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In almost all can manufacturing plants there is a bodymaking machine in which the side seam of the can is soldered. After the can has been formed, it passes over a solder bath about four feet long. The solder is applied by a roller, following which the soldered seam is heated by a burner. The cans then pass over a cloth wiping wheel which removes the excess of solder, and a blast of air is applied for cooling. The solder consists of 98 per cent. lead and 2 per cent. tin, and in order to investigate the amount of lead fume passing into the air at various points, a can line isolated from other can lines was studied. Samples of air were collected at the breathing zones by M.S.A. Electrostatic Precipitator, and analysed for lead by the thioacetamide method. The data obtained showed that contamination of the air from the (well ventilated) solder bath was of minor importance compared with that from the burner, wiper and cooling blower; e.g. 10 cubic metres of air from these latter sources might contain 28–49 mg. of lead, as compared with 0.3–4.5 mg. from the former. When the wiping wheel was enclosed and ventilated by an exhaust, the air at all the points tested contained only 0.4–1.1 mg. of lead, less than the permissible maximum of 1.5 mg. Samples of air taken at the same time from a room adjacent to the test room contained 2.9 mg. of lead.

H. M. Vernon.


A group of 71 individuals working with explosives containing ammonium picrate were kept under observation for 1–15 months. The 'milling' and 'preforming' groups were exposed to the greatest amount of picrate dust, and the picrate collected on the filter paper inserts in the respirators of two workers during a 6-hour milling operation yielded 52 and 156 mg. of picrate respectively.

Seven of the workers developed dermatitis which was thought to be due to the picrate, but this may not have been the sole agent responsible because other components were occasionally present. The cutaneous lesions appeared usually on the dorsum of the hands, on the anterior surface of the forearms, and at the end of the elbows. They consisted mostly of erythematous patches containing papules and vesicles. Five of the seven individuals were able to return to work without developing further lesions, but they were urged to wear rubber gloves. The data obtained seemed to show that the persons least exposed were the most likely to develop dermatitis, and it was concluded that the picrate does not act as a primary irritant, but that sensitization to it may develop. The workers did not show systemic poisoning, but there was some staining of skin and hair.

When rabbits and guinea-pigs were kept for periods up to 12 months in the buildings where milling and preforming were carried on, over half of them died, and brown granular deposits, presumably picrate, were found in lungs, liver, heart muscle and kidney.

H. M. Vernon.


Fujiwara discovered that when sodium hydroxide and chloroform are heated together, a red colour develops. The test is not specific for chloroform and has been used for the colourimetric determination of various chlorinated hydrocarbons. In the present investigation the influence of several factors on the estimation of carbon tetrachloride, chloroform and carbon tetrachloride has been studied, and it was found that the test allowed the detection of the tetrachloride in concentrations as low as 2 μg per ml. when it was dissolved in acetone. Also, chloroform and carbon tetrachloride 1.3 μg per ml. could be detected when dioxane was used as a solvent. Employing a fixed concentration of sodium hydroxide and using acetone as a solvent, the minimum detectable amount of a number of organic halides was estimated. Also the optimum concentration of sodium hydroxide for maximum colour production was investigated.

H. M. Vernon.


The pathological effects of the inhalation of antimony trioxide were studied in guinea-pigs. The animals were at first exposed in the experimental chamber for 2 hours daily, and after 3 weeks, for 3 hours daily. The average dust concentration in the chamber was 45. mg. of antimony trioxide per cubic metre of air, as determined gravimetrically by means of an electrostatic precipitator. It was computed that the guinea-pigs retained 1.6 mg. of trioxide daily, and that the 24 guinea-pigs employed, inhaling from 13 to 424 mg. All the animals showed extensive pneumonitis, and 11 out of the 15 animals inhaling 77 mg. or more of the trioxide showed fatty degeneration of the liver. In white cells of the blood decreased, and so did the polymorphonuclear leucocytes and eosinophils, but the lymphocytes showed a relative increase. No pathological changes were demonstrable in the heart or kidneys.

H. M. Vernon.


Balme opened the discussion by saying that the Disabled Persons (Employment) Act has not yet received the attention which it merits from the medical profession who, with the hospital services, will be so directly involved.

In general terms, the purposes of the Act may be summarized as follows: First, it establishes the important principle that disability of any shape or form—whether congenital or acquired, medical or surgical, general or local—constitutes a claim upon the State for assistance, and that such assistance should not merely be expressed in terms of financial allowances or pensions, but rather in measures calculated to restore physical functions, wherever possible, and reinstate the disabled person in some suitable form of gainful occupation. Secondly, it makes provision for the vocational training and industrial resettlement of those who, subsequent to hospital treatment for injury or sickness, need to learn a new profession, trade or occupation before being fit to resume employment. Thirdly, it assists disabled persons to secure work by means of a requirement on employers to engage a stated proportion of men or women so handicapped. Fourthly, it provided employment under sheltered conditions of those who are severely disabled, but are able to do regular paid work, provided that they do not have to stand up to the working conditions of competitive employment.
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A register is to be compiled of all persons substantially handicapped by reason of disability, and this will not only be a record of disabled persons for whom suitable jobs must, if possible, be found, but will also be a register of the failure of our hospital services to prevent residual disablement. The particular directions in which medical assistance is essential to the successful operation of this Act, may be summed up in the phrases: Prevention of residual disability; assessment of loss of functional capacity; and payment for disabilities.

Certain well-established principles have emerged from experience of medical rehabilitation during the war: rehabilitation should be part of treatment prescribed by the physician or surgeon in charge of the case and not something secondary commenced and carried out during convalescence. The same principles regarding rehabilitation should apply to all forms of medical and surgical disability including a variety of chest complaints, to loss of abdominal muscular tone, arthrosis, psychosis, and diseases of the central nervous system. Responsibility for all forms of rehabilitation treatment should be delegated to a single medical officer who should be responsible for the training and general supervision of the various ancillary workers. A carefully thought-out programme should be laid down for each type of medical and surgical disability, combining the use of physiotherapy and active exercises, remedial games and appropriate handicrafts, alternating with prescribed periods of rest, relaxation and mental entertainment. The programme must always be related to the kind of work to which the patient hopes to return. The initial rehabilitation, whether in the wards or out-patient department, but the later stages are best carried out away from the hospital atmosphere.

Experience gained during the war has proved the value of physical reconditioning, selected occupational handicrafts and group games as adjuncts to expert psychiatric treatment for patients suffering from psychoneurotic disorders. The almoner or welfare worker can render important service, since in large numbers of cases of illness or injury a psychological disturbance is present.

The hospital services must provide scientific guidance for the assessment of functional capacity and work in close co-operation with the Disablement Rehabilitation Officer, who has the responsibility of finding suitable work. The hospital which actually treated the patient should take the initiative in following up his case and arranging for placement if this appears to be necessary.

Successful implementation of the Disabled Persons (Employment) Act will require the setting up of a comprehensive system of hospital rehabilitation throughout the country, providing four types of centres:

(a) An efficient physiotherapy department at every hospital for in-patients.

(b) A large out-patient rehabilitation centre (or centres) in every town or district.

(c) Residential rehabilitation centres outside the town.

