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PLAINTIFF'S
EXHIBIT
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FACTORIES

ANNUAL REPORT OF THE CHIEF INSPECTOR OF FACTORIES

FOR THE YEAR

1954

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by Command of Her Majesty.
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LONDON
HER MAJESTY'S STATIONERY OFFICE

PRICE EIGHT SHILLINGS NET

9605

cellulose solution-vapours. The spray shop is 80 ft. by 80 ft. and 30 ft. high. The items to be sprayed are moved into the shop close to the exhaust ventilation openings by an overhead crane. These openings, with water curtains behind, are provided at different levels up to a height of 30 ft., and the sprayers stand on gables at varying heights to apply the spray, opening and closing the ventilator shutters according to the level at which they are spraying.

The same principle was applied in an exhaust installation for spray-painting diesel engines. The work is done at a production line in a large building. Screens are fitted at each side of the conveyor carrying the engines and a strong down-draught exhaust is provided through a grid in the floor. The paint is directed into a moving water stream and the result is efficient and clean.

Since the making of the Asbestos Industry Regulations in 1931, the method of dust control generally adopted on looms followed very closely that described in the "Report on Methods for Suppressing Dust in Asbestos Textile Factories".^{*} This method comprised individual exhaust hoods at fell, beards, back-rest and so on. Although this method was a considerable advance at the time, some thought has been given recently to a different approach, aimed at attaining the maximum enclosure of the loom, instead of individual hoods at dust-producing points as hitherto. Among experiments which have been going on, one factory at which brake linings are made has been able to achieve almost complete enclosure of two small modern automatic looms. The enclosure is made up of sheet iron, and at the front there is a large sloping glass window hinged at the top so that it can be swung open for setting up, adjustments, etc. A minimum space is left at the breast and at the warp. Various panels of the enclosure are made to be easily detachable for inspection and maintenance purposes. The enclosure is exhausted by trunking at top and bottom, so that even when the front window is open, or panels are removed, there is a draught of clean air towards the machine at the breathing level of the operator. Good artificial lighting is arranged within the enclosure, to make loom parts easily visible through the window. Both management and operators agree that the method of enclosure is a great improvement and the management is going ahead with plans for the more difficult task of enclosing older looms. At another factory, similar but quite independent steps have been taken to enclose looms. In this case, the looms were of an older type and were in course of being transferred to a new building. The enclosure of the looms incorporated hinged windows, but, when seen, most of the windows were secured in the open position. Investigation showed that this was happening because the management had overlooked some design details important from the workers' point of view. For example, the windows were too heavy, so that, once opened, there was every temptation for the operators to tie them open. Again, no artificial lighting was provided within the enclosures, so that, on dull days, vision through the windows was difficult. The slope of the windows was not well chosen, so that, on bright days, there was considerable specular reflection from the window glass. The firm is now considering alteration of the enclosures to meet these points. Notwithstanding these criticisms, there was no doubt that, even with the windows open, a higher degree of dust control was obtained, because of the conservation of the exhaust draught into a stream directed from the worker towards the machine.

A firm of briquette manufacturers has provided exhaust ventilation for the pitch-cracking machines and at the position where pitch-cracking is being

^{*} H.M. Stationery Office, 1931.

ried out by hand. This has, of course, been one of the requirements of the Patent Fuel Regulations since the Code first came into force. It has presented a difficult problem because the low melting point of pitch tends to make the dust clog the extractors and ducts. Three-sided receptacles to which exhaust ventilation is fitted have been provided at convenient positions and the pitch is deposited at the open side for cracking. The dust is carried into high chimneys, from which there is no appreciable escape at the top. As it was expected that there would be accumulations of deposited pitch in the ducts, ample provision was made for opening them for cleaning purposes. So far, the system has been satisfactory and has greatly improved conditions.

Light transparent plastic materials are increasingly used for ventilating plant handling corrosive substances. Such materials have all the advantages of glass and can be moulded into a variety of shapes. Their use is illustrated in the construction of a plastic booth to enclose a bromine drum during filling. The booth has a wooden frame with transparent plastic-sheeted sides and top, and the front portion slides upwards to admit a drum for filling. When the drum is in position the front is pulled down and the drum totally enclosed. The bromine filling main passes through the back sheet of the booth and an exhaust fan removes vapour when the drum is being filled. Workers still wear protective clothing, but the use of the booth dispenses with the necessity for wearing masks at the filling operation.

In conclusion, factory heating, general ventilation and local exhaust ventilation are not matters which should be considered independently, as the provision made for one so often has a substantial effect on the others. Much trouble could be avoided if heating and ventilation were together given early consideration in the design and construction of new factory buildings. The heating and ventilating systems should be carefully planned in relation to both the building and the processes. Finally, competent professional advice is an absolute necessity in this highly specialized branch of engineering.

