STUDENTS' SECTION, LONDON BRANCH.

THE FOURTH GENERAL MEETING OF THE LONDON BRANCH OF THE STUDENTS' SECTION was held on Tuesday evening, January 29th, 1924, at Aldine House, Bedford Street, the Chair being taken by Mr. H. G. Austin.

An abstract of the paper read follows :—

The History and Geology of the Oilfields of Mexico.

By C. A. SANSOM.

The Oil Industry of Mexico dates back to the year 1882, when the first well was drilled at Viego, West of Tuxpam. It was not, however, till 1901 that oil was obtained in commercial quantities (near Ebano), and in that year the output amounted to 10,000 barrels. The industry expanded rapidly during the next few years under the pioneering enterprise of Messrs. S. Pearsons and Sons, and in 1907 the production reached 1,000,000 barrels. In the next year the Dos Bocas field was discovered, and the output rose to 3,500,000 barrels.

In 1910 the Casiano and Potrero fields were brought in, the initial well, Casiano No. 7, giving 25,000 barrels a day, and the famous Potrero No. 4 over 100,000 barrels. Both of these gushers were eventually brought under control.

About the same time oil was proved in the Topila and Panuco areas, and the production rapidly mounted to over 25,000,000 barrels in 1913. In this year the big Alamo field, West of Tuxpam, was discovered.

In the following year and during 1915 considerable trouble was caused by political disturbances, and for a time drilling was completely stopped. Moreover, shipping facilities were curtailed in the years following on account of the war, and many of the largest gushers were partially shut in. However, the output continued to increase, and by 1916 it had reached 40,000,000 barrels.

GEOLOGY OF THE OILFIELD REGIONS.

The rocks covering the greater part of Eastern Mexico are cretaceous and tertiary. The important oil strata are the lower cretaceous Tamasopa limestone and the upper cretaceous San

Felipe limestones and shales. Oil is found also, when structural and physical conditions allow, in the cretaceous-eocene Mendez shales. It occurs in anticlines and domes, usually accumulating in fissures and cavities in the shales and limestones. The rocks are traversed by basaltic dykes, which not only dome the strata and thus produce a normal trap, but also render the rocks porous and cavernous, and themselves form important barriers to migrating oil.

Both the Tamasopa and San Felipe limestones are considered to be mother rocks. Movement of oil is rendered very easy and rapid owing to the extensive underground fissures, and the rock pressure is considerable. Conditions are therefore ideal for large gushers.

The general strike of the rocks of North-Eastern Mexico is approximately N.S. In the Isthmus of Tehuantepec and in Yucatan and Tabasco the Caribbean fold system is strongly felt, and the strike is E.W. The general dip in the north is easterly away from the mountains, and at the coast thick Pleistocene deposits obscure the solid geology.

Drilling Methods.

Heavy combination rigs are generally used, the rotary for traversing the newer soft formations, and the cable tool for penetrating the massive cretaceous limestones. Drilling costs are usually high, being accentuated owing to difficulties due to the great rock pressures. These have been as high as 1000 lb. to the square inch. Wells are usually under 2000 ft. in depth, though in the north 4000-ft. holes have been drilled.

Pipe-Lines.

These have been, up till recently, unable to cope with the enormous supplies of oil available. A 6-in. and 8-in. series of pipes connects the main oilfield regions with the ports of Tampico and Tuxpam, and the system has been greatly expanded during the last few years.

Type of Oil.

There are two main types—the Northern Heavy Oil (sp. gr., 0·973 to 0·993), and the Southern Light Oil (sp. gr., 0·922 to 0·947). In addition there is the oil found in the Isthmus of Tehuantepec (sp. gr., 0·792 to 0·881), which yields a fair percentage of benzine and a high grade lubricating oil. The Tampico oil is very viscous, and is often mixed with a lighter type in order to accelerate its flow through the pipes.

Development in 1916 and Later Years.

Early in 1916 the great Carro Azul No. 4 gusher was brought in at over 250,000 barrels daily, being one of the largest gushers ever known. This was followed in 1918 by the discovery of two large fields—the Naranjos and Tepetate. Both were noted for their enormous gushers, daily flows of 90,000 barrels a day being not uncommon. The year 1918 was also notable for the flooding of many of the older fields by salt water. One of the first wells to be affected was the famous Potrero No. 4, which yielded salt water very suddenly in December, and it was soon followed by other wells in the same field. This phenomenon was unique in its way, as many powerful producers changed to salt water in a single night.

The year 1918 also witnessed the end of the two big oilfields of Casiano and Tepetate, which in their brief existence produced an enormous quantity of oil. In 1919 the production rose to 87,000,000 barrels, representing more than 12 per cent. of the total output of the world for that year.

