

ton, and erect buildings and set apart grounds of sufficient area and size to contain a complete exhibit of American railway plans and appliances. This was practically the first exclusive exhibition of its kind ever held, and, apart from the main exhibition building, there were several buildings erected by the largest and most widely known manufacturing firms who deal exclusively with railway material. The exhibition fulfilled its purpose of bringing the railway delegates in touch with the latest improvements, and as these are the men upon whose word the adoption of new plants and the placing of large orders really depends, it is believed that the exposition will have an important effect in increasing the exports of American-made railway supplies and material.

The questions that came up for discussion at the Congress were grouped in five main sections, as follows: First, Ways and Works; second, Locomotives and Rolling Stock; third, Working; fourth, General; and fifth, Light Railways. Under the head of Ways and Work there were four sub-sections, the first of which dealt with wooden sleepers or cross-ties, and was concerned with a study of the selection of kinds of wood and also a study of the processes of preservation of railway sleepers or ties. Then followed articles and a discussion of Rails for Lines with Fast Trains, in which the question of cross-sections of heavier rails, the best metal for rails and ties, rail joints, suspended joints, and supported joints were gone into at great length. The third sub-section was concerned with improved rail crossings, spring and movable point frogs, and continuous rail crossings. The fourth sub-section was devoted to a discussion of Concrete and Embedded Material. Under the head of Locomotives and Rolling Stock one of the most interesting papers dealt with the great increase which has taken place during the past ten years in the size and power of locomotives, an increase amounting on some roads to as much as 45 per cent. The important question of automatic couplers was discussed in papers showing the advantages and disadvantages of such couplers; the improvements effected in their construction, and their use in conjunction with other couplers.

No papers dealt with under this head commanded more absorbing interest than those concerning electric traction, in which its progress on important lines of railways was traced, and the much-discussed questions of the comparative value of continuous, alternating, and polyphase current received lengthy attention.

In Section 3, devoted to the Working of the Railways, the sub-section possessing most interest was that devoted to the Automatic Block System, in which the recent improvements in automatic block signaling were discussed, and it was shown what progress had been made in their introduction. In Section 4, devoted to General Subjects, the questions of slow freight rates, bookkeeping, duration and regulation of work, and provident institutions were the subject of papers and full discussion. In the last section, Light Railways, it was shown what influence the construction of light railways may have had on the traffic of the main lines and working of light railways. The second section under this head was devoted to the consideration of the direct financial co-operation by the State and by localities interested in the development of light railways, and a paper was given outlining the results obtained in Belgium by the institution of a central authority for studying the projects, and supervising the construction and organizing the working of secondary railways constructed with the financial assistance of the State and of the district affected. The third section considered the organization of a cheap service on main railway branch lines which carry little traffic and on light railways. The subject of the last section, Traffic Conveyed by Automobiles, brought the Congress to the consideration of what may safely be termed the very latest development of railway transportation. It dealt with the question of the organization of service of auto-motors on routes where there was not enough traffic for a railway. The development of the separate steam or gasoline-propelled railway car is as important a change, in its more limited sphere, as the electrifying of the main lines of some of the steam railways.

The magnitude of the International Congress may be judged from the fact that the home and foreign delegates together numbered nearly one thousand, and that there was not a single one among these many who was not qualified to rank as an expert in some branch of the complex construction, organization, and management of the world's railroad systems. These delegates come from every corner of the earth; they have built and operated railroads under every possible condition of topography, climate, population, and private and government control. The intercommunication of ideas by papers, addresses, and discussions must result in a general improvement of method, the rejection of old and the incorporation of new and better construction, plant, and operation; results which will be furthered by the personal contact and private exchange of views and experience between individual members.

