	4.78
(b) Riveting by hand.....		7.50	5.13	4.78
Bookbinding (power).....	1.00	1.35	1.05	.67
Brewery and malt works.....	5.00	5.25	4.25	3.92
Bridge construction (other than iron).....	7.00	8.00	5.54	5.05
Brickmaking (by machinery).....	4.20	3.75	4.25	3.75
Candy factories.....	1.60	2.25	1.33	.96
Canning factories:				
(a) Vegetable products.....	2.60	2.10		
(b) Animal products.....		3.25		
Carpentry:				
(a) Cabinetmaking.....	4.90	4.25	2.61	2.34
(b) General contract.....	4.90	7.00	5.52	4.93
Carpet factories.....		1.65		
Carriage factories.....	4.40	4.50	2.06	1.52
Casting works:				
(a) Iron.....	3.40	4.25		
(b) Steel.....	2.70			
Cement plants.....	5.00	4.25	4.25	3.75
Celluloid factories (articles).....		2.25		
Chemical works.....	3.50	4.25		
Cleaning establishments (chemical).....		2.75		
Cloth printing.....	1.10-1.20	1.75	1.53	1.28
Clothing factories.....		1.25	.23	.13
Coking plants.....				
Construction:				
(a) Railroad, excluding tunneling.....	5.30	8.00	5.54	5.05
(b) Iron bridges and boilers.....	7.00	10.00	5.54	5.05
Copper and brass works.....	4.00	4.00		
Cotton and one-half wool spinning, weaving, etc.....	1.20	1.75	1.26	1.08
Dairy products factories.....	1.30	3.25		
Drayage, riggers, and heavy movers.....		7.00		
Dyeing establishments (power).....		1.75	1.53	1.28
Electrical:				
(a) Machinery plants.....	4.50	4.00		
(b) Installation of same.....	4.50	4.00		
(c) Apparatus factories.....	2.40	1.75		
(d) Installation lights, telephones, etc.....	6.00	2.50-8.00		
(e) Lighting and power establishments.....		5.50		
Enameled-ware factories.....		2.75		
Firearm manufacturing.....		2.75	3.34	2.77
Flour mills:				
(a) Water power.....	3.40	4.00-4.50	4.79	4.26
(b) Steam power.....	3.40	3.50-4.00	4.79	4.26
Furnaces: (a)				
(a) Bessemer, Thomas & Martin (steel).....				
(b) Blast.....				
(c) Crucible.....				
(d) Puddling.....				
(e) Zinc.....		4.00		
Furniture factories:				
(a) Wood.....	4.00		1.32	.94
(b) Iron and brass.....		3.25	3.34	2.77
Gas works (including installation).....	4.20	3.50	3.23	2.76
Glass factories:				
(a) Except tableware.....		2.15		
(b) Table glass.....		3.25		
Glove factories.....		.90		
Glue and gelatine factories.....	1.40	2.75		
Hat factories.....		1.00	.23	.13
Hemp spinning (ropes, etc.).....		1.90	.60	.45

* None under a, b, c, and d in Switzerland.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY A SINGLE IMPORTANT INSURANCE COMPANY IN 1910, AS CHARGED BY INSURANCE COMPANIES IN 1899 (AVERAGE), AND UNDER COMPENSATION BILL OF 1899 AS ESTIMATED BY GOVERNMENT ACTUARY—SWITZERLAND—Continued.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power."]

Industry.	Premium rates charged under negligence law.		Government estimate of cost, under bill defeated in 1900, of—	
	A single insurance company, 1910.	Average for all companies, 1899.	Industrial and non-industrial accidents.	Industrial accidents only.
House smithing.....	4.40	4.25	5.13	4.78
Instruments and apparatus.....	2.70	2.75	1.17	.99
Knife makers.....		2.75		
Knit-goods factories.....	.90	1.10	.23	.13
Laundries (power).....		2.25		
Leather bags, etc. (power).....		1.25		
Locomotive works.....		5.50		
Loom factories.....		2.25		
Machine and repair shops (power).....	4.10	3.75	1.17	.99
Masonry.....	4.90-4.30	6.00	3.61	3.21
Metal pressing, stamping, etc.....		3.25	2.06	1.52
Musical instruments, manufacturing.....		2.25	1.17	.99
Nail factories.....		2.25		
Nitrocellulose and collodion factories.....		5.00	4.98	4.42
Oil factories (linseed and rape).....		3.75		
Ordinance factories.....		4.25		
Paint factories.....	2.50	2.75	3.23	2.76
Painters:				
(a) Exterior.....	3.00	3.50	1.19	.77
(b) Interior.....	3.00	2.25	1.19	.77
Paper factories:				
(a) Envelope.....		1.35		
(b) Carton and box.....	3.40	1.90	1.05	.67
(c) Pasteboard and paper.....	3.40	4.50		
(d) Wall paper.....		1.65	1.05	.67
Paper hanging.....		1.75		
Petroleum refineries (a).....				
Pharmaceutical factories.....	2.70	2.25		
Piano and organ factories.....	3.00	2.25	1.17	.99
Plated-ware factories.....		1.75		
Polishing and grinding factories.....		1.80-3.00		
Powder factories (black).....	(b)	(b)	4.98	4.42
Printers, lithographers, and art printing.....	1.70	1.20	1.05	.67
Quarries:				
(a) Ordinary stone.....	5.40	6.50	1.55	1.20
(b) Marl and cement.....	5.40	7.50	1.55	1.20
(c) Slate.....	5.40	9.00	1.55	1.20
Railways:				
(a) Steam.....		5.00-3.50	3.79	3.49
(b) Cable and electric.....		2.00-2.50		
Rendering (oleomargarine and artificial butter).....		3.25		
Rolling mills:				
(a) Small iron and wire.....		3.75	5.13	4.78
(b) Coarse wire.....		5.00	5.13	4.78
(c) Thin sheet iron.....		3.75	5.13	4.78
(d) Coarse sheet iron.....		5.50	5.13	4.78
(e) Tubes.....		5.50	5.13	4.78
Rubber and gutta-percha manufacturing.....		2.25		
Safe factories.....		3.25		
Sawmills.....	5.90	8.00	5.52	4.93
Sewing-machine factories.....		2.25		
Sheet-iron factories.....		2.50		
Shipbuilding plants.....		4.75		
Shoe factories.....	1.90	2.25		
Silk and velvet mills.....	1.00-1.20	.55	.36	.27
Slaughterhouses.....		4.75	2.08	1.54
Soap factories.....	2.30	3.25		
Stonemasonry (shops and buildings).....	4.10	4.50		
Street cleaning (exclusive of drayage).....		3.75		
Sugar refineries.....	3.50	3.25		
Tar products factories.....		2.75		
Tanneries.....	2.20	3.25		
Terra-cotta factories.....		2.25		
Tinsmithing.....	2.90-3.80	5.50	2.06	1.52
Tobacco factories.....	1.80	1.10	.44	.27
Tool makers.....		4.50	2.06	1.52

a None in Switzerland.

b Not accepted.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY A SINGLE IMPORTANT INSURANCE COMPANY IN 1910, AS CHARGED BY INSURANCE COMPANIES IN 1899 (AVERAGE), AND UNDER COMPENSATION BILL OF 1899 AS ESTIMATED BY GOVERNMENT ACTUARY—SWITZERLAND—Concluded.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power."]

Industry.	Premium rates charged under negligence law.		Government estimate of cost, under bill defeated in 1900, of—	
	A single insurance company, 1910.	Average for all companies, 1899.	Industrial and non-industrial accidents.	Industrial accidents only.
Tunnelling:				
(a) Ordinary	5.80	9.50	5.54	5.05
(b) By machinery	8.50	11.00	5.54	5.05
Turning factories:				
(a) Iron		3.75		
(b) Wood		4.25	1.32	.94
Type foundries.....	1.30	1.90		
Warehouse and storage.....		5.50		
Waterworks (exclusive of installation).....		2.75		
Watchmakers (exclusive of cases).....	.80	.55	.39	.12
Wax, leather, and waterproofing factories.....		1.10		
Weaving establishments.....	1.30	1.10		
Wire rope and cable manufacturing.....		3.25		
Wood carving.....	3.00			
Wood-pulp factories.....	3.80	5.50	4.98	4.42
Wool spinning, weaving, and finishing.....	1.30	1.50	2.04	1.92
Wrecking operations.....		10.00		

CANADA.

In the Dominion of Canada legislation relating to workmen's compensation for consequences of industrial accidents has been undertaken in much the same way as it is now being undertaken in the United States, viz, by the Provinces of the Dominion separately.

Wherever legislation of this type has not yet been enacted, the liability for the negligence of the employer under the common law or under statutes, or both, is of the same character in general as in various States of the United States; and while there is some variety in the rates of premiums charged in the different Provinces of the Dominion of Canada, even though there are no workmen's compensation laws, the premiums are substantially uniform, with the exception of the variations caused by the presence of such laws.

New laws have been enacted in different Provinces as follows:

British Columbia, providing indemnities in the event of accident while at work unless "attributable solely to the misconduct or serious neglect of the workman."

Quebec, granting compensation under substantially the same conditions as in British Columbia.

New Brunswick, enlarging the liability on the negligence principle so that the defense of the assumption of the risk rule is greatly restricted in its application and the defense of the fellow-servant rule also, though not in the same degree. The employers' liability insurance companies doing business in Canada treat it as, in effect, a workmen's compensation act.

Tables of rates are presented as follows:

First, the average rates charged employers in each of the industries named, covering their liability under the common law and under negligence statutes. These are reproduced from the standard manual generally in use in Canada.

Second, the average rates charged employers for each of the industries named, covering their liability under the workmen's compensation acts separately of British Columbia and Quebec and under the new employers' liability act of New Brunswick. These are also taken from a standard manual, generally in use in Canada, giving rates which are net for Quebec, and with certain discounts which were here applied for New Brunswick and British Columbia.

In the rates of premiums supplied there are a few which call for special comment, as, for instance, premiums for laundries, where a very much larger rate is charged when "without guards."

Source: Manuals in use by stock insurance companies in Canada.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES UNDER THE EMPLOYERS' LIABILITY LAWS OF CANADA AND UNDER THE WORKMEN'S COMPENSATION ACTS OF BRITISH COLUMBIA AND QUEBEC AND THE NEW EMPLOYERS' LIABILITY ACT OF NEW BRUNSWICK.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see pp. 723, 726, 741.]

Industry.	Premium rates as charged by insurance companies under—			
	Employers' liability laws of Canada.	Workmen's compensation acts of—		Employers' liability act, 1909, New Brunswick.
		British Columbia.	Quebec.	
Agricultural machinery works.....	0.42	1.17	1.80	1.08
Automobile factories.....				
Bakeries and biscuit factories.....	.17	.89	1.37	.69
Beer bottling and shipping concerns.....	.28	1.36	2.10	1.26
Belt and saddlery factories (power):				
(a) Belts.....	.21	.94	1.45	.73
(b) Saddlery.....	.28	1.04	1.60	.80
Boiler construction works:				
(a) Riveting by machinery.....	.63	1.96	3.25	1.62
(b) Riveting by hand.....	.63	1.96	3.25	1.62
Bookbinding (power).....	.23	.85	1.30	.65
Brewery and malt works.....	.28	1.36	2.10	1.26
Bridge construction (other than iron).....	4.73	7.00	17.50	7.00
Brickmaking (by machinery).....	.42	1.26	2.10	1.05
Candy factories.....	.17	.89	1.37	.69
Canning factories:				
(a) Vegetable products.....	.28	1.20	1.85	1.11
(b) Animal products.....	.28	1.20	1.85	1.11
Carpentry:				
(a) Cabinetmaking.....	1.00	1.49	2.30	1.27
(b) General contract.....	1.50	2.00	5.00	2.00
Carpet factory.....	.20	1.01	1.56	.78
Carriage factory.....	.47	1.32	2.20	1.10
Casting works:				
(a) Iron.....	.52	1.44	2.40	1.20
(b) Steel.....	.52	2.17	3.61	1.81
Cement plants.....	1.00	1.56	2.40	1.56
Celluloid factories:				
(a) Articles only.....	.35	1.13	1.75	1.05
(b) Celluloid.....	1.40	3.30	5.50	2.75
Chemical works.....	.49	1.83	3.05	1.53
Cleaning establishments (chemical).....	.21	.94	1.45	.87
Cloth printing.....	.20	1.01	1.56	.78

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES UNDER THE EMPLOYERS' LIABILITY LAWS OF CANADA AND UNDER THE WORKMEN'S COMPENSATION ACTS OF BRITISH COLUMBIA AND QUEBEC AND THE NEW EMPLOYERS' LIABILITY ACT OF NEW BRUNSWICK.—Con.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see pp. 723, 726, 741.]

Industry.	Premium rates as charged by insurance companies under—			
	Employers' liability laws of Canada.	Workmen's compensation acts of—		Employers' liability act, 1908, New Brunswick.
		British Columbia.	Quebec.	
Clothing factories.....	0.16	0.94	1.45	0.73
Coking plants.....	.32	.75	2.15	.75
Construction:				
(a) Railroad, excluding tunneling.....	1.50	3.00	7.50	3.00
(b) Iron bridges and boilers.....	4.73	7.00	17.50	7.00
Copper and brass works.....	.42	1.44	2.40	1.20
Cotton and wool spinning, weaving, etc.....	.20	1.01	1.56	.78
Dairy-products factories.....	.28	.96-1.11	1.60-1.85	.80-.93
Drayage, riggers, and heavy movers.....				
Dyeing establishments (power).....	.21	.94	1.45	.87
Electrical:				
(a) Machinery plants.....	2.10	3.40	8.50	3.40
(b) Installation of same.....	2.10	3.40	8.50	3.40
(c) Apparatus factories.....	.42	1.44	2.40	1.20
(d) Installation lights, telephones, etc.....	1.05	2.00	8.50	2.00
(e) Lighting and power establishments.....	1.05-1.79	2.25-4.05	3.75-6.75	2.25-4.05
Enameled-ware factories.....				
Firearm manufacturing.....	.37	1.07	1.78	.89
Flour mills:				
(a) Water power.....	.28	1.20	1.85	1.02
(b) Steam power.....	.28	1.20	1.85	1.02
Furnaces:				
(a) Bessemer, Thomas & Martin (steel).....				
(b) Blast.....	.49	1.36	3.90	1.36
(c) Crucible.....	.49	1.36	3.90	1.36
(d) Puddling.....	.49	1.36	3.90	1.36
(e) Zinc.....	.32	1.19	3.40	1.19
Furniture factories:				
(a) Wood.....	1.00	1.49	2.30	1.27
(b) Iron and brass.....	.42	1.44	2.40	1.20
Gas works (including installation).....	.42	1.56	2.40	1.44
Glass factories:				
(a) Except tableware.....	.15-.42	.88-1.26	1.47-2.10	.74-1.05
(b) Table glass.....	.15	.88	1.47	.74
Glove factories.....	.16	.94	1.45	.73
Glue and gelatin factories.....	.35	1.14	1.75	1.05
Hat factories.....	.20	1.02	1.56	.78
Hemp spinning (ropes, etc.).....	.70	1.78	2.75	1.65
House smithing:				
(a) Other than iron construction.....	2.10	4.00	10.00	4.00
(b) Iron construction.....	4.73	7.00	17.50	7.00
Instruments and apparatus.....	.42	1.14	1.90	.95
Knife makers.....	.42	1.44	2.40	1.20
Knit-goods factories.....	.16	.94	1.45	.73
Laundries (power):				
(a) With guards.....	.35	1.30	2.00	1.20
(b) Without guards.....	2.10	4.22	6.50	3.90
Leather bags, etc. (power).....	.28	1.04	1.60	.80
Locomotive works.....	.52-.63	1.96	3.25	1.62
Loom factories.....	.50	1.73	2.40	1.20
Machine and repair shops (power).....	.50	1.44	2.40	1.20
Masonry.....	1.50-2.10	2.00	5.00	2.00
Metal pressing, stamping, etc.....	3.50	4.50	7.50	3.75
Mines—Coal:				
(a) Anthracite.....	1.05	3.19	5.50	2.47
(b) Bituminous.....	.84	3.02	5.20	2.34
Musical Instruments, manufacturing.....	.35	1.14	1.75	1.05
Nail factories.....	.42	1.44	2.40	1.20
Nitrocellulose and collodion factories.....				
Oil factories (linseed and rape).....	.42	1.29	2.15	1.08
Ordnance factories.....	.52	1.87	3.11	1.56
Paint factories.....	.24	.96	1.77	.89
Painters:				
(a) Exterior.....	1.05	2.00	5.00	2.00
(b) Interior.....	1.05	1.14	1.75	1.05

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES UNDER THE EMPLOYERS' LIABILITY LAWS OF CANADA AND UNDER THE WORKMEN'S COMPENSATION ACTS OF BRITISH COLUMBIA AND QUEBEC AND THE NEW EMPLOYERS' LIABILITY ACT OF NEW BRUNSWICK—Con.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power." For benefits, see pp. 723, 726, 741.]

Industry.	Premium rates as charged by insurance companies under—			
	Employers' liability laws of Canada.	Workmen's compensation acts of—		Employers' liability act, 1909, New Brunswick.
		British Columbia.	Quebec.	
Paper factories:				
(a) Envelope.....	0.42	0.82	1.37	0.69
(b) Carton and box.....	.56	1.26	2.10	1.05
(c) Pasteboard and paper.....	.70	1.35	2.25	1.13
(d) Wall paper.....	.70	1.35	2.25	1.13
Paper hanging.....	1.05	2.00	5.00	2.00
Petroleum refineries.....	.42	1.44	2.40	1.20
Pharmaceutical factories.....	.17-.63	.82-2.00	1.37-3.35	.68-1.68
Piano and organ factories.....	.23-.47	.97-1.46	1.48-2.25	.81-1.24
Plated-ware factories.....	.14	.84	1.30	.78
Polishing and grinding factories (iron and steel).....				
Powder factories (black).....				
Printers, lithographers, and art printing.....	.23	.85	1.30	.65
Quarries:				
(a) Ordinary stone.....	2.10	4.06	6.25	4.06
(b) Marl and cement.....	1.57	3.09	4.75	3.08
(c) Slate.....				
Rendering (oleomargarine and artificial butter).....	.28	.96	1.60	.80
Rolling mills:				
(a) Small iron and wire.....	.52	2.17	3.61	1.81
(b) Coarse wire.....	.52	2.17	3.61	1.81
(c) Thin sheet iron.....	.52	2.17	3.61	1.81
(d) Coarse sheet iron.....	.52	2.17	3.61	1.81
(e) Tubes.....	.52	2.17	3.61	1.81
Rubber and gutta-percha manufacturing.....	.17	.82	1.37	.69
Safe factories.....	.52	1.57	2.61	1.31
Sawmills.....	1.00	2.00	5.00	1.50
Sewing-machine factories.....	.37	1.22	2.03	1.02
Sheet-iron factory.....	.42	1.44	2.40	1.20
Shipbuilding plants.....	1.58	3.00	7.50	3.00
Shoe factories.....	.14	1.00	1.55	.78
Silk and velvet mills.....	.16	.94	1.45	.73
Slaughterhouses.....	.70	1.95	3.90	1.95
Soap factories.....	.28	1.11	1.85	.93
Steam railroads:				
(a) Under 50 miles.....	2.10	6.92	10.50	6.30
(b) Over 50 miles.....	3.50	8.77	13.50	8.10
Stonemasonry (shops and buildings).....	.63	1.56-2.00	2.40-5.00	1.56-2.00
Street cleaning (exclusive of drayage).....	1.05	1.80	4.50	1.80
Street railways, horse, cable, electric.....	.56	1.59-1.75	2.45-2.70	1.47-1.62
Sugar refineries.....	.45			
Tar-products factories.....	.35	1.30	2.00	1.20
Tanneries.....	.23	1.13	1.73	.87
Terra-cotta factories.....	.42	1.26	2.10	1.05
Tinsmithing (away from shop).....	2.10	4.00	10.00	4.00
Tobacco factories.....	.14	.84	1.30	.65
Tool makers.....	.42	1.44	2.40	1.20
Tunneling:				
(a) Ordinary.....	4.73	7.00	17.50	7.00
(b) By machinery.....	4.73	7.00	17.50	7.00
Turning factories:				
(a) Iron.....	.42	1.44	2.40	1.20
(b) Wood.....	1.00	1.49	2.30	1.27
Type foundries.....	.42	1.44	2.40	1.20
Warehouse and storage.....	.70	1.24-2.60	3.30-4.00	1.65-2.00
Waterworks (exclusive of installation).....	.35	1.46	2.25	1.35
Watchmakers (exclusive of cases).....	.28	.96	1.60	.80
Wax, leather, and waterproofing factories.....	.17	.82	1.37	.69
Weaving establishments.....	.20	1.01	1.55	.78
Wire rope and cable manufacturing.....	.52	2.17	3.61	1.81
Wood carving.....				
Wood-pulp factories.....	.70	1.74	2.90	1.45
Wool spinning, weaving, and finishing.....	.20	1.01	1.55	.78
Wrecking operations.....	4.73	7.00	17.50	7.00

NEW YORK.