In 1920 as many as fifty-one new wells were drilled in different parts, of which thirty-three were productive. Most of these were situated in the small competitive area of Northern Amatlan and Southern Chinampa, and this overdrilling soon led to a rapid incursion of salt water into the deeper wells. The Southern Chinampa pool quickly declined and was soon followed by the Los Naranjos field.

These declines were partially offset by the discovery, in October 1920, of the Zacamixtle field, which grew rapidly in importance. A new area was also opened up south of Los Naranjos, and in the first nine months of 1921 sixty-three new wells were completed in and around this district.

Throughout 1921 salt water was steadily rising in the Amathan field, which had produced a large quantity of oil during 1920. By September 29th the edge water had reached the top of the structure, and the field became to all intents and purposes derelict. About the same time the Zacamixtle field also became a victim, and its large gushers turned one by one to salt water.

The elimination of these two fields so early was entirely unexpected in authoritative quarters. It had been hoped that the Amatlan-Zacamixtle pools would take the place of the exhausted Los Naranjos, and their failure to do so upset all calculations.

The year 1922 was chiefly remarkable for the rapid rise of the Cerro-Azul-Toteco pool, which at one time produced 400,000 barrels daily. A decline, however, set in, and by December the output had dropped to 175,000 barrels a day. In this year the

production of the Panuco fields increased rapidly, so that by the close they were giving 30 per cent. of the total for the country.

This rise was continued throughout 1923, and in March, for the first time since 1910, the Northern and Southern Fields produced an equal amount of oil. As the Panuco oil is a heavy one, the proportion of light oil to the total declined from 83 per cent. in 1921 to 43 per cent. in 1923.

Recent Operations.

These have been greatly restricted owing to revolutionary troubles, but have been practically confined since the latter part of last year (1923) to the Cacalilao (Northern) district, the Isthmus of Tehuantepec, and a small area north of the Alamo field. The only real success met with has been in the Cacalilao district, the total production from this area having been at the rate of over 100,000,000 barrels yearly. The Isthmus, where the occurrence of oil is somewhat similar to that in the Gulf cretaceous fields of the U.S.A., has been disappointing, but drilling is being continued. This area, together with the States of Tabasco, Yucatan and Quintana Roo, may be described as the most hopeful area at the present time. The Cacalilao field cannot now be far from its peak of production (if it has not already reached it) and, if political conditions allow, the areas mentioned should be worthy of exploitation. Time alone will show whether they will become even a good second to the old exhausted fields of Eastern Mexico.

The Chairman (Mr. H. G. Austin) said they had all listened to a most interesting paper. He did not think the paper lent itself very well to discussion, but hoped that some of the members present had some questions to ask.

Mr. A. B. Miskin asked whether the author could give him some idea of the fauna of the Tamasopa limestone. Was it exclusively marine; and were there, in the San Felipe series or in the beds above, any foraminiferal marls. He would also like to know whether the intrusion of basaltic rock often resulted in the drying up of the oil in the shatter belt round the intrusion. What was the probable source of the volcanic ash met with in the Isthmus of Tehuantepec, mentioned in the latter part of the paper? He would like to know whether caving took place in the rocks shattered by intrusions. Was there any definite evidence of the relation of oil accumulation to the ancient shore lines in the district, and where were these shore lines?

Mr. T. G. B. Davies asked what might be the probable cause of the oilfield fires occasionally experienced.

Mr. Sansom, in reply, stated that very little was known about the fauna of the Tamasopa limestone. He referred Mr. Miskin to Garfias's paper on "The Oilfield Region of N.E. Mexico (*Econ. Geol.*, Vol. X., pp. 195-224), and also to the numerous other references in the Bibliography which he could supply. The fauna of the Tamasopa was unquestionably marine. He regretted that he had no information regarding the occurrence of foraminiferal marls, but suggested that foraminifera were found in the Eocene Mendez shales.

He did not think that intrusion of igneous rocks resulted in the drying-up of the oil. His conception was that the intrusions took place prior to oil migration, which was arrested in the cavernous spaces thereby formed.

The direction of oil migration was westerly towards the main mountain masses, whose easterly edge probably coincided approximately with the ancient shore line.

With regard to the formation of the volcanic ash, this might have been produced either by a submarine eruption or by a big volcano in the Otontopec region to the north-west. He did not suppose that caving took place owing to intrusions, as the rocks were resistant and would be indurated by the heat of the rising volcanoes.

In reply to Mr. Davies, the main cause of oilfield fires was :—(1) The ignition of oil vapours coming into contact with the flames under the boilers. This was the case in the Amatlan fire. (2) Lightning striking a well, as in the case of Petrero No. 4. (3) Carelessness among the workers on the derrick.