

The exhibition of the Jevons manuscripts and correspondence has been made possible by the kindness of his son and daughter, Mr. H. S. Jevons and Miss H. W. Jevons. Mrs. Eleanor Marquand Delaney gave permission for the use of her father's manuscripts, and Dr. Tyson, librarian of the University of Manchester, allowed the use of the Christie Library for the exhibition.

TRANSPORT IN GREAT BRITAIN

IN a paper on "The Troubles of Transport", read on September 9 to Section F (Economics) of the British Association at the recent meeting in Belfast, Prof. C. F. Carter (professor of applied economics in Queen's University, Belfast) discussed some current problems of road and rail transport in Great Britain. Figures were quoted showing that transport is an expanding activity (thus making adjustment easier); that it is mostly by road; and that 45 per cent of the 'activity' of transport is organized as an ancillary to some other activity. "It is most unlikely," said Prof. Carter, "that the ownership of ancillary vehicles would have developed to this point if it were not an efficient way of organizing transport. There is . . . no evidence that it would be advantageous to break it down. It follows that the possible field for public ownership of the carriage of goods by road is only a minor part of that activity."

The discussion of transport problems in the past year, continued Prof. Carter, has been concentrated on organization and ownership, and has avoided the fundamental issues, which are the relation of charges to costs, the problem of public obligation, and the principles of taxation of road transport.

In theory, the charge for an item of transport should be proportional to the cost of providing an extra unit flow of transport service of that type, when the system has been fully adapted to supply the extra services effectively and conveniently. The ratio of two charges should equal the ratio of costs, taking no account of interest on the cost of 'permanent' assets such as the road bed. The difficulty of costing transport services is very great, and the results must be in part arbitrary. With the railways, enough is known to show that "the present pattern of charges not only bears no relation to costs, but often works the other way". On the road, the difficulty is to find a true economic cost when taxation is so important. Prof. Carter pointed out that "the 'cost' of the roads should for our purposes mean the cost of maintaining and improving them so that next year they can carry traffic as speedily and safely as this year"; with road vehicles increasing in number by 5 per cent per year, this cost would much exceed the sums at present being spent on maintenance. A National Roads Council is needed, charged with the duty of advising on road development and of keeping running estimates for five years ahead of the least expenditure necessary to maintain the roads and to adapt them to expected traffic requirements. Part of the taxation of road vehicles should be segregated as a Roads Tax, paid into a revived Road Fund, which would be autonomous and would carry forward balances from year to year. The Fund should receive what the National Roads Council estimates to be the proper sum to be spent on the roads—whether or not the economic situation allows this amount to be actually spent.

"A more fearsome dragon now lies in our path, called the Public, who are supposed to insist on various uniformities which flatly contradict the principles we have been discussing." Thus rail passenger fares are expected to be proportional to distance, whereas they should be tapered. Uniformity of rates over the whole of a public organization's system prevents any reflexion of the large differences in cost between different routes. Proposals for dealing with this on the railways were made in Prof. Carter's paper.

After traders have chosen to carry what is convenient to them in their own vehicles, and road hauliers have given preference to profitable traffic, the common carrier by road or rail is left with the odd lots, the awkward cross-country journeys; in particular, the railways are left with precisely the traffics which economically they are least fitted to handle. "If we reject any solution to this problem which involves forcing users to use a particular kind of transport, there seems to me to be only one solution: substantial differential taxation of those parts of transport which have the privilege of choosing their traffic."

The proper taxation of road transport thus has four parts: the general requirements of the Chancellor of the Exchequer; a tax on petroleum, as long as the state of the balance of payments is deemed more grave than the coal supply; a roads tax; and a levy on those not accepting public obligations.

Towards the end of his paper, Prof. Carter remarked: "I think we need a cooling-off period, to help transport to recover its commercial common-sense after a surfeit of politics; and the best cooler would undoubtedly be a weighty Royal Commission, charged with the duty of giving the whole matter up-to-date and careful study".

SHAPES OF AEROPLANE WINGS

A PAPER on "The Shape of Wings to Come", by Mr. D. Keith-Lucas, chief designer of Short Bros. and Harland, Ltd., was read on September 8 before Section G (Engineering) of the British Association at the recent meeting in Belfast. The paper has since been published in full in *Engineering* (174, 349; 1952). It is of considerable interest as it goes a long way towards explaining the departures from orthodoxy of wing form which can be seen daily by persons who live near certain airfields.

Mr. Keith-Lucas explains that the main purpose of sweep-back is the reduction and the postponement to higher speeds of compressibility effects normally met with on straight wings at high subsonic speeds. The velocity of the wing relative to the air may be resolved into components normal to and parallel to the span. It is shown that the main aerodynamic effects are fixed by the former, so that the effective air speed of the wing can be made low by the use of sweep. End effects, at the root and the tips of the wing, reduce this benefit by half. It is also shown that at high supersonic speeds the unswept wing can be made efficient again, providing only that it is very thin; for example, the thickness of the sections may have to be as little as 3 per cent of the chord. Sweep-back was first introduced, however, in order to stabilize the all-wing aeroplanes which it was hoped to use before the penalty of severe drag of the

resulting thick wing was fully appreciated. There is an interesting discussion in the paper of an Australian project for an all-wing airliner using a 30 per cent thick wing fitted with boundary-layer suction in order to reduce the drag.

