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A SUGGESTED PROGRAM OF INDUSTRIAL
ACCIDENT PREVENTION FOR INDIA BASED
ON AMERICAN PRACTICES

Thesis for the Degree of M. A.
MICHIGAN STATE COLLEGE

Jadurai L. Rupani
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This is to certify that the

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*A Suggested Program of
Industrial Accident Prevention for
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Rollin H. Simonds
Major professor

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A SUGGESTED PROGRAM OF INDUSTRIAL ACCIDENT PREVENTION
FOR INDIA BASED ON AMERICAN PRACTICES

By

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Chapter I

INTRODUCTION

Why This Subject was Selected for Study

India is an agricultural country. 86% of the people live in the villages. 14% of the total population is engaged in industries like textile, mining, chemical, etc. Industrialization is in its infancy. It has many chances to develop its industries. Textile, iron and steel, chemical and jute manufacturing industries are considerably developed in the country. There is continuous movement of population from rural to urban areas. Surplus population in agriculture find employment in the cities where industries are conducted, with the result that the present trend of the people is to move towards industries. Accidents are common and are increasing with the greatest speed. Very few accident prevention methods are practiced. Government tries to protect the interest of the workers through factory and compensation laws, but the management does very little in the direction. Management is working in that direction but they do not have enough suggestions and definite schemes. Study is needed in that direction and the main purpose of this study is to enable Indian industries to adopt some

of the safety suggestions. Suggestions for accident prevention are made on the basis of American practices but much attention is paid to make it suitable for Indian business conditions, hence they may be found much useful.

Its Importance, Implication and Application

Industrial safety and security of jobs is the real challenge to the industry today in every country. Existing laws and rules in many countries require in varying degree that the work places be maintained in safe conditions, adequate first-aid facilities be provided, accidents be reported and employees be compensated when accidentally injured. Management should not care for increased production at the cost of lives of its employees.

The State of This Study Up to Date

The subject of industrial safety is in its youth as compared with the other subjects of industrial relations but due to its youthfulness, it is full of abundant energy. Very few industrialists realized the value of accidents in terms of human deaths and volume of production. American Society of Engineers has been functioning for 35 years and it takes keen interest in the field of industrial safety. The National Safety Council is the

prime safety organization in America. It renders many important services in the field of accident prevention. It has functioned since 1913. They collect thousands data, investigate causes and suggest remedies in their annual proceedings. They publish a monthly magazine and provide a continual flow of safety materials to their thousands of members. Since World War II, this organization has become much more important in the field of safety and the narrative account is available since then. They have been publishing "Accident Facts" every year. This report mainly consists of collection of data on the nature and causes of accidents. H. W. Heinrich, Assistant Superintendent of Engineering and Inspection Division of the Travelers Insurance Company worked on "Industrial Accident Prevention" and made a scientific approach to it. His work is mainly on philosophical, psychological and educational aspects of the subject.

During the war, the division of industrial hygiene of National Institute of Health prepared a manual of industrial hygiene and published it in the year 1943. The work has been mainly done on the prevention and control aspects of diseases in industries particularly along the line of public health and sanitation requirements. H. H. Judson and James M. Brown, professional engineers of New York have worked on occupational accident prevention. They have suggested in their book some of the

safety activities and improvements of the plants. Woodbury, Arthur H. Reede of Harvard University and W. R. Dittmar have worked on workmen's compensation laws which is one of the important aspects of safety plants.

Since then, Dr. R. H. Simonds of Northwestern University did work on the cost aspect of safety. Very few persons have made objective studies on the cost problem of safety even in America. This work has provided a sound basis for calculating the money value of accident reduction. He has proved cost of accidents to industries in terms of money, production and man-hour losses.

As regards India, no such specific type of work has been done in the field of accident prevention. Subject of production in the field of business administration has been neglected. Less amount of output, larger number of working hours, low wages and more physical labor is required to operate machines. The idea of mass scale production is not yet in practice. In a country like India where millions of people do not even find bare necessities of life, mass scale production would result in more supply with less prices. The present trend of the National Government is towards industrialization and with the growth of many industries, production will involve many problems and problems like industrial safety will be given enough consideration.

Chapter II

ACCIDENT STATISTICS IN U. S. A.

Importance of Accident Statistics

United States, today is the most mechanized country in the world. Its industrial economy has given tremendous prosperity and increase in the living standard. Yet associated with it, the modern developments are the increasing number of accidents. The loss of manpower to the nation can be judged from the statistics in table 1, in which the accidental deaths are compared with those caused by diseases for the years 1944, 1945, 1946, and 1948.

Throughout the years 1944-1948 it is found that only three diseases caused more deaths than accidents. They are heart disease, cancer, and cerebral hemorrhage. 135 to 323 deaths per 100,000 resulted due to heart disease in those years. Those caused by cancer and cerebral hemorrhage during the same period were 135 to 129, and 76 to 94 respectively. Eleven years ago deaths caused by Nephritis and Pneumonia were more than those caused by accidents, but improved medical facilities have dropped down these casualties by about 28% in case of Nephritis and 54% in case of Pneumonia. The drop in accidental

Table 1*

Cause of Death	Deaths per 100,000			
	1944	1945	1946	1948
Heart Disease	135	321	307	323
Cancer	129	134	130	135
Cerebral Hemorrhage	94	86	78	76
ACCIDENT	72	73	70	67
Nephritis	69	67	58	53
Pneumonia	49	44	38	35
Tuberculosis	41	40	36	30

deaths during that period was only 11 percent. Even during the four years 1944-1948 period, it is seen that deaths due to cerebral hemorrhage dropped down from 94 in 1944 to 76 in 1948, registering a steady decline. During the same period accidental deaths have moved down only to 67 in 1948, from 72 in 1944. It may happen that in years to come even cerebral hemorrhage may cause less deaths than accidents. The National Safety Council further points out: "If you make a 10 minute safety speech - 2 persons probably will be accidentally killed and 200 injured while you talk, costs will amount to \$135,000."¹

* The table has been composed from the "Accident Facts" reports of National Safety Council, 20 Wacker Drive, Chicago. The years reports consulted were 1946, 1947, 1948, and 1949.

¹ "Accident Facts," National Safety Council publication, 20 Wacker Drive, Chicago 6, Ill., year 1946, page 17.

The devastating effects of accidents may be brought out more clearly from Tables 2 and 3. The ages of victims of accidents are studied.

Table 2

Sex	Deaths per 100,000			
	1944	1945	1946	1948
Male	106	107	99	93
Female	41	42	42	42

Table 3

Age	Deaths per 100,000			
	1944	1945	1946	1948
All ages	71.8	72.7	70.8	67.1
0 to 4	62.6	58.9	59.3	335.6
5 to 14	30.6	31.1	28.1	24.6
15 to 29	69.3	61.9	61.9	55.4
25 to 44	49.2	50.8	49.5	46.6
45 to 64	68.2	70.6	70.0	65.9
65 & over	280.6	290.7	285.4	284.0

It is seen from Table 2 that the accidental deaths in males are considerably higher than those of females.

In 1944, 106 deaths per 100,000 resulted, the figures in 1948 were 93, a drop of 13, in the females, however the death rate has remained practically the same.

The age group to be affected the most in 1944 were, in decreasing order of magnitude: (1) 65 years and above; (2) between 15 and 24; (3) between 45 and 64; and (4) between 0 and 4. The decline in the death rate has not remained uniform and in 1948 the positions were (1) 65 and above, (2) 45 to 64, (3) 5 to 14, and (4) 0 to 4.

In 1944, 280.6 persons per million died in the first group. Four years later they died at a slightly increased rate but since it represents a group in which most of the constructive energy is already spent, it is not so important.

Children between the age of 0-4 died at the rate of 62.6 per million in 1944. In 1948 their death rate was 55.6 per million, registering only a slight decline. This is a serious disadvantage as it reduces the manpower which otherwise would be available after 15 years.

Accidental deaths in the age group of 15 to 24 is yet another serious drainage as it deprives the actual working manpower. In 1944 their death rate was 69.3 per million and in 1948 55.4. It is gratifying to note that the decline in accidental deaths in this group is the strongest. Fewer deaths have also resulted in the group with age limits of 45 to 64. In 1948 the death

rate in this group was 65.9 per million as compared to 68.2 per million in 1944.

It is thus seen that accidents take a heavier toll than that taken by some diseases, that males have higher deaths due to accidents than females and the children and youths between 15 and 24 are the most important groups affected.

Types of Accidents

Accidents in different spheres of life are compared in Table 4, for the years 1945, 1946, 1947, and 1949. The major fields in which the comparisons are made are, motor vehicles, public non-motor vehicles, workers off job, occupational and home.

Total accidental deaths during the years 1945 to 1947 increased from 96,000 in 1945 to 97,000 in 1947, but decreased suddenly to 91,000 in 1949. Injuries also followed a similar trend registering 10,60,000 as maximum in the year 1946. The motor vehicle accidents kept up an increase from 28,600 in 1945 to 32,300 in 1947 and dropped slightly to 31,500 in 1949. The injury during the same periods were highest, in 1946 about 1,200,000 but dropped in later years. In 1949, 1,100,000 injuries were caused. Occupational accident deaths were 17,000 in 1947 which is the highest number but dropped to 15,000 in 1949. Injuries in the same group recorded a similar

Table 4

Type of Accidents	1945	1946	1947	1949
All Accidents				
Deaths	96,000	99,000	100,000	91,000
Injury	10,250,000	10,400,000	10,600,000	9,500,000
Motor Vehicles				
Deaths	28,600	33,700	32,300	31,500
Injury	1,000,000	1,200,000	1,150,000	1,100,000
Occupational				
Deaths	16,000	16,500	17,000	15,000
Injury	2,000,000	2,050,000	2,050,000	1,850,000
Worker's Off Job				
Deaths	29,000	36,000	32,000	31,500
Injury	2,500,000	3,250,000	2,700,000	2,600,000
Public Non-motor Vehicles				
Deaths	15,500	17,000	18,000	15,500
Injury	1,850,000	2,100,000	2,200,000	1,950,000
Home				
Deaths	33,500	33,000	34,500	31,000
Injury	5,000,000	4,950,000	5,200,000	4,650,000

change, dropping to 1,850,000 in 1949 from 20,500 in 1948. Deaths due to accidents in workers off job rose sharply in 1946 and so did the injuries but dropped down considerably in recent years. Accidental deaths in home were highest in 1945 and so were the injuries in the homes in 1949, they fell to second place for deaths and remained in the first for injuries. Public non-motor vehicle

recorded the least number of deaths in 1945 though not the injuries. Its relative positions changed but the number of accidents were practically the same in 1949. Injuries however increased.

