

work in Peru. Engineer Machado presented a paper on petroleum in Chile, Engineer Hermitte and Lieut.-Col. Romero on the petroleum formation of Argentina. The topography and mineralogy of the Andes region was treated of in various papers.

The Argentine Meteorological Office presented a large number of interesting papers, chiefly upon the meteorology of Argentina and the southern ocean. The director, Dr. Davis, presented a paper upon the temperature of Argentina as compared with other portions of the globe. A paper by Prof. Clayton dealt with a new method of forecasting which promises to cover periods much longer than is now possible. Profs. Mossman and Solyom presented papers on the effect of the antarctic currents upon the weather of South America, and the cyclones and anti-cyclones of the South American continent, respectively.

Dr. Knoche presented a paper descriptive of the organisation of the meteorological service of Chile, and Dr. Montessus de Ballore a paper on a convention of the seismological services of Chile and Argentina. Dr. Negri read a paper on two seismic laws discovered by himself.

Biology.

The communications to this section included the following:—The action of the principal alkaloids on protozoas, Prof. Scala; a contribution to the study of some arthropods of Chile-Argentina, Prof. Porter; contribution to the study of sea fishes in Uruguay, Prof. Bouyat; the mosquitoes, gad-flies, and serpents of Argentina, Señor Brethes; the marsupials of Chile, Dr. Wolffsohn; the vegetation of the north-western portion of Argentina, Dr. Seckt; a reclassification of Argentine vascular plants, Dr. Stuckert.

Anthropology.

Two papers were presented by Dr. Ameghino relating to three fossil human skeletons found in Arroyo Siasgo and El Moro. Other papers discussed different characteristics of the Indians and indigenous inhabitants of certain regions of South America, particularly Argentina, and of means of caring for such peoples and preserving accurate data respecting them. The origin of the American races and the languages of different South American races were subjects of investigation. Of especial interest were the results presented by Prof. Mercante of a comparative study of 1200 of the Argentine youth between the ages of six and twenty years, the sexes being nearly equally divided.

Engineering.

Many of the papers in this section dealt with architecture, particularly that of the Latin American countries. Notable among these were the papers of Engineer González. Engineer Selva discussed the advisability of houses for workmen and the best forms of such houses. A sentiment was adopted emphasising the absolute necessity of finding a solution for the question of reducing house rent for workmen and employees of modest salary. The same author also discussed the subject of earthquake construction. The subject of reinforced cement construction occupied the attention of one session. Railway and bridge questions occupied another session. The question of irrigation is a very important one in several of the South American republics, particularly Argentina. Conforming to the importance of the subject, two sessions were devoted to the discussion of the laws and systems of irrigation in Argentina, and with various plans for betterments. Rivers and harbours and their various needs received attention in another session, as did various municipal matters relating to sanitation, transportation, and streets, in another. The engineering section attracted unusual attention.

Agriculture.

Engineer Juan A. Devoto presented a paper detailing his investigations of the micro-organisms of milk. Dr. Wolffhugel read a paper on the zooparasites of the domestic animals of the Argentine Republic. Recommendations were made to protect the guanaco and vicuña. Great interest was manifested in this section, and a large number of papers were presented dealing with the practical details of this branch of science. One which attracted much attention was on the degeneration of the Malbeck, by Señor Suárez.

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Psychology and Pedagogy.

In this section Prof. Jakob gave the inaugural address, discussing human beings with defective brains. Among the papers were:—Value of psychological statistics in pedagogy, Señor Mercante; necessity of methodical investigation of the child and all abnormal persons, Dr. Piñero; abnormal psychology and education, Prof. Senet; investigations of the nervous system, Dr. Roveda; the measurement of intelligence, Dr. Vidal; experiments upon the sensitiveness of the human skin, Dr. Duceschi.

RESOLUTIONS.

During the congress a large number of resolutions were adopted by the various sections, which at the close were ratified by the entire congress. The substance of some of the most important is given below.

The necessity of solving the problem of reduced rent for the workman and the employee, so that they may live near their work, which is usually in the centre of the city. It may be remarked in passing that this question is especially important in Buenos Aires, where the population is spread over a very large area in one-story houses, instead of the tall structures of Anglo-Saxon cities.

Reiterating the necessity of prosecuting and accelerating the Pan-American railroad according to a fixed plan.

The advisability of studying the causes which hinder the more general adoption of reinforced concrete constructions.

The strong approval of a project for the formation of a "Union Internacional Hispanoamericana de Bibliografía y Tecnología Científicas." The details of such an organisation were worked out.

Recognising the convenience of a reform of the Gregorian calendar.

Recognising the advantage of adopting the meridian of Greenwich for all American countries and from January, 1911, basing their time on meridians differing by an exact number of hours from Greenwich, as is already in use in the United States.

The urgent necessity of preventing adulterations and frauds in foods.