In the State of New York a workmen's compensation act, applying to certain industries and to certain occupations embraced by other industries, went into effect September 1, 1910. The compensation payable according to the terms of this act is as follows:

Compensation for death, to widow or next of kin wholly dependent on earnings of workman, a lump sum of twelve hundred times the daily earnings, but not more than \$3,000, less any weekly payments already received for disability due to the same accident; if no widow or next of kin wholly dependent upon earnings, a proportionate sum not exceeding the foregoing, according to the injury to such dependents; if no dependents, expenses of medical attendance and burial expenses, not exceeding \$100.

Compensation for disability, a weekly payment, after two weeks' disability, of half wages, not exceeding \$10 per week, nor in the aggregate, the "damage suffered;" payments are to continue during incapacity, but not for more than eight years.

This law does not abrogate the right of action under the common law or statutes previously in force; but if an election is made to proceed under the common law or these statutes, the right to claim under the workmen's compensation act is thereby barred.

The law of New York in relation to the liability of employers for injuries to their employees prior to the going into effect of the workmen's compensation act, was a negligence law, with some modifications of the fellow-servant and assumption of risk rules in certain industries. Apart from the compensation act described above, which is of limited application, the liability of employers in industry generally has been broadened by an act which also took effect September 1, 1910, and which provides substantially as follows:

When personal injury is caused to an employee who is himself in the exercise of due care and diligence at the time (1) by reason of defects in the ways, works, machinery, or plant, owing to the negligence of the employer or "any person in the service of the employer and intrusted by him with the duty of seeing" that the same were in proper condition; (2) by reason of the negligence of any person "intrusted with any superintendence," or any person intrusted with authority to "direct, control, or command" any employee, the employee or his next of kin is to have the same right to recover as would a stranger.

The chief contractor is also made chargeable with the liability of subcontractors.

Notice is required within one hundred and twenty days, and commencement of action within one year, in order to take advantage of this act.

The assumption of risk by the employee extends only to risks "inherent in the nature of the business which remain after the

employer has exercised due care and has complied with the laws affecting or regulating such business or occupation for the greater safety of such employee." In any case in which the defense of assumption of risk would have been available at common law, it will not be allowed under the statute unless the employee knew of the defect or dangerous condition and failed within a reasonable time to give information thereof to his employer or some person superior to himself; and not in such case if the employer or superior knew of it, or if the employer might have known of it "by reasonable and proper care, tests, or inspection." The burden of proof of showing contributory negligence is upon the employer, instead of the employee being required to prove he was not guilty of such negligence.

Option is given by mutual consent and agreement of employers and employees to bring themselves under the compensation act, in which case the employer's liability under the common law and statute is waived, unless the injury is caused by the employer's failure to comply with a valid order as to safeguarding his employees, or by his serious or willful misconduct.

In the rates here given, the two rates under "housesmithing" are, respectively, ordinary housesmithing and what is known as "iron and steel construction." The latter is also to be found under the head of "construction" in subhead "(b) iron bridges."

The increases in rates for industries which are directly affected by the workmen's compensation act are from 100 per cent to 200 per cent. This is notwithstanding the fact that the companies have fixed their commission upon the additional premium paid to cover the liability under the workmen's compensation act at only 5 per cent, which is but a small fraction of the commission regularly paid on employers' liability premiums.

At the time this report goes to press, the actuaries and other representatives of the companies are about to bring out a new manual giving the results of their further investigation of costs. It is not at this time known whether the manual will show, on the average, an increase or diminution in rates.

The rates of premium presented herewith are as follows:

First, the average rates charged prior to September 1, 1910, for the liability of employers under the common law and the statutes then existing, for each of the industries named. These rates are based upon a certain manual of employers' liability rates, in common use by the insurance companies engaged in this business, less a uniform discount of 55 per cent, which has been the discount usually given in the State of New York, by the most actively competing companies.

Second, the average rates charged since September 1, 1910 (when the new workmen's compensation act and the act modifying the liability of employers who do not come under the new workmen's

compensation act went into effect) for insurance against the employers' liability under the common law and the statutes, other than the workmen's compensation act, which continues in full force and under which claim may be made.

It will be observed that these rates are uniformly about 10 per cent higher than the rates previously charged. They are said to represent about the additional charge which the most conservative companies attempted to secure even before September 1, 1910; but their being agreed upon has doubtless been due in no small degree to the conviction that there has been a substantial, though not large, increase in this liability by reason of the new legislation. Some of the larger variations are due to changes in the manual rates.

Third, the average extra rates charged since September 1, 1910, for each of the industries named, covering the liability of the employer under the workmen's compensation act. These are according to a new rate manual in use since September 1, 1910.

It will be observed that these additional rates are in most cases small; but in some cases they are large, amounting to an increase of the cost by 100 per cent or more. The explanation of this is that the smaller extras are for industries in which there are relatively few persons employed who come within the provisions of the workmen's compensation act, and the heavier rates are when all, or substantially all, of the employees come within its provisions.

Fourth, the entire average rates of premiums charged since September 1, 1910, covering the liability of the employer under both the statutes and common law and the workmen's compensation act, being a combination of the second and third columns.

All of these are rates charged by stock companies. No rates have been obtained for mutual companies.

The rates here given are from the Employers' Liability Manual and the New Manual of rates under workmen's compensation act.

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES UNDER THE OLD LAW, UNDER THE NEGLIGENCE LAW OF 1910, AND UNDER COMPENSATION LAW OF 1910—NEW YORK.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power".]

Industry.	Premium rates charged under—		Extra rate charged for compensation law of 1910.	Total under compensation law of 1910.
	Old law.	Negligence law of 1910.		
Agricultural machinery works.....	0.65	0.72	0.18	0.90
Automobile factories.....	.59	.42	.10	.52
Bakeries and biscuit factories.....	.38	.42	.06	.48
Beer bottling and shipping concerns.....	.45	.75	.19	.94
Belt and saddlery factories (power).....	0.39- .52	0.42- .57	0.06- .08	0.48- .65
Boiler construction works:				
(a) Riveting by machinery.....	1.30	1.50	.37	1.87
(b) Riveting by hand.....	1.30	1.50	.37	1.87
Bookbinding (power).....	.27	.08	.08	.38
Brewery and malt works.....	.45	.50	.13	.63

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES UNDER THE OLD LAW, UNDER THE NEGLIGENCE LAW OF 1910, AND UNDER COMPENSATION LAW OF 1910—NEW YORK—Continued.

The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power".]

Industry.	Premium rates charged under—		Extra rate charged for compensation law of 1910.	Total under compensation law of 1910.
	Old law.	Negligence law of 1910.		
Bridge construction (other than iron).....	6.08	5.00	1.25	6.25
Brickmaking (by machinery).....	.59	1.30	.32	1.62
Candy factories.....	.38	.42	.06	.48
Canning factories:				
(a) Vegetable products.....	.65	.50	.13	.63
(b) Animal products.....	.65	.50	.13	.63
Carpentry:				
(a) Cabinetmaking.....	.52	.60-1.25	.09-1.75	.69-3.00
(b) General contract.....	2.03	2.25	2.75	5.69
Carpet factories.....	.36	.40	.10	.50
Carriage factories.....	.39-.59	.30-.42	.06-.10	.36-.52
Casting works:				
(a) Iron.....	.65	.72	.18	.93
(b) Steel.....	1.08	1.75	.45	2.20
Cement plants.....	.81	2.00	.50	2.50
Celluloid factories:				
(a) Articles.....	.65	1.00	.50	1.50
(b) Celluloid.....	1.31	1.45	.36	1.81
Chemical works.....	.81	.90-1.00	.22-.25	1.12-1.25
Cleaning establishments (chemical).....	.16	.25	.06	.31
Cloth printing.....	.36	.40	.10	.50
Clothing factories.....	.14	.15	.04	.19
Coking plants.....	.59	.65	.16	.81
Construction:				
(a) Railroad, excluding tunneling.....	2.27-4.05	2.50	3.75	6.25
(b) Iron bridges.....	6.08	7.50	5.00	12.50
Copper and brass works.....	.81	.55	.14	.69
Cotton and half wool, spinning, weaving, etc.....	.36	.40	.10	.50
Dairy products factories.....	.32	.35	.10	.45
Drayage, riggers, and heavy movers.....	.50			
Dyeing establishments (power).....	.16	.25	.06	.31
Electrical:				
(a) Machinery plants.....	1.35	1.75	1.50	3.25
(b) Installation of same.....	1.35	1.75	1.50	3.25
(c) Apparatus factories.....	.50	.55	.14	.69
(d) Installation lights, telephones, etc.....	5.36	3.00	1.25	4.25
(e) Lighting and power establishments.....	1.62-2.93	3.75	3.25	7.00
Enamelled-ware factories.....				
Firearms manufacturing.....	.32	.35	.09	.44
Flour mills:				
(a) Water power.....	.59	.65	.10	.75
(b) Steam power.....	.59	.65	.10	.75
Furnaces:				
(a) Bessemer, Thomas & Martin (steel).....	1.17	2.50	.60	3.10
(b) Blast.....	1.17	2.50	.60	3.10
(c) Crucible.....	1.17	2.50	.60	3.10
(d) Puddling.....	1.17	2.50	.60	3.10
(e) Zinc.....	.59	.65	.16	.81
Furniture factories:				
(a) Wood.....	.52	.60	.09	.69
(b) Iron and brass.....	.65	.72	.18	.90
Gas works (including installation).....	.81	.75	1.50	2.25
Glass factories:				
(a) Except tableware.....	.09-.27	.20-.30	.02-.08	.22-.38
(b) Table glass.....	.09	.20	.02	.22
Glove factories.....	.27	.30	.08	.38
Glue and gelatin factories.....	.81	.42	.10	.52
Hat factories.....	.27	.30	.08	.38
Hemp spinning (ropes, etc).....	1.24	1.37	.34	1.71
Housesmithing.....	2.70-6.08	3.00-7.50	3.25-5.00	6.25-12.50
Instruments and apparatus.....	.32	.25	.07	.32
Knife makers.....	.50	.35	.09	.44
Knit-goods factories.....	.27	.30	.08	.38
Laundries (power).....	1.04	1.50	.37	1.87
Leather bags, etc. (power).....	.38	.42	.06	.48
Locomotive works.....	.78	.90	.22	1.12
Loom factories.....	.32	.35	.09	.44
Machine and repair shops (power).....	.65-.79	.50	.13	.63
Masonry.....	1.31-2.75	3.00-5.00	3.25-2.50	6.25-7.50
Metal pressing, stamping, etc.....	2.70	6.00	.18	6.18
Mines:				
(a) Coal.....		1.20	6.00	7.20
(b) Iron.....		3.00	6.00	9.00

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES UNDER THE OLD LAW, UNDER THE NEGLIGENCE LAW OF 1910, AND UNDER COMPENSATION LAW OF 1910—NEW YORK—Concluded.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated, the rates given are for establishments "with power".]

Industry.	Premium rates charged under—		Extra rate charged for compensation law of 1910.	Total under compensation law of 1910.
	Old law.	Negligence law of 1910.		
Musical Instruments manufacturing.....	0.16	0.35-0.22	0.09-0.03	0.44-0.25
Nail factories.....	.65	.72	.18	.90
Nitrocellulose and collodion factories.....				
Oil factories (linseed and rape).....	.59	.65	.10	.75
Ordnance factories (erecting).....	.65-2.75	.72-3.00	.18-.45	.90-3.45
Paint factories.....	.32	.35	.08	.43
Painters:				
(a) Exterior.....	1.35	1.75	3.25	5.00
(b) Interior.....	1.35	1.25	2.00	3.25
(c) Shop.....	.32	.35	.09	.44
Paper factories:				
(a) Envelope.....	.27	.30	.07	.37
(b) Carton and box.....	.52	.57	.15	.72
(c) Pasteboard and paper.....	.65	1.25	.18	1.43
(d) Wall paper.....	.32-.96	.35-.72	.08-.18	.43-.90
Paper hanging.....	1.35	1.25	2.00	3.25
Petroleum refineries.....	.59	.65	.10	.75
Pharmaceutical factories.....	.38-.81	.42-.90	.10-.22	.52-1.12
Piano and organ factories.....	.20-.52	.22-.60	.03-.09	.25-.69
Plated ware factories.....	.32	.35	.09	.44
Polishing and grinding factories (iron and steel).....				
Powder factories (black).....				
Printers, lithographers and art printing.....	.27	.30	.08	.38
Quarries:				
(a) Ordinary stone.....	2.43	4.00	3.50	7.50
(b) Marl and cement.....	2.43	3.00	3.00	6.00
(c) Slate.....	2.43	4.00	3.50	7.50
Rendering (oleomargarine and artificial butter).....	.32	.35	.10	.45
Rolling mills:				
(a) Small iron and wire.....	.65	1.40	.35	1.75
(b) Coarse wire.....	.65	1.40	.35	1.75
(c) Thin sheet iron.....	.65	1.40	.35	1.75
(d) Coarse sheet iron.....	.65	1.40	.35	1.75
(e) Tubes.....	.65	1.40	.35	1.75
Rubber and gutta-percha manufacturing.....	.38	.42	.10	.52
Safe factories.....	.59	.65	.18	.90
Sawmills.....	1.46	1.62	.25	1.87
Sewing-machine factories.....	.32	.35	.09	.44
Sheet-iron factory.....	.31	.30	.22	1.12
Shipbuilding plants.....	.67-1.94	1.00-3.00	.15-.60	1.15-3.60
Shoe factories.....	.23	.22	.04	.26
Silk and velvet mills.....	.14	.15	.04	.19
Slaughterhouses.....	.97-1.31	1.25	.20	1.45
Soap factories.....	.38	.42	.10	.52
Steamships:				
(a) River and lake.....	1.25			
(b) Ocean.....	.70			
Stonecutting (shops and building).....	.81-2.75	.75-3.00	.19-3.25	.94-6.25
Street cleaning (exclusive of drayage).....	1.35			
Sugar refineries.....	.65	.50	.13	.63
Tar products factories.....	.32	.42	.10	.52
Taneries.....	.52	.57	.08	.65
Terra-cotta factories.....	.59	1.30	.32	1.62
Tinsmithing.....	2.70	3.00	3.25	6.25
Tobacco factories.....	.16	.17	.03	.20
Tool makers.....	.50	.35	.09	.44
Tunneling:				
(a) Ordinary.....	8.42	7.50	5.00	12.50
(b) By machinery.....	8.42	7.50	5.00	12.50
Turning factories:				
(a) Iron.....	.50	.50	.13	.63
(b) Wood.....	.52	.60	.09	.69
Type foundries.....	.50	1.45	.10	1.55
Warehouse and storage.....	1.24	1.25	.30	1.55
Waterworks (exclusive of installation).....	.32	.60	.15	.75
Watchmakers (exclusive of cases).....	.32	.25	.07	.32
Wax, leather, and waterproofing factories.....	.38	.42	.10	.52
Weaving establishments.....	.36	.40	.10	.50
Wire rope and cable manufacturing.....	.65	.72	.18	.90
Wood carving.....				
Wood-pulp factories.....	.97	2.00	.50	2.50
Wool spinning, weaving, and finishing.....	.36	.40	.10	.50
Wrecking operations.....	6.17	9.00	3.00	12.00

UNITED STATES.

Except as regards federal legislation relating to certain classes of artisans and laborers employed by the United States and the recent legislation in New York, taking effect on September 1, 1910, and the laws of Maryland and Montana, setting up state insurance for miners, the laws of the United States itself and of the various States are all based upon the principle of negligence and differ only in the application of the same. In several States there is scarcely any modification of the common law, while in others there are material modifications of the three rules which are usually invoked in defense of the employer, viz, contributory negligence, negligence of fellow-servants, and assumption of the risk.

The variations of the laws in these regards were set forth fully in the article upon the "Legal liability of employers for injuries to their employees in the United States," published in the Bulletin of the Bureau of Labor No. 74, issued in January, 1908, since which time, with the exception of the modifications in the States referred to and extensive modifications made in 1910 in the States of Ohio and Oregon, there have been no important amendments to these laws.

Most of the leading casualty and employers' liability insurance companies of the United States have been for some years cooperating in what is known as "The Liability Conference," which has, from time to time, by careful analysis and comparison of the statistics of the experience of these companies under employers' liability insurance policies, formulated and modified rates of premiums.

Largely as the result of these labors, a manual was put forth some years ago, which, while undoubtedly widely departed from at times (the companies having been perfectly free to compete and to exercise their judgment concerning individual risks), has been followed throughout the country more widely than any other table of rates. These rates were put out on the basis of a 100 per cent charge in certain States of the United States, embracing no less than thirteen of the States and Territories. These include some States in which legislation has been more or less progressive and in which industries are pretty well developed and several in which legislative improvement in this regard has been tardy, but where there is relatively little general industrial development.

The most interesting thing about this publication, however, is that from the lowest to the highest, taking into account the discounts given in each of the remaining eight groups of States, there is a variation of no less than 300 per cent. In other words, the rate in Pennsylvania, which is alone in the class for which the rates are lowest, is only one-fourth the rate in Arizona, Idaho, Kansas, Montana, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, Tennessee, Texas, Utah, and Washington, where the rate is the highest.

An examination of these rates indicates that in competition with industries of the same class situated in other States industries have been at a disadvantage by reason of the great differences in the rates for employers' liability insurance. These differences appear to be quite as great and therefore quite as formidable a disadvantage in competition as obtains between the rates charged in one country of Europe and in another for workmen's compensation insurance, and reveal the fact that the industries of the United States have not been free, by any means, from this disturbing factor. Even the rates here given do not fully measure the differences, for the reason that they do not take into account differences in the actual hazards of particular establishments which have frequently caused the actual rates to differ widely from the manual rates, in some cases being much higher and in other cases much lower.

