

AUTOMOBILE RESEARCH

ON the invitation of the Institution of Automobile Engineers, a representative of NATURE was privileged to inspect its new Research Laboratory at Brentford and to see a cross-section of the important work which is being done there under the superintendence of the director, Dr. E. Giffen, for the benefit of the automobile industry. The chairman of the Research Committee, Mr. W. A. Tookey, explained how its scope has been developed during the ten years since this co-operative work was taken over by the Institution and organized on a wide basis whereby it consists of representatives from the Institution, from affiliated members and from Government departments.

The work of the Committee is financed by grants from the Department of Scientific and Industrial Research and by contributions from the Society of Motor Manufacturers and Traders and from the affiliated members, who now number more than three hundred firms—including many who have their own research departments but at the same time find it an advantage to work in close co-operation with the Research Committee.

The new laboratory has been designed and built specially for the work being carried on there and provides excellent facilities for the many classes of investigations which arise in connexion with the engine, the transmission, the chassis and the operation of automobiles. Some of these give rise to questions of fundamental and general importance which at the same time involve problems of design and operation. A series of investigations illustrative of this range of interest is being developed at the present time which relate to the frothing or aeration of oil and to its harmful effects in service. In the chemical laboratory the fundamental causes which give rise to aeration of the lubricant are being investigated, and it may be anticipated that the results will yield information of wide application wherever frothing occurs either as an advantage or as a disadvantage in industry. Parallel investigations are being carried out in the chassis laboratory and in the engine laboratory to determine the effectiveness of de-aerating devices and to ascertain the influence of aerated oil on the behaviour and loading capacity of engine and other bearings.

Another investigation of a fundamental nature which is in course of development is intended to study systematically the factors which control the scuffing of piston rings, a phenomenon which can occur both under idling conditions and at high loads and temperatures. The work is being carried out on a single-cylinder, liquid-cooled unit coupled to a hydraulic dynamometer. The temperature of the jackets is closely controlled by the use of ethylene glycol in conjunction with a cooler, and the supply of lubricant to the cylinder walls is also under regulation. At the moment, the experimental work is directed towards the establishment of a satisfactory testing technique, and when this has been done it is proposed to examine the relative merits of various surface finishes and treatments for piston rings, and of different designs of rings.

The equipment of the cold room which forms a notable feature of the general laboratory has been

designed to enable a detailed study to be made of the starting performance of engines at low temperatures. It can be operated at thermostatically controlled temperatures down to -25°C . and is large enough to accommodate two full-size engines, mounted on test-beds run into the cold room on a movable ramp. A large capacity tank containing a low freezing point coolant is placed above the engines and by means of an electrically driven impeller and a system of three-way cocks the coolant can be circulated through either engine. The advantage of this arrangement is that it allows prolonged motoring test runs to be made without excessive temperature rise due to engine friction. The engines can also be driven through a swinging field dynamometer and a 10:1 reduction gear outside the cold room which enables a range of speed from 10 to 200 r.p.m. to be employed, while the incorporation of a free wheel in this gear permits the engine to accelerate when starting.

A line of research of very timely importance is one which is being arranged in order to study systematically the power loss resulting from the use of producer gas in a converted petrol engine. The gas used is produced from anthracite in an "Emergency" dry type producer which, in order to simulate road conditions, is mounted on a bumping rig and is subjected to a cooling air blast, in addition to the circulation of water through the jacket. The engine is a six-cylinder, side valve unit of 3.5 litres of a type commonly used in trucks up to three tons capacity. Immediately beyond the throttles, the gas and air are fed into a common pipe which acts as a mixing chamber. This pipe is connected to one branch of a tee-piece mounted on the engine intake manifold, the other branch being arranged to carry the normal petrol carburettor, which is enclosed in an airtight box. The arrangement of the controls in conjunction with this system of connexions permits the engine to be run either exclusively on producer gas or on producer gas combined with varying degrees of petrol enrichment. Provision has been made for manual adjustment of ignition timing, and in addition to studying the performance of the standard engine on producer gas, possible means of making good the power loss by raising the compression ratio, by increasing the calorific value of the fuel and by the injection of steam in the producer have been under investigation.