Among these groups, the occupational group has considerable importance even though it is not the highest in incidence. The reason for this is that injuries and deaths in this field lead to working hour loss, loss of manpower, higher cost of production and economic disturbance since these accidents involve people who are engaged in active work. Rest of the work shall be devoted to the study of various aspects of occupational accidents.

Accident costs are magnified 4 times by indirect losses. The high indirect cost of industrial accidents - 4 times as great as the direct cost should be regarded as an important factor while determining costs. Authorities agree that the indirect cost of industrial accidents involving injuries to persons is four times greater on the average than the direct cost of medical payments and disability benefits. Indirect costs are costs of time lost by other employees who stop work out of curiosity, out of sympathy or to assist the injured employee, cost due to the damage to the machine, incidental costs due to the interference with production, failure to fill orders in time and payments of forfeits.

Direct costs are the cost of medical payments,^{and} disability benefits.

Graphical representation is made in Graph 1.

It is seen that both the frequency and severity rates have come down appreciably from 1926. The decrease in these rates is not however uniform but shows occasional ascending tendencies also. It is found that both these rates are considerably higher in 1929 and 1941 in comparison to the years immediately preceding them. By about 1941 the decrease is very slow and no appreciable results are produced until 1946. After 1946, however the decline in both these rates is rapid and last year it has hit the minimum record ever reached. It is to be studied whether this decline goes on uniformly now or both these rates will go up slightly as before. In general when trends for both severity and frequency rates examined, it is found that considerable decline in both the rates has taken place. The decline however is not uniform. This decline is due to definite steps taken to minimize the accidents.

The same conclusion is confirmed in Table 6, for some of the industries. The industries thus examined are automobile, chemical, electrical, petroleum, railroad, steel and textile. The table is given on page 15. In this table are given the frequency and severity rates for the years 1945, 1946, 1947 and 1949. In each of the industries a = Frequency rate, and b = Severity rate.

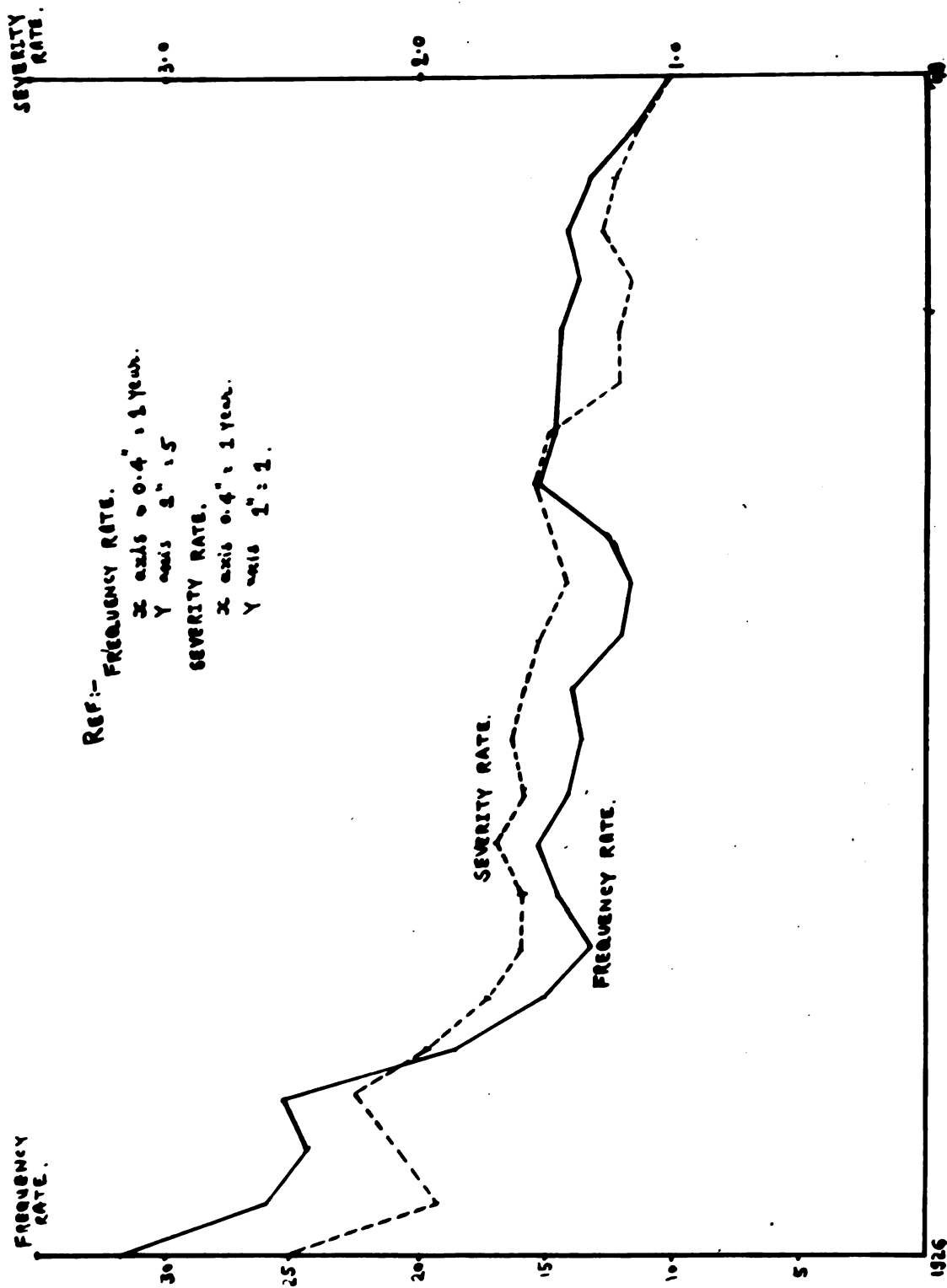


Table 5

Year	Number of Units	Frequency Rates	Severity Rates
1926	1725	31.87	2.50
1927	2089	25.95	1.88
1928	2552	24.52	2.03
1929	3603	25.39	2.25
1930	4118	18.47	1.97
1931	4383	15.12	1.72
1932	3937	13.20	1.59
1933	3776	14.56	1.59
1934	3866	15.29	1.70
1935	3796	14.02	1.58
1936	4093	13.57	1.64
1937	4032	14.05	1.58
1938	4497	12.18	1.53
1939	4734	11.83	1.42
1940	5163	12.52	1.44
1941	5325	15.39	1.53
1942	5537	14.68	1.49
1943	6060	14.52	1.20
1944	5857	14.46	1.21
1945	6262	13.63	1.16
1946	6212	14.16	1.28
1947	6634	13.26	1.23
1948	6707	11.49	1.12
1949	7185	10.14	1.02 ¹

¹ "Accident Facts," National Safety Council report, 1950, page 28, 20 N. Wacker Drive, Chicago, Illinois.

Table 6

Industries	1945	1946	1947	1949
Automobile				
a	10.29	11.10	10.06	6.35
b	.62	.83	.66	.57
Chemical				
a	10.08	10.09	8.86	5.72
b	1.06	.86	.92	.60
Electrical				
a	6.34	7.36	6.02	4.83
b	.44	.53	.45	.38
Petroleum				
a	14.38	13.61	13.16	10.54
b	1.33	1.48	1.33	1.03
Railroad				
a	15.37	11.14	8.08	8.35
b	1.44	1.09	1.11	1.62
Steel				
a	7.23	7.19	6.08	4.96
b	1.75	1.69	1.60	1.49
Textile				
a	12.13	11.44	8.83	7.88
b	.68	.78	.54	.57

Frequency rate is the number of disabling occupational injuries per million man-hours exposure while the severity rate is the total time charged for occupational injuries per thousand man-hours of exposure. The time charges for each injury include actual calendar days and arbitrary charges for deaths and permanent disabilities based on a time charge of 6000 days for a death.

All these industries have decreased their frequency and severity rates in 1949, than in 1945, yet three of them have maximum frequency and severity rates in 1946, such industries are automobile, chemical, and electrical. Those in which these rates were not maximum in 1946 had a negligible change in 1946 as compared to the decline in these rates in post 1946 period. Railway industry had the highest frequency rate of 15.37 and severity rate of 1.44 in 1945. Next to it were Petroleum and Textile industries with frequency rate of 14.38 and 12.13 respectively. Their severity rates were 1.33 and .68. The highest severity rate was in steel industry of 1.75. The lowest frequency and severity rates were in electrical industries. In 1949 petroleum industry in spite of its appreciable amount of drop had highest frequency rate of 10.54. The railroad had the highest severity rate of 1.62. The lowest in both these rates in the year 1949 was also electrical engineering with frequency rate of .83. It is interesting to note that the severity rate of railways has suddenly shot up in 1949.

It is now proposed to study influences of various agencies in causing permanent disabilities and death during the period 1937-1941. These causes are divided into three groups. They are: (a) unsafe acts; (b) personal cause; (c) mechanical causes.

Tables 7, 8, and 9, which are given on the following page give the percentage of these accidents during these years. Tables have been compiled from the "Accident Facts" reports of National Safety Council of the years 1944, 1945, 1946, and 1948.