CHAPTER 16

Lighting and Colour

Lighting

SUBSTANTIAL progress has been made throughout the year in the provision of natural and artificial lighting. Due to the rapid progress in lighting technique, a factory considered well-lit fifteen years ago is now, in comparison with modern standards, a dull place; opinion as to what is good and what is merely average continually alters with each new advance in technique.

Architects and occupiers are fully aware of the advantages of good natural lighting, not only in obtaining efficient performance of the visual task, but also in providing a cheerful and "open air" atmosphere. Nevertheless architects, although anxious to design new factories with the best possible natural lighting, find that in these days of high fuel costs the heat-loss through large areas of glass cannot be ignored; they may then specify double windows or special glass with low heat-loss factor. In existing factories, especially in older ones, an increase in natural lighting can only be obtained

in colour marking, in contact with potassium bichromate, had multiple chrome ulcers on one hand.

The sites of the lesions in the 220 cases are shown in the table below:

Nature of Occupation	Nasal Septum	Upper Limb, including fingers	Lower Limb	Abdomen	Multiple
Manufacture of bichromates ...	25	49	1	-	28
Dyeing and finishing ...	-	1	-	-	-
Chromium plating ...	29	64	3	7	1
Other industries ...	12	4	-	-	1
Total ...	66	118	4	2	30

In the specified industries, the distribution of the lesions by site is similar to that found on previous occasions. Owing to the nature of the work in the bichromate industry, ulceration on two or more sites was relatively common; many cases suffered from chrome ulceration on more than one limb or, for example, on a finger and in the nasal septum. A rigger, aged 37, in a firm manufacturing bichromate, sustained, just inside one nostril, a chrome ulcer which gave rise to a cellulitis of the neighbouring tissues, causing radiating neuralgia of the face and head.

All the lesions due to chromium plating were, except in one case, single lesions, nearly two-thirds of which occurred on the hands or fingers, while nearly one-third consisted of ulceration of the nasal septum. Two cases of ulceration of the skin of the abdomen were due to chromic acid crystals falling through the workers' shirt-fronts during the replenishment of the bath. One of these men subsequently developed two circular chrome ulcers, each about half an inch in diameter, on the abdominal wall. There are other and safer ways of replenishing a chrome bath. In 23 cases, including 18 employed on chromium plating, it was reported that ulceration followed the entry of chromic acid solution or crystals into small cuts or abrasions which had not been adequately protected by waterproof dressings.

Six of the 17 cases recorded under "other industries" worked in a chromating process to which the Chromium Plating Regulations do not apply. Fume arose from the chromating baths due to the poor design of the exhaust ventilation. All these cases suffered from chrome ulceration of the nasal septum; the firm instituted periodical medical examinations and installed new ventilating plant. Two other cases of nasal ulceration in this group were employed as sprayers of a chrometch primer containing, among other ingredients, zinc tetroxochromate. This work was not performed under local mechanical exhaust ventilation and the general ventilation of the department was inadequate to control the hazard. The men were said to be "enveloped" in spray.

ASBESTOSIS AND CANCER OF THE LUNG

In 1947 an analysis was made* of 235 deaths, either caused by asbestosis or in which asbestosis had been proved at autopsy, which had come to notice during the years 1924 to 1946 inclusive. In this series of cases, cancer of the

* Dr. E. R. A. Merewether, Annual Report of H.M. Chief Inspector of Factories, 1947, p. 79.

lung was found to be present, either as a cause of death or as a concomitant, in 22 (17.2 per cent) of the 128 male deaths and in 9 (8.4 per cent) of the 107 female deaths, the proportion for all cases being 13.2 per cent.

The investigation has continued and further analyses of the total number of asbestosis cases which has come to notice from 1924 to 1954 inclusive, have been made. In these analyses, cases in which asbestosis was accompanied by pulmonary tuberculosis are shown separately, as are cases in which cancer of the lung was a cause of death or a concomitant. Eleven cases, 4 male and 7 female, in which cancer of sites other than the lung was found, are included under asbestosis.

ASBESTOSIS: DEATHS RECORDED FROM MARCH 1924-DECEMBER 1954

Diagnosis	Male	Female	Total
Asbestosis	117	84	201
Asbestosis and Pulmonary Tuberculosis	47	41	88
Asbestosis and Cancer of Lung	41	14	55
Total	205	139	344

NOTE.—4 male and 7 female asbestosis cases also had cancer of sites other than lung and are included under "Asbestosis".

The total number of cases up to the end of 1954 was 344, of which 205 were males and 139 females. The number of cases in which cancer of the lung was present was 55 (16.0 per cent), the figure for males being 41 (20.0 per cent) and for females 14 (10.1 per cent). The percentage of cases with cancer of the lung was higher in both males and females than in the previous analysis but the proportion among males was, as before, about twice that among females.