The rates here given are from the "Manual of Liability Insurance," by E. W. de Leon, published by the Spectator Company, New York, containing the standard rates of the Liability Conference, with discounts.

[The premium rates used in the following States will be found on the succeeding pages, and are to be applied throughout according to the class given below, exclusive of the exceptions which apply only to the industries specified.]

Alabama.....	Class	III throughout.
Arizona.....	Class	I throughout.
Arkansas.....	Class	II (except metal, 80 per cent of Class I).
California.....	Class	VI (except contractors, Class V).
Colorado.....	Class	VI (except contractors, Class II).
Connecticut.....	Class	VI (except contractors, Class V, and textile, 20 per cent of Class I).
Delaware.....	Class	II throughout.
District of Columbia.	Class	VII (except contractors, Class V).
Florida.....	Class	VIII (except contractors, Class V).
Georgia.....	Class	III (except contractors, Class II).
Idaho.....	Class	I throughout.
Indiana.....	Class	III (except contractors, Class II).
Iowa.....	Class	II (except metal, 80 per cent of Class I).
Illinois.....	Class	II (except metal, 80 per cent of Class I).
Indiana.....	Class	III (except contractors, Class II).
Kansas.....	Class	I throughout.
Kentucky.....	Class	II (except contractors, Class I, and metal, 80 per cent of Class I).
Louisiana.....	Class	VII (except contractors, Class V).
Maine.....	Class	IV (except contractors, Class V).
Maryland.....	Class	VII (except contractors, Class V).
Massachusetts.....	Class	IV (except contractors, Class V).
Michigan.....	Class	VIII (except contractors, Class V).
Minnesota.....	Class	II (except metal, 80 per cent of Class I).
Mississippi.....	Class	VI (except contractors, Class V).

Missouri.....	Class	II (except metals, 80 per cent of Class I).
Montana.....	Class	I throughout.
Nebraska.....	Class	II (except metal, 80 per cent of Class I).
Nevada.....	Class	I throughout.
New Hampshire....	Class	IV (except contractors, Class V).
New Jersey.....	Class	VII (except contractors, Class V, and metals, Class IX, and textile, Class VI).
New Mexico.....	Class	I throughout.
New York.....	Class	V throughout.
North Carolina....	Class	III (except contractors, Class II).
North Dakota.....	Class	I throughout.
Ohio.....	Class	III (except contractors, Class V, and furnaces, Class IV, and metals, Class IV).
Oklahoma.....	Class	I throughout.
Oregon.....	Class	III (except contractors, Class I).
Pennsylvania.....	Class	IX (except contractors, Class V).
Rhode Island.....	Class	II throughout.
South Carolina....	Class	III (except contractors, Class II).
South Dakota.....	Class	I throughout.
Tennessee.....	Class	I throughout.
Texas.....	Class	I throughout.
Utah.....	Class	I throughout.
Vermont.....	Class	IV (except contractors, Class V).
Virginia.....	Class	VII (except contractors, Class V).
Washington.....	Class	I throughout.
West Virginia.....	Class	VII (except coal mines, Class IX).
Wisconsin.....	Class	II (except metal, 80 per cent of Class I).

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES IN THE UNITED STATES, ACCORDING TO MANUAL OF LIABILITY INSURANCE.

[The rates here given are average rates for the industries or industry groups specified: rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power."]

Industry.	Premium rates charged by insurance companies, according to Manual of Liability Insurance, in—								
	Class I.	Class II.	Class III.	Class IV.	Class V.	Class VI.	Class VII.	Class VIII.	Class IX.
Agricultural machinery works.....	1.45	0.97	0.87	0.73	0.65	0.58	0.51	0.44	0.36
Automobile factories.....	1.30	.87	.78	.65	.59	.52	.46	.39	.33
Bakeries and biscuit factories.....	.85	.57	.51	.43	.38	.34	.30	.26	.21
Beer bottling and shipping concerns.....	1.00	.67	.60	.50	.45	.40	.35	.30	.25
Belt and saddlery factories.....	1.15	.77	.69	.58	.52	.46	.40	.35	.29
Boiler construction works:									
(a) Riveting by machinery.....	2.88	1.92	1.73	1.44	1.30	1.15	1.01	.86	.72
(b) Riveting by hand.....	2.88	1.92	1.73	1.44	1.30	1.15	1.01	.86	.72
Bookbinding (power).....	.60	.40	.36	.30	.27	.24	.21	.18	.15
Brewery and malt works.....	1.00	.67	.60	.50	.45	.40	.35	.30	.25
Bridge construction (other than iron).....	13.50	9.00	8.10	6.75	6.08	5.40	4.73	4.05	3.38
Brickmaking (by machinery).....	1.30	.87	.78	.65	.59	.52	.46	.39	.33
Candy factories.....	.85	.57	.51	.43	.38	.34	.30	.26	.21
Canning factories:									
(a) Vegetable products.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
(b) Animal products.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
Carpentry:									
(a) Cabinetmaking.....	1.15	.77	.69	.58	.52	.46	.40	.35	.29
(b) General contract.....	4.50	3.00	2.70	2.25	2.03	1.80	1.58	1.35	1.13
Carpet factories.....	.80	.53	.48	.40	.36	.32	.28	.24	.20
Carriage factories.....	1.30	.87	.78	.65	.59	.52	.46	.39	.33

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES IN THE UNITED STATES, ACCORDING TO MANUAL OF LIABILITY INSURANCE—Continued.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power."]

Industry.	Premium rates charged by insurance companies, according to Manual of Liability Insurance, in—								
	Class I.	Class II.	Class III.	Class IV.	Class V.	Class VI.	Class VII.	Class VIII.	Class IX.
Casting works:									
(a) Iron.....	1.45	0.97	0.87	0.73	0.65	0.58	0.51	0.44	0.36
(b) Steel.....	2.40	1.60	1.44	1.20	1.08	.96	.84	.72	.60
Cement plants.....	1.80	1.20	1.08	.90	.81	.72	.63	.54	.45
Celluloid factories:									
(a) Articles.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
(b) Celluloid.....	2.90	1.93	1.74	1.45	1.31	1.16	1.02	.87	.73
Chemical works.....	1.80	1.20	1.08	.90	.81	.72	.63	.54	.45
Cleaning establishments.....	.35	.23	.21	.18	.16	.14	.12	.11	.09
Cloth printing.....	.80	.53	.48	.40	.36	.32	.28	.24	.20
Clothing factories.....	.30	.20	.18	.15	.14	.12	.11	.09	.08
Coking plants.....	1.30	.87	.78	.65	.59	.52	.46	.39	.33
Construction:									
(a) Railroad, excluding tunneling. {From.....	5.05	3.37	3.03	2.53	2.27	2.02	1.77	1.52	1.26
{To.....	9.00	6.00	5.40	4.50	4.05	3.60	3.15	2.70	2.25
(b) Iron bridges and boilers.....	13.50	9.00	8.10	6.75	6.08	5.40	4.73	4.05	3.33
Copper and brass works.....	1.80	1.20	1.08	.90	.81	.72	.63	.54	.45
Cotton and one-half wool spinning, weaving, etc.	.80	.53	.48	.40	.36	.32	.28	.24	.20
Dairy products factories.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Drayage—Biggers and heavy movers.....	1.10	.73	.66	.55	.50	.44	.39	.33	.28
Dyeing establishments (power).....	.35	.23	.21	.18	.16	.14	.12	.11	.09
Electrical:									
(a) Machinery plant.....	3.00	2.00	1.80	1.50	1.35	1.20	1.05	.90	.75
(b) Installation of same.....	3.00	2.00	1.80	1.50	1.35	1.20	1.05	.90	.75
(c) Apparatus factories.....	1.10	.73	.66	.55	.50	.44	.39	.33	.28
(d) Installation lights, telephones, etc.....	11.90	7.93	7.14	5.95	5.36	4.76	4.17	3.57	2.98
(e) Lighting and power establish- {From.....	3.60	2.40	2.16	1.80	1.62	1.44	1.26	1.08	.90
{To.....	6.50	4.33	3.90	3.25	2.93	2.60	2.23	1.95	1.63
Enameled-ware factories.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Firearm manufacturing.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Flour mills:									
(a) Water power.....	1.30	.87	.78	.65	.59	.52	.46	.39	.33
(b) Steam power.....	1.30	.87	.78	.65	.59	.52	.46	.39	.33
Furnaces:									
(a) Bessemer, Thomas & Martin (steel).....	2.60	1.73	1.56	1.30	1.17	1.04	.91	.78	.65
(b) Blast.....	2.60	1.73	1.56	1.30	1.17	1.04	.91	.78	.65
(c) Crucible.....	2.60	1.73	1.56	1.30	1.17	1.04	.91	.78	.65
(d) Puddling.....	2.60	1.73	1.56	1.30	1.17	1.04	.91	.78	.65
(e) Zinc.....	1.30	.87	.78	.65	.59	.52	.46	.39	.33
Furniture factories:									
(a) Wood.....	1.15	.77	.69	.58	.52	.46	.40	.35	.29
(b) Iron and brass.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
Gas works (including installation).....	1.80	1.20	1.08	.90	.81	.72	.63	.54	.45
Glass factories:									
(a) Except tableware..... {From.....	.20	.13	.12	.10	.09	.08	.07	.06	.05
{To.....	.60	.40	.36	.30	.27	.24	.21	.18	.15
(b) Table glass.....	.20	.13	.12	.10	.09	.08	.07	.06	.05
Glove factories.....	.60	.40	.36	.30	.27	.24	.21	.18	.15
Glue and gelatin factories.....	1.80	1.20	1.08	.90	.81	.72	.63	.54	.45
Hat factories.....	.60	.40	.36	.30	.27	.24	.21	.18	.15
Hemp spinning (ropes, etc.).....	2.75	1.83	1.65	1.38	1.24	1.10	.96	.83	.69
House spinning.....	0.00	4.00	3.60	3.00	2.70	2.40	2.10	1.80	1.50
Instruments and apparatus.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Iron frame construction.....	13.50	9.00	8.10	6.75	6.08	5.40	4.73	4.05	3.33
Knife makers.....	1.10	.73	.66	.55	.50	.44	.39	.33	.28
Knit goods factories.....	.60	.40	.36	.30	.27	.24	.21	.18	.15
Laundries (power).....	2.30	1.53	1.38	1.15	1.04	.92	.81	.69	.58
Leather bags, etc. (power).....	.85	.57	.51	.43	.38	.34	.30	.26	.21
Locomotive works.....	1.74	1.16	1.04	.87	.78	.70	.61	.52	.44
Loom factories.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Machine and repair shops (power).....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
Masonry.....	6.10	4.07	3.66	3.05	2.75	2.44	2.14	1.83	1.53
Metal pressing, stamping, etc.....	6.00	4.00	3.60	3.00	2.70	2.40	2.10	1.80	1.50
Mines, coal:									
Anthracite.....	2.90	1.93	1.74	1.45	.....	1.16	1.02	.87	.73
Bituminous.....	2.30	1.53	1.38	1.15	.....	.92	.81	.69	.58
Musical-instrument manufacturing.....	.35	.23	.21	.18	.16	.14	.12	.11	.09
Nail factories.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
Nitrocellulose and collodion factories.....	1.30	.87	.78	.65	.59	.52	.46	.39	.33
Oil factories (hseed and rape).....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
Ordnance factories..... {From.....	6.10	4.07	3.66	3.05	2.75	2.44	2.14	1.83	1.53
{To.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Paint factories.....	.70	.47	.42	.35	.32	.28	.25	.21	.18

PREMIUM RATES IN THE FORM OF PERCENTAGE OF PAY ROLL AS CHARGED BY INSURANCE COMPANIES IN THE UNITED STATES, ACCORDING TO MANUAL OF LIABILITY INSURANCE—Concluded.

[The rates here given are average rates for the industries or industry groups specified; rates in subdivisions of the specified industries may vary considerably. Unless otherwise stated the rates given are for establishments "with power."]

Industry.	Premium rates charged by insurance companies, according to Manual of Liability Insurance, in—								
	Class I.	Class II.	Class III.	Class IV.	Class V.	Class VI.	Class VII.	Class VIII.	Class IX.
Painters:									
(a) Exterior.....	3.00	2.00	1.80	1.50	1.35	1.20	1.05	0.90	0.75
(b) Interior.....	3.00	2.00	1.80	1.50	1.35	1.20	1.05	.90	.75
(c) In shop.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Paper factories:									
(a) Envelope.....	.60	.40	.36	.30	.27	.24	.21	.18	.15
(b) Carton and box.....	1.15	.77	.69	.58	.52	.46	.40	.35	.29
(c) Pasteboard and paper.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
(d) Wall paper.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Paper hanging.....	3.00	2.00	1.80	1.50	1.35	1.20	1.05	.90	.75
Petroleum refineries.....	1.30	.87	.78	.65	.59	.52	.46	.39	.33
Pharmaceutical factories.....	{From. .85	.57	.51	.43	.38	.34	.30	.26	.21
	{To. 1.80	1.20	1.08	.90	.81	.72	.63	.54	.45
Piano and organ factories.....	{From. .45	.30	.27	.23	.20	.18	.16	.14	.11
	{To. 1.15	.77	.69	.58	.52	.46	.40	.35	.29
Plated-ware factories.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Polishing and grinding (iron and steel).....									
Powder factories (black).....									
Printers, lithographers, and art printing.....	.60	.40	.36	.30	.27	.24	.21	.18	.15
Quarries:									
(a) Ordinary stone.....	5.40	3.60	3.24	2.70	2.43	2.16	1.89	1.62	1.35
(b) Marl and cement.....	5.40	3.60	3.24	2.70	2.43	2.16	1.89	1.62	1.35
(c) Slate.....	5.40	3.60	3.24	2.70	2.43	2.16	1.89	1.62	1.35
Rendering (oleomargarine and artificial butter).....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Railroads, steam.....									
Railroads, electric.....									
Rolling mills:									
(a) Small iron and wire.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
(b) Coarse wire.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
(c) Thin sheet iron.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
(d) Coarse sheet iron.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
(e) Tubes.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
Rubber and gutta-percha manufacturing.....	.85	.57	.51	.43	.38	.34	.30	.26	.21
Safe factories.....	1.10	.73	.66	.55	.50	.44	.39	.33	.28
Sawmills.....	3.25	2.17	1.95	1.63	1.46	1.30	1.14	.98	.81
Sewing-machine factories.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Sheet-iron factories.....	1.80	1.20	1.08	.90	.81	.72	.63	.54	.45
Shipbuilding plants.....	4.30	2.87	2.58	2.15	1.94	1.72	1.51	1.29	1.08
Shoe factories.....	.50	.33	.30	.25	.23	.20	.18	.15	.13
Silk and velvet mills.....	.30	.20	.18	.15	.14	.12	.11	.09	.08
Slaughterhouses.....	{From. 2.15	1.43	1.29	1.08	.97	.83	.75	.65	.54
	{To. 2.90	1.93	1.74	1.45	1.31	1.16	1.02	.87	.73
Soap factories.....	.85	.57	.51	.43	.38	.34	.30	.26	.21
Steamships on lakes and rivers.....	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Steamships on ocean.....	.70	.70	.70	.70	.70	.70	.70	.70	.70
Stonecutting (shops and buildings).....	{From. 1.80	1.20	1.08	.90	.81	.72	.63	.54	.45
	{To. 6.10	4.07	3.66	3.05	2.75	2.44	2.14	1.83	1.53
Street cleaning (exclusive of drayage).....	3.00	2.00	1.80	1.50	1.35	1.20	1.05	.90	.75
Sugar refineries.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
Tar-product factories.....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Tanneries.....	1.15	.77	.69	.58	.52	.46	.40	.35	.29
Terra-cotta factories.....	1.30	.87	.78	.65	.59	.52	.46	.39	.33
Tinsmithing.....	6.00	4.00	3.60	3.00	2.70	2.40	2.10	1.80	1.50
Tobacco factories.....	.35	.23	.21	.18	.16	.14	.12	.11	.09
Tool makers.....	1.10	.73	.66	.55	.50	.44	.39	.33	.28
Tunneling:									
(a) Ordinary.....	18.70	12.47	11.22	9.35	8.42	7.48	6.55	5.61	4.68
(b) By machinery.....	18.70	12.47	11.22	9.35	8.42	7.48	6.55	5.61	4.68
Turning factories:									
(a) Iron.....	1.10	.73	.66	.55	.50	.44	.39	.33	.28
(b) Wood.....	1.15	.77	.69	.58	.52	.46	.40	.35	.29
Typc foundries.....	1.10	.73	.66	.55	.50	.44	.39	.33	.28
Warehouse and storage.....	2.75	1.83	1.65	1.38	1.24	1.10	.96	.83	.69
Waterworks (exclusive of installation).....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Watchmakers (exclusive of cases).....	.70	.47	.42	.35	.32	.28	.25	.21	.18
Wax, leather, and waterproofing factories.....	.85	.57	.51	.43	.38	.34	.30	.26	.21
Weaving establishments.....	.80	.53	.48	.40	.36	.32	.28	.24	.20
Wire rope and cable manufacturing.....	1.45	.97	.87	.73	.65	.58	.51	.44	.36
Wood carving.....									
Wood-pulp factories.....	2.15	1.43	1.29	1.08	.97	.86	.75	.65	.54
Wool spinning, weaving, and finishing.....	.80	.53	.48	.40	.36	.32	.28	.24	.20
Wrecking operations.....	13.70	9.13	8.22	6.85	6.17	5.48	4.80	4.11	3.43

UNITED STATES AND NEW YORK.

The following tables have been supplied by an experienced casualty underwriter as his estimate of the average rates in the entire United States upon the classes of industries enumerated, of the average rates charged in New York in recent years under the employers' liability laws, and of the rates now being charged for the insurance of employers against their liability, under both the employers' liability laws as amended and the new workmen's compensation act.

That the rates which he reports as the average charged in New York in recent years are materially lower in most cases than the rates already given as the manual rates, less the discount applicable to New York according to the manual, is due to the fact that the manual rates have been largely disregarded and competition has forced the giving of lower rates upon the average. These rates, therefore, afford an opportunity to make a much more careful comparison as to what the actual increase in rate has been since the adoption of the new laws in New York.

In some cases the compensation rates furnished by this underwriter differ from those which have been deduced from the manual, as, for instance, in "Canning factories, animal products." This is due to a better knowledge on his part of the actual distinctions made by the insurance companies than was possessed by the writer, who could only follow the manual.

ESTIMATE MADE BY AN EMPLOYERS' LIABILITY INSURANCE MANAGER OF PREMIUM RATES ACTUALLY REALIZED IN THE FORM OF PERCENTAGE OF PAY ROLL.

[Unless otherwise stated, the rates given are for establishments "with power."]