Both mechanical and personal causes have created 4818 accidents during the same period. The other group of unsafe acts has slightly less number of accidents - 3112. Improper attitude caused by 50% of the accidents among those due to personal reasons. Lack of knowledge and skill caused another 30%. The two factors contributing between them 80% of the total caused by personal reasons. Both these factors can be very effectively reduced by imparting proper knowledge and skill, since improper attitude may arise frequently from lack of knowledge. Employment of skilled and intelligent labor may also reduce accidents considerably. Among the accidents caused by mechanical causes, hazardous arrangements begs 36% and improper guards and defect again claim 25% and 15% respectively. Unsafe dress causes 6% of the accidents in this group. All these factors can be very effectively controlled. The most unsafe acts causing accidents are unnecessary exposure to danger, unsafe use of equipment and work on moving equipments respectively, causing 25, 15 and 14% of accidents caused by unsafe acts.

Table 7
Accidents Caused by Unsafe Acts

	Number of Accidents	Percent
Total Accidents	3112	100
Unnecessary Exposure to Danger	796	25
Unsafe Use of Equipment	467	15
Work on Moving Equipment	428	14
No Protective Equipment Used	275	9
Improper Starting or Stopping	284	9
Overloading and Poor Arranging	214	7
Making Safety Devices Inoperative	157	5
Operating at Unsafe Speed	93	3
No Unsafe Act	398	13

Table 8
Accidents by Personal Cause

	Number of Accidents	Percent
Total Accidents	4818	100
Improper Attitude	2376	50
Lack of Knowledge or Skill	1457	30
Bodily Defect	102	2
No Personal Cause	883	18

Table 9
Accidents by Mechanical Cause

	Number of Accidents	Percent
Total Accidents	1418	100
Hazardous Arrangement	1634	36
Improper Guarding	1214	25
Defective Agencies	747	15
Unsafe Dress	277	6
Improper Ventilation	32	1
No Mechanical Cause	914	19

It is found that accidents are near the top among the causes of death and that the accident rates have declined less than the death rates of many diseases. Occupational accidents are one of the important losses of accidents. The modern trend in various industries points to sharp decline in frequency and severity rates in 1946-1949 period. Among some of the more important causes of accidents are:

- (1) Improper attitude
- (2) Lack of Knowledge and Skill
- (3) Hazardous arrangements
- (4) Handling improper equipment
- (5) Unnecessary exposure to danger
- (6) Unsafe use of equipments

Chapter III

EFFECTS OF ACCIDENTS ON PRODUCTION

Even though accidents are not considered tolerable in any society, the financial problems often dominate the practical situation. No industrial administrator likes to run his industry at a loss and, therefore, is likely to judge the preventive measures on a profit and loss basis. He may tolerate the preventive measure, the application of which in industry does not give any extra profit but he will certainly not tolerate any measures likely to produce net loss. Therefore estimates for the savings made by the preventive measures must be accurately made. Accidents have therefore been studied by analyzing cost of production, cost of accidents and cost of injuries, etc. It has been found that annual reports of accidents expressed in terms of dollars lost due to accidents carry to the management as much meaning as those expressed in terms of severity and frequency rates would. In this chapter is studied cost of accidents and other financial aspects of industrial accidents.

In Table 10 are reported the cost of accidents in millions of dollars for the years 1945, 1946, 1947, and 1949. These costs have been subdivided as those due to

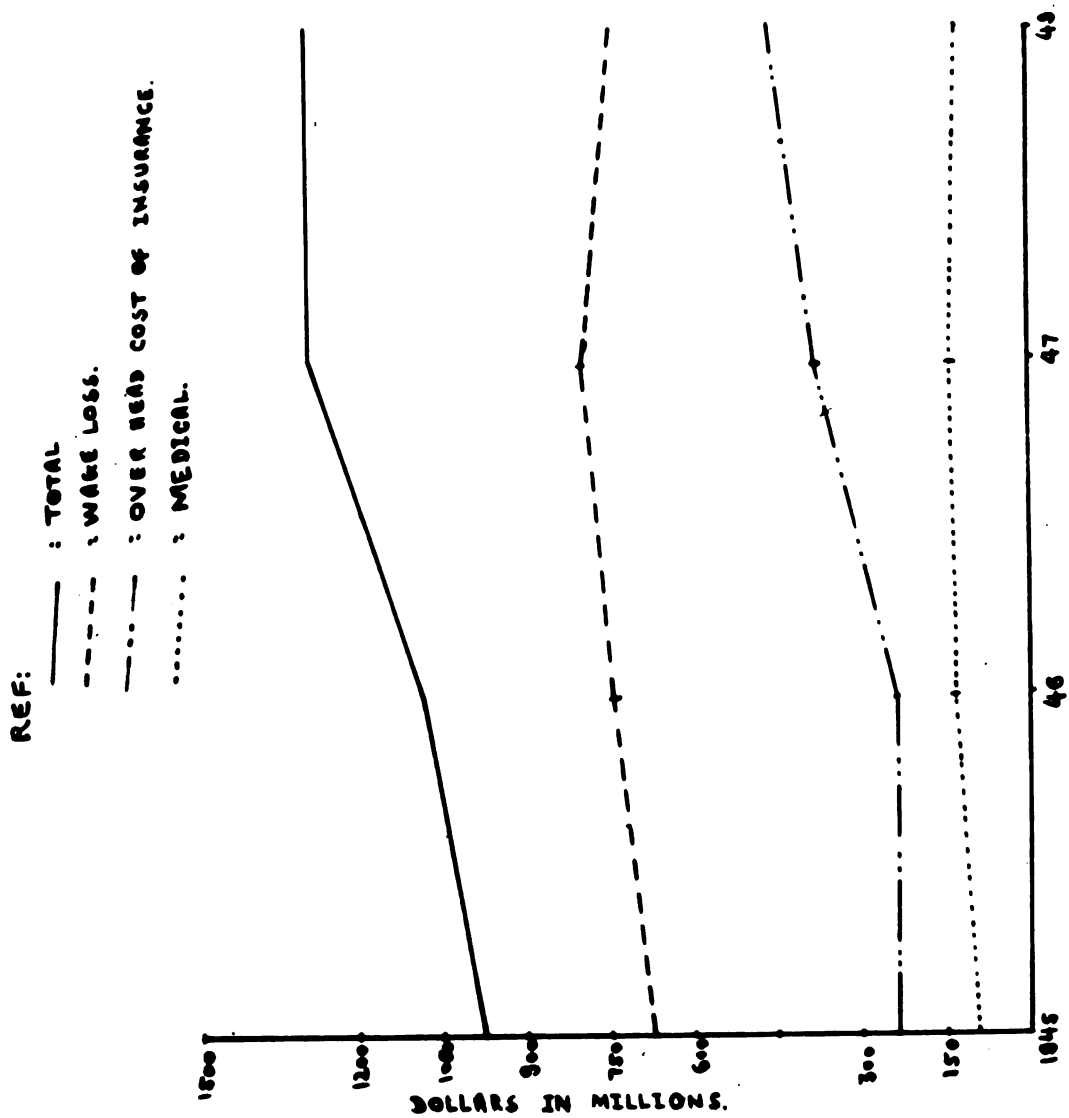
Table 10

	Dollars in Millions			
	1945	1946	1947	1949
Total	1000	1100	1300	1300
Wage Loss	680	750	800	750
Medical	100	130	140	120
Overhead Cost of Insurance	240	240	380	450

wage losses, medical expenses and overhead costs of insurance.

Total costs in occupational or industrial accidents have gone up steadily since 1945 to 1947 from one thousand million dollars to 1300 million dollars. They have remained steady in 1949 at the 1947 level. Wage losses which were steadily increasing from 1945 to 1947, dropped to 750 millions in 1949 from 800 millions, in 1947. The hospital expenses also show a trend parallel to that of wage losses. In 1949 they dropped to 120 millions from 140 millions of 1947, only losses which kept a steady increase throughout all these years were overhead costs of insurance. They have arisen from 250 millions in 1945 to 450 millions in 1949.

It was shown in the severity and frequency rates given in Graph 1 and Table 5 on pages 13 and 14 in Chapter II that both these rates increased during the period 1941



to 1946 but dropped down considerably in recent years and recorded a minimum in 1949. The costs of accidents did drop down as sharply as the severity and frequency rates, but in many spheres a drop is definitely recorded. In some cases the loss is maintained at the level of previous years. A sharp agreement between the two data may not be expected due to other factors like inflation and subsequent higher wages paid to labor. These have tended to increase the actual loss per loss of man-hour. Yet the close relation between the prevention of accidents and lowering of these losses could readily be seen from the above comparison.

Time lost by accidents is yet another measure whereby the cost of accidents can be figured out as in the absence of accidents much time could have been utilized for increased production and subsequent higher profits. The time thus lost can be divided into two groups as reported in Table 11. The first one includes the time lost by injured workers and includes hours lost due to absence, leave for hospitalization or during treatment, etc. The second one is that of time lost by other non-injured workers. This is caused by those who rush down to the scene of accidents, give aid to the victims, watch them and discuss the causes and results of the accidents. The first loss can be reduced only by reducing the number of accidents. In Table 11 are given

Table 11
Time Lost in Millions of Man-days

	1945	1946	1947	1949
Total time lost	276	280	280	275
By injured workers	46	48	48	45
By other workers	230	230	230	230

the time lost by industries in millions of man-days during the years 1945, 1946, 1947, and 1949.