Vice-President Fairbanks, who in the absence of the President presided at the opening of the Congress, gave a broad touch of human and international interest and meaning to the Congress in some happily-chosen words, when he said that the sessions of the International Railway Congress "bring into closer fellowship distinguished and able representatives of many nations inspired by a wholesome, common impulse. They bring together those who are engaged in promoting the arts of peace and who are desirous of advancing the welfare of mankind. They enlarge the circle of international acquaintance and tend to preserve international amity. They emphasize the fact that our common good is to be promoted by the maintenance of a broad, fraternal, international spirit. While deliberating upon methods to promote the efficiency of the railway, let us hope that you may cultivate a purpose to promote the adjustment, through the arbitrament of reason, so far as may be done consistently with national honor, of those perplexing problems which sometimes arise to menace the world's peace. The nation which seeks an honorable settlement of differences with its neighbors in some other manner than by the sword, is not decadent; it is not wanting in national virility. It is merely manifesting an advanced degree of civilization. It is evidencing the fact that the barbaric strain has run out of its blood. The railroad is one of the most potent agents of modern civilization. With the steamship it has done as much, perhaps more than any other agency to break down the barriers of ignorant prejudice, and unite the world in a common feeling of brotherhood."

AN ELECTRIC PROCESS FOR MANUFACTURING PEAT.

An electric process for the treatment of peat has lately been adopted in England at the Johnson and Phillips works. The peat is transformed into a hard combustible which is well adapted for use under boilers. The operation is said to last about two and a half hours and the material costs less than ordinary coal. The combustible which is thus produced has a high calorific value and gives scarcely any smoke. A plant on a large scale is shortly to be installed in Ireland, and if successful it will be an important move in the direction of utilizing peat as fuel under the best conditions. In the present process the peat as it comes from the bogs is placed in cylinders which revolve at a high speed, and well pressed, while a set of air fans are used to drive off the water which forms about 80 per cent of the total. A set of electrodes is placed in the cylinders and connected with a dynamo. The circuit is completed through the mass of the peat between the electrodes. The resistance which the peat offers to the current causes a considerable heat, and the latter breaks up the peat and pulverizes it, but without causing it to lose any of its properties. In order to increase the conductivity of some kinds of peat, they add certain chemical products. After this process the peat is treated by a set of kneading rollers which give it a plastic consistency so as to enable it to take any desired form. From here it passes to an automatic press which forms it into briquettes. It is then ready for use and is taken to the store-room. It is to be remarked that although the passage of the current through the peat gives rise to a heating effect, the results obtained in this way are quite different from those which another method of heating would produce. By a fire heat the particles of the peat lose their different constituent matters, while the electric heating causes them to disintegrate, thus freeing their cellular material and distributing it throughout the entire mass of the peat. Thus all the particles become adapted for combustion. To obtain a harder material, the disaggregated peat is given a longer treatment with the current. The air is kept out by a tight cover, and the mass is then treated with an adhesive solution so as to unite the particles. The experiments have been made with the above process on a large scale and at a great expense, and it is said to have been greatly improved in the details and can now be applied commercially.

ARTIFICIAL COTTON.

Some recent experiments have been made in Bavaria in regard to preparing artificial cotton from pine wood, and it is said that the new process allows it to be made cheaply enough so that the artificial cotton may compete with the natural product. In the method which has proved the most successful the wood, which has had the bark removed, is cut into thin sticks or fibers one-sixteenth of an inch or less in thickness. These are placed in a large horizontal copper cylinder lined with lead, into which steam is passed. When the separating action of the steam on the wood fiber has been prolonged sufficiently, an acid solution of sodium sulphite is added and the cylinder is heated under a pressure of three atmospheres during thirty-six hours. The wood, which has become completely white, is washed and then passed through a crusher. After washing again, the fibers are further whitened by a chloride of lime treatment. The matter which is thus obtained is dried and constitutes a pure cellulose which

is then heated under pressure with a mixture of nitric and hydrochloric acids and chloride of zinc. The pasty mass thus formed is mixed with a little gelatine and castor oil, which give a certain resistance to the fiber. The cellulose is then formed into fine threads by a spinning machine, and these are washed in a carbonate of soda solution and dried. These threads are said to form a very good fabric when woven, and can easily be dyed. Although the experiments have as yet been carried on only in the laboratory, there is no doubt that the process may be applied on a large scale, thus coming into the European market as a competitor for the imported cotton.

