

new city subway, and to give commuters thereby a convenient method of traveling from the business section of the city to their suburban homes.

This completely revolutionizing scheme of one of the oldest roads in the East, taken in connection with the installation of the Fourth Avenue tunnel with electricity by the New York Central, indicates pretty clearly that the trunk lines in the East are entering the electrical railroad field in order to save their traffic from complete demoralization by the trolleys. The struggle between the two systems of transportation, steam and electricity, is thus likely to terminate in the general adoption of the latter for nearly all work except possibly the long-distance through express service. Eventually this may also be changed to follow in the line of progress; but at present it is impossible to predict its future.

In New England the trolleys have intersected the country so that passengers can go from one town to another without once riding on the steam roads, and in most cases the two lines run parallel. The trolleys in nearly all such instances have robbed the steam roads of their local, short-distance traffic. The latter tried the expedient at first of reducing fares to compete with the trolleys, but this proved of little avail, for the trolleys were more convenient and satisfactory for a ride of five or ten miles than the steam cars. The time table of the latter would have to be revised so that trains would have to run every five or ten minutes to hold this local, short-distance traffic.

The changed attitude of the steam roads indicates now that they will enter extensively into the work of building trolley roads as feeders to their main lines. Towns and cities a few miles back from the steam roads are being connected rapidly by short trolley roads built and operated by the steam roads. These trolleys run to meet all trains, and passengers thus find it convenient for them to connect with trains at the least possible expense and trouble. Formerly only stages connected these towns with the steam roads, and their isolated positions inland retarded their growth tremendously.

The effect of this enlightened system has already been noticeable. Towns and villages that possessed unusual natural surroundings, but owing to their location inland were out of touch with the rest of the world, have suddenly increased in population and business enterprise. Some of them have actually doubled in population within three years owing to their direct connection with the steam roads by trolley feeders. Summer visitors have flocked there, so that their former stagnant life has been completely revolutionized.

It is apparent that most of the eastern roads have within the current year reached the conclusion that they must wake up and adopt new policies. They cannot run counter to public demands much longer when the latter have the electric roads to use as a final weapon to force them to compliance. The New York Central and the New Haven roads have both entered extensively in the electrical field all along their extensive routes. In some instances they have bought up the different trolley systems, or secured control of them so they would no longer compete with the steam roads, but act as feeders to them.

Several of the eastern railroads have gone far in the past few months in building feeders to their lines, and incidentally forestalling private trolley companies in constructing new systems in localities where the traffic is now small. The question of establishing motor cars as feeders has been tried in England by the Great Western Company, and the same subject has been brought up here for consideration. In parts of the country where no trolley roads are to-day built, the motor cars might connect small hamlets with large towns on the line of the railroad, and thus promote better traffic. The English motor cars used for this service between the Lizard and Helston station, in Cornwall, accommodate 32 passengers, and since they have been in operation they have proved profitable. A similar service was tried this summer at several of the beaches by the New Haven road. The beaches had natural advantages that should make them popular, but no company had yet built trolleys running to them. It is doubtful if the summer traffic would be sufficient to make a trolley line profitable for the whole year, for the travel is confined chiefly to the three or four summer months.

The New Haven road started a line of motor cars from the nearest station to the beaches, connecting with the principal trains running to the cities. The result has been that the traffic to the beaches more than doubled this year, and at the present rate of increase the summer population should almost warrant the building of a trolley line within another year or two. The success of such summer motor cars as feeders to the main railroad lines has the further advantage of opening up new territory and laying the foundations for future trolleys. It is possible to ascertain the relative value and possibilities of a new route by installing such a motor car line. If the natural advantages of the place are sufficient to attract summer visitors when a good service is provided, the

projection of a trolley line is merely a matter of a year or two. Next summer the New Haven road promises to develop many new beaches and isolated routes by this method, and if the traffic increases, trolley lines under the steam road's control will follow.