Industry.	Estimate of premium rates actually charged.			
	United States.		New York.	
	Average rates.	High rates.	Recent years.	Under compensation act, 1910.
Agricultural machinery works.....	0.50	0.80	0.50	0.90
Automobile factories.....	.35	.50	.25	.52
Bakeries and biscuit factories.....	.25	.40	.25	.48
Beer bottling and shipping concerns.....	.60	.80	.45	2.25
Belt and saddlery factories.....	.30	.40	.20	.48
Boiler construction works:				
(a) Riveting by machinery.....	1.00	1.40	1.00	1.87
(b) Riveting by hand.....	1.00	1.40	1.00	1.87
(c) Installation of.....	2.00	3.00	1.50	2.10
Bookbinding (power).....	.20	.30	.20	.38
Brewery and malt works.....	.40	.60	.25	.63
Bridge construction (other than iron).....	5.00	5.00	4.00	6.25
Brick making (by machinery).....	.60	1.25	.60	1.62
Candy factories.....	.25	.40	.25	.48
Canning factories:				
(a) Vegetable products.....	.40	.60	.40	.63
(b) Animal products.....	.60	1.00	.60	1.03
Carpentry:				
(a) Cabinetmaking.....	.40	.60	.40	.69
(b) General contract.....	2.00	2.50	1.75	5.00
Carpet factories.....	.20	.30	.20	.50
Carriage factories.....	.35	.50	.25	.52

ESTIMATE MADE BY AN EMPLOYERS' LIABILITY INSURANCE MANAGER OF PREMIUM RATES ACTUALLY REALIZED IN THE FORM OF PERCENTAGE OF PAY ROLL—Continued.

[Unless otherwise stated, the rates given are for establishments "with power."]

Industry.	Estimate of premium rates actually charged.			
	United States.		New York.	
	Average rates.	High rates.	Recent years.	Under compensation act, 1910.
Casting works:				
(a) Iron.....	0.50	0.80	0.50	0.90
(b) Steel.....	1.00	1.40	1.00	2.20
(c) Metal.....	.50	.80	.50	.90
Cement plants.....	1.00	2.00	1.25	2.50
Celluloid factories:				
Articles.....	1.00	1.45	1.00	1.50
Celluloid.....	1.25	2.00	1.25	1.81
Chemical works.....	.60	.90	.60	1.12
Cleaning establishments (chemical).....	.20	.30	.20	.31
Cloth printing.....	.20	.30	.20	.50
Clothing factories.....	.12	.20	.10	.26
Coking plants.....	.50	.75	.40	.81
Construction:				
(a) Railroad, excluding tunneling.....	2.00	2.50	1.50	6.25
(b) Iron bridges.....	6.00	9.00	4.50	12.50
Copper and brass works.....	.35	.50	.35	.69
Cotton and wool spinning, weaving, etc.....	.20	.30	.20	.50
Dairy products factories.....	.35	.50	.25	.45
Drayage, riggers, and heavy movers.....	2.50	3.50	2.50	4.50
Dyeing establishments (power).....	.20	.30	.20	.50
Electrical:				
(a) Machinery plants.....	.35	.50	.35	.69
(b) Installation of same.....	.35	.50	.35	.69
(c) Apparatus factories.....				
(d) Installation lights, phones, etc.....				
(e) Lighting and power establishments.....	2.50	3.60	2.50	7.00
Enameled-ware factories.....	.40	.60	.40	.69
Firearms manufacturing.....	.35	.50	.25	.44
Flour mills:				
(a) Water power.....	.50	.80	.40	.75
(b) Steam power.....	.50	.80	.40	.75
Furnaces:				
(a) Bessemer, Thomas & Martin (steel).....	1.25	1.75	1.25	3.10
(b) Blast.....	1.25	1.75	1.25	3.10
(c) Crucible.....	.50	.80	.50	.90
(d) Puddling.....	1.25	1.75	1.25	3.10
(e) Zinc.....	.50	.80	.50	.81
Furniture factories:				
(a) Wood.....				
(b) Iron and brass.....	.35	.50	.35	.69
Gas works (including installation).....	.60	.90	.45	2.25
Glass factories:				
(a) Except tableware.....	.15	.25	.15	.22
(b) Table glass.....	.15	.25	.15	.22
Glove factories.....	.12	.20	.12	.38
Glue and gelatin factories.....	.40	.50	.40	.52
Hat factories.....	.12	.20	.10	.19
Hemp spinning (ropes, etc.).....	1.00	1.50	1.00	1.71
House smithing.....	3.00	4.00	2.00	6.25
Instruments and apparatus.....				
Knife makers.....	.35	.50	.25	.44
Knit-goods factories.....	.20	.30	.20	.38
Laundries (power).....	.60	.75	.50	1.87
Leather bags, etc. (power).....	.30	.40	.20	.48
Locomotive works.....	.60	.90	.60	1.12
Loom factories.....	.35	.50	.25	.44
Machine and repair shops (power).....	.40	.60	.40	.63
Masonry.....	3.00	4.00	2.00	6.25
Metal pressing, stamping, etc.....	4.00	6.00	3.00	6.18
Musical instruments manufacturing.....	.20	.25	.20	.25
Nail factories.....	.50	.80	.50	.90
Nitrocellulose and collodion factories.....	1.25	2.00	1.25	1.81
Oil factories (linseed and rape).....	.40	.50	.40	.75
Ordinance factories.....	.50	.80	.50	.90
Paint factories.....	.35	.50	.25	.43
Painters:				
(a) Exterior.....	2.00	2.50	1.75	5.00
(b) Interior.....	1.25	1.50	1.00	3.25

ESTIMATE MADE BY AN EMPLOYERS' LIABILITY INSURANCE MANAGER OF PREMIUM RATES ACTUALLY REALIZED IN THE FORM OF PERCENTAGE OF PAY ROLL—Concluded.

[Unless otherwise stated, the rates given are for establishments "with power."]

Industry.	Estimate of premium rates actually charged.			
	United States.		New York.	
	Average rates.	High rates.	Recent years.	Under compensation act, 1910.
Paper factories:				
(a) Envelope.....	0.20	0.30	0.20	0.37
(b) Carton and box.....	.40	.80	.40	.72
(c) Pasteboard and paper.....	.80	1.00	.80	1.43
(d) Wall paper.....	.25	.50	.25	.43
Paper hanging.....	1.25	1.50	1.25	3.25
Petroleum refineries.....	.50	.80	.50	.75
Pharmaceutical factories.....	.35	.50	.25	.52
Piano and organ factories.....	.20	.25	.20	.25
Plated-ware factories.....	.25	.40	.25	.44
Polishing and grinding factories (iron and steel).....	.50	.80	.50	.90
Powder factories (black).....	4.50	6.00	4.50	8.60
Printers, lithographers, and art printing.....	.20	.30	.20	.38
Quarries:				
(a) Ordinary stone.....	2.00	2.50	2.00	7.50
(b) Cement.....	2.00	2.50	2.00	6.00
(c) Slate.....	2.00	2.50	2.00	6.00
Rendering (oleomargarine and artificial butter).....	.35	.50	.35	.45
Railways:				
Steam.....	3.00	4.50	2.50	10.00
Cable or electric.....	1.50	2.00	1.50	4.75
Rolling mills:				
(a) Small iron and wire.....	.50	.80	.50	.90
(b) Coarse wire.....	.50	.80	.50	.90
(c) Thin sheet iron.....	.50	.80	.50	.90
(d) Coarse sheet iron.....	1.00	1.40	1.00	1.75
(e) Tubes.....	.50	.80	.50	.90
Rubber and gutta-percha manufacturing.....	.50	.80	.40	.52
Safe factories.....	.50	.80	.50	.90
Sawmills.....	1.25	1.50	1.25	1.87
Sewing-machine factories.....	.35	.50	.25	.44
Sheet iron factories.....	.60	.90	.60	1.12
Shipbuilding plants.....	2.00	3.00	2.00	3.60
Shoe factories.....	.12	.20	.10	.31
Silk and velvet mills.....	.12	.20	.12	.19
Slaughterhouses.....	.80	1.25	.80	1.45
Soap factories.....	.40	.50	.40	.52
Steamships—Lakes and rivers.....	1.25	1.25	1.25	1.43
Ocean.....	.70	.70	.70	.80
Stone cutting (shops and buildings).....	.50	.80	.50	.94
Street cleaning (exclusive of drayage).....	1.25	1.50	1.25	1.75
Sugar refineries.....	.40	.60	.40	.63
Tar-products factories.....	.50	.80	.50	.75
Tanneries.....	.35	.50	.25	.65
Terra-cotta factories.....	.60	1.25	.60	1.62
Tinsmithing.....	3.00	4.00	2.00	6.25
Tobacco factories.....	.10	.20	.10	.20
Tool makers.....	.35	.50	.25	.44
Tunneling:				
(a) Ordinary.....	6.00	9.00	4.50	12.50
(b) By machinery.....	6.00	9.00	4.50	12.50
Turning factories:				
(a) Iron.....	.35	.50	.35	.63
(b) Wood.....	.40	.80	.40	.69
Type foundries.....	.35	.50	.25	.55
Warehouse and storage.....	1.00	1.50	.75	1.55
Waterworks (exclusive of installation).....	.30	.50	.30	.75
Watchmakers (exclusive of cases).....	.20	.30	.20	.32
Wax, leather, and waterproofing, not including weaving factories.....	.30	.40	.30	.45
Weaving establishments for curtains and like fabrics.....	.20	.30	.20	.38
Wire rope and cable manufacturing.....	.50	.80	.50	.90
Wood carving.....	1.25	1.50	1.25	1.87
Wood-pulp factories.....	.80	1.00	.80	2.50
Wool spinning, weaving, and finishing.....	.20	.30	.20	.50
Wrecking operations.....	6.00	9.00	5.00	12.00

DECISIONS OF COURTS AFFECTING LABOR.

[Except in cases of special interest, the decisions here presented are restricted to those rendered by the federal courts and the higher courts of the States and Territories. Only material portions of such decisions are reproduced, introductory and explanatory matter being given in the words of the editor.]

DECISIONS UNDER STATUTE LAW.

EMPLOYER AND EMPLOYEE—INTERFERENCE WITH RELATION—ENTICEMENT—CONSTRUCTION OF STATUTE—*Abingdon Mills Company v. Grogan, Supreme Court of Alabama, 52 Southern Reporter, page 596.*—A. R. Grogan had been arrested for enticing employees from the Abingdon Mills, and he sued the company for malicious prosecution. Judgment was in his favor in the law and equity court of Madison County, but it was reversed on appeal. The immediate case is not one of interest as a labor question, but in the course of his remarks Judge Anderson, who delivered the opinion of the court, construed briefly the sections of the law of Alabama on which the original arrest was made. These are sections 6849 and 6850 of the Code of 1907, the first of which provides a fine for enticing or persuading any apprentice or servant to leave the service or employment of his master; while section 6850 relates to laborers, servants, etc., under contract in writing. In discussing the meaning of these two sections Judge Anderson said:

We can not agree with the contention of appellee's counsel that section 6849 has no application to employees of a cotton mill, but applies to menial servants only. The word "servant" is broad enough to cover laborers at a cotton mill, and we think, as used in said section, is synonymous with "laborer." It is true that section 6850 uses the words servant and laborer as well as others not mentioned in the preceding section, but we do not think that said last section prevents section 6849 from applying to "laborer" as included in the word "servant." The rule of construction is that, when statutes are in *pari materia*, they must be so construed as to give each a field of operation when it is possible to do so without doing violence to the language of either. The result is that section 6849 applies to apprentices and servants and which last word includes laborers, whether under written contract or not, and fixes a fine of not less than \$20 nor more than \$100, and may be imprisoned for three months, but no part of the fine goes to the injured party. On the other hand, section 6850 relates to persons not included in section 6849 as well as servants therein included, provided they were under a written contract, fixes a different fine, and provides for indemnity

to the injured party. The result is, when a servant is enticed away from his master, whether under a written contract or not, he can be convicted under section 6849 and punished accordingly, but in order for him to be convicted and punished under section 6850, it must be averred and proven that the servant or laborer was under a written contract of employment.

EMPLOYERS' LIABILITY—ACTIONS FOR INJURIES CAUSING DEATH—RIGHTS OF ALIEN BENEFICIARIES—*Cetofonte v. Camden Coke Company, Court of Errors and Appeals of New Jersey, 75 Atlantic Reporter, page 913.*—This case involved the right of a nonresident alien widow to recover damages for the death of her husband caused by accident occurring in the State of New Jersey. Judgment had been in favor of the plaintiff in the court below, and this judgment was affirmed by the court of errors and appeals in February, 1910, the injury having been inflicted in May, 1906. Various questions as to the duty of the employer and the assumption of risks were first disposed of, after which Judge Trenchard, who delivered the opinion of the court, took up the contention of the company that the law giving a right of action in cases of fatal injuries did not apply to nonresident aliens. On this point Judge Trenchard said:

There is much conflict in the cases arising in other jurisdictions under somewhat similar statutes, both in this country and England, upon this question. The great weight of authority, however, supports the proposition that nonresident aliens are not excluded from among the beneficiaries. The leading case is *Mulhall v. Fallon*, 176 Mass. 266, 57 N. E. 386. That is followed by *Kellyville Coal Co. v. Petraytis*, 195 Ill. 215, 63 N. E. 94; *Szymanski v. Blumenthal*, 3 Pennell (Del.) 558, 52 Atl. 347; *Renlund v. Commodore Min. Co.*, 89 Minn. 41, 93 N. W. 1057; *Bonthron v. Phoenix Light & Fuel Co.*, 8 Ariz. 129, 71 Pac. 941; *Romano v. Capital City Brick Co.*, 125 Iowa 591, 101, N. W. 437; *Cleveland, C. & St. L. R. Co. v. Osgood*, 36 Ind. App. 34, 73 N. E. 285; *Pocahontas Collieries Co. v. Rukas' Adm'r*, 104 Va. 278, 51 S. E. 449; *Alfson v. Bush Co.*, 182 N. Y. 393, 75 N. E. 230; *Pittsburg C. & St. L. R. Co. v. Naylor*, 73 Ohio St. 115, 76 N. E. 505; *Trotta v. Johnson*, 121 Ky. 827, 90 S. W. 540; *Atchison, T. & S. F. R. Co. v. Fajardo*, 74 Kan. 314, 86 Pac. 301; *Patek v. American Smelting Co.* 154 Fed. 190, 83 C. C. A. 284; *Vetaylor v. Perkins (C. C.)* 101 Fed. 393; *Davidson v. Hill (1901)* 2 K. B. 606, disapproving *Adams v. British & F. S. S. Co. (1898)* 2 Q. B. 430. The cases holding the contrary view, i. e., that nonresident aliens are excluded as beneficiaries, are *Deni v. Pennsylvania R. Co.*, 181 Pa. 525, 37 Atl. 558; *Maiorano v. Baltimore & O. R. Co.*, 216 Pa. 402, 65 Atl. 1077; *McMillan v. Spider Lake Sawmill & Lumber Co.*, 115 Wis. 332, 91 N. W. 979; *Brannigan v. Union Gold Min. Co. (C. C.)* 93 Fed. 164; *Adams v. British & F. S. S. Co.*, 2 Q. B. 430, which latter case as we have pointed out has been disapproved in England. The reasoning upon which these latter cases rest seems to be that (1) the laws of a country have no intrinsic force proprio

vigore beyond its territorial jurisdiction and limits; (2) statutes generally apply to those only who owe obedience to the legislature which enacts them, and whose interests it is its duty to protect; and (3) it is usual in conceding or granting rights to nonresident aliens to make express mention of them.

But we think the better reason, as well as the greater weight of adjudged cases, forbids that nonresident aliens be excluded, by interpretation, from among the beneficiaries designated in the statute. The decedent, though a foreigner, not being an alien enemy, if he had survived the injury, might have maintained an action therefor, if not otherwise specially disabled by law. (2 Cyc. 107.) The wife, having a vested right in the cause of action resulting from his death, should not be excluded as a beneficiary, though a nonresident alien. The injury to her may well be the same as if she were a resident. The legislature had power to include nonresident aliens, and they are within the natural and ordinary import of the language employed. Neither the context nor the corrective purpose of the statute suggests any reason for a restrictive interpretation. The act is in its highest sense remedial, and is entitled to receive the liberal construction which appertains to such statutes. (*Haggerty v. Central Railroad Co.*, 31 N. J. Law, 349; *Gottlieb v. North Jersey St. Ry. Co.*, 72 N. J. Law, 480, 63 Atl. 339.) The question of giving a statute intrinsic force *proprio vigore* beyond the territorial jurisdiction of the State is not involved. The act merely removes a common-law obstacle to recovery for a wrongful act. It merely provides a remedy for a wrong, committed within the State, by those within the State and subject to its authority, to others within its jurisdiction and entitled to its protection, whereby injury is done to still others within or without its jurisdiction. Had the legislature intended to restrict recovery to a resident widow or resident next of kin or both, or to a widow and next of kin who are citizens of the United States, it would have so said. Moreover, our statute has been under consideration in the United States courts. In *Dennick v. Central R. Co.*, 103 U. S. 11, 26 L. Ed. 439, in denying a contention that the provisions of the act that "every such action shall be brought by and in the names of the personal representatives of such deceased" limited the right of action to a personal representative appointed in the State, it was said: "The advocates of this view interpolate into the statute what is not there. * * * The statute says the amount recovered shall be for the exclusive benefit of the widow and next of kin. Why not add here, also, by construction, 'if they reside in the State of New Jersey?' It is obvious that nothing in the language of the statute requires such a construction. Indeed, by inference, it is opposed to it. The first section makes the liability of the corporation or person absolute where the death arises from their negligence. Who shall say that it depends upon the appointment of an administrator within the State?" In *Hirschkovitz v. Pennsylvania R. Co.* (C. C.) 138 Fed. 438, the court, construing our statute, held that a nonresident alien who is next of kin to the person killed is entitled to the benefit of a statute giving a right of action for the death of a person caused by the wrongful act or negligence of another. It will be seen, therefore, that the United States courts in the construction of our statute are in harmony with the views here expressed.

The judgment of the court below will be affirmed.

EMPLOYERS' LIABILITY—CONTRACTS BETWEEN PULLMAN COMPANY AND RAILWAY COMPANY—WAIVER OF EMPLOYEE'S RIGHTS—*San Antonio and Aransas Pass Railway Company v. Tracy, Court of Civil Appeals of Texas, 130 Southwestern Reporter, page 639.*—Kate Tracy was employed by the Pullman Company as a car cleaner and was injured in February and in April, 1908, by the negligence of this company and the railway company named. A judgment for damages against the railway company was given in the district court of Bexar County, from which an appeal was taken, on which appeal judgment was rendered in June, 1910.

There was a contract between the two companies by virtue of which the Pullman Company agreed to indemnify the railway company for any loss it might suffer by reason of accidents or injuries to employees of the Pullman Company while in the discharge of their duties or being transported by the railroad company. The Pullman Company had been held not liable in damages in the court below, and its dismissal from the suit was held by the railway company to be error. On this point the court of appeals, speaking by Judge Fly, held that the court below had ruled incorrectly, the contract not being one against the negligence of the carrier, but a form of guaranty corresponding to insurance contracts. As between the two companies, therefore, there was a reversal of judgment and the case was remanded for a new trial to determine which party was ultimately liable on the judgment in favor of Kate Tracy and against the railroad company, which was itself affirmed. It was held, however, that no contract of waiver by the employee herself would be valid.

On this point Judge Fly said:

The authorities cited herein which sustain and uphold the right of appellant to implead the Pullman Company under the contract between them denounce a contract against negligence, as affecting the rights of Kate Tracy, whether entered into between her and appellant or between her and the Pullman Company. That company may bind itself to indemnify appellant for damages resulting to the employees of the former, but it can not evade its responsibility by compelling its employees to waive all damages that may be inflicted by appellant. Such a contract is a monstrosity that will meet with condemnation in any court of Texas, whatever may be the rule in federal courts and other state courts. The contract in question is condemned and rendered invalid by article 4560i, Sayles' Ann. Civ. Rev. St., 1897. If the contention of appellant that the statute does not apply because the contract was not made between an employee and a railroad or street railway should be sustained, railway companies could annul the law by having the contract made with some other corporation or person, and then claim immunity by reason thereof.