(d) Special rehabilitation centres, scattered throughout the country, for the rehabilitation of particular disabilities.

The carrying out of such a programme will require a great expansion of trained staff and the inclusion of regular instruction in rehabilitation in the medical curriculum.

Stewart thought that occupations 'conducive to restoration of fitness' can be provided on a small scale in rehabilitation centres, but more important facilities can be provided in normal industry and in special rehabilitation shops and factories. The development of industrial rehabilitation must be accompanied by medical supervision at the place of work, that is, by a comprehensive industrial health service.

With good treatment the need for special rehabilitation measures decreases, but in the future, hospital authorities may have to consider the possibility of appointing their own industrial liaison officers who would not only provide a link with the patient's employer, but advise the surgeon concerning job-placement. No matter how efficient the hospital, how good the treatment, and how much contact the social service or almoner's department has with the factory, there can be no effective return to work, and therefore, no full rehabilitation and implementation of the Act, without the co-operation of the employer. The successful co-operation indicates promises of continued employment or alternative work scheme for retraining and rehabilitation workshops in the factory and assistance on matters arising under the Workmen's Compensation Acts.

It should be the primary responsibility of personnel management, under the present system, to play a part in the supervision of the return to work of the sick or injured worker. The finding of light or alternative work is a matter of considerable difficulty, and often there is no adequate medical control. Medical supervision of return to work is of great importance and is a main reason for the extension of medical services to cover the whole of industry. The industrial medical officer should obtain information of the incidence of sickness and accidents and of the progress of all sick and injured workers, and also compile an analysis of jobs and endeavour to establish special workshops in the factory. An account is given of a special rehabilitation shop set up in a large engineering works for injured employees who normally would not be at work, but would be undergoing treatment. During the 21 years of existence the shop employed over 500 injured workers and excellent results were obtained.

Griffiths pointed out that no mention has been made as to what the Act would cost industry if rehabilitation was to be effective. Out of every five million people would have to be found selected and unproductive jobs. The rehabilitation workshop has a greater educational than a curative value and the majority of cases will do better on alternative work.

Agate said if between 1 and 2 million disabled persons are going to register, notice must be taken of the Ministry of Labour's own estimate that of these, 25 per cent. have industrial disabilities, 50 per cent. have neurological disabilities, and 25 per cent. are neurotic. The medical and neurotic cases can only be improved a little by treatment, and the Disablement Rehabilitation Officers are failing to place such cases in their right jobs. In many medical disabilities dyspnoea on exertion is the main handicap and determines the kind of work a man can do. Cardiac cases prove hard to place. A comprehensive job analysis for all occupations in the country is needed, but possibly alternative is for the doctor who knows the case of a disabled man to prohibit specifically certain physical actions, such as lifting weights of more than 20 lb. The new Ministry Form 'D.P.I.' has this as its basis and is very helpful.

Watson-Jones thought that in most cases the resettlement of disabled persons called for very skilled medical experience coupled with a knowledge of industry. Disablement Rehabilitation Officers should be directed by local medical boards and their activities co-ordinated by regional medical consultants. Doctors should so influence their patients that a complete record was available of every individual who might have difficulty in seeking or keeping employment. If this was not done one of the greatest medical and social reforms of this generation would be imperilled. A. Thelwall Jones.


In this paper the authors discuss defects of the ischmic zone of the lumbar vertebrae as a cause of backache. The ischmic zone is a wedge-shaped area between the superior and inferior articular processes. This area is a narrowed bridge of bone and furnishes the only true bony support of the vertebral column. According to Chaddock, defects of the vertebral isthmus might result from faulty ossification, but Meyerding favours injury at birth or trauma superimposed on a congenital lesion as being responsible for such defects. Clinically the condition presents as low back pain which

The refractory brick industry in Kentucky consists of ten major plants with a total working population of about 2000. Two raw materials are used in the manufacture of fire brick: (1) raw flint clay containing 18 per cent. of free silica, and (2) raw flint clay containing 5 per cent. in the mould or parting sand, and averaged about 2000. Two raw materials are used in the manufacture of fire brick: (1) raw flint clay containing 18 per cent. of free silica, and (2) raw flint clay containing 5 per cent. of free silica. Analyses of the dust encountered in the various industrial operations ranged from 1 per cent. of free silica in burnt brick dust to 95 per cent. in the mould or parting sand, and averaged 12 per cent. The most dangerous sources of sustained dust production are the dry pan mills, with an average dust count of 5 million particles per cubic foot, the screen mills also produced much dust, and it was proved that this could be greatly reduced by their complete enclosure. If this could be greatly reduced by their complete enclosure, the average dust count was reduced from 108 to 10 million particles per cubic foot. The screen mills also produced much dust, and it was proved that this could be greatly reduced by their complete enclosure.

The essential feature of the silicotic process is an excessive fibrosis in the intrapulmonary lymphoid aggregations, contrasting with the insignificant fibrosis of benign pneumoconiosis, together with a fibrosis of the peri-lung connective tissue and a hyaline modification of the fibrous tissue due to the specific effect of silica. The nodules are tough, hard, and contain gritty foci; they impede the flow of lymph, there is a zone of black surrounding carbonaceous particles trapped amongst the fibrous tissue. The great majority of patients found in the alveoli measure less than 5μ and for this reason dust concentrations in atmosphere should be expressed as number of particles per cubic foot. Silica is excreted in the urine but no controlled investigations of silica balance have yet been made. Pulmonary tuberculosis is among those respiratory conditions which predispose to silicosis, while silicosis tends to make a man more vulnerable to tuberculosis. Even in modern hygienic conditions 75 per cent. of silicotics die of pulmonary tuberculosis.

K. M. A. Perry.


A clinical study of 116 patients with silicosis, 33 of whom came to necropsy. Fifteen cases of nodular silicosis, 15 cases of simple conglomerate silicosis, 77 cases complicated by manifest tuberculosis and 9 cases unclassified, comprised the group. The 15 cases of silicosis were cases of simple conglomerate silicosis in which more often added exposed to carbon dust. The pathogenesis of these lesions is not clear; the non-accidental factors and the dust which is inhaled are not considered.
and that in these cases histological as well as bacteriological evidence of tuberculosis has become obliterated. Pulmonary tuberculosis is the most important immediate cause of disability in silicosis; it is slowly progressive and does not respond well to either sanitary treatment or treatment by drugs. Chronic respiratory failure is a frequent complication and right sided cardiac failure is a common cause of death. It occurred in 26 out of the 116 cases, while there were clinical signs of decompensation in 16 cases, manifested by venous congestion, enlargement of the liver, and dependent oedema. Dyspnoea became aggravated by the onset of myocardial failure. X-ray demonstration of right ventricular enlargement is an important aid to diagnosis. The electrocardiogram showed right axis deviation. Other complications include fracture of ribs from muscular violence, enlarged lymph glands draining the lungs, chest wall abscess and obstructions of the biliary tract resulting from pressure on the common bile duct by enlarged silico-tuberculous lymph nodes.