SCIENCE NOTES.

A series of discoveries of great value to antiquarians and geographers have been made in the barren desert of the Fayoum by Mr. Seton Karr, the explorer. These investigations show that at some bygone period the old Kurun Lake consisted of a chain of minor oases running in a northwesterly direction from the existing lake and about fifteen miles distant from the actual border line. The explorer brought to light a large number of millstones, plates for grinding meal, and flint implements of the unmistakable Fayoum pattern, strewn over the whole length of the plateau lying parallel to the lake. A number of these trophies, some of which are surmised to belong to the neolithic period, while all afford undoubted evidence of primitive village communities, have been deposited in the Cairo Museum.

The British consul-general at Naples describes in the course of a recent report a new, easy, and commercially profitable system of cultivating truffles that has been discovered by two eminent Italian botanists, Prof. Mattei, who occupies the chair of botany at the Naples University, and Dr. Serra, of Castellammare, who also holds an important position in the botanical world. They have patented a mycelium, and they consider that once the ground has been thoroughly treated therewith, generation will be so spontaneous that further use of what may be called the "protoplasm" becomes unnecessary for a number of years; for the cultivated tuber will propagate itself the same as the wild one has done for unnumbered generations. They further assert that the crop which they propose to sow almost immediately will be ready to be gathered from October onward. Each oak tree is calculated to produce among its roots from 5 to 10 kilogrammes per year, which means that at \$2 per kilogramme each tree will produce from \$10 to \$20 per annum. The chief hope of the botanists referred to, of material profit, however, lies in the *Terfezia leonis*. This species of truffle originates from the roots of *Helianthemum guttatum*, a herbaceous annual which can be sown from year to year where it will best flourish. It is the easiest of all the varieties to grow, and is practically independent of water. In Tripoli the *Terfezia* practically takes the place occupied by the potato in more northern countries. It grows there to the size of an orange, and when taken from the ground is cut up and dried, and carried as food for the caravans which cross the desert. It can be cooked when required, either in water or in camel's milk, and will keep good for an indefinite period.

An important research expedition, which has for its objects the thorough investigation of the hydrography and biology of the central and western sections of the Indian Ocean, which are not explored by the "Challenger" expedition, is to be carried out under private auspices. The British Admiralty survey yacht "Sealark" has been obtained for the purpose. The party will first proceed from Colombo (Ceylon) to the group of coral atolls and submerged banks known as the Chagos Archipelago. This field opens considerable facilities for research, since no clear data regarding this portion of the Indian Ocean has been gathered since 1837. Thence it will go to Mauritius in August, to replenish stores, proceeding subsequently to the surface reef of Cargados and along the Seychelles group and Saya de Mabha bank. This route has been selected for the purpose of conclusively determining the depth of the ocean bed between Mauritius and Seychelles, about which there is at present much diversity of opinion. After leaving the Seychelles the expedition will survey the Agalegas group, finally returning to Colombo. Elaborate soundings and temperature tests are to be carried out, and the determination of the existence of any relatively shallow banks connecting India with the South African continent, or Mauritius with the Seychelles, the mutual relationships of the Chagos atolls, the general ocean changes that have occurred since the last surveys, and the nature of the currents at varying depths. Frequent dredgings will be undertaken for biological purposes, and the examination of the pelagic flora and fauna at various depths from 50 to 500 fathoms, as well as the ocean bed, and all parts of the coral reefs visited. The expedition hopes by this careful survey to obtain some definite information concerning the vertical distribution of animals and plants. The expedition will be absent for several months.