

Messrs. Creed and Co. have also developed an improved form of printer, in which compressed air is dispensed with, and the type characters are mounted on a circular disc and hit from behind by a little selecting hammer which is caused to stop at the part of the revolution corresponding to a letter by a circular group of selecting levers. This form of the apparatus is much more compact than the original instrument, and has a much higher printing speed; but we understand that it has not yet been adapted to wireless reception.

The Creed system with compressed-air working, as adapted to wireless reception, is capable of a speed of transmission of about 180 words a minute, which is in excess of the speed of the

printer; so that, in order to obtain the full capacity, two printers would have to be installed for one receiving perforator. The improved printer, however, will be capable of keeping up with the receiver, even in its improved form, and will be able to deal with something like an increase of 50 per cent. in the speed of transmission. Apart from considerations of traffic, high transmission speeds present advantages in that there is more chance of the message being completed without interruption by atmospheric or other extraneous effects. Very successful experimental working has been carried out between Cologne and the War Office station at Aldershot, and a wireless printing equipment of this kind is to be adopted between Brussels and a large station in the Congo district.

The New Oilfield of Northern Canada.

By W. JONES.

CONFIRMATION has now been received from Canada of the news that an important oil-well has been obtained in the North-West Territory of Canada. The full significance of this event is only gradually being realised by the public. It is probable that this is the commencement of the development of the largest oilfield in the British Empire—possibly one of the largest in the world.

For several years it has been known that geologists had found a land of much promise in the north, but until now, owing to the difficulties of transportation, no drilling operations had been attempted. The well, which is situated on the banks of the Mackenzie River, 48 miles beyond Fort Norman, within a few miles of the Arctic Circle, is about 1000 miles N.N.W. from Edmonton. It is 1300 miles journey by water beyond the northern limit of the railroads. This is the "farthest north" oil-well in the world, and is some 500 miles distant from any previous drilling. (The nearest producing oil-wells are those in Alaska.)

Little detailed geological information about this part of the North-West Territory is available, but it will be remembered that a geological exploration of the Mackenzie River basin was conducted by a party of English geologists, led by Dr. T. O. Bosworth during the year 1914, on behalf of a Canadian syndicate. On the return of the expedition it was reported that a great oilfield region had been determined. At that time much interest was aroused by the discovery, but, owing to the war, less attention was paid to the prospects than they would otherwise have received. The present development is the long-delayed sequel, for, according to the particulars now received from Canada, the well is located on the oil-claims which were "staked" by the Bosworth expedition. These claims have since been acquired by the Imperial Oil Co., the geological department of which has been headed by Dr. Bosworth for a number of years.

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The drilling machinery was sent north in 1919, and the well has been drilled on the site which was chosen in 1914 for the crucial test. The drillers stayed at their post throughout last winter, and the actual drilling commenced in the spring of this year. In the first 200 ft., useful quantities of a very high grade oil were struck, and at 800 ft., according to the report of the drilling party, the oil gushed up from the 6-in. casing in a column which rose 15 ft. above the top of the derrick. After half an hour the drillers capped the well, so that the oil may be preserved until storage tanks can be constructed. Until that time the well's exact yield will not be measured, but it is probable that it will produce a thousand, and possibly several thousand, barrels of oil a day.

According to the brief statement made in 1915 by Dr. Bosworth to the Institution of Petroleum Technologists (*Journ. Inst. Pet. Tech.*, March, 1915), and also in the *Petroleum World* (February, 1915), abundant seepages of oil were found throughout a very large region occupied by the Devonian rocks, and "in that region all the geological evidences of oil conspicuously occurred." The source of the oil was a thick deposit of "black bituminous shales and limestones, which cover an area of enormous extent." "In some places the black shales were actually undergoing combustion at the present time, and in several places oil was seeping out into the water for distances of several miles." The structure also was favourable, for the region is traversed by a system of mountain building anticlines. In Dr. Bosworth's opinion "the discoveries which had been made were of the greatest importance," and "fields of the utmost promise had been marked out, bearing all the indications and evidences that an unexploited field could be expected to show."