K. M. A. Perry.


Of thirteen radiator and boiler felters examined with X-rays ten showed undoubted evidence of changes attributable to their occupation. The castings were made in sand moulds with cores of sand and oil. They were cleaned with wire brushes causing a cloud of fine dust. The radiological picture was that of the fine motting in the middle and lower lung fields met with in pneumoconiosis. Some of the men complained of breath of rhonchi, more than two felt ill and unfit for work. The cause of the radiographic appearance is discussed. The dust inhaled contained iron, carbon and silica, but any conclusion as to which substance caused the motting was considered unjustified. A plea is made for further investigation as to whether the lung shadows are due to actual dust deposits in the lungs or to reaction of the lung tissue to the dusts. If the cause of the shadows is due to silica the men are entitled to compensation.

M. H. Jupe.


Mineral Wool is a fibrous glass-like material composed of rock wool, slag wool and glass wool, of which the first two are discussed. None contains more than a trace of free silica but samples show from 29.5 to 51.5 per cent. of silica. Dust is derived from the early stages from 12 to 36 million particles per cubic foot, and 76 per cent. of the workers studied had more than from 10 to 14 years' exposure to it. The only constant X-ray findings were increased linear markings in 51 per cent. of the group, the majority being from 30 to 34 years old, but a control group had a similar incidence of increased linear markings. This paper does not bear out a suggestion that dust from mineral wool is potentially dangerous, though the exposure here would have been long enough to produce abnormal X-ray appearances.

J. N. Agate.


The pipe covers in two Government Navy Yards and two Navy Contract Yards were examined for the presence of asbestosis, incurred in their occupation. The pipe covering frequently employed was amosite, a maged of calcium and aluminium silicates, and included rock wool, slag wool and glass wool, of which the first two are discussed. None contains more than a trace of free silica but samples show from 29.5 to 51.5 per cent. of silica. Dust is derived from the early stages from 12 to 36 million particles per cubic foot, and 76 per cent. of the workers studied had more than from 10 to 14 years' exposure to it. The only constant X-ray findings were increased linear markings in 51 per cent. of the group, the majority being from 30 to 34 years old, but a control group had a similar incidence of increased linear markings. This paper does not bear out a suggestion that dust from mineral wool is potentially dangerous, though the exposure here would have been long enough to produce abnormal X-ray appearances.

J. N. Agate.


The writer describes a disturbing increase in silicosis in Switzerland during recent years in consequence of which greater measures of protection are now introduced. Cases were first recorded in 1894 and in 1916 Staub published his case notes and induced employers to give greater protection and suitable compensation. This was the first legislation of its kind in Europe. Many suspected cases were later notified but in 1942-43 two-thirds of the cases suspected in miners could not be verified. It is pointed out that one must distinguish between mere anatomical change, physical signs and disturbance of function. The first may be present without the other two. Conversely, a miner may complain of sundry symptoms and believe his capacity to be much reduced from silicosis, yet careful examinations show no sign of this disease. Diagnosis must be based on radiography alone or on the history. Screening of X-rays and serial photographs are needed. He describes three stages:

1. Minute shadows of pin-head size scattered in the middle zones with increased striae and unbalanced hilar shadows.
2. Shadows up to the size of a pea which are so numerous as to give a granular or tapioca appearance.
3. Compact shadows, usually in the middle zones and perhaps spreading upwards, resembling growths and with atelecatic areas; signs of contraction, fibrosis and pleural thickening and adhesions.

The appearances described are not sufficient, by themselves, to permit a diagnosis of silicosis. One must also know the history. Many other diseases may be mistaken for silicosis. There is no typical relationship between the period of exposure and the extent of the X-ray changes. Clinical signs and symptoms seen in these cases include cough and rhonchi, prolonged expiration, cough with fremitus. In general, there is evidence of bronchitis. Fever is uncommon. Patients tire easily, lose weight and complain of much dyspnoea even while sitting. These symptoms should make one suspect silicosis. Tests with the spirometer are valuable. Important evidence may be gained by exercising the patient and noting his pulse and respiration before and after. In the case of Lausanne much attention has been given to estimating the functional efficiency of the patient. As already stated there is no parallelism between the radiological changes and the degree of incapacity. Only in 60 per cent. of cases was a reduction of vital capacity determined, and this held good in those in Stage I and in Stage 3. In the other 40 per cent. there was an increased capacity, in relation to the theoretical values found by multiplying the theoretical basal metabolic figure by 2.5. Furthermore the maximal vital capacities do not show any even reduction corresponding to the stages of the disease. The values obtained, taken in the resting subject, give little indication of the degree of effort of which he is capable. For this reason it is necessary to get spirometer readings during exercise. There is at Lausanne an ergometer with which one may measure exactly any given output of energy. The work done is expressed in watts.

The maximum physical effort of which the patient was capable during a period of ten minutes in a 'steady state' was estimated. A 'steady state' was when the respiratory exchanges were stabilized without any
deficient oxygenation of the arterial blood and with a recovery period at the end of three minutes. No attention was paid to the output of energy when the patient is driven to exhaustion. If the energy output in ten minutes was 140, 130, 120, 100, 80 and 60 watts there was some relation between these readings and the stages of the disease. Patients in the second stage of silicosis may easily reach an output of 140 watts while some in the first stage only reach 120. But patients in the third stage, if capable of reaching 100 or 80 watts, cannot keep it up for ten minutes and so exhaust their respiratory reserves. Most of them show a fall in oxygen in the arterial blood. Patients are also found in the second stage who can only work up to 100, 80 or 60 watts by exhausting their reserves. But one patient in the third stage and aged 53 was found to be capable of reaching 120 watts in a 'steady state'. Another patient in the third stage and aged 58, with normal maximum respiratory capacity of 1-60 litres, reached 140 watts.

These results emphasize the lack of parallelism between the functional impairment and the morbid changes. The morbid changes are due not only to the deposition of silica, but to the associated hyperaemia of the bronchi, oedema, exudation and spasm. P. H. Rossier has shown that vital capacity and respiratory changes are increased by injection of adrenalin, which causes relaxation of bronchial spasm. Similar changes are seen in exercise.

The increase of dead space in these patients is connected with hyperventilation. Many factors are involved in the reduction in the patients' performance. Attempts are being made to find out more of the consumption of oxygen during effort in patients with comparable diseases. If the partial tension of oxygen in the alveoli is not enough to convert most of the haemoglobin into oxyhaemoglobin then the consumption of oxygen will be highest when the patient breathes an atmosphere enriched with oxygen. The impaired activity of the heart, due to myocardial changes, displacement of the mediastinum and changes in the capillaries from lesions of vasomotor nerves, will all affect the readings obtained. Many other factors are also involved. Failure of respiration in these patients must not be forgotten, especially as so many of them have witnessed the distressing development of the disease in their comrades. Workmen who merely exhibit structural changes are not entitled to compensation. To obtain this there must be loss of functional efficiency.

G. C. Pether.


A correct diagnosis of silicosis must first be made, based on the knowledge of the hazard involved in an individual's occupation; the differential diagnosis from welder's lung, etc., must be considered. Normal clinical methods of examination give some picture of the disability; bronchospasm brought on by forced ventilation may be an important cause of this disability. The observation of any dyspnoea during normal activities is important. Respiratory function tests should always be correlated with the clinical findings, the history and X-ray studies, and notice taken particularly of the degrees of dyspnoea induced and the recovery times. The same equipment should be used throughout and a control series worked out from the normal individuals in the locality. Possible respiratory function tests are (1) measurement of tidal, complemental, reserve and residual air, and the vital capacity, (2) the normal minute ventilation and normal tidal volume, (3) the maximal minute ventilation and maximal tidal volume, (4) the pulmonary reserve, and (5) exercise tests on the bicycle ergometer or treadmill ergometer, or by other means. In which the expired air is collected and exercise minute volume, the higher the dyspnoea the closer does this figure approach the maximum minute ventilation. There is no substitute for time and experience in estimating pulmonary disability.