276 million man-days were lost in 1945 out of which 46 million man-days were by injured workers and 230 million man-days by non-injured workers. Thus the time lost by non-injured workers was 5 times as much as that lost by injured workers. The trend of this loss has increased from 1945 to 1946 to 280 million man-days. In 1947 it has remained at the level of 1946 but dropped down in 1949 to 275 million man-days. This figure is the minimum during the years 1945 to 1949 and represents the saving of 5 million man-days from 1947. The time lost by injured workers also shows a similar trend. Its minimum of 45 million man-days loss in 1949 represented as saving of 3 million man-days from the 48 million man-days loss in 1947. The time lost by non-injured workers has remained steady throughout this period at the level of 230 million man-days.

This data compares favorably with the severity and frequency rates shown in Table 5 of Chapter II and costs of accidents in Chapter III. The severity and frequency rates increased till 1946 from 1941 and then reached a minimum in 1949. Costs of accidents increased up to 1947 but kept the same level in 1949. As compared to this, the time lost due to accidents increased up to 1946, remained steady in 1947 but dropped to a minimum in 1949. Thus it is seen that the time lost has a close connection with costs of accidents and severity and frequency rates.

Table 12 presents the losses in terms of millions of dollars during the years 1945, 1946, 1947, and 1949. These losses have been classified according to the agencies which caused them. The group studied are accidental injuries, property damaged due to motor-vehicle accidents, fire losses and other costs of occupational accidents.

Total loss incurred has constantly arisen from 5100 million dollars in 1945 to 7500 million dollars in 1949. The greatest single group for expenses is that of accidental injuries. In 1945, 2700 million dollars were lost in this group. In 1949 the loss was 4400 million dollars. The fire losses also show a tendency similar to the previous two groups. They increased from a 484 million dollars in 1945 to 652 million dollars in 1949. The property damage due to motor-vehicle accidents rose

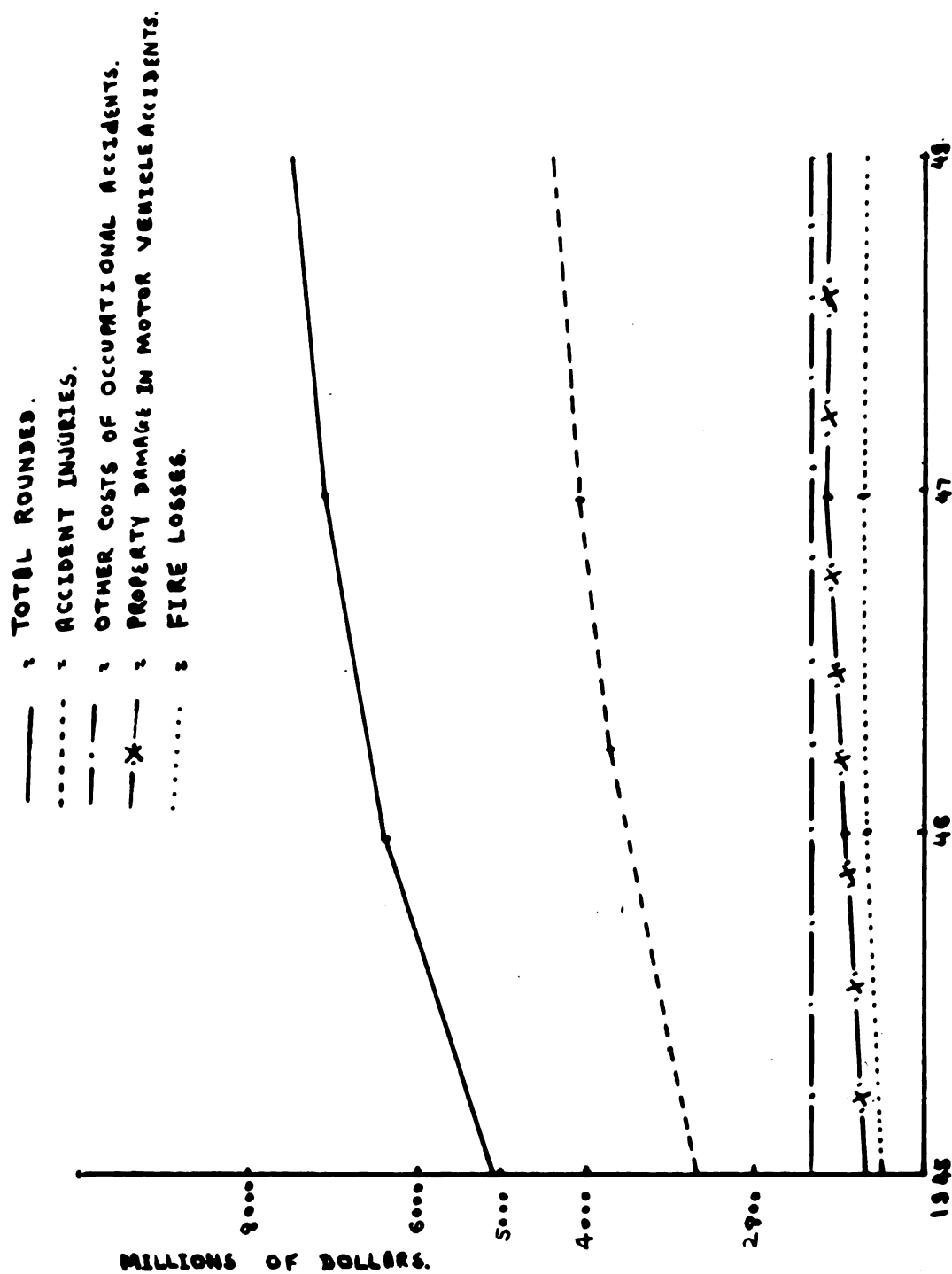


Table 12
(figures in millions of dollars)

	1945	1946	1947	1949
Accidental injuries	2700	3600	4100	4400
Property damage in Motor-vehicle accident	650	900	1100	1100
Fire losses	484	554	648	652
Other costs of Occupational accidents	1300	1300	1300	1300
Total (rounded)	5100	6400	7100	7500

to 1100 million dollars in 1949 from 650 million dollars in 1945. Other costs of occupational accidents has remained steady during these years.

In Table 13 are compared the losses undergone in various occupancies during the years 1944, 1945, 1946, and 1948, due to one of the above agencies, namely fires. The figures represent losses in millions of dollars.

In 1944 the total loss caused by fire was 456 million dollars; it increased continuously during the subsequent years and in 1948, 714.8 million dollars were lost. Dwelling occupancies suffered the greatest financial loss due to fires. In 1944, they lost 112.5 million dollars. This loss was temporarily reduced to 108 million dollars in 1945 but increased in 1946 and 1948. The loss in 1948 was 201.4 million dollars. The mercantile industry

Table 13
(losses in millions of dollars)

	1944	1945	1946	1948
Total	456	485	580	714.8
Dwelling occupancies	112.5	108	152.5	201.4
Mercantiles	87.5	115	146.3	168
Manufacturing	98	85.4	107.1	147
Public buildings	68.65	40.1	30.4	37.4
Miscellaneous	87.35	131.5	139.5	161
Fires, other than buildings	2	5	4.2	40.9

was the third biggest occupancy to suffer in 1944. Its loss was 87.5 million dollars but it rose to second place in 1948 losing 168 million dollars in that year. The increase in the losses was continuous. Manufacturing occupancy lost 98 million dollars in 1944 being second in loss in that year. In 1945 it dropped to 85.4 million dollars. In 1948 it was the third occupancy on the loss basis. This drop in the position did not indicate a drop in the dollars lost. On the other hand the losses have continuously risen from 1945 to reach 147 million dollar loss in 1948. Public buildings was the only group which showed an actual decrease in the losses. In 1944, 68.65 million dollars were lost, whereas in 1948 only 37.4 million dollars were lost. The figure of 1948

however is greater by 7 million dollars than the 1946 amount which was 30.4 million dollars. The loss therefore did not decrease uniformly in this group. Fires other than the buildings have caused many times more losses in 1948 than in 1944. In 1944 two million dollars were lost but in 1948, the loss amounted to 40.9 million dollars. Though the relative positions of various groups have changed slightly. All the fields excepting one have shown increased losses in 1948 as compared to 1944.

In Table 14 are compared the losses incurred by fires in various industries for the years 1944, 1945, 1946, and 1948. The industries that are thus compared are flour mills and elevators, wood workers, metal workers, railroads and other manufacturings in general. The losses are reported in millions of dollars.

Flour mills and elevators lost 20 million dollars in 1944. In 1945 the losses dropped down to 13 million dollars but increased suddenly in 1946 to 26 million dollars and were 25 million dollars in 1948. The woodworkers lost 11.75 million dollars in 1944 but in 1945 and 1946, they had lost only 3.8 and 3.7 million dollars respectively. In 1948 however the losses increased again to 15 million dollars. Metal workers lost 8.5 million dollars in 1944 had increased losses of about 15.7 million dollars in 1945, again reduced to 5.1 million dollars

Table 14
 Losses in Various Industries
 (figures in millions of dollars)

	1944	1945	1946	1948
Flour Mills & Elevators	20	13	26	25
Wood Worker	11.75	3.8	3.7	15
Metal Workers	8.5	15.7	5.1	14
Railroad	16.1	-	-	8.2
Other Manufacturings	57.75	52.9	67.7	86

in 1946 to rise again to 14 million dollars loss in 1948. Data for the railroads are not available for the years 1945 and 1946 but they lost 8.2 million dollars in 1948 as compared to 16.1 million dollars of 1944. Other manufacturing group in general rose from 57.75 million dollar loss in 1944 to 86 million dollar loss in 1948. The rises and the drops in the amounts lost by fire were not uniform in any of the groups excepting one. They fluctuated from year to year and excepting from the railroads all groups have shown increased losses in 1948 as compared to 1944.

Summary

Accidents in modern years are studied in three ways:

- (1) Amount of damage measured in terms of dollars

- (2) Time lost measured in terms of man-hour and man-days lost
- (3) Agencies which cause them.