EMPLOYERS' LIABILITY—FELLOW-SERVANT LAW—COMMON CARRIERS—CONSTITUTIONALITY OF STATUTE—*Chicago, Milwaukee and St. Paul Railway Company v. Westby, United States Circuit Court of Appeals, Eighth Circuit, 178 Federal Reporter, page 619.*—Marie Westby, widow and administratrix of the estate of Martin Westby, had recovered a judgment for damages in the circuit court of the United States for the district of South Dakota for the death of her husband while in the employment of the company above named, from which judgment an appeal was taken and a reversal secured. Apart from certain questions as to evidence and procedure the decision turned on the constitutionality of the statute of South Dakota, chapter 219, Acts of 1907. This statute abolished the defense of fellow-service in cases of injury to employees of "every common carrier engaged in trade or commerce in the State of South Dakota," and enacted the doctrine of comparative negligence.

On the ground that the phrase "every common carrier" includes all classes of transportation of persons, goods, or information for hire, the law was held not to be a railroad statute simply, and since on account of improper classification it bore unequally upon different groups of employers and employees it was declared unconstitutional and void. It was also held to be impossible of separation so as to retain any valid portion, excluding others. This is set forth in the concluding portion of the opinion of the court, which was delivered by Judge Sanborn and which is in part as follows:

The act of the legislature of South Dakota expressly includes within the same general term "every common carrier engaged in trade or commerce in the State of South Dakota shall be liable to any of its employees, or in case of his death to his personal representative," carriers, and employees in the constitutional and those in the unconstitutional class, those engaged in hazardous and dangerous, and those employed in comparatively safe occupations. The part of the statute applicable to the former class can not be separated from that applicable to the latter class, so that each may be read and may stand by itself, because both classes are embodied in the general words "every common carrier" and "any employee" and are included in a single declaration. The unconstitutional part can not be eliminated from the law by striking out or disregarding any words or clauses of the act. That result can be attained only by introducing into the statute words of limitation which would expressly restrict the general terms "every common carrier" and "any employee" to common carriers using dangerous power and machinery and their employees engaged in dangerous occupations about them, a species of legislation the courts are without the power to enact. The statute can not be restricted lawfully by construction to the constitutional class because the part applicable to that class is not separable from the part applicable to the unconstitutional class so that each may be read and may stand by itself, because it is not apparent that the legislature would have passed the act if it had been limited to the constitutional class,

because the legislature excepted neither class, and the legal presumption is that it intended to except none, and because the statute can not be restricted to the constitutional class by the elimination of words or clauses; but this result can be attained only by the introduction into it of express words or terms.

EMPLOYERS' LIABILITY—INSPECTION OF FACTORIES—VIOLATIONS OF STATUTES—DEFENSES—CONSTRUCTION—*Caspar v. Lewin, Supreme Court of Kansas, 109 Pacific Reporter, page 657.*—Kate Caspar, widow of Tony Caspar, sued William Lewin and others for damages for the death of her husband, resulting from injuries received while employed in a shop in which old iron and scrap metal were being cut into lengths for sale. The suit was brought under the factory law of Kansas (chap. 356, Acts of 1903), and involved questions as to the applicability of the statute to the establishment in which the injury was received and the construction of the statute. The defendants' contentions were to the effect that the business of buying and selling scrap iron gave character to their operations, and the mere fact that they cut iron into lengths did not bring it within the act; and, further, that the statute in question was patterned after a law of New York which had been construed by the courts of that State so as to relieve the employer from liability in like circumstances. An important question was the admissibility of the defense of contributory negligence in cases of accident following from the employer's failure to comply with the requirements of the statute.

The court held that the statute was an original one, even though embodying features common to the laws of other States, and that the defense of contributory negligence could not be pleaded where the employer's negligence consisted in failure to meet the requirements of the law. The opinion, which was delivered by Judge Burch, is of unusual interest and traces the development of factory legislation and the modes of interpretation by the courts at considerable length. Particular attention was called in the opinion to the New York labor law (chap. 415, Acts of 1897), requiring machinery, including gearing, belting, and shafting to be "properly guarded" and to the earlier law of Wisconsin (chap. 549, Acts of 1887), which requires that they shall be "securely guarded or fenced so as to be safe to persons employed" in any manufacturing establishment when they are "so located as to be dangerous to employees when engaged in their ordinary duties."

The fourth section of the statute of Kansas directs belt shifters or other devices for throwing belts on and off to be supplied in all manufacturing establishments using machinery and calls for the proper and safe guarding where practicable of machinery of every description. The fifth section declares the employer's liability for injuries resulting

from the failure to comply with the provisions of the statute. Caspar was killed while attempting to adjust a belt to a pulley on a shaft about 9 feet above the floor, no belt shifter having been provided. He stood upon a ladder to do the work, and his clothing was caught in an unguarded and roughly burred end of the shaft which was without a guard.

Taking up the seventh section first, in order to present the definition given therein of a manufacturing establishment, Judge Burch said:

The only purpose of incorporating section 7 in the act was to preclude a roving quest for the meaning of words. The section was designed to make the meaning of the term "manufacturing establishment" as it had been used in the previous sections so clear that there could be no misunderstanding of just what establishments were included. It first includes by name a number of establishments some of which may not be popularly known or regarded as manufactories—smelters, oil refineries, cement works, mills of every kind, machine shops, and repair shops. By force of the definition these all become manufacturing establishments. Then all other manufacturing establishments were included by the clause "and in addition to the foregoing any other kind or character of manufacturing establishment of any nature or description whatsoever." Then, in order that the full scope of the act might not be mistaken, the broadest possible definition of a manufactory was added, "(a place) wherein natural products or other articles or materials of any kind, in a raw or unfinished or incomplete state or condition, are converted into a new or improved or different form."

The process of manufacturing may be very complicated, or it may be simple in the extreme. There are primary and secondary stages. But the legislature has said that all establishments for the modification of natural objects to adapt them to human needs are embraced in the act. Very clearly that of the defendants is included. It is all the more easy to say this because it is apparent from the description given that the defendants operate what in all essential respects fulfills the popular notion of a mill for the production of a staple article. Besides this, the interpretation given the act serves to carry out the remedial and humanitarian purpose which it seeks to accomplish—the protection of working people from mutilation, physical deformity, physical pain, mental anguish, and death, occasioned by the absence of practicable safeguards from the environment of their toil.

The contention of the defendants next considered was that the shafting was so located as not to be dangerous to employees while engaged in their ordinary duties, and was therefore not within the requirements of the law as to guards, citing the law of New York and the construction put thereon by the courts of that State. Judge Burch traced a number of the provisions of the law through the enactments of several States, and continuing, said:

Different methods were employed in different States to secure compliance with their factory acts. In New York violations of article 6 of the Code of 1897 (Laws 1897, c. 415) were made punishable as misdemeanors, with increasing penalties for repeated infractions. No civil remedy was provided.

The statutes of all the States have not been compared, and all the differences of those which have been examined have not been noted. The foregoing, however, is sufficient to show the confused condition of the statute law of this country on the subject of protection to employees in factories when the legislature of this State approached the subject in 1903. It was not able, if it had been so inclined, to select an act, made to order, from the stock supplied by other States. It desired to cover a few matters in an effective way, but found no single statute, and no single section of any statute, which it could appropriate. Consequently it chose its own subjects, and framed its own regulations in its own way. Section 81 of the New York Code was too broad in its scope, too weak and indefinite in some of its requirements, and was unsuited for adoption because of the functions of the factory inspector. Its list of appliances was not accepted in its entirety. Substitutes for belt shifters were required to be safe. The items "cogs, gearing," were contracted into cog gearing. Vats, etc., and machinery were required to be properly—that is, suitably—according to the nature of the appliance, and safely guarded, but this need be done only where practicable. The protection of the act was extended without limitation to "the persons employed or laboring in any such establishment." It was made the duty of factory owners and operators not merely to provide the safeguards specified, but to keep their establishment furnished with them, and a right of action was given in every case where the absence of the required safeguards caused or directly contributed to death or injury. From all this it is plain that the statute is unique, was so created by the legislature, and is not a transcript of the law of New York or of any other State. The result is it has not been given a settled and definite meaning by the highest court of New York and the chief argument of the defendants may be laid aside.

Considered merely as a precedent, the New York case (decided in April, 1900) relied upon by the defendants was this: The plaintiff was employed to attend a machine known as a "clinker crusher." Overhead some 15 or 18 feet was a revolving shaft, with a collar to prevent end-thrust, from which projected a set screw. Under the shaft a platform was constructed for the purpose of affording access to a bearing immediately adjoining the set screw, which needed to be oiled. The platform was reached by means of a ladder. The plaintiff ascended the ladder to the platform to oil the bearing, the inevitable occurred, his sleeve caught in the set screw, and he was seriously injured. After quoting the statute, the court proceeded to emasculate it in the following way: "The manifest purpose of the enactment was doubtless to give more force to the existing rule that masters should afford a reasonably safe place in which their servants are called upon to work. We think, however, that the legislature could not have intended that every piece of machinery in a large building should be covered or guarded. This would be impracticable. What evidently was intended was that those parts of the machinery which were dangerous to the servants whose duty required them to work in its immediate vicinity should be properly guarded, so as to minimize, as far as practicable, the dangers attending their labors. Human foresight is limited, and masters are not called upon to guard against every possible danger. They are required only to guard against such dangers as would occur to a

reasonably prudent man as liable to happen. (*Cobb v. Welcher*, 75 Hun, 283 [26 N. Y. Supp., 1068].) In this case, as we have seen, the shafting was located from 15 to 18 feet above the floor of the factory, and the collar containing the offending screw was at one end of the building high above and out of reach of the servants who were engaged in operating the machinery below. It could only be approached by a ladder, and the only necessity of approaching it at all was for the purpose of oiling the bearing under the shafting. It does not appear that any accident of this character had ever happened before at this bearing, or that it had ever occurred to any of the persons operating the factory that such an accident was possible or liable to occur. The statute does not attempt to specify how machinery shall be guarded otherwise than as 'properly guarded.' The necessity for the guard and the character and description of the guard must of necessity depend upon the situation, nature and dangerous character of the machinery, and in each case becomes a question of fact." (*Glens Falls P. C. Co. v. Travelers' Ins. Co.*, 162 N. Y., 403; 56 N. E., 899.)

Taking up the argument of this opinion step by step, it may be observed that it proceeds precisely upon the same lines as if the statute did not exist. The practicability of safeguards for dangerous machinery does not depend upon the size of the factory or the number of pieces of machinery inside of it, but upon the nature of each machine. The question is, is the machine, or appliance, of such a nature that it is practicable to deprive it of its homicidal attributes and not destroy its usefulness? If so, it ought to be guarded, and all such pieces ought to be guarded, although a great many are assembled in one large building. The shaft bearing had to be oiled just as the crusher had to be operated, and the ladder and platform were provided for the purpose of conducting the oiler to the necessary place. The oiler was obliged to do the work of oiling the bearing in the "immediate vicinity" of the set screw in the revolving shaft. The statute named set screws and shafting as appliances to be properly guarded, so as to minimize the danger attending the labor of the oiler while at work in their immediate vicinity. It did not require superhuman powers, and would not have caused brain fag to foresee that a set screw projecting from a revolving shaft threatens danger to an employee obliged to work immediately adjoining them. The legislature had that much provision. That body put set screws and shafting in the category of dangerous devices to be properly guarded when in proximity to places where labor must be performed, and thereby established the measure of prudence to be exercised. The location of the shafting had nothing to do with the case. It made no difference whether the shafting was brought down to the floor or the floor was taken up to the shafting by means of the ladder and platform. Of course, the shafting was out of reach of persons operating machinery on the floor and who had no business with it, but it was not out of reach of the oiler, who did have regular business with it. Since it was imperative that the set screw in the shafting should be approached it was immaterial whether it was approached on a platform reached by a ladder or on the floor level. True, the only necessity for approaching the dangerous appliance was to oil the bearing, but that was a necessity, just as much as attending to the crusher below,

and whenever the operation was performed it was attended with danger. It is, indeed, true that a human being must be mangled before it occurs to some factory owners that a set screw in a rapidly revolving shaft is dangerous to the person who must work near it, and that is the reason why the statute required it to be guarded. There was no dispute about the situation, nature, and dangerous character of the set screw. No attempt was made to meet the peremptory terms of the statute and provide a guard for it. That it was the plaintiff's duty to bring himself in proximity to it was not questioned. Consequently, there was nothing left but to declare that a statutory duty had been violated. No reasons other than those considered having been stated in support of the decision, this court is unable to follow it.

The Glens Falls case was followed in 1905 by that of *Dillon v. National Coal Tar Co.*, 181 N. Y. 215, 73 N. E. 978. Shafting was located 14 or 15 feet above the factory floor. The foreman required a steam fitter to take down some pipe above the shaft while the machinery was running. The steam fitter worked on a ladder placed against the pipe. His jacket was caught by the shaft; he was whirled around, thrown to the floor, and severely injured. The court said: "As the shaft which caused plaintiff's injuries was elevated 14 or 15 feet above the floor of the defendant's factory and could be reached only by the use of the ladder, the defendant can not be charged with negligence under the factory act in failing to properly guard it. (*Glens Falls P. C. Co. v. Travelers' Ins. Co.*, 162 N. Y. 399 [56 N. E. 897].) The only argument upon which the defendant can be held liable, if at all, is that it failed in its duty to properly instruct the plaintiff before he was directed to take down the pipe upon which he was at work when injured. If the danger to be apprehended by coming in contact with the shaft was as open, obvious, and apparent to the plaintiff as it was to the defendant, the latter was under no duty to instruct the former in this regard, for in that event the risk was one which he voluntarily assumed."

With the utmost respect to the very learned court of appeals of New York, it is submitted that such rulings simply fritter away serious efforts on the part of the legislature to secure factory workers against the barbarities of an industrial system which has been conducted with amazing prodigality of human life and limb. It may be conceded that one way of preventing injury from shafting, set screws, and other appliances is to locate them out of reach. But they are not out of reach whenever a workman's duty, in the course of his employment, takes him to them. Whenever such an occasion arises, the statutory duty to interpose safeguards between the workman and danger arises. *Dillon* was obliged to work where unguarded shafting in motion would seize his clothing. The legislature had his situation in mind when the statute was framed. The foreman had the choice of stopping the machinery or running the risk of inflicting a personal injury in violation of law. He chose the latter course, the result followed which the legislature had foreseen and had tried to circumvent, and the injured man ought to have recovered.

The court's views have been indicated far enough to show that it is not inclined to read into the statute any words which would limit its application to workmen engaged in ordinary duties only. The Missouri court of appeals says this must be done to make any factory

act reasonable. (*Strode v. Columbia Box Co.*, 124 Mo. App. 511, 518, 101 S. W. 1099.) The Missouri statute contains such a limitation, and, as pointed out above, the statutes of other States are careful to incorporate similar provisions. The legislature had these precedents before it when framing the law of this State and rejected them, thereby indicating its view of what is reasonable. The conduct of the Wisconsin legislature has been recited. Interpreting the amended statute, the supreme court of that State said: "It is beside the case to argue, as counsel for appellant do in their brief, that the shaft, at the point where the injury was received, was not so located as to be dangerous to appellant's employees 'in the discharge of their ordinary duties,' particular significance being given to the word 'ordinary.' If the employees, from the standpoint of the master in the exercise of ordinary care, were required in the course of their employment to go about or over the shaft, and so come in dangerous proximity thereto or contact therewith, whether the duty was ordinary or exceptional, the situation was within the statute. The law is cast in general terms. We can not interpolate into it the word 'ordinary' and test appellant's conduct by a different standard than the legislature in the proper execution of its police power created. Such limitation upon the duty to guard as might be indicated by the word 'ordinary,' if it were in the statute modifying the word 'duty,' the legislature manifestly did not intend should exist, from the fact that the word was industriously, by amendment, dropped from the law as it formerly existed, the words 'discharge of their duty' being substituted for 'engaged in their ordinary duties.'" (*Miller v. Kimberley & Clark Co.*, 137 Wis. 138, 142, 118 N. W. 536, 537.)

This court has nothing to do with the policy of the factory act of this State, except to apprehend and give effect to it, or with the rigor of its requirements. Therefore, it holds that it makes no difference whether the duty be ordinary and general or exceptional and occasional. If a person employed or laboring in a manufacturing establishment may, at the behest of duty, come in proximity to one of the appliances specified in the statute, it must be properly and safely guarded for the purpose of preventing or avoiding death or injury to him.

Common experience everywhere, registered in tables of gruesome statistics, affords fresh demonstration every day of the inadequacy of the common-law doctrine of reasonable care to provide places and instrumentalities reasonably safe against foreseeable occurrences to meet the situation of men, women, and children who must manipulate, and must work in the midst of, the mechanical products of modern inventive genius. But when the legislature intervenes and makes the positive requirement that specific safeguards shall be maintained, the statute is too often treated as a legal superfluity, and cases are decided according to the same old rules. So, in this case, the defendants want to try the question whether they should reasonably have anticipated that Caspar would be killed, notwithstanding the specific and positive command of the statute that a belt shifter or other safe mechanical contrivance for putting on the belt should be provided, and that the shafting should be properly and safely guarded.

It is impossible for a factory owner or operator to foresee all the natural and probable results of his omissions. After an injury occurs he recognizes that his failure to adopt some protective measure caused the injury. Therefore it is the law that if a reasonable man would have foreseen that injury in some form was likely to result, and injury does result, he is liable although the precise form of the injury was not foreseen. The factory act cuts squarely across the common-law doctrine of reasonable prudence and supplies that foresight in reference to the places, structures, and appliances which it specifies. The legislature did not say, as in Connecticut and Massachusetts, that shafting so placed as, in the opinion of the factory inspector, to be dangerous to employees shall be guarded, or, as in Wisconsin, that shafting so located as to be dangerous to employees shall be guarded. It said that all shafting used in a manufacturing establishment shall be guarded; and whenever a required safeguard or appliance has not been provided, the only question open to investigation is whether the injury occurred under circumstances which made the absence of it a contributing cause. In those instances in which practicability is a factor that matter may be tried, but to submit to a jury the question of prudence and foresight where the law has been ignored would be to reopen a subject which the legislature has closed by a final decision.

In Washington, section 1 of chapter 37 of the Laws of 1903, page 40, provides as follows: "That any person, corporation, or association operating a factory, mill, or workshop where machinery is used shall provide and maintain in use proper belt shifters or other mechanical contrivances for the purpose of throwing on or off belts or pulleys."