J. N. Agate.


The big problem of evaluating the physical and mental capacities of all candidates for jobs is of such great sociological and economic importance that it overshadows the problem of the industrial capacity of the disabled; the latter problem is only part of the whole problem. The future of industrial medicine is closely allied to its success in promoting physical and mental hygiene, nutritional guidance, physical training and control of fatigue, and in the aiding of management in the selection of employees for specific types of work. Placement involves (a) an analysis of the job for physical requirements, (b) evaluation of physical capacity, and (c) matching capacities with the requirements of the job. It is necessary to realize however, that one of the most characteristic things about human beings is their variability, both in health and disease; and the greatest damage inflicted on either disabled or able-bodied by poor selection and placement, is not physical but psychological and results in loss of confidence, which may lead to more serious trouble with economic implications.

5100 different jobs in the federal service were analysed and their suitability for various kinds of disabled persons assessed. Only persons with amputation of the thigh, 1464 for those with foot amputations and 50 for those with double leg amputations. The placement potentialities were broad and it was found that the frequency and severity of accidents were lower than those of an able bodied group of similar age, experience and occupational characteristics. For those with orthopaedic deformities of the leg 1373 jobs were possible, of which 1471, of both feet 46. Apart from deformities of the hip these workers had the same accident experience as the able-bodied. Jobs for those with deformities of the upper extremities numbered 534, but the safety records of this group were not as favourable or severity of accidents as those of the able-bodied.

With regard to cardiac patients, these should avoid occupations involving sudden spurts with unduly slack intervals of rest; they should have regular hours and favourable conditions of work, avoiding extremes of air pressure and temperature. The patients' capacity for economizing his energy should be considered, and it should be remembered that in a heavy strain on the lower extremities is more easily tolerated than on the upper. No person liable to vertigo, syncope or sudden death should climb ladders, work near dangerous machinery or at high altitudes. Dusts induce cough and bronchial congestion and therefore should be avoided by those with mirtal disease, but any environment likely to cause infection of the upper respiratory tract should be avoided. Any occupation likely to cause anxiety or emotional disturbance should also be avoided. 1268 jobs were found suitable for cardiaics, and these patients' efficiency and productivity compared favourably with that of normal persons. Their accident rates were slightly higher with respect to frequency but as good with respect to severity.

With regard to placement of those with pulmonary tuberculosis, the job must not overtax the working capacity of the individual, and the working conditions must not be such as to be conducive to reactivation of the disease; and such that the patient is not a danger to other employees. 1328 jobs were suitable. The patients were found more suitable as the able-bodied, as their safety record was better. Their rate of absenteeism for sickness however, was high. 1269 jobs were found suitable for deaf workers whose productivity and efficiency was as good as the able-bodied, but psychological factors in individual cases may produce an accident rate higher than that of persons with normal hearing. 2179 jobs greater than that of normal persons of hearing and their productivity and efficiency compares favourably with the able-bodied though again psychological problems in individual cases increases their accident rate. They can often hear better in noisy
occupations. 2080 jobs were suitable for those blind in one eye; their performance was good but the accident rate was high; it is believed that this is due to fatigue. They must be given jobs which do not cause danger to others, and care must be taken to protect the remaining eye. Fifty-five jobs were suitable for the totally blind, and these people were found to have as good a performance as the normal.

K. M. A. Perry.


The industrially injured generally receive excellent surgical and hospital care, but recovery frequently lags in the convalescent period, and some cases do not get back to work because of the absence of a good introduction to work activity or appropriate placement when physical handicap has resulted from the injury. Inactivity prolongs disability and it sometimes develops discouragement or bad mental attitudes and fixations. No facilities have existed, however, for giving a medically supervised after-care to industrial cases that would prevent the development of these fixations.

Great success was reported from the Royal Air Force, who were giving a medically supervised after-care treatment, in the form of physical therapy and exercise, starting almost immediately following surgical operations. For the purpose of providing a facility where doctors could send the industrially injured, a Rehabilitation Centre was opened in Boston in June, 1943. Physical therapy was given concurrently with occupational therapy consisting of prescribed work in shops and other recreational activities. Of the first ninety-nine cases admitted to this centre, all of which were serious injuries, over 70 per cent. were either fully or partially restored to work capacity. There is a growing demand for such facilities which is a challenge to the medical profession and hospital services to provide them.

A. Thelwall Jones.


The views of industrial physicians and labour managers differ: the former is concerned with the amount and type of work an employee can do, the latter with the employee's job and skill. The physician's opinion is based on a physical examination supplemented by laboratory examinations and X-rays. Of 150,000 workers restricted at least four years, the last five per cent. were fit for all work, 16-12 per cent. fit for limited work and 5-3 per cent. unfit for work because of infectious disease, mental disorder or serious organic disabilities. A person must not be employed on work which may be harmful to himself or create a hazard to others; limited employees are classified: I. No hazardous machinery, II. No heavy lifting, III. Ground level work, IV. Avoid contact with or exposure to (specified agent), V. No extensive walking or standing, VI. Special and Miscellaneous (for example, must work in a noise-free area).

Employees returning after long illness should be classified before starting work. The employee's mental attitude is all important: with the wrong outlook, minor disabilities may be greatly magnified, and on the other hand, an over-ambitious employee may do himself harm. An adequate follow-up is essential as in particular the employee's immediate supervisor must be educated by personal contact by the medical department. To achieve full use of human power, supervisors who are completely familiar with production and technical methods are required and trained. Supervisors should be encouraged to refer problems to the medical department, and on transfer to a new job limited employees should be re-examined.

At the start of the scheme for employment of limited employees, the plant average was 10 per cent. and the highest percentage in any department 15 per cent. These figures have now been increased to 14 per cent. and 26 per cent. of limited employees. The success of the scheme allows the problem of the returning ex-service man to be faced with confidence especially if the word 're-employment' is used instead of 'rehabilitation.' It is estimated that 10 per cent. of ex-service men will have disabilities, of whom it is estimated 15 per cent. will be capable of returning to their pre-war job. Only 15 per cent. of the disabled (1.5 per cent. of all ex-service men) will have handicaps needing special consideration. Greater emphasis must be placed on the psychosomatic and psychological aspect, though to submit all ex-service men to a detailed psychological examination (including tests) on return to the factory would be unnecessary and unwise. The ex-service man should be encouraged to resume his place as a normal man, rather than as a 'problem child' but all who do not settle down should be seen.