The losses due to accidents is reported in terms of wage losses, medical expenses, overhead cost of insurance, and indirect costs. These losses are compared with the frequency and severity rate interpretations. The close relations between time wasted and dollars lost is also brought out. Moving to more details the relative importance of some of the agencies causing damages by some of the accidents has been studied. We have noted also in this chapter the losses caused by fires alone in various spheres and industries.

Chapter IV

SUGGESTIONS FOR PREVENTION OF ACCIDENTS

Accident prevention was usually regarded as a joint problem of management, federal and state governments, insurance companies and similar other agencies. Later on the importance of the management in combating the accidents was more clearly understood.* In 1948 Dr. J. L. Rosenstein stressed that management should recognize that safety is a monetary concern of the stock holders but it concerns the worker more deeply in his life, his home and his whole future; and therefore advocated that management give the safety program mainly to the worker and only offer complete financial and technical help in the same way as they offer technical help to the employee's credit union but do not control it. This advice is out of a conviction that safety is a workers' problem financially, physically, emotionally and socially, whereas the management is only concerned financially.

Many other authorities in safety and management would disagree with Rosenstein in his conclusion. Although

* Source: "Some thought for management men," from the "Human side of safety," Vol. 34 of transactions, 1948. National Safety Congress, p. 4-9. National Safety Council Publication, Chicago 6.

labor unions often become seriously concerned with the problem of accident prevention, workers on the whole have to be forced or led by management to wear safety equipment and follow safe procedures. Dr. R. H. Simonds of Michigan State College believes that it is a responsibility of management to plan, direct and control production and safety must be built into conditions and methods of production.

In the remaining part of this work are discussed various measures for accident preventions as they exist in the U. S. A. Suggestions for adoption of certain accident prevention devices in India are also made taking into consideration the specific Indian conditions.

Safety Organization

In the recent years, the American industrialists have awakened to the far-reaching consequences of accidents due to considerable degree to the efforts of National Safety Council. Today almost every important plant has some system of ensuring safety. The safety program has been worked out by three different methods. They are:

- (a) Organization by safety director,
- (b) Organization by safety committees,
- (c) Line organization.

In the first method, the whole safety program is put under the supervision and initiative of a single individual. This person who usually is a very important man in the top administrative circles of the plants has got to be intimately connected with various workers' problems and is the only person to devise suitable means to prevent accidents. As such besides being competent in this field he must command a very high esteem of the workers so that his suggestions might be carried out.

In the second method the safety program is in charge of a committee formed by the heads of different departments. The chief executive of the plant act as a chairman. This system is adopted in many small and medium size plants. More effective methods, quicker decisions, prompt execution and proper investigations result out of this system. The most important factor is that the particular conditions of the departments are fully represented by its heads. Many large plants adopt a system which is a combination of both the safety committee and safety director. This is the modern safety plan.

In line organization, all the functions as regards safety are carried on by the personnel of the plant. This system has certain advantages and they are:

- (a) Safety work is directly coupled with other operating problems so the personnel of the plant can devote more on safety.

- (b) It makes safety an integral part of all working processes.
- (c) It is sound and logical because when a job is done, it is safely done and the best way of performing any task is naturally a safe way. It results in lesser supervision.

The disadvantage of this system is that the every worker on the line must be skilled and educated to a conscious responsibility of doing things safely.

The National Safety Council in its safe practices pamphlet No. 42 on "organizing a complete industrial safety program" emphasizes an eleven-point scheme in starting a plan to prevent accidents from which real results may be expected. It lays emphasis on management leadership, cooperation of superintendent, role of safety directors, accident record analysis, executive cooperation, inspection of various departments, mechanical safeguards, first aid provisions, educational work and improving machinery and equipment.

Three principles of management's part in safety are outlined in Volume 19 of the transactions of 1948, National Safety Congress by R. Hargrove are:

- (a) Management should be interested in safety, itself.
- (b) Management should enforce safety practices.

The National Safety Council in its eleven-point program urges the manager to convince an average worker of his sincerity towards safety plan. According to the

pamphlet this could be done by visible science in the form of mechanical guards and good lighting. The main argument for these steps is the necessity of securing the cooperation of the worker, without which no safety plan would succeed. It is gratifying to note that many managements have exhibited interest in safety and co-operated with National Safety Council.

Cooperation of Superintendent

The role of manager and superintendent have equal responsibilities in the safety plan. "He must be field marshall in the safety campaign and by his own faith and enthusiasm he must win for it the respect and support of his foreman. If he treats it as a side issue, his foreman will treat it likewise. It must be made a vital part of the operating department."¹ This necessitates a very close cooperation between the safety director and the superintendent.

Safety Director

Many workers have advocated a safety plan in which one man must be made responsible in the safety program in every plant regardless of its size, where the costs

¹ Safe practices pamphlet No. 42: "Organizing a Complete Industrial Safety Program," National Safety Council publication, Chicago 6, page 2.

of maintaining separate safety director cannot be successfully met with, is advocated that management itself should take over the responsibility of a safety director. In a medium size plant an assistant may have the responsibilities and the nature of these responsibilities may decide a significant title like the safety engineer, a safety director or safety inspector. It is important that this work is not assigned to an overworked individual who may side track the whole safety plan. It is not necessary for the safety man to be technically educated though this knowledge may be a definite asset because he may obtain the necessary knowledge, generally from others. In highly specialized industry he may however need some training. More than the technical qualifications, the safety man should have nearly every personal qualifications that makes a successful man. He should have vision, initiative, diplomacy, persistency, judgment, leadership and above all sympathy. Usually this post requires much tactful handling not only with the workers but also with other businessmen, engineer designing machinery and higher bosses.

In order to couple very closely his work with the branches of that department, the safety director should be in close contact with other departments handling employee relations. Sometimes he is in charge of other employee relations.

Analyzing the Accident Records

No safety plan is likely to make much headway unless the results produced by it are scrutinized properly and accident records analyzed. The analysis of accident records is a duty of the safety director. Instructions on how to start and carry out this analysis are given in detail in the National Safety Council's safe practices pamphlet No. 21 on "Industrial Accident Records and Analysis." This suggests that all accidents be classified at least by departments; by agency (lathe, grinding wheel, hammer, etc.); part of agency (belt, geer or pulley); by manner of performance (operating, cleaning, oiling); by method of contact (falls, caught in or between, struck against); and finally by proximate causes (defective equipment, unsafe conditions, physical handicaps, lack of knowledge). Many foremen and others, sometimes may take an attitude of "we never had any accidents." A safety director without facts and figures is often at a disadvantage in a situation like this. Results which may be obtained by such records are:

- (a) Increased attention may be given to departments where accidents occur the most because they are sorted out.
- (b) Mal-condition, practices and agencies causing accidents are pointed out.
- (c) Individual qualities of foremen in handling their men are pointed out. They have thus chances to strengthen their weaknesses.

- (d) Friendly rivalry for improved records between departments can be set up.
- (e) Workers most susceptible to meet with accidents are easily pointed out.

It is impossible to separate estimating accident costs from these records. Detailed instructions on how to estimate accident costs in industrial plants have been given in the National Safety Council's pamphlet No. 111 on that subject, by Dr. R. H. Simonds of Michigan State College. He lays out a plan in which the total costs of accidents include the costs of medical care and compensation of injured workers, costs of production delays and property damage by accidents whether or not the accidents caused injury to the worker. He further divides the accidents in two divisions: (a) injury accidents; (b) no injury accidents. In the first group are the injuries sustained by employees in the course of and arising out of their employment, and industrial diseases. The second group includes accidents arising out of the activities of a company that cause property damage or interfere with production in such a manner that personal injury might have resulted even though no one happened to be hurt. The industrial accident costs serve two purposes:¹

¹ Interesting information about this problem is given in "Standard Methods of Injury Reporting," Vol. 27, p. 22 of transaction of National Safety Congress, National Safety Council publication, Chicago 6.

- (a) They provide basis for decisions upon which efficiency and profit depend. Even in so obviously desirable activity as accident prevention, some proposed measures must be accepted or rejected on the basis of their probable effects on profits.
- (b) Safety engineers frequently find the annual reports expressed in terms of dollar savings as meaningful to higher authority as those using frequency and severity rates.

Holding Meetings of Operating Executives

All supervisors, foremen, superintendents and operating heads should be summoned to general meetings. The main purpose of these meetings is to mobilize these men who are in a key position for the safety plan. This is usually accomplished in a number of ways. Operating executives and foremen should be kept informed of the accident prevention plan in advance. In this meeting, the foremen and the superintendents should be convinced of the dangers of accidents, of management's interest in cutting down the accidents, their own profits in case of decreased accidents and finally of the responsibilities. Since the worker's attitude towards safety will depend on the attitude of the foreman, he is a trigger to start of any plan. If he is convinced, he will pour enthusiasm on workers for the safety plan at departmental meetings presided over by him.

Plant Inspection

Loose machinery is often the cause of accidents. Each and every plant should employ one plant supervisor. Safe practices pamphlet No. 75 on "Safety Instructions" by National Safety Council contains valuable information about this accident prevention measure. According to pamphlet No. 42 of National Safety Council, plant inspection helps:

- (a) The foreman in each department to prepare his report as requested at the foremen's meetings.
- (b) To determine physical condition of a plant and checks dangers that need to be safeguarded.
- (c) To prepare for the guarding program.
- (d) Improve general housekeeping and sanitation.

The pamphlet suggests that inspection work should be carried out by foremen under supervision and guidance of safety director. Fire hazards, fire protection, (fire escapes, fire extinguishers) ice and snow hazards, yard hazards (open pits, railroad crossings), electrical hazards (open switches, defective portable lights), hazards at machine point of operation, power transmission hazards (unguarded belts and pulleys), material handling hazards (defective trucks), chemical hazards (acid, caustics), lighting, ventilation, housekeeping and spots of past accidents usually need inspection effectively to prevent accidents.