Recommending the adoption of standards of purity for the potable water of the Republic (Argentina); the necessity of forming an American society of chemists; the establishment of biological stations with a view to the study of marine life and the development of the fish industry; the advantage of legislation which will encourage the development of the petroleum industry and prevent all monopolies in this industry; the study of the German language in science courses along with French and English; the utility of employing the "altazimetro" invented by Rear-Admiral Mansilla, to facilitate nautical calculations; the stereographic method of locating the stars for nautical purposes, proposed by Captain Ballvé; an international American commission of psychological and pedagogical studies and a children's congress of specialists; the formation of agrarian societies modelled after those of France; the greater use of agricultural machinery, and the teaching of the use of such machines; the study of the conditions and regions suitable for the growth of the sugar beet with the view of extending its production; the development of the cotton-growing industry; uniform regulations in all American countries governing the importation and exportation of animals; legislation looking to the protection of working women before and after childbirth, and making compulsory the providing of time and suitable accommodation by employers for the necessary attention to babes.

C. D. PERRINE.

RECENT INVESTIGATIONS ON THE CULTIVATION OF RUBBER.¹

EXPERIMENTS on the cultivation and preparation of rubber are being pushed forward at several stations, and the results are discussed in the agricultural journals circulating in tropical and subtropical countries. Methods of tapping the tree have been studied in Hawaii, and found to have a marked effect on the yield of latex. Trees

¹ *Tropical Life.*

The *Agricultural News*. (Imperial Department of Agriculture for the West Indies.)

Bulletins of the Federated Malay States, and of the Hawaii Agricultural Experiment Stations.

tapped with a V-cut gave much less than others with a vertical cut, the greater yield, however, being partly due to the fact that the length of the incision in the latter case is greater than in the former. No advantage was gained from the use of four cuts daily instead of two. The effects of nitrate of soda on the flow of latex have also been studied. Fertilisers are in use in rubber plantations for increasing the growth and vigour of the trees, and it now appears that nitrate of soda also increases the flow of latex. In one experiment a group of five trees yielded 0.9 oz. of dry rubber in three days before applying the nitrate, and 1.3 oz. in the three days following its application, each tree receiving half a pound of the fertiliser. How far the method is economical has yet to be determined. All these experiments were made with Ceara rubber trees.

A number of analyses have been made of the latex from the plants growing in the Botanic Gardens, Singapore. A thirty-two-year-old tree of *Hevea brasiliensis* gave at one tapping 27 fluid ounces of latex, of which 61.08 per cent. was water, 2.3 per cent. serum solids, mainly organic matter, and 36.29 per cent. coagulum was obtained by means of acetic acid. Almost the whole of the coagulum was rubber, only a little resin being present. From another variety, *Landolphia Heudelotii*, the dry rubber yielded 89.5 per cent. of pure rubber and 10.5 per cent. of resin.

The question of preparing the rubber after the latex is obtained is of very great importance. Fine hard Pará rubber containing 10 or 20 per cent. of moisture has a higher relative value than the practically pure sheets from the East. It is considered that the difference in value is partly due to the difference in method of dealing with the latex, and a process has recently been devised in which the latex is treated with smoke, creosote, and acetic acid, so that it may coagulate under conditions comparable with those obtaining in Brazil. In this process, steam at a pressure of 30 or 35 lb., mixed with the fumes from strongly heated green palm leaves or other green parts of trees, is forced by a steam injector into tanks containing the strained latex. In about ten minutes the caoutchouc globules coagulate and rise to the surface.

An incidental problem is the most economical way of dealing with a rubber plantation until the trees come into yielding. A Bulletin from the Federated Malay States Department of Agriculture sets out the advantages of *Coffea robusta*. This plant, discovered wild in the Congo region in 1898, grows more rapidly and fruits sooner than the well-known *C. liberica*. When grown in rubber plantations, it yields a small return in the second year and a good return in the third and following years, but after five years it competes so seriously with the rubber that it must be cut out.

THE MINERAL RESOURCES OF THE UNITED STATES.¹

IN response to the latest of the periodic scares of impending bankruptcy due to the exhaustion of fuel, ore, or soil, the Geological Survey of the United States has been instructed to estimate the national economic mineral resources. Its report (Bull. No. 394), dealing with quantities on a continental scale, may excite the envy of the single countries of Europe; and though the factors are uncertain, the available supplies of most minerals are sufficient to render political restriction of output unnecessary. Thus, in the case of coal, Pennsylvania is known to have enough to

last for 492 years at the rate at which the material was being exhausted in 1907. Ohio has only used 0.9 per cent. of its proved supplies, and at the rate of production in 1907 they will last for two thousand years. In Maryland the coal will last for another 948 years. Mr. Gannet, in a general summary of the extent of the coal reserves, estimates that only one-third of one per cent. of the known and easily accessible supply was mined during the last century.