Even the question of the trackless trolley has received consideration in the past. Awakened from their long sleep, the railroads are looking around for every possible improvement and development that will place them abreast of the times. Having adopted electricity as an auxiliary motive power, it is only natural that they should seek to utilize it whenever possible.

The trackless trolley has been tried in Germany, but whether the greater cost of operating the cars over dirt or macadamized roads instead of on rails will not more than offset the expense of building tracks is a question that cannot be answered. There are, however, companies who believe otherwise. Within the past month two or three independent companies have been organized for experimenting with the trackless trolley. The application for a charter to use the turnpike for such a trackless trolley was denied the past month in New Jersey because there was no existing law which could control the operation of the cars. It was the legal opinion that the trackless trolley was neither a railroad, nor yet a vehicle in the ordinary sense of the word. Consequently until some new law was passed to control the trackless trolley, it would be wise to refuse to issue a charter for using the right of way of a public road. However, this short-sighted legal view of the matter will not be final if the trackless trolley can be proved to be of value in the development of the country.

Unquestionably the trackless trolley should prove an effectual feeder to the railroads in many parts of the country where small towns and villages are located off from the main lines of traffic, provided the cost of operation is low enough to justify this method of propulsion. The roads must be firm and smooth the greater part of the year to make the service of any value, and as a result they must be macadamized or securely built so that the drainage is perfect. Muddy winter roads would put the trackless trolley out of service about as quickly as anything. The snow problem would have to be considered also, for while it might be easy to clean the tracks of snow, sleet, and ice, it is quite another proposition to keep the whole side of a turnpike free of obstacles. There would also arise many problems regarding the right of way. Not every teamster or driver of an automobile would yield to the trackless trolley car the best part of the road, and trouble and confusion, with resultant litigation of a costly nature, might follow to involve the company.

However much these side issues of the general movement of the steam roads to adopt electricity may seem exaggerated and uncertain in their ultimate good, it cannot be denied that the old struggle between the trolley and steam railroad in the East is entering upon its final stage, which is nothing less than the capitulation of steam and electricity. The latter has proved too formidable for the former, and it is rapidly being adopted by the most conservative of steam railroad corporations, not simply for city tunnels and bridges, but for suburban traffic, country short-haul feeders, and even for express service in certain sections.

THE NEW YORK SESSIONS OF THE EIGHTH INTERNATIONAL GEOGRAPHIC CONGRESS.

The Eighth International Geographic Congress began its first convention in the United States at Washington, September 8, and continued it at Philadelphia, New York, Niagara Falls, Chicago, and St. Louis during the succeeding fortnight, under the presidency of Commander Robert E. Peary, U. S. N. The honorary presidency of the congress was held by President Theodore Roosevelt.

In New York the congress was the guest of the American Geographical Society, and the sessions were held at the house of the society in West 81st Street and in the halls of the American Museum of Natural History on Tuesday and Wednesday, September 13 and 14, while Thursday, the 15th, was devoted to an excursion up the Hudson to Mount Beacon and to West Point, closing the sessions in this city.

The days were devoted to the scientific programme, in which many papers of interest and value were presented, and of which an extended report will soon appear in the SCIENTIFIC AMERICAN SUPPLEMENT. The convention here began with a general session Tuesday morning in the lecture hall of the American Geographical Society, at which Commander Peary gave the visiting geographers, who numbered some 300, a cordial welcome to the city, and then introduced the general programme, which for the morning consisted of addresses on Deep Sea Deposits, by Sir John Murray; on the Volcanoes of Martinique, Guadeloupe, and Saba, by Dr. E. O. Hovey; and on the Rise and Development of the German Colonial Possessions, by Graf Joachim von Pfeil.