Some of the states have safety laws for the construction, operation and maintenance of factories. New York State Labor Department has such standard laws for the operation and maintenance of factories. Constructions of buildings is supervised and the department has authority to order for the alteration of construction or equipment which are harmful to employees. Municipal authorities control under penalty, threat, exits, fire escapes, fire retarding construction, sprinklers, elevators and boilers in buildings and housekeeping. Hotels, laundries, restaurants, bakeries and food manufacturing concerns, storage of combustibles, welding and spray coating are also controlled by municipality. Usually different boards are set up to control different occupational concerns by municipality.

Mechanical Safeguards and Engineering Revision

After inspection is made, a number of mechanical causes likely to cause accidents are recorded. Usually the foreman makes a number of suggestions regarding improvements. Unless these accidental causes are dealt with, it would be of no use to inspect the plants or to keep records. The safety director can help his superintendent to classify the recommendations as those which should be carried out, and referred back to foreman for "go ahead," those which should be sent to mechanical

department for repairs and those which seem impracticable and need discussions to clear out. It is important to remember here that all safeguards have to be installed in accordance with the specifications of the state and insurance company standards.

Taking safeguards are only temporary steps to prevent the accidents, but more fundamental means of eliminating the hazards of accidents is the engineering progress and subsequent engineering revision. This redesigns the machinery in such a way that they not only eliminate hazards but increase efficiency and production. This is often a neglected field which will pay unusually large returns on time and effort invested.

First Aid

Unless an injured worker receives preliminary first aid treatment, it may be that a minor injury may take a serious turn and result in an infection or disability. Detailed instructions for the first aid organizations are discussed in safe practices pamphlet of National Safety Council. In small plants it may be enough to have a first aid kit and some few workers trained in first aid but in large plants, first aid dispensary with graduate nurses may be necessary. Many concerns have appreciated the value of first aid. In words of Mr. Miller of the Texas Company, "First aid training plays a major part in

effecting substantial reductions in both injury, frequency and severity rates. It necessarily follows therefore that it contributed largely to a reduction in injury costs."¹

Psychologists have pointed out that security and self-being are among very important points of basic needs. Both these factors are very intimately connected with first aid.

Educational Program

Since it is absolutely necessary to obtain active cooperation from management and the workers, an educational program which interests both of them does more good than any other program. Information about this program can be had from National Safety Council safe practices pamphlet No. 72 on "Safety Committees." It says that the safety educational programs should be divided into three groups:

- (a) For the management
- (b) For foremen
- (c) For workers

Short reports and presence of management executives are essential to keep up the interest both of workers and of the administrators. Foremen need training in:

¹ First aid organization, Vol. 6, p. 4, Transaction, National Safety Congress, 1948. National Safety Council Publication, Chicago 6.

- (a) Determining standards for guarding machinery and equipment.
- (b) Formulating safety rules.
- (c) Investigation of accidents and deciding what must be done to prevent their recurrences.
- (d) To review all safety suggestions and recommendations and decide upon their practicability.

The workers usually need detailed instructions about local plant conditions and safety behaviour to prevent accidents. This can be done by posters, films, giving examples of insured workers emphasizing safety on calendars, on pay envelopes and finally by foreman. Special other activities like special safety instruction to new employees, warning signs, rule books, posting safety rules pertaining to particular departments, suggestion systems, classes in safety and first aid, fire drills and fire brigades, mass meetings or meetings by departments. Motion picture and film slides, prizes and bonus for safety and playlets, contests between departments, reaching the home of the workers through various agencies. Workmen safety committees and special campaigns such as "no accident week" and "clean up week" help a lot to enhance the educational program. Throughout the educational program, it is very important to arrange the program in such a way as to maintain interest throughout the program which has to be made continuous.

Workmen's Compensation Acts

In spite of all these anti-accident devices, accidents do occur and injure men. Men may be injured to a severe extent or die or suffer only slight injuries but all these mean financial loss which has got to be compensated. European countries took the lead in this matter and passed workmen's compensation acts. They have dual function of covering the losses resulting from personal injuries and of giving benefit payments which worker is entitled under the law. In U. S. A., passing of the compensation acts began in the second decade of the present century. Generally the concerns are required to carry insurance for workmen's compensation. Industrial injuries take a heavy toll in every country. Some of the individuals involved in the injuries are killed but quite a few are left to spend a miserable existence permanently incapacitated. The American Workmen's Compensation System is a living thing, constantly changing as laws are amended, administrative practices altered and work practices are improved.

Chapter V

INDUSTRIAL ACCIDENT PREVENTION ACTIVITIES IN U. S. A.

American employers became keenly aware that many accidents were unnecessary and costly early in the 20th century. The passage of various state workmen's compensation laws gave impetus to the activities of a few employers. National Safety Council was organized in 1913 and since then it has enjoyed a long and successful career. Practically every large company in the United States has a formally organized program. They generally carry on their work through line organization. Each and every plant has a safety committee and it is formed of:

- (a) Top management.
- (b) Safety supervisor.
- (c) Employees.
- (d) Foremen.
- (e) Maintenance department.
- (f) Worker-safety committees.

Each of the departments has to perform certain duties to maintain safety in the plant. We can discuss duties of each department in brief.

Top management:

- (a) It generally accepts responsibilities for all accidents.

- (b) Enforces safety programs.
- (c) Attends and takes active part in safety meeting.

Safety supervisor:

- (a) He is responsible for operation of specialized safety program.
- (b) Maintains accident records.
- (c) Analyzes accident records.
- (d) Coordinates safety activities.
- (e) Interviews all new employees.
- (f) And heads safety committee.

Employees, foreman, maintenance department and worker-safety committee works under safety supervisor; and each has certain duties to perform safety program successfully. We shall see functions of each.

Employees:

- (a) To work safely.
- (b) Obey safety rules and regulations.
- (c) Serve on safety committees.
- (d) Make safety recommendations.

Foremen:

- (a) To train men to work safely.
- (b) To investigate and report all accidents.
- (c) To maintain good housekeeping, proper ventilation and light.
- (d) To assume responsibility for accidents in their departments.
- (e) To give first aid when needed.

- (f) To inspect daily for clear aisles, safe piling, proper floor loads, safe clothing and safe practices.
- (g) To hold 15-minute safety meetings with employees once per month.
- (h) Serve on safety committees.

Maintenance Department:

- (a) To work with safety committees.
- (b) To safeguard against mechanical hazards.
- (c) To keep all machines and building in safe condition.
- (d) To inspect fire extinguishers, fire doors, exits and exit lights, sprinkler system, elevators and floor loads each week.

Worker Safety Committees:

- (a) To check safety activities against accident trends.
- (b) To make plant inspections.
- (c) To investigate serious accident.
- (d) To make recommendations for removal of accident hazards.
- (e) To study and help the department to improve accident record.

Such are the safety functions of various groups in the plants in America. This type of safety functions have been found in all large plants. A point should be added as regards the duty of the engineer who is responsible for safety in machine design.

Compensation Laws

Workers are familiar with compensation laws of the states in which they are employed. They are educated and directed to study that law. New York State has very good law of compensation. It was passed in 1913 and then was modified. It describes designated remedy in all cases of industrial injury. All types of workers are eligible for compensation. Industrial illness expenses, medical expenses and medical examination expenses have been covered by the compensation laws. They exist in all states. Some states has compulsory laws while others have optional or elective. Every state provides for some form of insurance for financing and guaranteeing the payment of benefits to the injured workman. Standard workmen's compensation and employer's liability policy is available throughout the country. Private insurance companies and other insurance carriers can issue such policy. It is known as standard workmen's compensation and employers liability policy.¹

Rates of premium are based upon wages earned during the life of policy. The standard policy contains injuries and diseases, death and medical benefits. In some states funeral expenses are generally allowed. In

¹ W. R. Dittmar: State Workmen's Compensation Laws. Oceana Publications, 461 W. 18th St., N. Y., p. 8, year 1950.

half of the states, the burial allowance is \$300, in Connecticut it is \$450 and in Illinois and Massachusetts it is \$500.¹ The list of the states having workmen's compensation laws has been given at the end of this book.

Workmen's compensation acts today have been separately legislated in each of the individual states in this country. This is due to wide range of difference in employment and industrial conditions in different parts of the country.

First Aid and Hospital

Even the smallest industrial establishments where workers sustain injury have first aid equipment and the provision for medical and hospital service in the event the latter is required. The first aid cabinet is kept continuously stocked in accordance with local requirements. Such first aid cabinets have first aid attendant and he is available all working hours. He is properly instructed by a physician and it also offers hospital facilities and the services of a physician, if necessary. First aid cabinets have enough instruments, drugs and dressings equipment. This is for small plants but in larger industrial concerns they have dispensaries, plant emergency hospitals and the full time services of

¹ W. R. Dittmar: State Workmen's Compensation Laws, p. 49.

physicians are available. Dispensary buildings are on the premises with hot and cold running water facilities. They have graduate nurses who attend during the working hours. G. M. C. has such dispensaries in all its plants. Ford has very good hospital for its employees. Majority of the large plants have resuscitation. Some big plants have two or three. They are trained in resuscitation. Instructions are repeated before the workers from time to time as regards first aid and resuscitation.

Plant Inspection and Accident Records

Regular weekly plant inspection is common in all plants. They have plant supervisors who are trained in the line of plant engineering. He inspects plants regularly and assures that they are in good working condition. Safety superintendent keeps the records of accidents. He is provided with all kinds of information as regards accidents. His duty is to find out the proximate reasons of accident.

