

form of borrowed money and that in the form of share capital. It was thoroughly bad that the incidence of profits tax should favour borrowing money and put such a heavy burden on ordinary share dividends, but he agreed with the authors of the report that too much time and energy were occupied by the problem of death duties.

Apart from this, few of the issues specifically indicated by Prof. Carter were mentioned by the other speakers, though Prof. Carter did not suggest that they would necessarily be discussed. Some of these points may be mentioned in conclusion to indicate that something more was done at the conference than to ventilate a pressing problem of modern industrial development and to seek possible solutions. There is the question whether there is a right balance between compulsory and voluntary saving; is it good or bad for technical progress that so much capital invest-

ment should be financed from ploughed-back profits; are the inducements and privileges given to private savers sufficient, or could a useful increase in private saving be obtained by further inducement? Again, are selective means of encouraging specially productive industries needed and can we make better use of men with ideas but no great ability in finance or sales? What is the place of general measures such as the investment allowance and do frequent changes diminish their efficacy? Is there any better way of controlling fund-raising from the markets than the present Capital Issues Committee, or would it be better for technical progress if capital were rationed by prices? Is there any better way of ensuring finance for small companies which unite technical progressiveness with business competence, and can anything be done to allay the fears of small firms which inhibit them in seeking outside finance?

SMOKING AND LUNG CANCER

REPORT OF THE TOBACCO MANUFACTURERS' STANDING COMMITTEE

THE tobacco manufacturers of Great Britain, disturbed by the reports that the evidence for a close relation between smoking and lung cancer was piling up, gave in 1954 a fund of £250,000 to the Medical Research Council for furthering research on the subject. Not satisfied with the results of their philanthropy, the manufacturers are now about to set up a new fund for research to the tune of £1 million. Their Standing Committee consists of technical representation from the different companies, and a scientific consultants panel of two eminent scientists, namely, a chemical technologist and a statistician-geneticist.

The report issued by the Standing Committee (6-10 Bruton Street, London, W.1), dated June 17, 1957, shows undisguised attempts to belittle the findings of those investigators who have shown a correlation between smoking and lung cancer. For example, it points out that one's daily intake of benzpyrene in the air in a West Country town is equivalent to the benzpyrene content of the smoke from forty cigarettes and the daily intake in London to the benzpyrene from one hundred cigarettes. These statements could imply that the best-known carcinogen (benzpyrene) present in cigarette smoke can be ignored as a factor in the lung cancer-smoking relation, since the air already contains more benzpyrene than the amount to which the great majority of smokers are exposed. Unfortunately for this idea, the lung cancer rate has been rising rapidly in many places all over the world and including towns in Norway, Iceland and Denmark, where the air is far less smoky than in English towns and where, as a consequence, the benzpyrene content of the air is a small fraction of the English figures. Moreover, women have a much lower lung cancer rate than men, although they breathe the same air.

Nevertheless, the laboratory work of the Committee is largely concerned with the measurement and the formation of benzpyrene in cigarette smoke. The report records that the arsenic content of

cigarettes is declining due to alterations in the pest-control technique on the tobacco crop. However, the implication that arsenic in the smoke could be the responsible carcinogen is undermined by the available lung cancer figures for Turkey, where the disease is about as common as in other European countries, but where the tobacco contains scarcely any detectable arsenic.

Although the report begins by rejecting the lung cancer-cigarette relation, its laboratory work energetically pursues the theme that cigarette smoke contains carcinogens such as benzpyrene, arsenic, dibenzanthracene, or some as yet unknown carcinogen lurking among the other constituents of cigarette smoke, which are identifiable or have still to be defined.

The report brings its heavy guns to bear on the statistical aspect of the problem. It emphasizes that a contingent statistical relation does not guarantee causation. Let us take an example of what could be called contingent. Seaside-sunburn in London school children, before the motor-car, was always preceded by a railway journey. The railway journey is contingent to the sunburn but is not the cause of the sunburn. To take a strictly practical point of view, the seaside-sunburn could have been avoided by shutting down the railways, and in the same way lung cancer could be largely avoided by closing the cigarette factories, quite independently of whether lung cancer and smoking have a causal or a contingent relationship.

The report refers to the 'genetic factor', that is, a hypothetical factor present in part of the population which determines not only susceptibility to lung-cancer but also a disposition to seek tobacco. Then why did not this genetic trait show itself before the lung cancer epidemic got under way, at about 1910-20?