In 88 cases (25.6 per cent) asbestosis was accompanied by pulmonary tuberculosis but this complication was relatively more common among females (29.5 per cent) than among males (22.4 per cent).

The age at death (in specified age groups) is shown in Table 35 for asbestosis, asbestosis with pulmonary tuberculosis, and asbestosis with cancer of the lung. For each condition, the mean age at death was higher for males than for females, while for both sexes the mean age was lowest for asbestosis with tuberculosis and highest for asbestosis with cancer of the lung. Two male deaths from asbestosis with pulmonary tuberculosis occurred before the age of 20, and 10 (6 male and 4 female from asbestosis and 2 male and 1 female from asbestosis with cancer of the lung) over the age of 70.

The duration in years of exposure to asbestos dust is shown in Table 36. Two of the women who died, one from asbestosis and one from asbestosis with pulmonary tuberculosis, had had less than one year's exposure to asbestos dust, while for eleven men, seven cases of asbestosis and four of asbestosis with cancer of the lung, the duration of exposure was over forty years. For both sexes the shortest mean duration of exposure was recorded for asbestosis with pulmonary tuberculosis.

TABLE 33
ASBESTOSIS : ANALYSIS BY SEX AND AGE AT DEATH

Type of Case and Sex	Age at Death						Total	Mean Age
	Under 20	20-29	30-39	40-49	50-59	60-69	70 & over	
MALE								
Asbestosis ...	—	2	7	31	42	29	6	51.7
Asbestosis and Pulmonary T.B. ...	2	2	11	17	8	7	—	43.2
Asbestosis and Cancer of Lung ...	—	—	—	12	19	8	2	55.0
FEMALE								
Asbestosis ...	—	5	28	32	14	4	1	43.4
Asbestosis and Pulmonary T.B. ...	—	11	21	5	3	1	—	35.1
Asbestosis and Cancer of Lung ...	—	—	6	3	3	1	1	45.6
TOTAL								
Asbestosis ...	—	7	35	63	56	33	7	49.1
Asbestosis and Pulmonary T.B. ...	2	13	32	22	11	8	—	40.3
Asbestosis and Cancer of Lung ...	—	—	6	15	22	9	3	52.7

NOTE: 4 male and 7 female asbestosis cases also had cancer of sites other than lung and are included under "Asbestosis".

TABLE 36

ASBESTOSIS: ANALYSIS BY SEX AND DURATION OF EXPOSURE

Type of Case and Sex	Duration of Exposure in Years										Mean Exposure
	Under 1	Over 1 but under 2	2-4	5-9	10-14	15-19	20-29	30-39	40-49	Total	
MALES											
Asbestosis	—	—	1	11	22	23	38	14	7	116	20.7
Asbestosis and Pulmonary T.B.	—	—	6	10	10	10	10	1	—	47	14.6
Asbestosis and Cancer of Lung	—	—	2	4	5	3	16	7	4	41	22.3
FEMALES											
Asbestosis	1	16	3	34	21	12	8	2	—	84	10.8
Asbestosis and Pulmonary T.B.	1	4	3	13	15	6	2	1	—	41	11.0
Asbestosis and Cancer of Lung	—	—	3	5	1	2	1	—	—	14	9.4
TOTAL											
Asbestosis	1	6	9	45	33	35	46	16	7	209	16.4
Asbestosis and Pulmonary T.B.	1	4	14	23	16	16	12	2	—	89	11.8
Asbestosis and Cancer of Lung	—	—	5	9	8	5	17	7	4	55	19.9

21 case excluded—no information.

NOTE: 4 male and 7 female asbestosis cases also had cancer of sites other than lung and are included under "Asbestosis."

PNEUMOCONIOSIS)

The usual tables have been brought up to date, and are set out below.

It will be noted that in the foregoing tables the mean ages at death and the mean durations of exposure recorded for women are lower than those for men. Many women leave the asbestos industry at a relatively early age on marriage and this may have influenced these means to some extent. Furthermore it is possible that the presence of asbestos may not have been recognized in some women who died subsequent to leaving the industry on marriage; the omission of these cases would tend to reduce the mean ages and durations of exposure. On the other hand it may be that asbestos dust has a more serious effect on women than on men, thereby leading to a relatively earlier death after a relatively shorter period of exposure.