Interpreting this statute the supreme court of that State said: "The legislature has left little room in the premises for the exercise of discretion of mill operators or of judgment on the part of juries. The statute was manifestly intended for the protection of life and to prevent the mangling of human bodies. To that end the legislature sought to make the protection as complete as such devices can make it. It did not say that belt shifters shall be maintained where necessary, and leave mill operators and juries to say when the necessity exists. The term 'proper belt shifters,' as used in the statutory connection, does not merely mean belt shifters in proper or necessary places, but rather sufficient 'belt shifters or other mechanical contrivances' to effect the 'throwing on or off belts on pulleys.' There is no classification of pulleys or places as to the matter of necessity or practicability; and it was the manifest theory of the lawmakers that, when belts have been placed upon any pulleys for the purpose of operating machinery, the necessity for removing and replacing them will at some time arise; and that in order to guard against danger from an attempt to shift them while in operation, some effective contrivance must be maintained for that purpose. It certainly must be conceded that the contrivance must be maintained at all places where belts are shifted while in operation in order to exempt the mill from the charge of negligence. The shifting of some belts while the machinery moves may seldom occur, but it is upon those rare occasions that the protection is needed. We are not now prepared to say that occasion may never arise when a question of this character may be proper for a jury, although it seems to us that, under this statute, such occa-

sions must be very rare. To open the way for controversies as to whether the protection designated by the statute is or is not necessary or practicable in given places would lead to much litigation, which might result in the nullification of the very purpose of the statute. Such statutes are mandatory, and it is not for the mill owners or juries to say whether the requirements are wise or necessary." (*Whelan v. Washington Lumber Co.*, 41 Wash. 153, 155, 83 Pac. 98, 99 (111 Am. St. Rep. 1006).)

The protection of the act extends only to the persons employed or laboring in the factory; that is, acting within the scope of some employment or labor. The servant must be in a place which he may properly occupy, his conduct must be within the proper sphere of his duties, and the failure to supply a safeguard, considered with reference to its purpose, must bear a true causal relation to the injury, although under the stringent provisions of the act it need not be the whole cause. The master may not, however, successfully evade the statute by attempting to narrow the scope of his servant's duty by rules or instructions. Thus, in this case, workmen were obliged to ascend the ladder to put the belt on the shaft pulley and to oil the shafting. The statute could not be nullified by an order to do this work only while the machinery was not in motion. The court submitted to the jury the question of Caspar's contributory negligence and the verdict acquitted him of fault. The defendants say that under the evidence he was culpably negligent as a matter of law. The plaintiff replies that contributory negligence is not a defense to an action founded upon the factory act. The question thus raised is one of interpretation. The statute is the very essence of simplicity, clear and emphatic in statement, absolutely free from ambiguity. "If any person employed or laboring in any manufacturing establishment shall be killed or injured in any case wherein the absence of any of the safeguards or precautions required by the act shall directly contribute to such death or injury," an action lies.

The common law already gave a right of action to some employees under some circumstances. If the master failed to exercise reasonable care to provide reasonable safeguards, and if the servant did not assume the risk and if he were not guilty of contributory negligence, then a liability existed. The sole purpose of the statute was to wipe out this narrow and conditional liability and substitute another. Words were duly chosen to that end which are unsusceptible of misunderstanding. The word "any" is a term of indifference, and its repetition shows that it was used deliberately and emphatically—"any person," "any manufacturing establishment," "any case," "any safeguards or precautions." Consequently distinctions can not be made by interpolating qualifications and conditions, whether in respect to persons and cases or in respect to places and safeguards; and to declare that the act means no more than that "any person who, at the time of injury, was himself in the exercise of due care," may maintain an action, is to amend the law and not to interpret it. Furthermore, technical legal terms from the law of personal injuries are employed. The subject of contributing causes of the injury sued for is specifically treated. No exception to liability is made when the workman's negligence contributes to the injury. The legislature having chosen not to impose such a condition upon recovery, the judiciary is powerless to do so.

The statute is a factory act and an employer's liability act combined. It bears internal evidence that the employer's liability acts of other States had been studied. They are usually drawn in favor of "an employee," and consequently are held to exclude employees of subcontractors. To meet this defect the protection of the act was extended not only to persons employed, but also to persons laboring in a manufacturing establishment. The staple employers' liability act, however, expressly limits its application to "an employee who at the time of the injury is in the exercise of due care." (Acts Colo. 1893, c. 77; Acts Ind. 1893, c. 130; Laws Mass. 1887, c. 270; Laws N. Y. 1902, c. 600.) The omission of any such restriction from the Kansas law appears to have been deliberate and intentional.

It may be said that the letter of a statute should not prevail over its sense and spirit, that a literal interpretation rewards carelessness, and that the act ought to be construed in connection with the settled maxims and principles of the common law. Precisely the same arguments were made in *McAllister v. Fair*, 72 Kan. 533, 84 Pac. 112, 3 L. R. A. (N. S.) 726, 115 Am. St. Rep. 233, and were refuted in the opinion by the chief justice. But what is the spirit of this statute? It is to stop the insufferable waste of human life and limb which has been the universal accompaniment of the conduct of manufacturing industries. The law is a police regulation adopted to reform the inhumanity of factory methods, and to prevent the casting into the world of dependent cripples and widows and orphans left without means of support. This purpose includes the reduction of the number of casualties to the careless as well as to the prudent. If the prescribed precautions be taken and the required safeguards be installed, killing and maiming will cease, or at least will be reduced to a minimum.

In order that the factory owner may understand the imperative character of the act it was necessary to provide some means of enforcing it. A criminal prosecution is a common method, but the legislature did not adopt it. Instead of this it provided a civil remedy in damages. The sanction was affixed for public purposes. In those cases in which want of care on the part of the employee contributes in some degree to his injury the public ends to be subserved would be defeated unless the negligent man were able to recover. Consequently the statute provides that an action may be maintained by an employee in any case in which the factory owner's neglect to obey the statute contributes to the injury.

In an action to recover the value of a cow killed by a railway company which had not fenced its track as the statute required, Judge Cooley said: "There still remains the question, however, whether the railway company could be held liable if the plaintiff himself was guilty of contributory negligence. Were this a common-law action it is clear that such contributory negligence would be a defense. (Citing cases.) But this is not a common-law action. It is an action given expressly by a statute, the purpose of which is not merely to compensate the owner of property destroyed for his loss, but to enforce against the railway company an obligation they owe to the public. The statute is a police regulation, adopted as much for the security of passengers as for the protection of property. (Citing cases.) And the decisions may almost be said to be uniform that in cases like the present, arising under such statutes, the mere negligence

of the plaintiff in the care of his property can constitute no defense. (Citing cases.) (*Flint & Pere Marquette R. Co. v. Lull*, 28 Mich. 510, 515.) Contributory negligence is not a defense to an action brought under the Kansas statute authorizing a recovery for stock killed in the operation of a railroad where the right of way is not fenced. (*Railway Co. v. Paxton*, 75 Kans. 197, 88 Pac. 1082.) The public policy to be promoted by fencing dangerous factory machinery is identical in every respect with that which requires the fencing of railroad tracks.

It is fair to presume that the natural instincts of persons to avoid mutilation, pain, and perhaps death will prevent any undue stimulation of carelessness through the influence of the statute, and the suggestion of such a result may be ignored along with the scarecrow arguments frequently advanced that litigation will be increased and capital driven from the State by effective factory acts. In any event, these were matters for the legislature to weigh against the enormities of the former system when adopting its policy. The common law affords little aid to the interpretation of this statute because, as already shown, it was intended to abrogate the common law and substitute a new and different duty, right, and remedy. "It is entirely clear, however, that where an absolute and specific duty to guard or fence dangerous machinery is imposed upon the master by statute, such new condition must, in a very material manner, affect the relations of the parties, and modify to a considerable extent their rights and duties as they existed at common law. And here a distinction is to be noted between statutes such as the employer's liability act (Acts 1893, p. 294, sections 7083-7087; Burns's Ann. St. 1901), which provide in general terms that the employer shall be liable for injuries to an employee where the injury is occasioned by reason of defects in the condition of ways, works, plant, tools, and machinery, etc., and statutes which require of the employer the performance of a specific duty, such as to guard or fence dangerous machinery. Statutes of the former class do little more than declare the rule of the common law. Statutes of the latter class impose specific obligations. A failure to comply with the requirements of the first may or may not be negligence. A violation of the second is an unlawful act or omission, a plain breach of a particular duty owing to the servant, and generally constitutes negligence per se." (*Monteith v. Kokomo, etc., Co.*, 159 Ind. 149, 151, 64 N. E. 610 (58 L. R. A. 944).)

The common-law doctrines of reasonable care, assumption of risk, contributory negligence, and coservice took their rise at a time when shoes were made at the bench, the weaver had an apprentice or two, and the blacksmith a helper. Steam and electricity have revolutionized manufacturing industries so marvelously that no vestige of former conditions remains. But while the factory worker's environment has been completely changed, his common-law rights and remedies have remained unchanged. It has been well understood for a long time that there is no juristic or economic excuse for this state of affairs. The liberty of capital to conduct its own business in its own way does not include the right to inflict the cruelties which have invariably characterized industrial progress. The liberty of the wage-earner to contract for extra pay for extra hazard and to seek some other employment if he does not like his master's methods is a

myth, or, as has been said, "a heartless mockery." (*Kilpatrick v. Grand Trunk R. R. Co.*, 74 Vt. 288, 52 Atl. 531, 93 Am. St. Rep. 887.) The man and the machine at which he works should be recognized as substantially one piece of mechanism, and mishaps to either ought to be repaired, and charged to the cost of maintenance. The courts can not abolish the old rules and adopt others which shall suit existing facts and remedy existing evils. That must be done by the legislature. But when tardy statutes are promulgated, the courts should interpret them as favorably as their terms will allow, and not proceed to shackle them with the discredited common-law manacles. Sometimes it is held that quite radical factory acts make no change in the law. Sometimes it is declared that their most remedial features must be strictly construed because they penalize the factory owner. More often than otherwise it is held that the precious doctrine of assumption of risk can not be affected unless, like the king, it be expressly named. It is usually taken for granted that a legislature could not think of permitting a negligent factory worker to recover, although the farmer may collect damages from a railroad company for killing the cow or mule which he negligently permits to run at large.

In a recent Indiana case the opinion reads: "It is a matter of common knowledge that, owing to the spirit of invention and the demands of business, the use of powerful, swiftly moving, and dangerous machinery in manufacturing establishments in this country has been constantly growing at an ever increasing rate for many years, and at the same time the casualty list from accidents resulting from the use of such machinery has been constantly swelling until at the date of the passage of this law it has reached alarming proportions. Both the title of the act, which declares it to be 'An act concerning labor and providing means for protecting the liberty, safety, and health of laborers,' etc., and the provisions of the law, clearly show that this condition of affairs was in the legislative mind in the enactment of this law, and was an evil sought to be remedied thereby. Its obvious purpose, among other things, was to reduce the hazard to those employed about dangerous machinery, to protect them from injury by accidental contact therewith, and it was evidently designed to protect the employee not only from unavoidable accidents, but from his own negligent and careless acts which might result in his injury from accidental contact with such dangerous machinery. Not that the law gives to the employee a new right or remedy against his employer for such injuries, or in anywise relieves him from his common-law duty to exercise reasonable care to protect himself. Its purpose is to prevent injury, not to give a right or remedy for its occurrence." (*Evansville Hoop, etc., Co. v. Bailey*, 43 Ind. App. 153, 159, 84 N. E. 549, 551.)

The Indiana statute makes a violation of its requirements a misdemeanor punishable by fine for the first offense and by larger fines and by imprisonment for succeeding offenses. (Laws 1899, c. 142, sec. 25.) The Kansas statute depends for its enforcement upon the terror of suits for damages. It may be wise or unwise, but it is so framed. As the Indiana court perceived, the public humanitarian purpose is the same, although the employee be negligent. Therefore it may be concluded that the Kansas statute did intend to confer a new right and a new remedy.

It is not necessary to pursue the subject further. The court holds that mere contributory negligence is not a defense to an action founded upon the factory act.

One other matter should be noticed, although the affirmance of the judgment of the district court does not depend upon it. Section 6 of the act makes it sufficient, in order to establish liability, for the plaintiff to prove in the first instance that death or injury resulted in consequence of failure to provide the required safeguards, or that failure to provide such safeguards directly contributed to such death or injury. The plaintiff showed that the shafting was unguarded, and that as a direct result and consequence Caspar was killed. Under the statute the plaintiff was not required to go further and offer proof in the first instance that it was practicable to guard the shafting. The legislature was evidently moved by the fact that very often an injured employee is not competent to demonstrate the practicability of providing safeguards and may not be able to command the expert evidence necessary to do so. The accident may have wrecked the machine, or the factory owner may remove it or may deny him access to it. When the employee is killed, or witnesses are killed, the way to recovery is still further embarrassed. On the other hand, the factory owner always possesses the ability to show that additions in the direction of safety would destroy the efficiency of the appliance causing the injury, or would otherwise be impracticable.

In *Henschell v. Railway Co.* (78 Kans. 411, 96 Pac. 857) this section of the statute was not brought to the attention of the court, and its purpose and effect were not considered. In that case the plaintiff proved that he was injured by a type of machine which required the manipulation of unguarded cogs. Therefore it was said that he was bound to extricate himself from the predicament in which his own evidence placed him by showing how it was practicable to guard the cogs. Since the statute contemplates that ordinarily a plaintiff should not rest under such a burden, the third paragraph of the syllabus is overruled.

The judgment of the district court is affirmed.

EMPLOYERS' LIABILITY—RAILROAD COMPANIES—HAZARDS—CONSTRUCTION OF STATUTE—CONSTITUTIONALITY—CLASSIFICATION—*Louisville and Nashville Railroad Company v. Melton*, *Supreme Court of the United States*, 30 *Supreme Court Reporter*, page 676.—Spencer Melton, a resident of Hopkins County, Ky., sued in the circuit court of that county to recover damages for an injury received by him while working for the company named. Melton was employed as a bridge carpenter, but was engaged at the time he received his injury in the construction of a frame foundation for a coal tipple near the company's track at Howell, Ind. The injury was caused by the breaking of a chain selected, as it was alleged, by the foreman, Melton being at the time engaged in carrying out the foreman's orders.

The action was based on the employers' liability statute of Indiana, act of March 4, 1893, applicable to railroads operating in the State

and fixing liability for injuries to employees caused by defects in tools and machinery or resulting from the negligence of persons giving orders. Various contentions were made by the company, as that the common law should control, that the courts of Kentucky could not administer a statute of Indiana, and that the law in question was unconstitutional if held to apply to the class of employment under consideration. Judgment was in Melton's favor in the circuit court, and this judgment was affirmed by the court of appeals of Kentucky, from which the case was brought on a writ of error to the Supreme Court of the United States, where it was again affirmed.

The court below refused to accept the company's contention that Melton was not within the statute because his employment was not one involving railroad hazards proper, saying:

We are unable to see the force of this distinction. A railroad can not be run without bridges, bridges can not be built without carpenters. The work of a bridge carpenter on a railroad is perhaps no less perilous than the work of an operative on one of its trains. Coal tipples are no less essential to the operating of a railroad than bridges, because the engines can not be operated without coal. The construction of a coal tipple is therefore essential to the operating of a railroad.

The company contended that the court in so holding caused the statute to embrace employees which it did not in fact include, as construed by the supreme court of Indiana, and that if it did include them it was unconstitutional. In ruling as it did, it was claimed that the Kentucky court had ignored the findings of a sister court and violated the provision of the Federal Constitution requiring full faith and credit to be given in each State to the public acts and judicial proceedings of every other State. Inasmuch, however, as it was found that the rulings of the supreme court of Indiana had not been pleaded in the course of the trial, the question could not be raised at this time.

The second constitutional question involved the application of the provision of the fourteenth amendment to the Federal Constitution, requiring the laws of the States to afford equal protection to all. On this point Mr. Justice White, who spoke for the court, said:

That the fourteenth amendment was not intended to and does not strip the States of the power to exert their lawful police authority is settled, and requires no reference to authorities. And it is equally settled—as we shall hereafter take occasion to show—as the essential result of the elementary doctrine that the equal protection of the law clause does not restrain the normal exercise of governmental power, but only abuse in the exertion of such authority, therefore that clause is not offended against simply because, as the result of the exercise of the power to classify, some inequality may be occasioned. That is to say, as the power to classify is not taken away by the operation of the

equal protection of the law clause, a wide scope of legislative discretion may be exerted in classifying without conflicting with the constitutional prohibition.

It is beyond doubt foreclosed that the Indiana statute does not offend against the equal protection clause of the fourteenth amendment, because it subjects railroad employees to a different rule as to the doctrine of fellow-servant from that which prevails as to other employments in that State. (*Tullis v. Lake Erie & W. R. Co.*, 175 U. S. 348, 44 L. Ed. 192, 20 Sup. Ct. Rep. 136; *Pittsburg, C. C. & St. L. R. Co. v. Ross*, 212 U. S. 560, 53 L. Ed. 652, 29 Sup. Ct. Rep. 688.) But while conceding this, the argument is that classification of railroad employees for the purpose of the doctrine of fellow-servant can only, consistently with equality and uniformity, embrace such employees when exposed to dangers peculiarly resulting from the operation of a railroad, thus affording ground for distinguishing them for the purpose of classification from coemployees not subject to like hazards or employees engaged in other occupations. The argument is thus stated: "Plaintiff in error does not question the right of the legislature of Indiana to classify railroads in order to impose liability upon them for injuries to their employees incident to railroad hazards, but it does insist that, to make this a constitutional exercise of legislative power, the liability of the railroads must be made to depend upon the character of the employment, and not upon the character of the employer." Thus stated, the argument tends to confuse the question for decision, since there is no contention that the statute as construed bases any classification upon some supposed distinction in the person of the employer. The idea evidently intended to be expressed by the argument is, that, although speaking in a general sense, it be true that the hazards arising from the operation of railroads are such that a classification of railroad employees is justified, yet, as in operating railroads, some employees are subject to risks peculiar to such operation and others to risks which, however serious they may be, are not in the proper sense risks arising from the fact that the employees are engaged in railroad work, the legislative authority in classifying may not confound the two by considering in a generic sense the nature and character of the work performed by railroad employees collectively considered, but must consider and separately provide for the distinctions occasioned by the varying nature and character of the duties which railroad operatives may be called upon to discharge. In other words, reduced to its ultimate analysis the contention comes to this: That by the operation of the equal-protection clause of the fourteenth amendment, the States are prohibited from exerting their legitimate police powers upon grounds of the generic distinction obtaining between persons and things, however apparent such distinction may be; but, on the contrary, must legislate upon the basis of a minute consideration of the distinctions which may arise from accidental circumstances as to the persons and things coming within the general class provided for. When the proposition is thus accurately fixed, it necessarily results that in effect it denies the existence of the power to classify, and hence must rest upon the assumption that the equal-protection clause of the fourteenth amendment has a scope and effect upon the lawful authority of the States contrary to the doctrine maintained by this

court without deviation. This follows, since the necessary consequence of the argument is to virtually challenge the legislative power to classify, and the numerous decisions upholding that authority. To this destructive end it is apparent the argument must come, since it assumes that however completely a classification may be justified by general considerations, such classification may not be made if inequalities be detected as to some persons embraced within the general class by a critical analysis of the relation of the persons or things otherwise embraced within the general class. A brief reference to some of the cases dealing with the power of a State to classify will make the error of the contention apparent.

In *Magoun v. Illinois Trust & Sav. Bank*, 170 U. S. 294, 18 Sup. Ct. Rep. 594, while declaring that the power of a State to distinguish, select, and classify objects of legislation was, of course, not without limitation, it was said, "necessarily this power must have a wide range of discretion." After referring to various decisions of this court, it was observed:

"There is therefore no precise application of the rule of reasonableness of classification, and the rule of equality permits many practical inequalities. And necessarily so. In a classification for governmental purposes there can not be an exact exclusion or inclusion of persons and things."

