

referred to such achievements as the canals which make it possible for ocean-going steamers to penetrate half-way across the continent of America, the 1,000,000 miles of roads which serve the Empire, the 12,064-ft. long Lower Zambezi Bridge, one of the longest bridges in the world, the railways of Canada, India and Australia, the trans-oceanic trade in foodstuffs and the developments of ports. It is of interest to note that Smeaton's old chart of the Clyde showed a depth of 42 inches at high tide near a point where the *Queen Mary* was launched in 1934. Striking effects have been achieved by irrigation. It was after the famine of 1865-67 that irrigation was started in India on modern lines. Famines do not now occur in India; shortage and scarcity exist at times, but the possibility of areas of the size and population of Great Britain being left without food owing to the failure of a capricious monsoon has long since been ended.

Whatever has been accomplished, however, "the opportunities of the future," said Sir Alexander, "are vastly greater than any that the past has

offered, but frankly, I look with anxiety on the years to come. The machine . . . sometimes seems to be taking control. Inventions and developments succeed one another with bewildering speed, and there seems, unfortunately, to be no limit to the possible results of uncontrolled and misapplied ingenuity. In such circumstances no one can say where Engineering may lead us or what limit there is to the power of the engineer. One thing is certain, and that is that there must be control".

Finally, Sir Alexander appealed for more co-operation between engineers themselves, for the subordination of personal and independent views and feelings to a common policy. "I would like it to be possible for one broad policy to inspire and guide all classes of engineer. I would hope that in time there would arise a body of engineering opinion so weighty, so authoritative, so sure, so sane, that it would prevent waste of energy and misplaced enterprise, and would inevitably command attention in the politics and administration and life of our country and Empire."

Soil Drift in South Australia

THE advances being made by deserts into areas occupied by man, sand drift, and desiccation, are problems which have awakened interest in several parts of the world. At the present time they are under consideration in the Middle West of the United States of America, in West Africa and in South Australia.

Under the auspices of the Council for Scientific and Industrial Research of the Commonwealth of Australia an important monograph (Pamphlet No. 64, Melbourne, 1936) on this subject entitled "Soil Drift in the Arid Pastoral Areas of South Australia" by Mr. F. N. Ratcliffe embodies the researches carried out by the author into this important matter. The history of the investigations are given in a foreword. During the year 1935, the minister in charge of the Council (Senator, the Hon. A. J. McLachlan) asked that consideration should be given to the possibility of undertaking any action to combat drift of soil in the arid and semi-arid parts of Australia. Mr. Ratcliffe, an officer of the Council, was deputed to undertake investigations in typical areas such as the northern portions of South Australia. It is stated that the publication of the report must not be taken to mean that the opinions expressed in it necessarily represent the considered views of the Council.

The problem of soil drift in Australia, says the author, is not, of course, confined to the area dealt with in the report. In order to shorten the period given to the investigations undertaken, the work was confined to the pastoral areas of South Australia. In other regions vegetations differing in type from, and in many ways more complex than, those described in the report would have had to be studied. On the whole, it is considered very unlikely that the problem in, say, western New South Wales would differ essentially from that in South Australia, although the details of the picture might not be quite the same.

The problem of soil drift and the deterioration of the pastoral country is a factor of very considerable importance to Australia's future, as is the case in certain other parts of the world. It is therefore, as the author states, very desirable, if not essential, that its nature and the difficulties which it presents should be properly appreciated by laymen and administrators as well as by scientific workers. Since the laws upon which a country is governed are the work of the administration, the burden of responsibility for a failure to recognize and then deal with a state of affairs often aggravated if not produced by man himself rests with the administrators. Mr. Ratcliffe presents a very clear picture of the

existing conditions and position in the past of southern Australia. It is of interest to note that some of the photographs illustrating the pamphlet have a marked resemblance to parts of West Africa on the south Saharan borderland. It is impossible here to follow the author throughout his investigations, but they may be summarized.

Mr. Ratcliffe holds the theory that the soil drift in Australia is chiefly, if not solely in parts, due to the excessive utilization of the soil by man, chiefly stock; that, in other words, the drift is the result of the disintegration of the soil layers *in situ* into loose particles which thus produce in the end a desert; that these desert conditions are not produced, or even assisted to any material extent, by sand or particles blown from neighbouring desert areas. He admits that this latter is the theory of the local farmers, who speak of the 'encroaching sand' or 'encroaching desert'. The author apparently holds strongly to his theory of the local origin *sur place* of the sand or drift resulting from the gradual deterioration of the soil.

It is difficult to follow this theory. May there not be a certain amount of sand invasion on to good stock grounds from areas outside which are in various stages of degradation down to pure desert conditions—as, in fact, is well demonstrated in the Sahara? Is there any great or sharp distinction between areas containing what Mr. Ratcliffe terms soil drift in Australia and the lands in the immediate vicinity of the Sahara on which the soil is still capable of producing a vegetation of use to man and his animals, but which gradually becomes overlaid with an ever-thickening carpet of blown sand? Is not this a possible factor in Australia? It is

difficult to credit the fact that in these deteriorating lands in South Australia the conversion to drift and aridity is practically entirely produced *sur place*, through the admittedly improvident actions of the occupiers of the land by excessive stock grazing and so forth.

The author, after a study of the literature on the problem of erosion elsewhere in the world, considers that "conditions in the Australian arid pastoral areas have no exact parallel elsewhere, and thus the problem of their deterioration must be tackled on its own merits". It is difficult to follow the argument. The resulting aridity leading up to desert conditions in several parts of the world is an outcome of the excessive activity of man and his wasteful utilization of the lands in question, with the inevitable result that the water supplies commence to become intermittent, and then cease, the spring water-level or the water-table sinking in the soil to a depth beyond its possible further utilization for his purposes. The ensuing conditions and their origin in modern times would appear to have a considerable similarity in the three regions of the globe already mentioned.

The remedies suggested by the author, with suitable modifications easily ascertainable in the region in question, appear equally applicable and called for in all. "Permanent pastoral settlement," says the author, "is only possible when the stocking is in equilibrium with the vegetation, and not merely exploiting plant capital"; and he urges the need for readjusting the stocking policy of the arid pastoral country. This is an equally pressing problem in parts of northern Nigeria and in the French Colonies bordering on the southern Sahara.

Geomorphology of the Irish Sea Basin

By Prof. J. Kaye Charlesworth

A MORNING session of Section C (Geology) at the meeting of the British Association at Blackpool was devoted to a discussion of the geomorphology of the Irish Sea Basin. Although the discussion brought out perhaps little that was new, it outlined the main features of the evolutionary development which, treated historically, may have a wider appeal.

The Irish Sea-basin had its beginnings in the remote geological past. The sediments of the geosynclinal sea, which during Lower Palæozoic times obliquely crossed the site of the present

basin with shore-lines far beyond the present coasts to the north-west and south-east, were compressed into concertina and less acute folds at the close and elevated into a mountain system. At this remote date, the Irish Sea-basin appeared if only in shadowy outline, and there emerged the rim of mountains of hard rocks that, save in the Mourne then unborn, more or less surround the sea of to-day and exhibit in the trend of their valleys, ridges and geological strike lines, the north-east south-west Caledonian direction. The release of pressure probably initiated the tectonic