TABLE 37
FATAL CASES INVESTIGATED UP TO THE END OF 1954

	Number of deaths	Average age at death	Duration of employment in years		
			Longest	Shortest	Average
SILICOSES					
Pottery:—					
Silicosis	782	61.7	62.0	2.8	38.3
Silicosis with Tuberculosis	519	56.1	67.0	5.0	34.7
Sandstone:—					
Silicosis	282	61.3	62.0	9.0	39.1
Silicosis with Tuberculosis	230	57.6	58.0	5.0	37.4
Grinding of Metals:—					
Silicosis	124	59.5	61.0	14.0	35.9
Silicosis with Tuberculosis	212	54.1	56.0	2.8	33.0
Sandblasting:—					
Silicosis	76	50.7	42.0	1.7	13.5
Silicosis with Tuberculosis	99	46.2	46.0	2.0	13.1
Manufacture of scouring powders:—					
Silicosis	16	40.8	37.0	2.3	8.3
Silicosis with Tuberculosis	6	40.8	11.2	2.0	7.0
Miscellaneous:—					
Silicosis	311	55.8	57.0	1.5	24.6
Silicosis with Tuberculosis	265	51.8	50.0	0.7	24.9
TOTAL:—					
Silicosis	1,591	59.6	62.0	1.5	34.1
Silicosis with Tuberculosis	1,331	54.4	67.0	0.7	31.2
ASBESTOS					
Asbestosis	237	49.6	48.0	0.5	16.5
Asbestosis with Tuberculosis	89	40.5	33.0	0.8	11.4

TABLE 15
DEATH CERTIFICATES RECORDING FIBROSIS OF THE LUNGS, INCLUDING
ALL FORMS OF PNEUMOCONIOSIS AND BYSSINOSIS

	England and Wales, 1943-1952								England and Wales		Scotland	
	1943	1944	1947	1948	1949	1950	1951	1952	1953	1954	1953	1954
SILICOSIS:-									PNEUMOCONIOSIS			
1. Refractories industries ..	9	8	10	13	15	20	20	11	10	16	3	2
2. Pottery, manufacture of ..	41	48	54	48	63	73	70	78	79	101	1	2
3. Sandstones, quarrying and dressing ..	21	20	12	10	15	10	13	9	11	16	1	2
4. Stone masons ..	44	41	42	40	36	29	13	11	11	11	1	2
5. Metal grinding ..	11	8	9	8	10	8	10	10	11	11	1	2
6. Sandblasting ..	6	4	3	3	3	3	3	3	3	3	1	1
7. Steel dressing and cleaning of castings ..	5	11	13	13	10	11	6	11	10	13	8	6
8. Sand, pebble, flint and sand crushing ..	1	1	1	1	1	1	1	1	1	1	1	1
9. Sourcing powders, manufacture of ..	1	1	1	1	1	1	1	1	1	1	1	1
10. Abrasive wheel manufacture ..	1	2	1	1	1	1	1	1	1	1	1	1
11. Glass cutting and bevelling ..	1	1	1	1	1	1	1	1	1	1	1	1
12. Millstone dressing ..	1	1	1	1	1	1	1	1	1	1	1	1
13. Slate quarrying and dressing ..	6	13	10	10	11	17	11	11	11	11	1	1
14. Granite quarrying and dressing ..	1	1	1	1	1	1	1	1	1	1	1	1
15. Tunnel mining (average work, etc.) ..	1	1	1	1	1	1	1	1	1	1	1	1
16. Coal mining ..	13	24	24	24	24	24	24	24	24	24	24	24
17. Gold mining (South Africa) ..	1	1	1	1	1	1	1	1	1	1	1	1
18. Tin mining ..	1	1	1	1	1	1	1	1	1	1	1	1
19. Iron ore (haematite) mining ..	1	1	1	1	1	1	1	1	1	1	1	1
20. Lead mining ..	1	1	1	1	1	1	1	1	1	1	1	1
21. Copper mining ..	1	1	1	1	1	1	1	1	1	1	1	1
22. Barytes mining ..	1	1	1	1	1	1	1	1	1	1	1	1
23. Clay mining ..	1	1	1	1	1	1	1	1	1	1	1	1
24. Mining engineers ..	1	1	1	1	1	1	1	1	1	1	1	1
25. Miscellaneous ..	2	6	11	11	11	9	9	14	10	14	10	9
Total ..	308	353	358	334	375	433	431	382	432	443	280	318
Asbestosis ..	11	16	15	15	17	17	18	12	14	12	1	1
PNEUMOCONIOSIS:-												
Coal mining ..	64	78	130	117	120	109	100	173	1	1	1	1
Other industries ..	11	5	12	19	14	16	18	42	1	1	1	1
Byssinosis ..	10	3	4	3	7	11	3	13	11	20	1	1
OTHER CASES OF FIBROSIS ..	128	148	116	151	154	178	173	177	167	110	16	20
GRAND TOTAL ..	1,133	1,223	1,435	1,544	1,577	1,732	2,037	1,953	2,115	2,085	277	338

The above figures are based on information contained in Death Certificates as notified to the Registrar General.
The figures for Scotland relate to males only.