Again considering the subject in *Orient Ins. Co. v. Daggs*, 172 U. S. 557, 19 Sup. Ct. Rep. 281, it was reiterated that the legislature of a State has necessarily a wide range of discretion in distinguishing, selecting, and classifying, and it was declared that it was sufficient to satisfy the demand of the Constitution if a classification was practical, and not palpably arbitrary.

In *Minnesota Iron Co. v. Kline*, 199 U. S. 593, 26 Sup. Ct. Rep. 159 [Bulletin No. 69, p. 882], a statute of Minnesota, providing that the liability of railroad companies for damages to employees should not be diminished by reason of accident occurring through the negligence of fellow-servants, was held not to discriminate against any class of railroads, or to deny the equal protection of the laws because of a proviso which excepted employees engaged in construction of new and unopened railroads. In the course of the opinion the court said (p. 598): "The whole case is put on the proviso, and the argument with regard to that is merely one of the many attempts to impart an overmathematical nicety to the prohibitions of the fourteenth amendment." These principles were again applied in *Martin v. Pittsburg & L. E. R. Co.*, 203 U. S. 284, 27 Sup. Ct. Rep. 100 [Bulletin No. 70, p. 743], and the doctrines were also fully considered and reiterated at this term in *Southwestern Oil Co. v. Texas*, 217 U. S. 114, 30 Sup. Ct. Rep. 496.

And coming to consider the concrete application made of these general principles in the decisions of this court which have construed the statute here in question, and statutes of the same general character enacted in States other than Indiana, we think, when rightly analyzed, it will appear that they are decisive against the contention now made. It is true that in the *Tullis* case, which came here on certificate, the nature and character of the work of the railroad employee who was injured was not stated, and that reference in the course of the opinion was made to some state cases, limiting the right

to classify to employees engaged in the movement of trains. But that it was not the intention of the court to thereby intimate that a classification, if not so restricted, would be repugnant to the equal protection clause of the fourteenth amendment, will be made clear by observing that the previous case of Chicago, K. & W. R. Co. v. Pontius, 157 U. S. 209, 15 Sup. Ct. Rep. 585, was cited approvingly, in which, under a statute of Kansas classifying railroad employees, recovery was allowed to a bridge carpenter employed by the railroad company, who was injured while attempting to load timber on a car. And in the opinion in the Pontius case there was approvingly cited a decision of the court of appeals of the eighth circuit (Chicago, R. I. & P. R. Co. v. Stahley, 11 C. C. A. 88, 62 Fed. 362), wherein it was held that, under the same statute, an employee injured in a round-house while engaged in lifting a driving-rod for attachment to a new engine could recover by virtue of the statute. All this is made plainer by the ruling in St. Louis Merchants' Bridge Terminal R. Co. v. Callahan, 194 U. S. 628, 24 Sup. Ct. Rep. 857, where, upon the authority of the Tullis case the court affirmed a judgment of the supreme court of Missouri, which held that recovery might be had by a section hand upon a railroad, who, while engaged in warning passers-by in a street beneath an overhead bridge, was struck by a tie thrown from the structure.

While, as we have previously said, it is true there are state decisions dealing with statutes classifying railroad employees sustaining the restricted power to classify which is here insisted upon, we do not think it is necessary to review them or to notice those tending to the contrary. They are referred to in the opinions rendered in the court below. Nor do we think our duty in this respect is enlarged because, since the judgment below was rendered, the court of last resort in Indiana (Indianapolis Traction Co. v. Kinney, 171 Ind. 612, 85 N. E. 954, and Cleveland, C. C. & St. L. R. Co. v. Foland, decided April 20, 1910, 91 N. E. 594) has, upon the theory that it was necessary to save the statute in question from being declared repugnant to the equality clause of the state constitution and the fourteenth amendment, unequivocally held that the statute must be construed as restricted to employees engaged in train service.

Affirmed.

EMPLOYERS' LIABILITY—RAILROAD COMPANIES—HAZARDS—REPAIR WORK—CONSTITUTIONALITY OF STATUTE—*Swoboda v. Union Pacific Railroad Company, Supreme Court of Nebraska, 127 Northwestern Reporter, page 215.*—Frank Swoboda was employed by the company named in its shops at Omaha as helper in the blacksmith shop. At the time of the injury complained of Swoboda was assisting in flattening iron washers at a steam hammer and was hurt, it was alleged, by the carelessness of the employee operating the hammer. It was in evidence that the washers were used for repairs to cars and engines, and on this account the action was brought under the Nebraska employers' liability act of 1907, which abrogates the fellow-servant doctrine for certain railway employments.

Judgment was rendered in Swoboda's favor in the district court of Douglas County, whereupon the company appealed on the ground that, unless the law was restricted in its application to employees exposed to the peculiar hazards affecting the construction, operation, and repair of railroads, it was unconstitutional, and that as the statute was drawn it discriminated unfairly against railroads as employers. The supreme court affirmed the judgment of the court below, sustaining the constitutionality of the statute on the authority of *Missouri P. R. Co. v. Mackey*, 127 U. S. 205, 8 Sup. Ct. 1161. and *Tullis v. R. Co.*, 175 U. S. 348, 20 Sup. Ct. 136.

The question of the applicability of the law to the employment in question was then discussed. On this point Judge Fawcett, who delivered the opinion of the court, said:

The defendant's contention that plaintiff is not within the class protected by the statute because he was not injured through a risk or hazard incident and peculiar to the business of constructing, repairing, and operating railroads, is not sustained by the wording of the statute. The statute reads: "That every railway company operating a railway engine, car, or train in the State of Nebraska shall be liable to any of its employees, who at the time of injury are engaged in construction or repair work." That constitutes one class of employees who are entitled to the benefit of the statute. Then, separated from the former by the disjunctive "or," we have the other class, viz, "or in the use and operation of any engine, car, or train for said company." It is clear from this wording of the statute that the legislature intended that the fellow-servant rule (not law) should not apply to any of the employees of any railroad in the State who were either engaged in the operation of engines, cars, or trains, or were engaged in construction or repair work. Substantially the same reason sustains the entire classification; that is to say, there are dangers inherent in and peculiar to all the vocations described in the statute, which are rarely, if ever, encountered by employees working for a master not engaged in the operation of a railway. The legislature well knew that substantially all railway construction or repair work is dangerous, performed either in the immediate vicinity of tracks upon which trains are passing or by the use of dangerous machinery, as in the case at bar. Classifications should receive a practical construction, and we are of opinion that a reasonable application of the law to the facts in the case before us not only brings the plaintiff within its purview, but forbids a holding that the law itself is obnoxious to the Constitution of the United States or to the constitution of the State of Nebraska.

We must not be understood as deciding that all work of construction or repair of any article or structure performed in the service of a railroad company comes within the purview of the statute. The work of a railroad company is divided into many departments. The duties and hazards of employees in one department may be as dissimilar from those in other departments as are those of a clerk or bookkeeper in the uptown headquarters from those of an engineer or brakeman on a train; and questions may hereafter arise as to the scope of the act under consideration, which we do not now decide.

But, where the work of construction or repair is as closely connected with the actual operation and use of the railroad as the work of the present plaintiff, it seems clear that it is within the class of hazards covered by the act.

LAUNDRIES—REGISTRATION—POLICE REGULATIONS—CONSTITUTIONALITY—*District of Columbia v. Shong Lee, Court of Appeals of the District of Columbia, 38 Washington Law Reporter, page 460.*—A police regulation of the District of Columbia requires every person who commonly launders for pay, on the premises occupied by him or her, the wearing apparel or bed and table linen of another to report such fact in writing to the health officer of the District. Shong Lee, a Chinese laundryman, contended that failure to so report constituted no offense; that the regulation is in conflict with the act of Congress which imposes a tax on laundries in the District; that the regulation is unreasonable and oppressive and therefore void; and that, as the regulation was meant to reach washerwomen working in their homes, his laundry was not of the class intended to be covered by it. The police court of the District sustained the contention of Lee, but this judgment was reversed by the court of appeals and the regulation held valid and applicable to all persons doing domestic laundering for pay on premises occupied by them.

Judge Robb, speaking for the court, said in part:

We see nothing unreasonable or oppressive in this regulation. The defendant in error is simply required to report to the health officer that he is conducting the kind of a laundry mentioned in the regulation, giving his name and the location of the premises. That he has given similar information to the assessor for a different purpose is of no consequence. We think the regulation both reasonable and conducive to the public health.

The language employed is general and there was just as much, if not more, reason apparently for including such a business as that of the defendant in error as any other.

PAYMENT OF WAGES—SEMIMONTHLY PAY DAY FOR RAILROAD EMPLOYEES—CONSTITUTIONALITY OF STATUTE—*New York Central and Hudson River Railroad Company v. Williams, Court of Appeals of New York, 92 Northeastern Reporter, page 404.*—This was a suit in equity brought by the company named to secure an injunction against John Williams, labor commissioner of New York, to prevent him from instituting proceedings against the company for violations of sections 10 and 11 of the labor law of the State (C. L. ch. 31), the contention being that the provisions of the law in question violate the constitution of the State and of the United States. Judgment had been against the company in the supreme court of the State,

appellate division (see same case, 64 Misc. Rep. 15, 118 N. Y. S. 785, Bulletin No. 86, p. 340), and on this appeal that judgment was affirmed. The contentions of the company and the rulings of the supreme court are set forth in full in the Bulletin above referred to. Of the full discussion of the case by the court of appeals it is necessary to state only that the law was upheld as within the power of the legislature to amend the charters of corporations, and that the provisions relative to individuals and partnerships operating railroads are separable, so that even if unconstitutional as to them, the law is not invalid as to corporations operating railroads. The law was upheld also as a valid exercise of the police power of the State in behalf of the parties to whom it applies. Many cases were considered, the opinion, which was delivered by Judge Willard Bartlett, concluding as follows:

There is an irreconcilable conflict in the decisions in different jurisdictions as to the constitutional validity of labor legislation fixing the medium and time of payment of the wages of those who work for corporations. After the foregoing review of the leading cases, I find no difficulty in sustaining our New York statute on the ground which has been stated. It does not confiscate corporate property directly or indirectly. It does impose a greater future burden upon the corporations to which it relates; but that, I think, is within the power of the legislature to the extent to which it has been exercised in this case.

For the foregoing reasons, I advise the affirmance of this judgment, with costs.

DECISIONS UNDER COMMON LAW.

BLACKLISTING—CONSPIRACY—EVIDENCE—*Rhodes v. Granby Cotton Mills, Supreme Court of South Carolina, 68 Southeastern Reporter, page 824.*—Following a strike in the Granby Cotton Mills, the superintendent prepared a list of striking employees and furnished the same to a number of superintendents of other mills as a matter of so-called mutual courtesy, as a result of which the plaintiff, Olin M. Rhodes, was unable to secure employment as a mill worker, though it was in evidence that, while members of his family struck, he himself was not a striker. Judgment was rendered for actual and punitive damages, and an appeal taken, the result being that the judgment of the court below was affirmed.

Numerous exceptions were taken to the rulings of the judge in the court below, and especially to his rulings in confusing, as it was alleged, conspiracies and lawful agreements and his refusal to grant a nonsuit on the grounds that there was no sufficient evidence to support the charge of a conspiracy. Judge Gary, who delivered the opinion of the court, reviewed the evidence at considerable length, showing the existence of the custom of mill superintendents to exchange lists and

to refuse to employ blacklisted employees, though there was no agreement or obligation to do so other than a tacit understanding and mutual courtesy with reference to the matter. It was also shown by the testimony of the plaintiff and his witnesses that employment was refused at a number of mills in a designated association to all workmen whose names were on these lists.

Judge Gary then said:

It will be observed that the foregoing testimony is of two kinds—direct and circumstantial. Even though it be conceded that the direct testimony only tended to prove that the defendant and other mills sustained toward each other a relation denominated a courtesy or understanding, but that it did not tend to show an agreement that they would not employ those blacklisted by any of said mills, still it does not follow that there was error in refusing to grant a nonsuit, direct a verdict or order a new trial. If the circumstantial evidence tended to show that the relation which the mills sustained toward each other was so intended and did have the direct effect of preventing those who were blacklisted by one mill from getting employment at the others, then it would make very little difference whether such relation was called a courtesy, or an understanding, or an agreement, as it is the result which is expected to follow from the relation, and not the name by which it is called, that characterizes it. (*Blackwell v. Mtge. Co.* 65 S. C. 105, 43 S. E. 395.) In other words, a person is presumed to intend the natural consequences that may reasonably be expected to result from his act. (*State v. Chemical Co.*, 71 S. C. 544, 51 S. E. 455.) Therefore, if the plaintiff was prevented from getting employment at the other mills as the direct or proximate result of being blacklisted by the defendant, then it could reasonably be inferred that there was such an understanding or agreement between the mills as naturally to cause such result, and such understanding or agreement would in effect constitute a conspiracy; the name by which it was called being immaterial.

In considering the circumstantial evidence, even if no single fact is sufficient to establish prima facie a conspiracy, nevertheless, when the several circumstances are considered together, they may have such effect. The rule is thus stated in *Dantzler v. Cox*, 75 S. C. 334, 55 S. E. 774: "The ninth exception assigns error in overruling the motion for a new trial on the ground that there was no testimony to support the verdict. While there was no direct and positive testimony sustaining the defenses set up in the answer, still there were facts and circumstances from which the jury might properly have drawn the inference in favor of said allegations. The rule is thus stated in *Railroad v. Partlow*, 14 Rich. Law, 237: 'It may be that no one of the facts would of itself warrant the inference, and yet, when taken together, they may produce belief, which is the object of all evidence.' In 1 Greenleaf, Ev. sec. 51a, it is said: 'It is not necessary that the evidence should bear directly upon the issue. It is admissible if it tends to prove the issue, or constitutes a link in the chain of proof, although alone it might not justify a verdict in accordance with it. All the circumstances mentioned in this ground may be regarded as links in the chain of proof, from which the jury might deduce the inference of the defendants' privity and direction in the acts of tres-

pass. This is usually the case where an issue depends on circumstantial evidence." This principle is affirmed in *Wertz v. Railway*, 76 S. C. 388, 57 S. E. 194. The circumstances tending to show a conspiracy are (1) the keeping of a blacklist by the mill discharging the employee, not only as a matter of information for itself, but also for the benefit of those mills with which it sustained a certain relation denominated a courtesy or understanding; (2) the fact that as a result of such courtesy or understanding a discharged employee was prevented from getting employment at any of the other mills. These facts at least tended to establish an implied agreement which was in effect a conspiracy, and the exceptions raising this question are overruled. As the appellant's attorneys concede that the charge of the presiding judge upon the question of conspiracy was free from error, it is unnecessary to discuss the law upon that phase of the case.

Having reached the conclusion that there was testimony tending to show a conspiracy, we proceed, lastly, to consider the twenty-first and twenty-fifth exceptions, which assign error on the part of the presiding judge in refusing to charge when requested by the defendant's attorneys that the plaintiff was not entitled to punitive damages. There are two reasons why the request to so charge was not erroneous: (1) The conspiracy alleged in the complaint imports an intentional wrong, and for such wrong punitive damages are recoverable. (*Pickens v. Railway*, 54 S. C. 498, 32 S. E. 567.) (2) The refusal of the defendant to withdraw the name of the plaintiff from the blacklist after becoming aware of the fact that he was not a striker, and that he could not get employment at the other mills while his name remained upon the blacklist, tended to prove malice.

It is the judgment of this court that the judgment of the circuit court be affirmed.

EMPLOYER AND EMPLOYEE—INTERFERENCE WITH RELATION—CONSPIRACY TO DESTROY TRADE—*Globe and Rutgers Fire Insurance Company v. Firemen's Fund Fire Insurance Company*, Supreme Court of Mississippi, 52 Southern Reporter, page 454.—The first company named had sued in the circuit court of Adams County to recover damages from numerous rival companies for tort. The company's declaration alleged a conspiracy by the various companies named to deprive it of the services of its experienced and valuable agents and to compel it, as far as they were able, to leave the State. The declaration was demurred to as not offering facts constituting grounds of action and for other reasons. This demurrer had the effect, so far as the hearing thereon was concerned, of admitting the truth of the statements contained in the declaration. The demurrer was sustained by the lower court, whereupon the complainant company appealed, and secured a reversal of the judgment of the lower court. The grounds for this ruling appear in the following portion of the opinion of the supreme court, as delivered by Judge Mayes.

Having stated the facts, Judge Mayes said:

The declaration states facts which show that defendants are not in the mere exercise of just rights, but that they are wickedly, unlaw-

fully, and maliciously interfering with plaintiff's employee for the sole purpose of harming it. Under the facts alleged in the declaration, it may have been perfectly permissible for the defendants to have employed the agent of plaintiff and paid him better for his services. They might employ him, or any number of plaintiff's agents similarly in the employ of plaintiff, without violating any principle of lawful right, if the object of the employment was in the honest furtherance of their own business enterprises. But the facts stated in the declaration show a determination to destroy and drive plaintiff out of business, and the declaration alleges a conspiracy for this purpose. Surely no individual or corporation may maliciously and wantonly set about to ruin a competitor. As an incident to the advance of one's own business and for the purpose, he has the right to use all proper methods, and his competitors must be able to cope with his ingenuities. As is said in the case of *Martell v. White*, 185 Mass. 260, 69 N. E. 1087 [Bulletin No. 53, p. 958]: "Competition in business is permitted, although frequently disastrous to those engaged in it. It is always selfish, often sharp, and sometimes deadly." The fact that a rival in business is vanquished is not of itself sufficient to give rise to a cause of action against his competitor; but the facts must go further, and show that the contest was carried on by methods not allowable in such warfare.

For an association of persons to conspire together for the sole purpose of destroying one's business certainly transcends legitimate and lawful competitive methods. Every person must be free to ply his own calling. If he may be interfered with by having his employees driven from his service by fraud, misrepresentation, intimidation, obstruction, or molestation, and in this way have his business destroyed, the effect upon his business operations is as deadly as if the law permitted an incendiary to burn or a mob to destroy. If his business is to be destroyed, it can make little difference in result whether it be by the unlawful use of fire or unlawful intimidation or molestation. Legitimate competition he must meet, or surrender; but legitimate competition only means that all may make the best lawful use of their faculties and their means. If in so doing their competitor's business is destroyed as a mere incident of his inability to successfully contend against superior skill or means, that is but the hardship of legitimate warfare. The world is always in search of improved methods and reduction of cost.

In the case of *Employing Printers' Club v. Doctor Blosser Company*, 122 Ga. 509, 50 S. E. 353 [Bulletin No. 59, p. 361], there is to be found a lengthy and exhaustive discussion of the question involved in this case. In that case it was held that, wherever there is a malicious interference with one's employees, an action can be maintained against the party so interfering. The gist of this action is the malicious and unlawful interference with plaintiff's business, to his damage. The action would lie as well against one as against all the defendants; but the charge of the conspiracy is the basis of the right to join all in the same suit as parties defendant. It becomes, by reason of the conspiracy, the joint wrong of all conspirators.

As we have already seen from the authorities, the right to recover for malicious interference extends to all kinds of contracts; that is to say, all contracts of service whatever may be their nature. But it is argued on the part of appellees that there was no contract for

any definite period of time between plaintiff and Lawrence [the employee who was persuaded to leave service], and therefore there could be no interference which would justify the action. We do not think, under the authorities, that it makes any difference whether there was a contract between plaintiff and Lawrence for a definite period of time or not. There was a service and a quasi contract, and plaintiff had a right to have this service to continue free of malicious interference. The suit is because of a malicious and wanton interference with plaintiff's rights, and is not for the breach of any contract.