The thin swept-back wing is shown to be peculiarly susceptible to aeroelastic effects; that is, to the aerodynamic consequences of structural distortion in flight. A simple example of such an effect is the so-called aileron reversal. This is also met in unswept wings. If the extra lift produced by the downward deflexion of an aileron acts towards the rear of the wing, it produces a 'nose down' twist of the structure which will cause a net loss of lift at sufficiently high speeds. An academically interesting solution to the general problem is the 'aeroisoclinic' wing invented by G. T. R. Hill. This leads to a swept wing which is weak in torsion. Aileron reversal is to be avoided by obtaining lateral control from wing tips the incidence of which to the wind can be varied, instead of the conventional ailerons. The case for crescent wings is also made. It seems, however, that at moderate supersonic speeds there is little to beat the delta planform with its large internal volume, especially at the wing root. This allows ample space for a stiff structure, the load, the fuel, the undercarriage, and the whole variety of apparatus and equipment carried by modern aeroplanes.

It is a big problem to get highly swept wings to give adequate lift at slow speeds, and the possible solutions of the landing problem are the subject of controversy among aeronautical scientists and engineers. An American aeroplane with sweep which is variable in flight has recently been flown. There are advocates of the use of parachutes, stowed helicopter blades, etc. In fact, the shape of wings to come is as yet indeterminate because of the difficulties of flying slowly.

HARNESSING KNOWLEDGE

ANNUAL CONFERENCE OF ASLIB

THE fact that Aslib could choose "The Significance of Information in Present-Day Industrial Society" as the theme of its twenty-seventh annual conference, held recently at Swanwick in Derbyshire, clearly indicates that the day is past when 'information' could be dismissed as the concern of the chemist or physicist alone. The very phrase has an Aristotelian ring that nevertheless yields nothing in emphasis to the twentieth century's pre-occupations with men as minders of machines. So, indeed, it should be, for as Sir Stephen Tallents declared in opening the conference, "ideas have to-day become not only the most potent of forces but also the most precious of cargoes". Those same ideas, communicated and applied, are the life stream of an industrialized society, which must perish unless it can produce more goods more cheaply than ever before.

In this modern industrial and scientific society, the key to future development is the speed with which new ideas can be put to work—such was the burden of the principal paper at the conference, presented by Prof. T. U. Matthew, who holds the chair of engineering production in the University of Birmingham—the only one of its kind in Great Britain. We have, he said, achieved a new type of chain-reaction in which new knowledge and ideas, travelling at a rate governed by the effectiveness of our information

services and means of publication and communication, give rise to an endless succession of transmigrations and further ideas in an ever-widening range of specialized fields of research and development. For the truth of this, one need not look beyond the post-war capital development programmes in coal, steel and chemical production, which have all felt the impact of modern methods of communication on a large scale.

These, it is true, are fields in which, for the most part, large industrial units are engaged. It is encouraging to know that, according to the recent survey "Research and Development in British Industry", produced by the Federation of British Industries, some £30,000,000 is now being spent on research each year compared with £5,500,000 just before the Second World War. But responsibility for bringing into the production stage the vast stores of new knowledge that become available in this way still lies generally with a comparatively small group of larger companies. Behind them stretch the thousands of firms of intermediate and smaller size, the majority of which have not, as yet, got to grips with the concept of increasing productivity, let alone the definitive shape that can be given to that concept by the utilization of published facts and figures. Add to this picture of the production side of industry the stimulus that can come from the communication of data and ideas in connexion with home and foreign markets, internal and external freight facilities, international trade and currency regulations and, not least, industrial labour relations—the vision is stirring indeed.

Here, as Prof. Matthew indicated, arise both the immediate obstacle and the long-term challenge. It is already clear, he said, that the present rate of discovery arising from fundamental research in physics, chemistry and the applied sciences, far exceeds the digestive capacity of existing development resources—hence the growing pressure for a new technological university and more technologists to bridge the gap between scientific research and industrial application. On a wider stage, the rate of exploration of the world's raw material resources has outstripped the nations' capacity to finance and organize their development. To this fact can be traced such schemes as the United Nations technical assistance projects, the 'Point 4' plan of the U.S. Government and the Colombo plan. Both nationally and internationally, these far-sighted proposals mean a mounting pressure on information services. Steps to encourage the interchange of knowledge and to speed up the processes of accumulating, abstracting, classifying and disseminating information on research and technical developments, production processes, raw material resources and market opportunities have already been taken, nationally, by Aslib, the Department of Scientific and Industrial Research and the research associations and, internationally, by the Office for European Economic Co-operation and the British Commonwealth Scientific Offices. The danger is that, in the smaller firms which have not yet established information departments of their own, these existing facilities may pass unnoticed, at least until the supply of technologists has increased. For the immediate future, he said, it is a question of assisting individual managers, who are not yet alive to the great wealth of recorded information open to them, to exploit it with only their present resources of staff. To Henri Fayol's six activities of management of fifty years ago, it is now time to add a