Industry does not 'owe' anything to the limited employee; properly employed the limited employee is not a hindrance, and the granting of special privileges transfers the employment of 'limited employee' to the realm of charity, unjustified unless grants-in-aid are made by the Social Security Board or State Rehabilitation Commission. Quite apart from medical ethics, caution must be exercised in telling the management about the limited employee's disability in case over-caution by the supervisor reacts to the employee's detriment. Physical disabilities are easier to place than mental or emotional. Limited employees are sometimes placed capable of doing a full job; but degenerative conditions present the greatest problem and, it has to be recognized, do result in increased risk to the employee and to industry.

T. A. Lloyd Davies.


The author describes a very ingenious method by which the blind can be employed on precision work.

In manufacturing tapered roller bearings it is essential that the diameter of the various parts for anti-friction bearings be ground to within very fine dimensions of the specified sizes. Those parts falling over and under the specified size limit are detected and removed by means of an electronic device. To enable a blind operator to complete this very fine inspection with the same accuracy as a sighted worker, the Timken Roller Bearing Company has invented a sound detector which gives a high note indicating oversize, a middle note within the specified limits, and a low note indicating undersize. Thus it is possible for the blind to do inspection work within one twenty-five millionth of an inch, using their ears. This apparatus is available to any industry willing to employ the blind for inspection work without any rights or royalties.

Blind employees do sound tests which are the final inspection of the assembled bearings for smooth and noiseless operation and also file testing by feel for hardness of steel. It has been found that the blind can do about 80 per cent. as efficient work as the regular employee.

R. S. F. Schilling.


From 35 years ago, when the question was whether to adopt a compensation law (Mississippi is the oldest), the problem to-day is how to broaden the law so as to include all workers and all types of industrial injuries. (Each state in U.S.A. has its own compensation law. In Michigan, Workmen's Compensation is administered by the State, but the law is compulsory for all employers of eight or more persons (over 40,000 employees being subject). The Unemployment Compensation Law is similarly compulsory for employers of eight or more persons, and under this law 182
employers are registered so that the majority of the 50,000 employers subject to the workmen's compensation law employ less than eight persons.

In 1937 scheduled occupational diseases were admitted for compensation but not in a contributory scheme, for example, a grinder received compensation for pneumoconiosis but not a moulder working in the same room and exposed to the same hazard. The 1943 amendment removed the requirement that industrial injuries must be accidental to be compensable, and general occupational disease was substituted for schedule disease. Compensation is paid both for injury due to a single event and not due to an event, for example, a disease. It may also be paid for aggravated disease. To receive compensation a disease must be personal and be due to causes and conditions which are characteristic of and peculiar to the business of the employer and which arise out of and in the course of the employment. A dissenting judgment (of greater legal significance than the majority) is quoted in which a woman using the hands for manipulating bottles suffered from bursitis but because this type of work did not carry an increased risk of developing bursitis, she was not (in the opinion of the dissenting judge) entitled to compensation. A woman developing arthritis and partial subluxation of the proximal metacarpophalangeal joint of both hands from filing castings, was on this basis refused compensation by the commission, as the injury was not due to causes and conditions characteristic of and peculiar to the bursitis of the employer. This case may be not a decision. In the author's opinion that is the criterion by which eligibility for compensation must be decided. Compensation is not intended to cover the chronic ailments arising in advancing years. Sometimes the division between natural illness and injury is vague, and distinction depends not on the nature of the disease but on circumstantial evidence, for example, a hernia in a man doing heavy work is probably occupational in origin but in a man doing light work probably arises naturally.

Consideration of these matters should be kept in the hands of competent persons of good judgment who know the difference between speculation and proof.

T. A. Lloyd Davies.


In changing the basis of workmen's compensation to a contributory scheme, the National Insurance (Industrial Injuries) Bill, 1945, should remove much of the workman's grievances with the present system, and it is important to note, change the work of the medical profession. The employee will contribute to the Industrial Injuries Fund by weekly stoppage of pay 4d. for men, 3d. for women, 3½d. for boys under 18 years and 2d. for girls under 18 years. The employer will pay similar amounts. The payments are additional to the contributions to the National Insurance Fund, and already workers have said they intend to use this compulsory levy in an argument for increased wages. The fund will be aided, if the Treasury think necessary, by an Exchequer contribution equal to one-fifth of the aggregate amount collected, making a total (with the Exchequer's payment) of £27½ million a year.

All persons under any contract of service or apprenticeship in Great Britain are insured (excluding the armed forces, police, certain workers not yet prescribed in other Crown employment, or under a public or local authority). Of the 13¼ million men and 44 million women classified as employees in the Social Insurance Report, 1944, approximately 10½ million will be insured for industrial injuries. In 1938, 460,000 persons received £6 million in compensation under the Workmen's Compensation Act, out of a population at risk of 7,800,000.

Benefits are not based on loss of earning capacity (whether due to different injuries) and the tendency to consider this particular section of the social insurance plan in isolation from the general scheme is unwise, and has raised industrial injury payments above the general level. No regard has been paid to the cost to the community, but even so the T.U.C. are pressing for an increase of the industrial injury benefits from 45s. to 55s. per week. The National Union of Mineworkers considers that the dangerous nature of their work warrants an increase of 50 per cent. increase in benefits. Differences in payment may return to the districts, and in any case the nation cannot afford an incentive to remain out of productive work.

Under the new system, a claim for benefit involves five points, the name, occupation, employer, insurance officer, office clerk and doctor. Will this cause delay in payment, and will the introduction of government officials into an intimate health circumstance and a private matter between man and master cause difficulty? The scheme is important, and the Act specifically empowers the Minister to promote research. But will the Industrial Health Research Board continue to be understaffed and inadequately housed, or will the Ministry set up its own research organisation? To conduct adequate enquiries into the cause of accidents a national health statistical department will be required. In addition to the Advisory Council provided for by the Act, it is suggested a medical advisory committee should be set up to advise the Minister on medical matters (especially the assessment of prescribed industrial diseases) so that the influence of the medical profession may attain its full effect.

T. A. Lloyd Davies.


More patients complain of visual discomfort than poor vision, so satisfactory refraction calls for comfortable vision as much as a normal visual acuity. Poor vision is never uncomfortable, even if it is inconvenient but active use of the eyes for near vision is uncomfortable whether for an emmetrope or a corrected myope. The causes of discomfort are manifold, and astigmatism is the most common; others are asynkinesis as in hypermetropes, where the amount of convergence required does not equal the amount of accommodation, excessive power of both accommodation and convergence which can in part be remedied by overcorrection of the refractive error, or low power of both accommodation and convergence which requires either orthoptics, fixed prisms incorporated in the patient's glasses, or a combination of the two methods. In measuring muscle balance the prism base is is not different in different individuals (with identical injuries) and the tendency to consider this particular section of the social insurance plan in isolation
to the glasses themselves, are faulty measurement of interpupillary distance at the range at which the patient works, vertical imbalance induced by the correcting lenses, either when the lens grinds is at fault, when the patient looks down through two different powers of lenses, or when there is no decentration to correct anatomical differences of height of the eyes. Some patients have an asymmetrical nasal bridge which again calls for decentration of the lenses. Cylinders used to correct astigmatism have certain positive secondary prismatic effects or induce artificial cyclophoria which cause discomfort. Many cases of ‘eye-strain’ are due to low convergence with low accommodation, and these must not be tried by binocular lenses. Untreated weak convergence accounts for more discomfort than all the others together, and patients can sometimes be helped with slightly extract and a little base-in prism effect. Poor accommodation may be due to ciliary weakness or spasm, and result in having no reserve for close work, in which case a little overcorrection will give some reserve, which ought to be one-third of the total accommodation. A lens grinder cannot produce satisfactory lenses unless the refraction is accurate and his instructions complete in every detail.