A further theme pursued in the report is the alleged imperfect randomness of the patients who were the subjects of the Doll-Hill investigation. Surely, non-randomness is what is required: to

choose parallel lung-cancer and non-lung-cancer patients for comparison whose other differences have been cancelled out with the exception of one variable, namely, smoking or non-smoking. This Doll and Hill did: they studied 1,357 men who had contracted lung cancer and the same number of men free of lung cancer as controls, together with 108 women suffering from lung cancer and 108 women controls. The patients and their controls were in the same hospitals in London, Birmingham, Cambridge, Leeds and Newcastle and in rural areas of Dorset and Wiltshire; they belonged to the same age group, had been in hospital for the same length of time, and the controls even had the same disease (cancer) of some other part of the body. It would be difficult to imagine a more carefully worked out scheme of matched controls. The results of the Doll-Hill

investigation are now too well known to need reiteration.

The report develops the argument that modern therapeutic methods have allowed age groups liable to lung cancer to survive which would previously have had large losses by death at a less advanced age. Let us then assume that the steep fall in the tuberculosis death-rate since the latter part of the past century has saved susceptible groups for a later death from lung cancer. But what of the women? Their death rate from lung cancer is much below that of the men. It will be necessary then to postulate a second hypothesis, that lung cancer is sex-linked. But our difficulties are not over, for the lung-cancer rate for women has been rising quite rapidly. For the moment, this line of argument is better abandoned.

I. HIEGER

THE NATIONAL COAL BOARD'S PNEUMOCONIOSIS FIELD RESEARCH

By DR. J. W. J. FAY

Chief Scientist of the Research

PNEMOCONIOSIS is a condition which starts almost imperceptibly with the fixation of a small amount of dust in the lung, and as the period of exposure increases more and more dust is accumulated. So long as the condition remains as 'simple' pneumoconiosis, it is believed that it will not progress if the subject is removed from the dusty environment, and disability is absent or comparatively slight. The rarer but more serious form is known as 'complicated' pneumoconiosis, or progressive massive fibrosis. In this form of the disease the patient's condition deteriorates even if he is removed from the dusty environment. Progressive massive fibrosis is thought to be caused by the superposition of an extraneous infection, probably tubercular, on a background of simple pneumoconiosis usually in its more advanced stages. Hence, if pneumoconiosis is halted at the earlier stages of the simple form, the results are not serious. Both forms of the condition are recognizable by X-ray examination of the lungs.

In spite of the work which has already been done, pneumoconiosis still presents a serious problem in the coal-mining industry, about five thousand new cases being certified every year. The National Coal Board has therefore undertaken a field research to study the effect of the dust breathed by coal-miners in the course of their work. As the result of long-term field studies it is hoped to obtain accurate data on which to base safe levels of dust concentrations which miners will be able to tolerate throughout their working lives without suffering any considerable disability.

The research, which was started in 1953, is being conducted at twenty-five collieries in England, Scotland and Wales. The selection of collieries is designed to provide a reasonable cross-section of mining practices, conditions and types of dust, in order to investigate the effect of composition as well as quantity of dust. These twenty-five collieries employ about 35,000 men, approximately 5 per cent of the coal-miners in the United Kingdom.

Medical Studies

There are two mobile medical units, each equipped with the most up-to-date X-ray machines for taking full-size chest X-rays of the population at each colliery every three years or so. Each unit is in charge of a senior medical officer and includes a qualified physiologist, a radiographer and clerks, technicians and ancillary staff to a total complement of nine.

The films are classified into categories of pneumoconiosis according to the international (I.L.O.) classification, which recognizes four stages of simple pneumoconiosis and four of progressive massive fibrosis.

The reading of the films is done by the senior medical officers. Due precautions are taken to estimate the accuracy and consistency, including the application of cross-checks and a continuous statistical control on the reading levels. By this means a uniform and satisfactory standard of reading is maintained.

The first round of X-ray surveys has been completed, and the results have shown a wide range of prevalence of significant pneumoconiosis at the different collieries.

At the time of the X-ray survey, details have been recorded of the past working histories of all the men examined. There is thus available a record of the prevalence of pneumoconiosis on an individual basis among the present populations at the collieries, together with a record of the environmental history which has contributed to the prevalence revealed. This information enables an estimate of the prevalence throughout the coalfields to be made.

The examination is voluntary, but the co-operation of the men has been extremely good, the overall response being about 95 per cent. The lapses have been analysed in terms of age and occupation and they do not appear to be significant in either respect. Thus the population examined is considered to be representative of all the men working at the collieries at the time of the surveys.