There may be some early authorities which conflict with the view of the law announced in this case; but the more modern and more just decisions, according to our view, sustain our conclusions. We were early taught that one of the maxims of the law was that "there is no wrong without its remedy." Wanton and malicious interference with one's business, with the purpose to destroy it, is a wrong that will be admitted by the most indifferent. We hardly think it necessary to pursue the discussion of this case further.

Reversed and remanded.

EMPLOYERS' LIABILITY — FELLOW - SERVANTS — ASSOCIATION THEORY—*Louisville Railway Company v. Hibbitt, Court of Appeals of Kentucky, 129 Southwestern Reporter, page 319.*—Martin Hibbitt was a motorman on street car of the company named, and was injured, it was alleged, by the negligence of another motorman in the employment of the same company. From a judgment in Hibbitt's favor the company appealed, in part on a question of instructions to the jury and in part on the ground that the two motormen were fellow-servants. The judgment of the court below was sustained. As to the question of fellow-service, Judge Carroll, who delivered the opinion of the court, spoke in part as follows:

When the servant accepts employment, the master should be held accountable for injuries inflicted upon him by the negligence of other employees over whose movements the injured servant has no control. The imposition of this duty upon the master will not render servants more indifferent to danger or lead them into conduct they would avoid if compelled to suffer the consequences of their own acts. On the other hand, it will have a tendency to make the master more careful in the selection of his servants. Let us take this case as an illustration. The motorman on the Market street car was selected and employed by the street railway company. It had opportunity before engaging his service to ascertain his competency and afterwards to observe his capacity to safely operate a car, and had the right to discharge him at any time he failed to perform in a satisfactory manner his duties. But it is safe to say that Hibbitt did not have the right to exercise any of these privileges and was not consulted as to the fitness of the other motorman to perform the service he was engaged in. And yet we are told that as between the street-car company and Hibbitt, Hibbitt must bear the burden of the other man's incompetency or negligence. There does not seem to be good reason for thus shifting responsibility to a dependent employee or for relieving the master from an obligation that as between the two should be

borne by the one clothed with power and authority. If, however, the master employs servants to labor together in a common employment, and each is so situated that he may observe the acts and conduct of the other, there is more reason why the master should be exonerated, and the injured servant has little right to complain when by attention to his associates and the manner in which they conduct themselves he can save himself from their inadvertent or negligent acts. It may well be said that the servant assumes the risk of being injured by a fellow-servant when he is so situated that he may by exercising care for himself and at the same time by keeping an eye on his colaborer avoid the injury. But if the fellow-servant doctrine is extended beyond this, there is no reasonable place at which it can stop short of the complete exoneration of the master for the negligent acts of all servants who are not superior one to the other. If the servant whose employment gives him no direct association with or opportunity to protect himself from the negligence of another servant is made to suffer for the acts of that servant merely because they happen to be working in the same building or room or place or on the same train, why should not the rule be extended to embrace all other servants of the same master without reference to where they work or whether they are engaged in the same character of work or not? The injured servant has no more opportunity to protect himself from one class than he has from the other. It is therefore illogical to say that persons who are doing identically the same kind of work for the same master, although neither has any direct association with the other, and is not so employed as that he can protect himself from the negligence of the other, are fellow-servants, but that the servants who do not happen to be engaged in precisely the same field of labor are not fellow-servants.

But there is so much confusion and conflict in the cases that it would be a difficult as well as unprofitable task to undertake to state the positions of the different courts. It would not, however, be far out of the way to say that in the various phases of the fellow-servant doctrine each court of last resort has adopted a measure or standard of liability for itself. Nearly all of them seem to recognize that it is a harsh and unreasonable rule, and yet one that is so firmly fixed in the jurisprudence of the country that it can not well be gotten rid of except by legislation. It would seem that the courts holding to what is known as the "department theory" are endeavoring to break away from the principle first declared in *Farwell v. Boston & W. R. Corp.* (4 Metc. (Mass.) 49, 38 Am. Dec. 339), which is the leading American case on the subject, that all employees of the same master, when neither occupied the position of vice principal or representative of the master, were fellow-servants in the sense we are considering, but are not prepared to abandon it altogether. We appreciate the fact that in some instances it will be difficult to apply with reasonable certainty and fairness the "association theory" that we have adopted. It may be perplexing in many cases for the trial court to draw with accuracy the line that separates servants so associated as to exempt the master from liability for an injury to one caused by the neglect of another from those servants who do not assume the risk of injury by a fellow-servant. But, at last, it is a question of fact to be settled, as are other questions of fact, by the court if the facts are admitted, and by a jury if they are in doubt. And, however troublesome its application may

appear, we have no doubt that the justice and common sense of the courts will find a way to apply it to the facts of each case that will not make it less adaptable than many other rules of law that must be adjusted to conditions as they arise and be met and solved as the right and justice of the case seems to demand. We are also aware that this rule has not been approved by many courts; but we are nevertheless of the opinion that the theory upon which it rests will not suffer by comparison with the distinctions made in the "department theory" doctrine followed by many courts.

EMPLOYERS LIABILITY—SAFE PLACE—LOW BRIDGE OVER RAILROAD TRACK—RULES—DEFENSES—*West v. Chicago, Burlington and Quincy Railway Company, United States Circuit Court of Appeals, Seventh Circuit, 179 Federal Reporter, page 801.*—Stella West sued as administratrix of the estate of Henry W. West to recover damages for his death. West was a brakeman employed by the company and was killed by striking against a sill of a low bridge while he was on the top of a furniture car, in the discharge of his duty. The accident occurred on a stormy night. The bridge had a clearance of but 19 feet 8½ inches, the usual clearance for a bridge being 22 feet, and the telltales or warning strings at the bridge had been down for a period of 6 weeks prior to the accident, though evidence was submitted that they had been replaced the second day prior to the accident. This was disputed, however, and the court of appeals held that the question was properly one for submission to the jury.

Judgment had been against the plaintiff in the circuit court for the southern district of Illinois, but this was reversed on appeal, and a new trial ordered. The opinion of the court of appeals was delivered by Judge Baker, who took up first the description of the bridge, showing its clearance of less than 5½ feet above the top of the car on which West was at the time of his injury, while he was 6 feet tall. He then said:

This was sufficient to make a prima facie case under the first charge of wrongful conduct. The ways of these great roads of commerce are maintained for the indefinite future. To erect permanent structures in such locations and relations that employees when discharging their duties are likely to be killed indicates an almost wanton disregard of human life. Under its denial the company did not conclusively overcome the prima facie showing. Such a death trap is not to be excused except by a necessity that can not reasonably be avoided. The bridge foreman testified that when an old bridge at this location was replaced by the present one it was the intention to raise the new bridge, but the commissioners objected because the grade of the approaches would be too steep. There was no proof that the commissioners objected to the raising of the bridge if the company would also raise the approaches, nor what the cost of filling the approaches would be. A civil engineer testified that the track was upgrade both ways from the bridge, and that while the clearance

could be made sufficient by lowering the track, "the grade would have to be carried out so far I should say it would be impracticable." Physical practicability was thus admitted; and, there being no evidence of how far the grade would have to be extended nor of the cost, the jury were not bound to accept an unsupported opinion that the change was financially impracticable. There was no proof to establish conclusively that the expense was beyond what a master of ordinary prudence would incur, first, out of regard for the safety of his employees; and, second, to save the damages that would accrue throughout the existence of the death trap in all cases where assumption of risk or contributory negligence could not successfully be used in defense.

With evidence sufficient to go to the jury upon the questions of the company's negligence respecting clearances and telltale, it was incumbent upon the company, in order to warrant a directed verdict, to establish affirmatively and conclusively either that West had assumed the risk or that he negligently contributed to his injury.

Judge Baker then took up the various defenses offered, as follows:

Assumption of risk of injury by the low bridge: From the teaching in *Hough v. Rld. Co.*, 100 U. S. 213, 25 L. Ed. 612, that a railroad company's negligence in building and maintaining its tracks and appurtenant structures "is not a hazard usually or necessarily attendant upon the business," nor one "which the servant, in legal contemplation, is presumed to risk," it is apparent that West, by the act of entering the service, did not agree to take upon himself the danger of the negligent lack of clearance. When, if ever, did he assume the risk?

West, 25 years old, had had 4 years' experience as a brakeman. For 2 years he had worked on this division. During several months preceding his death the trains on which he worked had passed under this bridge about 20 times a month. The fatal occasion was in the middle of the night. How often the trains on which he worked passed under this bridge in the daylight was not shown. If it might be inferred that some of his trains passed in daytime, still there was no evidence that he was ever in a position on the trains where he could see the bridge. If it might be inferred that he had noticed the bridge, that would be far from establishing that he had ever apprehended the danger arising from its presence. The record contains no evidence that any one had informed him of the particular danger nor any statement or admission that he knew of it. The knowledge, actual or constructive, that must have been brought home to West was not merely knowledge that there was an overhead bridge in this locality, but knowledge of the danger that would arise at the instant when a tall man standing erect on a high car in a moving train was about to pass under the bridge.

As bearing on the question of West's knowledge of the danger arising from this low bridge, a time-table was introduced which bore this print:

"Every man in the employ of the company that is in the train and engine service should have a copy of these time-table rules on hand.
* * * Overhead bridges will not clear a man standing on top of high cars. Employees must look out for and guard themselves accordingly."

If this rule is to be construed as a notice that the company had been and intended to continue to be negligent in the construction of overhead bridges, and as a requirement that employees, without having any particular defect called to their attention, should hunt for and at their peril find all the defects, the rule is void as being an attempted abandonment of the company's duty and an attempted destruction of the employees' right to rely upon the belief that the company's duty has been faithfully performed until notice of failure in some particular is brought home to them—void as against public policy—just as void as the efforts in bills of lading to compel shippers to assume the carrier's negligence in transportation. As an attempted notice of the particular danger at this particular place, the rule manifestly falls short. And there was no direct proof that West had knowledge of the rule. If it might be inferred from the company's custom of furnishing its brakemen with copies of the time-tables that West had been provided with a copy, the inference is not conclusive.

But, concerning permanent obstructions (the maintenance of which, unless reasonably unavoidable, is negligence per se), we think a further principle is involved, namely, that in law an employee is not bound at his peril to keep his consciousness continually charged with memories of the locations and relations of such obstacles, and that his engrossment in his duties at the time may excuse his failure to recall the impending peril. (Shearman & Redfield on Negligence (4th ed.), sec. 198; *Dorsey v. Construction Co.*, 42 Wis. 583.) So, assumption of risk being a matter of defense, it would be necessary for the company to establish not merely that West at some former time had apprehended the danger, but also that the circumstances at the time of the injury were such as not to excuse a reasonably prudent person from having the memory of the peril within the immediate field of his consciousness.

Assumption of risk from the absence of telltales: On this, the record contains the further evidence that a written notice that the telltales were down was posted on a bulletin board, and that the matter was a frequent topic of conversation among the trainmen. But there was no direct proof that West had knowledge either of the written notice or of the talk. If knowledge might be inferred, it would not be the only inference on that subject that would be warranted by a consideration of all the circumstances in the record.

We are not now saying, with respect to either the lack of clearance or of telltales, that 12 reasonable men, under proper instructions from the court, might not properly find that a prudent person, circumstanced as was West, would have known of the dangers before stepping on the high car and would either have kept off or gone ahead knowingly at his own risk. But as different inferences of ultimate facts were fairly deducible from the state of the evidence, the question of assumed risk should have been submitted to the jury.

Contributory negligence: During a storm in the night, while discharging an immediate duty, West was proceeding along the tops of the cars. We can find nothing in the circumstances on that occasion that would have compelled the jury to find as the only legally permissible finding of fact that any danger was so obvious and imminent that a reasonably prudent person would not have acted at West did.

The judgment is reversed, with the direction to grant a new trial.

INTERFERENCE WITH CONTRACT OF EMPLOYMENT—PROCURING DISCHARGE—DAMAGES—*Ruddy v. United Association of Journey-men Plumbers, etc., Local No. 24, Supreme Court of New Jersey, 75 Atlantic Reporter, page 742.*—In the district court of Newark, Antony S. Ruddy was allowed damages against the organization named for procuring his discharge from employment, whereupon the latter appealed. The appeal resulted in the judgment of the court below being affirmed in February, 1910. The facts appear in the opinion, which was delivered by Judge Reed, and is as follows:

This case was tried before a district court without a jury. The court has sent up the stenographer's notes taken on the trial, with a general finding in favor of the plaintiff. The question is whether the trial court could find in any rational view of the evidence a situation which would support this finding.

Mr. Ruddy, the plaintiff, was a plumber, and was employed as such by one William Jacobi, who discharged Mr. Ruddy. Afterwards Mr. Ruddy was employed by F. J. Sturm, and was also discharged by him. The plaintiff claims that he was discharged in both instances because one William Ryan, the business agent of Local Union No. 24 of the United Association Journeymen Plumbers, Gas Fitters, Steam Fitters, and Steam Fitters Helpers of the United States and Canada, acting for that association, caused Ruddy's employers to discharge him. There is testimony to show that Ruddy while working for Mr. Jacobi was approached by Ryan, who was admittedly the agent of the association, and that Ryan asked Ruddy to join Local No. 24. Ruddy told Ryan that he already belonged to one local union, and did not see why he should make any change. Ryan then saw Jacobi and told him that he would have to discharge nonunion men. Jacobi then discharged Ruddy, and Ryan sent Jacobi union men to take Ruddy's place, Ryan said to Jacobi: "We have union men, and you should have union men, and Mr. Ruddy is not a union man, and to harmonize matters you ought to employ union men." Again, when Ruddy was afterwards working for Sturm, Ryan went to see Sturm, and told him that he had a non-union man working for him. Sturm told Ryan that the man belonged to Local No. 5, and Ryan replied that there were objections; that the other men would not work with Local No. 5. Mr. Sturm took Ruddy off the job on which he was then working, and put him at some jobbing work elsewhere. Ryan came to see Mr. Sturm again, and said that he, Sturm, would have to lay off that man; that he was not a union man; that is, he did not belong to their local. Sturm said to him: "This job is so near completed I would like to have him finish this job." Ryan replied: "I will get you a good man." Sturm promised to discharge Ruddy the next day, when he had finished the job, and he did discharge him.

I think that from the testimony the court could draw the inference that there was a threat in two instances—that unless Ruddy was discharged the members of Local No. 24 would in a body leave the services of these two employers. The threat did not consist of a statement merely that members of Local No. 24 would not work with nonunion men, but it was a distinct warning that Ruddy must be discharged or, if he was not discharged, the employers would be left

without the means of executing their contracts. There was testimony that Ruddy was pursued from one employer to another with a determination to force him into membership with Local No. 24, and that by this pursuit it was hoped to strip him of his means of earning the wages of a mechanic, unless he acceded to the demands of the association. The court could draw the inference from the testimony that there was a general agreement that upon information received by the business agent, the walking delegate, or the members of the union, that a nonunion man was at work on the same job, that the other members would quit that work. By this combined understanding there was put in the hands of the general business agent a power not merely to call out the union members, but to call them out for the express purpose of compelling the discharge of other employees. From the testimony it could be inferred by the court that this power was exercised in the present case, and resulted in the discharge of the plaintiff. These conditions being legitimately inferable by the court, it was justified in finding a judgment in favor of the plaintiff.

LABOR ORGANIZATIONS—CLOSED-SHOP AGREEMENTS—LEGALITY—*Kissam v. United States Printing Company of Ohio et al., Mills et al. v. Same, Court of Appeals of New York, 92 Northeastern Reporter, page 214.*—The above actions were brought, the first by a stockholder and the second by employees of the company named, against the company and certain stereotypers' unions to procure the setting aside of a contract between the defendant parties for the exclusive employment of union workmen in the stereotypers' department of the company. Lower courts had sustained the right of the parties to so contract, and this judgment was affirmed on final appeal to the court of appeals, as appears from the following quotation from the opinion of Judge Werner, who spoke for the court.

After indicating who were the parties plaintiff, Judge Werner said:

In all other respects the actions are identical, and they are based upon voluminous complaints which charge the defendants with conspiring and confederating to compel the defendant United States Printing Company to enter into an agreement with the several labor unions named as defendants to the effect that from and after January 1, 1904, the said printing company would employ none but members of the several stereotypers' unions therein referred to, and would discharge all employees in its stereotypers' department who should refuse to avail themselves of the opportunity to become members of said unions. The various acts and proceedings by which this agreement was brought about are set forth in great detail, with appropriate allegations of their illegality, and these are supplemented by the assertion that the agreement is void because induced by coercion. The complaints are further amplified by allegations that the agreement, thus unlawfully entered into with reference to the stereotypers' department of the United States Printing Company, is to be followed by similar agreements designed to control the action of that corpora-

tion in the conduct of all its other departments; that the effect of such action will be to cause the discharge of the plaintiffs and many others similarly situated and to prevent them from obtaining employment elsewhere; that owing to the peculiar and far-reaching methods employed by the labor unions referred to, and the fact that they are unincorporated bodies or associations composed of many hundreds of members, the plaintiffs have no adequate remedy at law, and will have no remedy at all unless the agreement between the United States Printing Company and these unions is declared void and the defendants are restrained and enjoined from carrying out its provisions.

A preliminary injunction was issued, the specific provisions of which need not be recited, and that was subsequently modified in certain particulars. Thus the record stood when the case was brought to trial. Much evidence was introduced, and some of it bears most cogently upon questions which lie at the very foundations of the relations between employer and employee, not merely as individuals, but as organized bodies, whose purpose it is to induce or exact rights and privileges which must interfere, more or less, with individual freedom of action. If these questions were open for consideration by this court, they would be interesting and perplexing, for they involve legal and sociological problems of the highest importance. But they are not open to us. The unanimous affirmance by the appellate division (see 128 App. Div. 889, 112 N. Y. Supp. 1134, and 128 App. Div. 890, 112 N. Y. Supp. 1137) of the judgment entered at special term limits our investigation to the correctness of the legal conclusions upon the facts found by the trial court. We are bound to assume that the facts found are supported by the evidence, and if the legal conclusions are sustained by these findings the judgment must be affirmed.

The learned trial court found that the execution of the agreement between the United States Printing Company and the several labor unions resulted in great financial benefit to the former and disposed of the differences between the parties; that the agreement was not entered into for the purpose of gratifying malice against the nonunion employees of the printing company, or of inflicting injury upon them; that it was not the object of the defendants to compel the plaintiffs to join the unions; that no pressure so imperative, as to amount to compulsion, was exerted upon the printing company with regard to the discharge of the plaintiffs from their employment; and that there was no conspiracy to compel the plaintiffs to join the unions or solely to injure them in their employment.

Upon these findings of fact the learned trial court based the legal conclusions that the agreement was in all respects lawful, that it was not entered into under duress, that no unlawful act has been committed by the defendants, and that the complaint should be dismissed. These conclusions are in accordance with the decisions of this court arising out of similar or analogous conditions (*National Protective Association v. Cumming*, 170 N. Y. 315, 63 N. E. 369; *Jacobs v. Cohen*, 183 N. Y. 207, 76 N. E. 5; *People v. Marcus*, 185 N. Y. 257, 77 N. E. 1073), and the judgments in both actions must therefore be affirmed, with costs.