J. N. Agate.

Psychiatry in Industry. Cameron, D. E. (1945). Canad. med. Assoc. J., 53, 338. The industrial psychiatrist has three main functions, teaching, clinical practice and research. Managers, foremen, doctors, nurses and employees must be taught the facts of human behaviour. The more a man knows about himself and others, the less frustrated he will be. The more executives know of human motivation, the more efficient they will be. Teaching should emphasize that any job analysis must take into account whether the job can give satisfaction to the worker and to what kind of worker.

The importance of psychosomatic medicine is not yet realized; many are still ignorant of all the persuasive symptoms of tension, even those who can evaluate it in gastro-intestinal and cardiac disorders are ignorant of the nature of many cases of tinnitus, dizziness, blurred vision, postural hypoxia, pruritus and many dermatoses. If an overloaded man who is excessively keen on doing his job well, he will become ill and finally be lost to industry. Another cause of serious wastage of valuable employees is placing incompatible individuals together as when a highly gifted but emotionally insecure man is teamed up with an aggressive boss. Psychiatric principles must be applied by the whole industrial team, as the surgeon with his aspesis, the housewife with her insistence on pasteurized milk, the engineer and the draingage system are the principles of bacteriology. The specialist psychiatrist should assess the personality at intake into industry, be available for consultation when required and, by suitable employment recommendations, ensure that nobody is employed where he will certainly break down. Research must discover what kind of jobs and situations produce excessive tension, in what kinds of persons serious degrees of tension will occur and how such tensions can be prevented and cured. E. H. Larkin.

Psychosomatic Medicine in Industry. Ross, H. G. (1945). J. Michigan State med. Soc., 44, 1067. If health is to be a positive conception, the patient must be considered as a whole in relation to his environment. To this study, the term psychosomatic medicine is applied. Medicine has become sectionalized, and in its attempt to separately pursue purely scientific advances in medical knowledge, a return to the practice of the art of medicine is the essential foundation for psychosomatic medicine. The status of an industrial physician as a specialist is the subject of controversy but the industrial physician has to have a broad and broadening vision rather than the narrowing view of the specialist in other branches of medicine. Because of his opportunities of studying the patient’s working and living conditions, the industrial physician is in a favourable position to apply the principle of psychosomatic medicine. The sickness-prone worker may be of three types:—I. those of poor physique, of bad heredity, from a bad home or suffering from ‘just bad luck’; II. those with many complaints for which no organic cause can be found but who are actually ill; III. those with diseases complicated by psychic factors. The two latter groups present the greatest problem to medicine, industry and the community.

Treatment consists of explaining to the patient how the persons’ complaints are genuine, the relief of anxiety and emotional tension, the adjustment of housing, money and other worries. Those with recent emotional upsets respond better to treatment than those whose symptoms originate from childhood. Because so few psychiatrists are interested in industrial medicine, the industrial physician must, by exercise of common sense, apply the principle of psychiatry to these cases.

(To English readers this paper presents some confusion in terms. The first part of the paper is an admirable exposition of the need for the study of social medicine— to which the author applies the term psychosomatic medicine. The second part explains the psychosomatic origin and the need for psychiatric treatment for patients whose symptoms are not, in the true sense of the term, psychosomatic in origin, i.e. Group I in the author’s classification.)

T. A. Lloyd Davies.

An Industrial Mental Hygiene Programme for Federal Employees. Cronin, J. W., Solvy, B., and Wilder, W. S. (1945). U.S. Publ. Hith. Reps., 60, 1323. Only organizations employing large numbers of persons can create a fully staffed mental health unit, but smaller firms might combine for this purpose. This would need a uniform and scientific system of personnel management, though in small firms management is largely on a personal contact basis which often leads to a satisfactory job adjustment, loyalty and morale. As Industrial Mental Health Service is in its initial stage, centralized services would enable useful data to be collected and offer special service, such as psychometric testing to small firms.

Symptoms of maladjustment vary according to the war position: in times of urgency the human factor tended to be emphasized by management, and the individual worker found increased satisfaction in his job. Slackening of the war effort and the consequent insecurity have led to national and industrial anarchy, an aggressive boss. Psychiatric principles must be applied by the whole industrial team, as the surgeon with his asepsis, the housewife with her insistence on pasteurized milk, the engineer and the drainage system are the principles of bacteriology. The specialist psychiatrist should assess the personality at intake into industry, be available for consultation when required and, by suitable employment recommendations, ensure that nobody is employed where he will certainly break down. Research must discover what kind of jobs and situations produce excessive tension, in what kinds of persons serious degrees of tension will occur and how such tensions can be prevented and cured. E. H. Larkin.

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T. A. Lloyd Davies.
adequate supervision and training are especially important. In particular, the foreman must expand his role from production expert to a leader of those for whose work he is responsible.

T. A. Lloyd Davies.


Health risks of a toxic nature are relatively rare in New Zealand, but those that exist are important because so far they have frequently passed unrecognized. This country's system of social security aims at providing outside the factory facilities for medical treatment, but makes no provision for the supervision of the health of workers at work. But there are a few factories in which progressive management have appointed part-time medical officers and nurses. Nevertheless, where a doctor has been appointed his duties are directed towards curative rather than preventive work. The standards of first-aid and of first-aid equipment are low, individual sealed sterile dressings are unknown, and frequently no records are kept of persons treated.

The practice of preventive medicine in industry will be a new field for New Zealand doctors and nurses, but it can only be applied to industry if industrialists appreciate the importance of medical supervision which means a great deal more than a glorified casualty service or having a doctor 'on call'.

R. S. F. Schilling.


Owners of commercial, industrial or agricultural establishments in the Philippines are obliged to give free emergency medical attendance to their employees. This applies not only to private industry but to all Government establishments. Specific instructions are laid down as to the types of medical facilities to be given, their scope is determined by the numbers employed. For thirty workers a stock of emergency medicines must be maintained under the charge of a nurse or other intelligent person. When the industrial population exceeds 400 persons, the owner must employ the services of a physician and provide a dispensary or an emergency hospital. The Bureau of Health has inspectors to see that the law is enforced.

Philippine industries include mining, lumber, sugar, rice, hemp, tobacco, textiles, rattan and leather. The author describes the sugar industry in detail. Although occupational health risks must exist in this industry, workers claim little knowledge of such illness. There has been no morbidity due to exposure to bagasse, but dermatitis due to phenolic sprays for cleaning occurred until steam was used as a cleaner. The plant medical service provides care for the worker and his family at a cost to the worker of 1 per cent. of his salary. Preplacement medical examinations are necessary by law, but there is no varying set of standards for jobs with different physical demands. All workers irrespective of their job must meet the same physical standards before they can work. The main contra-indications to employment are hypertension and tuberculosis. The latter disease is extinct in the islands and its spread is feared by the people. Health education is very necessary because the average Filipino will not consult a doctor in the early stages of disease, but pamphlets have not been so successful as visiting nurses who can get into the provinces and barrios.