The foregoing remarks, together with the splendid result of the first test well, are significant. On studying a geological map of North America it will be seen that the Devonian forma

tion of the Mackenzie River covers a very large area, extending for hundreds of miles along the direction of the river. In the reported words of a geologist who accompanied the drilling party this year, "the biggest oilfield in the world is what has now been opened in the north."

Before this great oilfield can be made commercially profitable there are, of course, many difficulties to contend with, especially the long distance from civilisation, the severity of the Arctic climate, and the lack of adequate transportation. But as these obstacles did not prevent the exploitation of the gold in Klondike, we need have little fear but that this precious fluid in the Mackenzie valley will be won.

Several of the Canadian Geological Survey Memoirs describe the Mackenzie River district, though they do not enlighten us much on the subject of petroleum, which was the special object of the Bosworth expedition. The most interesting

of these is the report by Mr. R. G. McConnell, published in 1891, which mentions the bituminous rocks and pools of tar and oil, which he observed in many places. Memoir 108, on "The Mackenzie River Basin," by Messrs. Charles Camsell and Wyatt Malcolm, which appeared in 1919, also cites particularly the oil indications which Mr. McConnell had found, some of which had been noticed also by Sir John Franklin a century ago. This official memoir is very guarded on the subject of petroleum, and does not afford great encouragement to oil prospecting on the Mackenzie; but it is a comprehensive summary of the previously established facts, together with many valuable observations, old and new.

During the next few months there can be little or no progress made with the development in this frozen land, but doubtless many preparations are afoot, and next spring will see an unprecedented migration of oilmen to this northern clime.

Industrial Research Associations.

V.—THE BRITISH PORTLAND CEMENT RESEARCH ASSOCIATION.

By S. G. S. PANISSET.

ALTHOUGH the Portland cement industry had its origin in this country, the chief developments have occurred elsewhere, and the greater part of the manufacturing plant now in use is either of foreign production or a close copy thereof.

It may be disputed that this position has arisen from the absence of organised research in this country, but it is certainly true that the amount of scientific investigation in the British Portland cement industry has been insignificant compared with the work done in the United States and on the Continent.

With these circumstances existing, it is clear that the British Portland Cement Research Association is a needed institution, and it is some comfort to know that its arrival is not too late to be effective. The extent of the field of research still awaiting exploration is such that no agreed answer can be given to the fundamental questions, "What is Portland cement?" and "What happens when cement sets?"

In spite of the extensive research that has been conducted in the United States by Government institutions and by universities, the real nature of cement, and the chemistry and mechanism of its setting, are still matters of controversy, owing to the lack of concrete evidence.

The manufacture, in fact, is still in the empirical stage, based solely upon the knowledge that a mixture of calcareous and argillaceous materials containing about 76 per cent. of carbonate of lime will, when heated to incipient vitrefaction, yield a product which on grinding has pronounced hydraulic properties. Whether the hydraulic effect is due to the presence of simple silicates and aluminates of lime, whether complex

ternary compounds exist, or whether a part of the lime is uncombined and in the state of solid solution, are all problems which must be solved before it can be claimed that the best possible constructional material is being produced.

In connection with the setting of cement, it is still undecided whether this is due to colloidal or to crystalline action, and the manufacturer is accordingly in the dark as to whether he ought to be aiming at the production of colloids or of crystalline bodies to produce the best results.

The composure of manufacturers has now and again been disturbed by predictions that cement can be made from a mixture containing only two-thirds the conventional proportion of lime, and again that the stage of incipient vitrefaction now produced in rotary kilns can be improved upon by adopting blast-furnace methods and carrying the temperature to melting point. From the point of view of scientific knowledge the manufacturer is unable to deny that such statements are within the range of possibility, and hence there is always the fear that more than half the present cement-making plant may be rendered obsolete by new discoveries.

This is not a happy position for an industry, especially when such a discovery is likely to be the property of those who have hitherto been foremost in research—namely, the foreign competitor—and in this connection the advent of the British Portland Cement Research Association is not a day too soon.

Again, if it be supposed that the present methods of manufacture are permanent, the fact has to be faced that the thermal efficiency of the kilns in use is seldom more than 50 per cent., and here is a field for research that may lead,