The sectional meetings began in the afternoon, and at these the numerous papers of the convention were

read in full or by title. The sections meeting here and their officers were: Oceanography, William Libbey chairman, R. A. Harris secretary; Exploration, H. G. Bryant chairman, H. L. Bridgman secretary; Economic Geography, E. R. Johnson chairman, C. W. Hall secretary; Educational Geography, Charles R. Dryer chairman, E. C. Jones secretary; Volcanoes and Earthquakes, Charles H. Hitchcock chairman, E. O. Hovey secretary.

Tuesday evening a public lecture complimentary to the congress and the society was given in the auditorium of the museum by Dr. and Mrs. W. H. Workman on their recent high ascents among the Himalayas and the glaciers of those mountains. Dr. Workman has established the record for high altitude on land, attaining an elevation of 23,397 feet, and Mrs. Workman's record is only two thousand feet less. A brilliant reception at the house of the society followed the lecture.

The dinner of the congress was held Wednesday evening at the Endicott Hotel. This was complimentary to the foreign delegates, and was largely attended. In the course of the dinner Commander Peary announced that his plans for another attempt at the North Pole had gone so far that the keel of his new ship had been laid, and that she would be ready for use next summer. She is to be a vessel of the strongest construction, adapted particularly to the work in view, and provided with engines capable of exerting 1,500 horse-power. A feature of the evening was the presentation to Commander Peary of the gold medal awarded to him by the Paris Geographical Society for his Arctic researches.

Among the celebrities present may be mentioned Sir John Murray, of the Scottish Geographical Society; Prof. A. Penck, of Vienna; Dr. H. R. Mill, of London; Graf Joachim von Pfeil, of Berlin; Major A. St. H. Gibbon, of London; Profs. H. Cordier and G. Grandier, of Paris; M. de Claparède, of Geneva; Dr. Bela Erödi, of Buda-Pest; Prof. A. Marcure, of Berlin; Prof. Oberhammer, of Vienna; and Prof. J. Thoulet, of Nancy. About 120 foreign delegates were in attendance, and the total registration was about 800. The next convention of the congress, five years hence, will be held in Geneva, Switzerland.

SCIENCE NOTES.

Prof. Constantine Gregory, of Naples, has invented a new chemical process for the preservation of flowers and foliage. When the professor submitted the results of his first experiments to the Neapolitan Institute for the Advancement of Science, a few weeks ago, the association, after carefully examining them, requested the preservation of some plants which they described, and which in their opinion presented the greatest difficulties owing to their peculiar nature. The professor completed the trial set before him, and he has presented some splendid examples of begonia and orchid leaves which have a remarkable natural appearance. In recognition of this work he has been awarded the silver medal of the institute. The professor is now engaged upon the extension of his invention to fungi, and in the event of his achieving success he will be presented with the society's gold medal.

In a recent number of *La Energía Eléctrica*, A. Sandaran describes a new method of testing the molecular state of locomotive axles and other iron and steel pieces, this method being based on the magnetical properties of iron and steel, and intended to reveal any injury these pieces possibly have undergone in operation. From the principles of magnetism, it is inferred that when testing an iron or steel piece before commencing work, the graphical representation of a magnetizing cycle will afford an illustration of the magnetical properties of the piece concerned. Now the axles of locomotive and railway carriages, as well as other machine pieces, are exposed in operation to such vibrations and shocks as to become brittle, when the fracture will show a crystalline structure. At the same time the magnetical residual phenomena are diminished, the iron piece assuming the normal average state as corresponding with the magnetic force, its hysteresis being diminished and the ascending and descending branches of the induction curve differing from each other to no material degree. Between the magnetizing curves of an axle or another iron piece as recorded at different periods of operation there may thus be noted important differences, a magnetical investigation of the piece in question allowing of conclusions being made as to its present safety, and of stating whether any abnormal alteration such as an internal fracture has occurred.

The last 100-foot crib, which forms the foundation of the new government breakwater at South Chicago, was recently put in place and sunk by the contractors. The pier when completed will extend 6,900 feet from the shore of the north side of the Calumet River, and form a complete protection from north and northeast storms.