There is a Workmen's Compensation Act which provides adequately for the disabled.

The employer is required to pay all medical and surgical costs following injury or illness incurred by one of his employees.

R. S. F. Schilling.


The U.S. Department of Labour has Bureaus of Labour Statistics, Labour Standards, and others to supervise the employment of women and children. The U.S. Public Health Service incorporates an Industrial Hygiene Division and Industrial Hygiene Research laboratories. Since 1935 various occupational disease laws and the Social Security Act have been in practice the knowledge gained from previous research. Industrial hygiene started by considering traumatic injury at work and has evolved to concern itself with protecting every worker in industry and with ensuring the greatest possible physical and mental health for each. Forty-nine official industrial hygiene units are located in thirty-nine States.

The Industrial Hygiene Division of the U.S. Public Health Service is made up of (1) The Field Operations Section; (2) the Dermatoses Section; (3) The Medical Unit, which is consultative and undertakes epidemiological investigations; (4) the Engineering Unit; (5) the Dental Unit; (6) the Nursing Unit; (7) the Chemical Unit, and (8) the Statistical Unit. The Division working in cooperation with all manner of other interested bodies kept watch over working conditions in government munition plants, and disabilities and deaths from toxic exposure in making explosives were greatly reduced; it made a study of shipyard workers and the effects of welding; it undertook to protect the health of workers in 379 foundries in twenty-seven States, and of lead smelters in twenty-two States: it studied conditions in chrome plants, and in aluminium reduction and asbestos textile industries. It concerned itself with nutrition of war workers and prevention of accidents and illness in a variety of industries.

Laboratory research was directed to the toxic properties of explosives and DDT, but in particular of non-inflammable battle-ships paints, and the ingredients of synthetic rubber. High altitude temperature and pressures, oxygen breathing equipment, oxygen-helium resuscitation methods, and tropical conditions were all studied.

The Industrial Hygiene Division has assisted work in the individual States with funds, trained personnel, laboratory facilities, loan of equipment, consultative opinion and published literature.

The main post-war work was the shortage of trained industrial doctors. In 1939 the State of Indiana had only 10 per cent. of its workers supervised by a full-time industrial medical officer. Fundamental research is to be directed to adjustment of handicapped war veterans to industry, industrial dermatoses, health problems of air transport, hazards of atomic energy production, and the toxicity of new chemicals and plastics.

J. N. Agate.


Industrial dentistry lapsed between the World Wars but was resumed in the recent one. Minimal standards were laid down in 1941 by the American Dental Association. The Dental Unit of the Industrial Hygiene Division of the U.S. Public Health Service has assisted state health departments to correlate their activities and tackle industrial dental problems, and three of them employ full-time dental officers. Routine oral examination with X-ray can be done in the reasonable time of five or six minutes. Some industrial hazards are first noticed because of symptoms related to the mouth, as in the case of sore gums occurring as the first sign of poisoning in a plant using metallic mercury to make electric batteries. The industrial dentist needs to know the physical and toxic hazards involved, and must keep full records. A five days' course was given in December, 1944, at Columbia University on subjects relating to industrial dentistry. The essential parts of an adequate service are (1) examination and diagnosis; (2) emergency treatment; (3) recording of findings; (4) dental health education, and in a small plant a local dentist could be 'on call' to give them, while in the larger, full or part-time services are the sounder proposition.

J. N. Agate.

Before the war the incidence of occupational dermatitis in the U.S.A. was one case in every hundred employed workers. In war industries the figure amongst new employees sometimes reached 50 per cent. The conditions in the U.S.A. was one case in every hundred employed workers. In war industries the figure amongst new employees sometimes reached 50 per cent. The agents mainly responsible are petroleum products and greases, alkalis, and solvents. Full knowledge of industrial dermatologies; the U.S. Public Health Service has instituted processes besides experience in dermatology is needed for accurate assessment of the causes of the dermatitis.

Dermatitis due to alcalis, and solvents. Full knowledge of the U.S. Public Health Service has instituted processes besides experience in dermatology is needed for accurate assessment of the causes of the dermatitis.

The new employee should be aware of the smaller ones are behindhand owing to lack of knowledge of the work, and severe eczematoid dermatitis is seen among the metal round with charred leather, bones or wood charcoal, impregnated with carbonate. Much soiling of the exposed skin occurs in the atmosphere of workshops. Figures listed were drawn from the dust analysis, to which the steel is made richer in carbon content.


A table is given of the maximum allowable concentrations of some 130 materials which may contaminate the atmosphere of workshops. Figures listed include those laid down by a number of states, by the United States Public Health Service, and by the American Standards Association. Based on these figures, on animal experiments, and on industrial experience, there is a final column with estimated maximum allowable concentrations expressed in parts per million and milligrams per cubic metre. The basis and reliability of each of the values given in this final column is recorded and there is included brief abstracts from the literature.


Large-volume air samples are sometimes required, e.g., in an investigation of radon dust risks an 1800 cu. ft. sample was necessary for satisfactory quantitative determinations. The apparatus designed allowed efficient sampling rates as high as 65 cu. ft. per minute. The air was drawn through a bell-mouth type of inlet, 1-12 inches in diameter, fitted to a 25-inch flexible tube, and the dust or fume retained on the filter paper in the apparatus, which also contained the blower. When an ashen paper was not required the filter paper used was Eaton and Dikeman No. 613-21, and for gravimetric work, Whatman No. 44. To provide a minimum filtration area, the unit consisted of a cone and a frustum of a cone, with a total area of 1-55 sq. ft. The paper was prevented from collapsing or bursting by a wire screen. The article is illustrated by three photographs of the apparatus, with its manometer and flow regulating valve.


Poisoning by inorganic compounds of arsenic is dealt with fully in all standard treatises on toxicology. The toxicology of the organic compounds of arsenic has been described as complications of therapy, but little has been written of the effects of occupational exposure to organic arsenical compounds.

The authors estimated concentrations of arsenical dust calculated as As₂O₃ in the atmosphere of various parts of a plant making arsphenamine and related compounds. The mean value of all manufacturing operations was 0-006 mg. per cu. ft., the mean for packaging operations was 0-0023 mg. per cu. ft. Concentrations in the workroom range No. 44. To provide a minimum filtration area, the unit consisted of a cone and a frustum of a cone, with a total area of 1-55 sq. ft. The paper was prevented from collapsing or bursting by a wire screen. The article is illustrated by three photographs of the apparatus, with its manometer and flow regulating valve.

Urinary excretions were determined for workers in the manufacturing and packaging sections and for applicants for work. The ranges were as follows—manufacturing 0-006 to 0-500 mg. per 100 c.c.s. of urine; packaging 0-003 to 0-037; applicants (controls) 0-006 to 0-028. At higher levels of exposure in the manufacturing department increased urinary excretion was present but only a fraction of the calculated inhaled arsenic could be demonstrated in the urine. Analysis of hair in four manufacturing workers gave values higher than those previously reported in the literature, but these workers showed neither symptoms of arsenic poisoning nor unusually high concentrations of arsenic in the urine. The arsenic in the hair was believed to be of external origin and to have no diagnostic value. Symptoms of extremely mild arsenic poisoning were found among certain employees working under conditions of heavy exposure in the manufacturing department.