Education to Employees

This job is generally done by the foremen in all plants. Travelers Insurance Company has suggested some safety apparel guides for women which have been practiced in every plant where women are employed in hazardous occupations. Such safe costuming are of immense use to

women workers. They have been asked to put on:

- (a) Turban or cap to keep hair out of machine.
- (b) Short sleeves - no turn back.
- (c) No jewelry and no wrist watch allowed.
- (d) No hip pockets to catch.
- (e) No cuff and no trip.
- (f) Safety shoes with hard plastic toe military heel and sturdy sole.
- (g) No loose clothing to catch on machinery.¹

Heinrich has given a list of safety follow rules in his book "Industrial Accident Prevention." Some of the rules are given below:

- (1) Many plants hold safety meetings and educate their employees through
 - (a) Publicity, safety bulletins, posters, notices, special letters, payroll envelope inserts, slides and films, house organs, etc.
 - (b) Safety plays.
 - (c) Instructions in first aid and resuscitation.
 - (d) Employee rule books.
 - (e) Hiring and training programs.
 - (f) Use of loyal employees in "setting good examples."
 - (g) Safety messages on work orders, correspondence, etc.
 - (h) Contests.

¹ Source: Sprigal - Industrial Management, John Willey & Sons, N. Y., Year 1947, p. 613.

- (i) Job safety analysis.
- (j) Featuring specific safe practice rules.
- (k) Attendance at safety conferences.
- (l) Preparation of safety codes.¹

However these instructions are of much importance and many large plants carry them successfully. It is impossible to follow all directions for the small plants but some of them are easily followed by them with the least expenses. Plant magazines is an excellent form of promoting safety among the workers. All plants have safety programs and they use safety posters of some kind. National Safety Council has an elaborate poster service. Most of the casualty insurance companies include a poster service as one of the items in their workmen's compensation policies.

Industrial Lighting

Poor lighting is one of the causes of accidents so the Illuminating Engineering Society of New York has recommended the industrial lighting standards and it has been practiced by majority of the industrial plants.

¹ Source: Heinrich: Industrial Accident Prevention, McGraw Hill Book Company, N. Y., 1941, p. 361.

Eye Protection

The eye is a very complex structure. It lies in a bed of fat which gives it great mobility and protects it from pressure. The creator has placed the eyes in the safest and most useful location. When the creator has taken so much care of eyes to place it at the safest place it is but natural that we should take its proper care and try to protect them by all possible means. Today soft colors are being used on walls and machines to eliminate eye fatigue. Goggles or face shields are commonly used by majority of the workers while performing processes like welding. Eye diseases have become common in factory life so they have begun to keep eye doctors in factories. Eye sight surveys are being taken by doctors after certain time. Eye hazards are covered in several good films. The film "To Live in Darkness" is effective. It is shown by many plants to their workers. The Encyclopedia Britannica's film, "The Eyes and Their Care," presents an educational approach to the problem. American optical company's motion picture, "Right on the Nose," discusses a subject common to most plants, the proper of protective goggles.¹

¹ Source: Paul R. Ignatius - Film in Industrial Safety Training, Harvard University Press, p. 49, year 1949.

Safety Rules

Some of the common safety rules followed by all types of plants are:

- (1) Guards are kept in place before a machine is started. If the machines are to be operated with the guards removed, permission is obtained from the foreman.
- (2) Elevators must be operated with guards, safety gates and doors in place.
- (3) Defective or imperfect tools are not used.
- (4) Defects in machines are reported and are repaired at once.
- (5) Goggles are used when instructed by supervisors.
- (6) Only regular operators operate machines.
- (7) Horseplay or practical jokes are forbidden on company property.
- (8) Materials are decently piled.
- (9) Finger rings are not allowed by many supervisors.
- (10) Employees are not permitted to ride on any moving machines such as hand, gas or electric trucks, etc.¹

Such rules are practiced in form of "safety posters" or "safety bulletins" and they are placed wherever it is necessary. Their use is common because they have the "eye appeal."

¹ Source: Frederick Lippert: Accident Prevention Administration, McGraw Hill Book Company, New York, 1947, p. 105.

Film Shows on Safety

Many concerns have employed films as a means of accident prevention training. There is a wide selection of commercially produced films and these are used to emphasize some phases of training such as lifting methods, eye and foot protection or plant housekeeping. Some companies prepare their own film strips. It takes enough time for planning and shooting. Other drawback is that they are wide in scope and certain portion of them may not be applicable to the situation in a certain plant. It is more possible for large plants only.

Some of the films and slides have been described by Mr. Paul Ignatius of Harvard University. He says, "Films which apply specifically to one's own problems are obviously more effective."¹ Eye hazards are covered in several good films. The film, "To Live in Darkness" is effective. The National Film Board of Canada has made an excellent series of four films under the general title, "Accidents Don't Happen." Two of them are very much useful for safety committee training. P. H. Glatfeller Paper Company's motion picture, "Plan for Safety" is an important device for safety training. National Safety Council's slide film, "Invisible Red Ink," gives the idea

¹ Source: Paul R. Ignatius, "The Films in Industrial Safety Training," Harvard University Press, 1949, p.48.

of indirect cost of accident. The supervisory series of motion pictures is produced by the United States Office of Education is useful for safety training. They are four in series.

- (1) "Safety in Shop."
- (2) "Maintaining Good Working Conditions."
- (3) "Introducing the New Worker to his Job."
- (4) "Placing the Right Man on the Job."¹

National Safety Council motion pictures on safe practices relating to the use of portable power tools and Pullman Company's "Yards of Safety" have rendered valuable services in the field of safety.

¹ Source: Paul R. Ignatius, "The Film in Industrial Safety Training," year 1949, p. 50. Harvard University Press, Cambridge, Massachusetts.

Chapter VI

APPLICATION OF AMERICAN PRACTICES IN INDIA

"Industrial safety" is a burning problem of Indian industries at present. Since 1934 there was no specific facility for industrial safety in Indian industries. Very little protection was given to the workers in form of medical aid and sick leave with pay for a particular period. No compensation or security of job was given prior to this period. Security of jobs to injured workers is even neglected today but with the passage of factory act of 1934, many changes have taken place in Indian industries. The act provides that any part of machinery which the local government may prescribe must be adequately fenced. It also provides means and provisions for the escape in case of fire and for the protection from danger of persons employed in attending to the machinery in any factory.

Factory inspectors can order management for certain measures to be taken to remedy defects. The most urgent need for improvements in safety managements is in the case of seasonal factories. Many buildings have defects in structure. In cotton ginning factories there is always danger to workers on account of number of belts and

pulleys connecting the main line shaft and the confined space in which the operator has to work. The act further provides the prohibition of employment of women and children upon any operation in a factory which involves risk of bodily injury.

Mines act of 1923 empowers the president to make regulations providing for the safety of mine workers, the means of entry to and exit from mines, the number of shafts, the fencing of shafts, pits and outlets, the setting and maintenance of pillars, the use of safety lamps, etc.

The Royal Commission on Labor found that the regulations of safety in mines was in advance because of the certain measures. Factory accidents in India include accidents of all kinds that occur to workers during working hours. Accidents go on increasing every year. Workers are not trained in handling complex machinery. Employers neglect their elementary duty of installing proper safety devices. Number of accidents go on increasing rapidly every year. Dr. Kuczynski observes: "The fact remains that no country in the whole world shows such a rapid increase of the number of accidents as India."¹

¹ Source: "A Short History of Labor Conditions in Great Britain and the Empire," London, 1942, p. 130.

Safety activities are in infancy today. Labor unions and management are working closely together to find out the proper remedial measures. Many of the textile plants in Bombay have begun to organize safety training programs. Practically all textile plants have well equipped dispensary and a graduate licenciated physician. It is not only the necessity but the requirement too. Tata Iron and Steel industry plant, the biggest of its type in British Commonwealth has an excellent well equipped hospital for its employees. They have a safety plan for its employees. Many plants have first aid posts, dispensaries, still however many of them do not have enough drugs, appliances, qualified doctors and nurses. Recently departments for clinic, ear, eye, nose, throat, tuberculosis have been started by many plants. Tata Iron and Steel Company at Jamshedpur has 400 beds in their hospital. Delhi cloth mills have up to date X-ray department.¹

Welfare Activities

Labor welfare activities have done a great deal in coal mines. Welfare plan in tea plantation is under consideration. State governments have given up their policy of laissez faire in regard to welfare work. All

¹ Source: Indian Year Book, 1949. Published by the government of India, New Delhi, Industrial Safety Section.

railways have undertaken extensive schemes of "safety first" propaganda including the putting up of safety posters of safeguards both in English and vernacular languages at all prominent points and places. Free issue of illustrated booklets on accident prevention, publication of special articles with photographs in railway magazines, magic lantern lectures and the organization of safety first committees are in extensive use.

The mill owners' association has done a considerable amount of good work in accident prevention by drawing safety codes for the cotton textile industry and these codes were published. They are in operation since August 1, 1940. Still however much remains to be done in the field of safety. American safety practices are simple and useful. Indian industries can easily adopt many of the American practices. American industries have expensive safety programs and would involve much administration problems if adopted by Indian industries in the similar manner; still there are many possibilities of conducting safety programs on American lines. We can examine some of these possibilities.

Safety Organization

No plant has specific department for safety. Manager of the plant looks after the dispensary and sees that it functions efficiently but no other programs are

carried out by his office in the field of safety. Simple line organization can easily be introduced and can be well conducted. In such type of safety organization, all the functions as regards safety will be carried on by the general manager (personnel) because it is directly concerned with operating problems. Other advantages of such type of organization would be that safety would become an integral part of all working processes and can be more sound and logic. Safety department can be headed by a safety director and he can be assisted by:

- (1) A safety supervisor,
- (2) A safety manager,
- (3) A safety engineer,
- (4) A safety inspector, and
- (5) A safety adviser.

Safety director can head the above named accident prevention specialists; who must be trained in the safety methods. Each can be assigned certain duties and in order to perform above functions effectively, they must be taught principles of line and staff organization. Big textile plants in Bombay and Ahmedabad can easily afford such type of safety plans. Worker's safety committees can be formed and they may work with jobbers (foremen), maintenance department, safety supervisor, and the top management. Day to day safety problems may be presented by the individual workers to the workers'

committees which may work out in cooperation with other safety specialists. A chart explaining the safety program for Indian industries has been given.