These by no means exhaust the tale of the activities of the station for many investigations of a routine nature are being pursued, such as gear testing, crankshaft fatigue testing, and measurements of the durability of bearings and bearing materials under different conditions. These are all yielding information of the utmost value to the industry and providing an accumulated fund of knowledge which will lead to improvements in design and higher efficiency in operation. This is well illustrated by a test which was seen in operation in the general laboratory and which had been arranged to obtain data as to the transmission of heat from a brake drum to a wheel rim and tyre. On buses operated under severe city service conditions, particularly in hilly districts, trouble arises in consequence of the excessive temperatures which reach the tyres and inner tubes, by

transmission of heat from the brake drums. At one end of the axle in the apparatus used for the test the wheels rotate against a continuous braking force applied through the normal brake rods, the braking load being shown on a spring balance. The wheels at the other end are prevented from rotating by a torque arm and a spring balance indicates the brake torque applied to them and transmitted through the differential. Temperatures are measured at various parts of the apparatus by means of copper-constantan thermocouples. For parts which are rotating, the leads are soldered to pairs of copper and constantan slip-rings. In this way frequent temperature measurements can be made at selected points in the wheel rim, the brake drum, and the brake lining.

It has been possible to indicate in this survey only

the more outstanding of the tests in progress, but the full extent of the research work which has been completed can best be seen in the list of reports which have been prepared by the Laboratory. Among the latest of these are papers dealing with fuel economy and with the distressing phenomenon of brake squeak. In addition the research department abstracts and classifies technical information from English and foreign papers, and these abstracts and the full resources of the library are available to assist members in any technical problem or inquiry which may arise. In these ways the Laboratory is playing a most important part, and its new premises and equipment, used with the vigour that is apparent in its direction, give the assurance of even greater usefulness in the future.

PLANNING THE POST-WAR WORLD

IN his presidential address to the Institution of Electrical Engineers delivered on October 24, Mr. J. R. Beard reminded his audience that exactly twenty years ago, when chairman of the North-Eastern Centre of the Institution, he read a paper on "Post-war Conditions and Developments, with particular reference to the Electric Supply Industry". On re-reading it to-day, he found that purely technical achievement has fulfilled, and in many cases exceeded, the expectations then expressed. Where we have largely failed is in having no clear idea of the purpose for which these technical achievements should be used, and also in lacking ability to arrange that co-operation with non-technical people and interests which is necessary if the engineer is to produce the structure that he knows to be most efficient and useful to the community.

As a starting point, it is assumed that we all recognize that the War has brought about, and is bringing about, tremendous changes not only in our environment but also in our whole outlook on life, and that we are all prepared to agree with *The Times* that "To liberate Europe from Hitler does not mean to reverse the whole process of economic integration which has been set in motion. . . . Much harm may be done to our cause, both in Europe and oversea, by the insinuation that we stand for the old order and that our only aim is to restore the *status quo* in Europe and to maintain it at home. This charge should be emphatically and authoritatively refuted".

There is herein implied some, possibly belated, recognition that the old order is no longer producing a healthy and happy community and that, for one reason or another, apathy, selfishness and discontent, too much freedom in some directions and too little in others, were gradually undermining the character and vigour of the democratic nations. The malaise from which the democratic nations have been suffering is aptly summed up by the eminent American writer, Walter L. Lippman: "The muddle of the democracies comes from something deeper than their form of Government; it comes from the gradually accelerated destruction of all convictions about the nature of man and his destiny. . . . For how can this planet be governed by people who have ceased to believe that there is good and that there is evil?"

Dorothy Thompson, another American writer,

suggests that the primary origin of the War was the secession of Germany from Western civilization and that we are fighting a great civil war to force Germany back into it. She defines Western civilization as follows:

"It is not democracy, not parliamentary government and certainly not capitalism. All of these are merely manifestations of something else—temporary forms to express a more permanent content. Nevertheless, Western civilization is definable. It is the synthesis of three things: the Christian ethic; the scientific spirit; and the rule of law. The essence of the Christian ethic is that the weak have rights as well as the strong, and that the strong must set limitations on their own power. The essence of the scientific spirit is that the search for truth transcends the State and may not be limited or suppressed by the State. It presumes the separation of State and culture, that is, the separation of culture from force. The essence of the rule of law is that contract is superior to arbitrary force, it presupposes a continuity of relationships . . . from whose sovereignty no one is exempt, not the King, not the President, not the powerful, not the weak".

Mr. Beard concluded by considering electrical planning in the Empire. Where central or national generating authorities have been set up, the functions of supervision have usually been carried out by them—as in Eire, Victoria and most of the Canadian provinces. South Africa, Quebec and Southern Rhodesia have followed more closely the example of Britain in establishing a separate supervising authority, but on a narrower basis and with little control of municipalities. Similar bodies, with varying powers and functions, also exist in British India, New South Wales, Queensland and Kenya, but elsewhere in the Empire supervision is usually exercised directly through Government departments, which are in many cases primarily devoted to some allied activity such as local government or public works.

The variety of conditions under which electricity is generated is so great as almost to defy classification, but there has been a strong trend, particularly in the Dominions, towards some form of monopoly. For the most part this has resulted from the establishment of independent Government commissions,