Results of 323 complete blood counts on 35 arsenical workers were compared with 221 complete counts on a control group of workers not exposed to arsenical compounds. No statistically significant toxic effect on the bone marrow of those exposed to arsenical compounds was demonstrated. R. S. F. Schilling.


Dichloropropane (CH₃Cl—CHCl—CH₂) is widely used as a solvent and as an insecticide. In the present study various species of animals were exposed for seven hours daily, five days a week, in a chamber 4 x 4 x 6 ft. 400 litres of air per minute were drawn through the chamber, or a complete air change every seven minutes. A concentration of 2200 p.p.m. (or 10-4 mg. per litre) proved to be very toxic. Eleven of the sixteen guinea-pigs exposed were dead by the end of the fifth exposure,
and five out of twenty rats died after five exposures or less. Of four rabbits, two were dead after the second exposure. All but one of eleven mice died before the completion of one exposure. At a concentration of 1500 p.p.m. methods were followed that showed little evidence of being affected while in the chamber, though the growth of rats and guinea-pigs was adversely affected. Mice were very susceptible, all of twenty-two mice dying when exposed for four hours. At a concentration of 1000 p.p.m. twenty-five out of forty-five rats died after exposure on six to fifty-nine occasions, and three out of twelve guinea-pigs (twenty-two to ninety-seven occasions). Of five dogs and four pugs, four died after twenty-seven to ninety-six exposures.

Many tests were made of liver and kidney function, but no abnormalities were discovered except a lowering of the plasma protein level, and this was probably due to voluntary starvation. Haematological studies gave negative results. Autopsies showed that guinea-pigs and rats had moderate to marked fatty degeneration of the liver, and moderate fatty degeneration of the kidney. Mice dying after a two-hour exposure to 1500 p.p.m. showed marked fatty degeneration of the liver. The four dogs which died after numerous exposures to 1000 p.p.m. showed moderate to marked fatty degeneration of liver, kidney, heart and adrenal gland.

When the toxicity of dichloropropane was compared with that of four other chlorinated hydrocarbons, it was found that all but one of them. Dichloromethane was the least toxic, repeated exposures of rats to 5000 p.p.m., over a period of six months, being well tolerated. Trichlorethylene was more toxic, only two out of six rats surviving repeated exposures to 3000 p.p.m. Carbon tetrachloride killed six out of thirty rats by the time that eight exposures to 2400 p.p.m. had been made. The most lethal hydrocarbon of all was dichloromethane, twenty-two out of twenty-eight rats being dead after fifteen exposures to 1000 p.p.m. These comparisons of the various chlorinated hydrocarbons are not exact, as different strains of rats and different diets were used.


Welding operations incident to the construction and repair of steel ships often produce distortion of the metal plates, especially on decks and bulkheads. Subsequent corrective measures include shrinking, which involves the application of heat to distorted sections of steel plate by means of an oxyacetylene flame. Shrinking is often necessary in small confined spaces, and the oxides of nitrogen produced may cause poisoning: e.g., a man expired in thirty minutes after ten days from chemical pneumonia. The acetylene torches used in the shrinking equipment commonly vary from a consumption of 60 cu. ft, to one of 250 cu. ft. per hour, and the temperature of the flame is about 6000° F. Samples of air were collected in the breathing zone of the unventilated compartment (of 600 cu. ft. capacity) in which the man was poisoned, and analysed by the phenol disulphonic method. A shrinking torch of 125 cu. ft. capacity was used. The only ventilation was through a single door, and eight air samples collected over a period of twenty-three minutes showed a concentration of oxides of nitrogen averaging 196 p.p.m., with a maximum of 480 p.p.m. The concentration was not appreciably affected by the water curtain surrounding the acetylene flame, nor by cool metal surfaces. It was found that (in a 700 cu. ft. compartment) the concentration of oxides of nitrogen varied with the size of the torch, being only 38 p.p.m. when the acetylene consumption was 16 cu. ft. per hour, 210 p.p.m. when it was 60 cu. ft., and 350 p.p.m. when it was 1500 cu. ft. per hour. At this ventilation, the average concentration of oxides of nitrogen was only 4 to 48 p.p.m. H. M. Vernon.


A procedure suitable for determining minute quantities of mercury in biological and related materials is described. Organic matter is destroyed by a special apparatus, by boiling first with a mixture of sulphuric and nitric acids, followed by a second boiling treatment after addition of potassium permanganate. Mercury is extracted from the decolorized potash-permangante digest (diluted to 1-8 N. in respect to sulphuric acid) by means of a chloroform solution of di-β-naphthylthiocarbazone. The chloroform extract is then treated with a sulphuric acid-sodium thiocyanate mixture to separate the mercury from copper. The final estimation of mercury is made by photometric di-β-naphthylthiocarbazone-chloroform extracts of the copper-free aqueous phase following treatment with potassium permanganate. At least 50 g. of blood must be used for the reliable estimation of concentrations as low as 1 mg. of mercury in 100 g. of blood. A table, which compares the mercury content of the blood and urine of exposed persons, shows that the mercury content of the blood is very low. Except in one case, the amounts were well below 10 mg. for 100 g. of blood. The highest, 0.029 mg. per 100 g., was found in a case where the urine level was 44 mg. of mercury per litre. The mercury-di-β-naphthylthiocarbazone complex is more stable than the analogous dithizone complex. A. Thewll Jones.


A bitch was fed on a diet containing 0.4 g. of sodium fluoride daily. Some of a group of puppies between the 25th and 95th day were suckled by their mother fed on this diet, while others were fed by their mother for four weeks and then on food containing 0-1-0-2 g. of sodium fluoride. Extensive changes were produced both in the bones and developing teeth dependent on the dose and length of time for which the fluoride was given. Small doses, starting at an early age and administered for a long time, produced a dense periosteal bone formation. In puppies suckled throughout by their mother, bone changes were observed before changes occurred in the tooth buds; the periosteal cells assumed osteoblastic function before the enamel forming cells were affected. Changes in the bones and teeth could not be prevented by a vitamin D diet. Calcification of the dental and endosteal bone in spite of continued administration of fluorine suggests that the pathogenesis of the lesions in bone are different in rickets and fluorosis. Fluorine produced changes similar to rickets in the bones and dentine of puppies but its effect on the bones of older dogs differed from that of rickets. The author considers a full investigation into X-ray changes in the skeleton of children living in endemic areas and showing so-called "rioted enamel" should be carried out.

K. M. A. Perry.


The thymol-barbitone test first described by Maclagan in the British Journal of Experimental Pathology in 1944, is a serum turbidity test which, when positive, is said to indicate disturbed liver metabolism. The authors applied the test to 713 heparinized human blood samples and 49 (68 per cent.) gave a positive reaction, and to 52 chemical workers exposed at apparently safe concentrations to various chemicals, some of which were known to be toxic. Of the latter group there were no false negatives, but none of 30 presumed healthy individuals had a positive test. Liver damage was indicated in the greater number of reactors in the hospital patient series, but the authors were limited in their investigations to hospital patients. The validity of the test was lower than appraised by Maclagan. R. S. F. Schilling.