It describes the duties, powers and position of each individual involved in safety activities.

First Aid and Hospital

Dispensaries with an experienced doctors and compounders are found in many textile, sugar and chemical plants. Bombay and Ahmedabad textile plants have to maintain part-time experienced graduate physicians. They go for two hours and examine many patients. So far as medicine, drugs and dressing equipments are concerned, they are not so well equipped. Sometimes some dispensaries lack drugs, while others lack dressing facilities. Anyhow they operate inefficiently. They just operate because of the local governmental laws. There is hardly any incentive to serve the workers. The first aid cabinets should be made compulsory in all the plants. First aid attendant should be made available during all working hours. Hospital facilities and services of a surgeon must be made available when they are needed. Dispensary should be on the premises. Many of them do not have. Trained nurses can be easily introduced in the dispensaries of all plants. Ahmedabad and Bombay textile and chemical plants have begun to introduce trained

nurses. There is no habit of keeping resuscitation in the plant dispensaries. It is quite essential. Artificial respiration to workers working in hot climate is strictly essential but neither the workers are trained in resuscitation instructions nor it is maintained by any plant. Management has neglected it totally. It can be introduced in group plants which are engaged in same type of production.

Plant Inspection and Accident Records

They have plant inspectors but they do not examine it regularly. They are careless in this respect. Boiler inspectors are appointed by the local governments who examine the boilers. Their opinions are hardly put in practice by the management. With the result that bribery has become common among boiler and factory inspectors. Hundreds of lives are lost every year by the explosion of boilers. Accident records are inadequately maintained. Accident record forms may be revised and it should contain all details and information as regards accident. There should be regular weekly honest inspection in all plants. Safety superintendent should be appointed to keep the records of accidents. Plant supervisors should be kept and their training should be in the line of plant engineering. He can examine the plant regularly and should be able to assure that they are in good working condition.

Education to Employees

Education to employees in lines of safety is an important device by which accident can easily be eliminated. It is easy and cheap to provide with the workers. Very few plants have recently realized the value of such education for the employees. In illiterate countries like India, instructions through the media of posters, picture displays, films, slides and safety meetings can be explained in a simple manner. Employee rule books would not work successfully but hiring the training programs in form of concerts or dramas would work wonderfully among uneducated workers. Safety plays can easily be organized by the mill owners' associations. Women workers in textile plants put on native costumes like Sarees and it is very dangerous for them to work with such costumes. They should be educated in this direction to put on safety alliences like American women workers. They may be asked to put on turban or cap to keep their hair out of machines, use short sleeves and habits of using slacks with no hip pockets should be encouraged. Jewelry is commonly used by all women workers. They do not want to put it for the sake of fashions or liking but just to show their economic satisfaction. It should not be allowed. They hardly cover their feet with even ordinary shoes. Safety shoes with hard plastic toe, military heel and sturdy sole may be introduced.

Industrial Lighting

Poor lighting is found in most of the plants. Even during the night shifts low voltage bulbs are used. There is no such standard like industrial lighting. It should be introduced and soft colors may be used on walls and machines to eliminate eye fatigue. Habits of using goggles or face shields may be used to protect eyes. Eye sight surveys are never being taken with the result that the workers have to suffer many eye hazards. Workers do not care too much for their eyes so education in eye protection may be given through movie films or slides.

Safety Rules

Jobbers themselves hardly know any safety rules. Some rules are printed under their job contracts but they are either in English or in vernaculars. Indian workers are hardly able to read or write for any purpose. If some rules are hanging on walls or in the office of the manager, nobody cares to look at it even. In countries like India, where mass illiteracy is prevailing, safety rules printed on papers would not be an effective measure to educate their workers. The simple and interesting method for them is education through movie films. Such movies may be in their vernacular languages.

New workers are not introduced to their jobs so they do not know how to handle machines, with the result

many new workers become victims. It is necessary on the part of the management that worker's education in line of operating machines be wisely planned. They can be either introduced through some experienced workers or movie films in the line of introducing the workers to the new jobs may be shown to them. This practice would eliminate many accidents.

Need of National Safety Organization

India has lot of economic resources. It has abundant mineral wealth. Coal and iron are found in abundance in Bihar and Bengal (Eastern States). Government of India has undertaken number of hydro electric projects and the power derived from these projects is provided to many industries. More and more people go into industries and the country is in the stage of industrialization. All of them will have to face industrial safety problems. It would be of much advantage if National Safety organization like American National Safety Council is started. It can easily be formed if all the plant owners and their engineers cooperate and work out a standard safety program to be carried out each year. It can collect data from different industries, can analyze and interpret for finding accident facts. This type of work is done by National Safety Council at Chicago on the nationwide basis. Annual report may be published

and conventions may be held every year. It can serve thousands of innocent workers who become victims of accidents every year. Many agencies, groups of workers, companies and individuals can cooperate to publish annual ~~report~~ reports every year. It may be organized like National Safety Council of U. S. A. on a non-profit cooperative basis. It can carry out educational programs for reducing accidents. Finance may be done through individual membership. It can serve the industrial concerns, insurance companies, traffic, home or farm safety organizations. It can extend its cooperation to all those working to prevent accidents. Such organization can gather and distribute information about causes and methods of prevention of all classes of accidents. American National Safety Council has found a great success by working in this manner. India should have such national safety organization to promote safety.

Need of Workmen's Compensation Laws

Workmen's compensation laws are important and useful for every worker who is especially engaged in hazardous activities. Human life is uncertain and it may meet death at any moment. It is but natural that when a worker meets such ill fate, his family members who are dependent upon him may be provided with some sort of help. Such laws would help a lot to the disabled workers. Not

all the states in India have such laws to protect workers. Managements do not show much interest in taking compensation policies for their workers, though some of them have recently started for their employees but they are very few and can be counted on tip of fingers. Nationwide compensation laws are essential and the federal government should give power to state governments to legislate such laws. U. S. A. has such laws in all the states. In recent years, the government of India is taking a great deal of interest in industrial safety.

Dr. R. H. Simonds says: "Workmen's compensation laws are important not only to give aid to the injured worker after the injury, but for their effect in preventing accidents. Experience in the United States showed that when management knew its costs through workmen's compensation insurance would be higher with a bad accident record or lower with an improved safety performance, that provided a financial inducement to put money and effort into safety programs. As the cost of production losses and property damage resulting from accidents is more widely measured and recognized through the use of the new method for estimating uninsured costs, that will provide a further financial stimulus to management to reduce accidents."¹

¹ Dr. Rollin H. Simonds: "Estimating the Cost of Accidents in Industrial Plants," p. 2 (21); National Safety Council Publication, Chicago, Safe Practices pamphlet No. 111.

Insurance is one of the greatest safety devices, the use of which should be widely advocated. Government of India is serious about this problem. Recently a new office called the office of the chief adviser of factories has been started in New Delhi and this office issues from time to time valuable literature on the subject of safety. Federal government at New Delhi has proposed to open an industrial safety, health and welfare museum in New Delhi.

Sir Wilfried Garrett, chief inspector of factories in the U. K. was officially invited to India to look into many questions dealing with factory administration and industrial safety.¹

Indian industries can get much for their safety programs from the American safety practices. Social environment, economic resources and business conditions are much similar to the United States of America and practically all the above advocated practices can be adopted without any difficulty.

¹ "Industrial Safety," section of Indian Year Book, 1949. Published by the Government of India, New Delhi.

Chapter VII

SUMMARY

Importance of Safety

Employers realize that accident prevention is a profitable combination of humanitarianism and common sense good business policy. Day by day there has been remarkable increase of public interest in the conservation of life and property. The average person has become more safety conscious. Accidents cannot be fully measured in terms of money because human life is much more valuable than anything else in this world, but in this materialistic world parts of human body are measured in terms of money by many insurance companies and safety organizations.

The safety movement in the U. S. A. has become a thing of national importance. Thousands of persons give their valuable time to it. Millions of dollars go every year into safety programs. Safety programs have been organized on national basis in the U. S. A. and safety has begun to acquire prominence on an international basis. In countries like India where industrialization is in its infancy, the number of accidents increases with the highest speed. No other country in the world

has such a rapid rise as India. India should become aware of the losses of human lives and production. Productivity of any country can be raised while diminishing the rate of its accidents. Only America has emerged from the war an economically stronger nation, having improved its production capacity to the extent of 50 to 75 percent on the pre-war level. During this period America proved that productivity rate can be increased when the accident rate is decreased. Many plants installed efficient safety plans, workers were given security by many safety devices, and the fear of death or injury was removed from many minds.

Accident Prevention

The accident prevention movement actually began in the second decade of twentieth century in the United States and it has been rapidly growing since then. Accident prevention has been treated as science because it is based on facts and natural phenomena. It is solved with some kind of reasoning which is successfully applied to many types of sciences. First aid is generally available, and safety appliances are widely used in American industries. Though first aid training is by no means responsible for the entire success of a general safety program, it has perhaps contributed more to the success of that program than any other single factor

involved in the safety program. This type of training is often referred as the master salesman of the American safety program. Now^adays more progressive companies accept safety as an integral function of operation. To-day methods are employed which isolate and identify the causes of accidents and which enable direct and positive action to be taken to prevent their recurrence. Proper preventive measures are being taken and they are found very useful in reduction of accident rate in all industries. The worker is safer today in industry than he was before. The National Safety Council renders many important services in the field of prevention of accidents. It investigates, collects and interprets data from different industries. Remedial measures are suggested and safety rules are advocated by the council.

Such types of preventive measures for Indian industries would be of immense importance if properly introduced. Indian industries will benefit and will be able to reduce the accident rate if American safety practices are adopted in a suitable manner. The potentiality of any country depends upon its industries, and no nation can be said to be economically powerful if its industries are not properly developed.

Chapter VIII

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