In regard to the other fuels, the future is less assured for natural gas and petroleum. Assuming that petroleum generally comes from beds 5 feet in thickness, and with 10 per cent. of pore space, an acre would yield 5000 barrels of 42 gallons each. The extent of proved oil land in the States is enormous. Thus, it is expected that the State of California alone will supply 5,000,000,000 barrels. There has been a steady increase in the yield from 2000 barrels in 1859 to 106,000,000 in 1907. The yield, however, has fallen in many of the States, including Pennsylvania and New York, where, according to Dr. Day, it will be negligible ten years hence. The yield has fallen in Ohio, West Virginia, Kentucky, Colorado, Indiana, Texas, and Louisiana; but it has risen in California, Illinois, and Kansas. Dr. Day concludes that if the present production is not increased, the available supply will last the States for ninety years; but if the demand increases as rapidly as during the past few years, the end may come in 1935. He therefore suggests that oil should be limited to the purposes for which it is indispensable, such as lighting in scattered houses and as a lubricant. As half a pint of oil is used in an engine for every ton of coal burnt, the exhaustion of cheap lubricants would be an industrial disaster.

Dr. Day reports on the supplies of natural gas. In most cases the wells have a short life, and 1,000,000,000 cubic feet are still being wasted daily. Much of the waste is said to be unavoidable, as the gas cannot be saved economically from wells from which oil is being pumped; but legislation to prevent unnecessary waste is recommended. After a well has ceased to yield gas under high pressure, a supply can be obtained for years by pumping.

A mineral famine in the United States is most often predicted for iron, as the ores of present value are restricted in depth. The estimates compiled by Mr. Hayes show that there is no immediate fear of the end of the Iron age. He estimates the ore supply now available in the United States at 4,788,000,000 tons. If the present rate of increase in the consumption of iron be maintained, this quantity would, however, be used during the next thirty years; so that before 1940 American iron production would have begun to decline, and low-grade ores not included in the estimate quoted would have to be used. Mr. Hayes, however, concludes that the factors are so indeterminable that any further prediction as to the date of exhaustion of American iron ores "is so uncertain as to be wholly unprofitable and unwarranted."

The United States have been one of the leading producers of phosphates since 1867, and nearly half the phosphate manufactured is exported for the benefit of the exhausted soils of Europe. At the present rate of increase, the supply will only last twenty-five years, and Mr. van Horn, the author of the report on phosphates, therefore recommends that future leases should only be granted on condition that the phosphate shall be used in the States.

That predictions of a coal famine in America are idle may be realised from the reports on the little-known coalfields of the western and central States in Bulletin 341. It is edited by Mr. Marius R. Campbell, and includes twenty-two separate memoirs and a bibliography. The coals are partly Eocene, belonging especially to the Fort Union Series, and partly Cretaceous, coming mainly from the Mesaverde Series. The Sentinel Butte Field in North Dakota and Montana yields an Eocene lignite, of which 33,000,000,000 tons are available within a thousand feet of the surface, and in seams 3 feet or more in thickness. The coal yields excellent producer gas, and can be made into briquettes without the addition of any binder. The coal contains 34 to 45 per cent. of water, and after it is air-dried its calorific efficiency is from 8200 to 8600 British thermal units. From Sentinel Butte a series of coal fields extends south-westward through Montana, Utah, Colorado, Nevada, and New Mexico. The Eocene coals become less important, and the Cretaceous coals more important to the

United States Geological Survey. Bull. 341.—M. R. Campbell. Contributions to Economic Geology, 1907. Part II., Coal and Lignite. Pp. 444, xxv pls., 7 figs. (Washington: Government Printing Office, 1902.)

Bull. 347.—F. E. Wright and C. W. Wright. The Ketchikan and Wrangell Mining Districts, Alaska. Pp. 210+v, xii pls., 23 figs. (Washington: Government Printing Office, 1908.)

Bull. 374.—F. H. Moffit and A. G. Maddren. Mineral Resources of the Kotsina-Chitina Region, Alaska. Pp. 103, x, pls., 9 figs. (Washington: Government Printing Office, 1909.)

Bull. 379.—A. H. Brooks and others. Mineral Resources of Alaska, Report on Progress of Investigations in 1908. Pp. 418, x pls., 21 figs. (Washington: Government Printing Office, 1909.)

Bull. 380.—C. W. Hayes and W. Lindgren. Contributions to Economic Geology, 1908. Part I., Metals and Non-metals, except Fuels. Pp. 406, ii pls., 32 figs. (Washington: Government Printing Office, 1909.)

Bull. 394.—Papers on the Conservation of Mineral Resources. Reprinted from Report of the National Conservation Commission, February, 1909. Pp. 214, xvii pls., 2 figs. (Washington: Government Printing Office, 1909.)