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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

PLANNING THE PANAMA CANAL.

The Board of Expert Engineers, gathered from many parts of the world, that recently met in Washington on request of President Roosevelt, to decide upon the best type of canal to build at the Isthmus of Panama, has before it what is probably the most momentous question of a strictly engineering character that was ever passed upon in the history of the world. Upon its decision will depend the time of completion, the cost, the character, and very largely the commercial success of this great enterprise. The Board will have placed before it an enormous amount of engineering data that has been gathered through the several decades in which work has been done, either in the way of surveys or construction, upon the forty-two-mile stretch of country on which the canal is located. The mere engineering data, such as surveys, borings, topographical work, meteorological and geological observations, in themselves form a most voluminous record. These constitute the facts as distinguished from the theories, and it is upon the facts, after all, that the final plans must be built up and the final decision based. In addition to these ascertained facts, however, the advisory board will have placed before it many alternative plans, the most important, because the most complete, of which is that one drawn up by the late French Panama Canal Company and indorsed by the International Commission of Engineers. There will also be the amended plans, as favored by the Isthmian Canal Commission; the apparently somewhat hasty and ill-digested plans of the late Chief Engineer Wallace for a sea-level canal; the proposals of Mr. Bunau-Varilla, the Chief Engineer of the late French Panama Company, for the construction, at an early date, of a canal with a high summit level, with arrangements for its gradual conversion during operation into a sea-level canal. Furthermore, there is the important study of the subject which was recently defined in a pamphlet prepared by Lindon W. Bates, which proposes to create large navigable basins at each end of the canal, and to convert considerable areas of mosquito-infested and malarial swamp into fresh-water lakes.

In a letter read at the first meeting of the Board, Chairman Shonts stated that this system of presenting the subject by offering several alternative plans had been adopted, because it seemed to be the method by which all essential information could be conveyed in the most condensed form possible. He stated further that the Commission desired the opinion of the International Board not only upon these plans, but upon any variation of them, or upon any entirely different plan that might suggest itself. During the last of this month the Board will accompany the Commission to the Isthmus of Panama, to make a personal inspection of the work.

FILTRATION FOR CROTON WATER.

That filtration of the city's water supply is one of the surest means of preventing typhoid fever and kindred diseases, has been proved in every case in which filtration plants have been built and put in operation. In recent years the SCIENTIFIC AMERICAN has given much attention to the question of water supply filtration, and the records, as far as they have appeared in these columns, go to prove that of all municipal improvements, this is one of the most beneficent and immediate in the betterment of the health of the inhabitants.

The question has recently been placed before the Mayor in a letter from Dr. Darlington, the Health Commissioner of this city. He points out the impossibility of safeguarding the sources of city water supply by the absolute prevention of infection of the watershed from which the supply is drawn. As regards the Croton watershed, the region is to some extent settled already, and there are various scattered centers of population which are showing evidence of rapid growth. It has been suggested that the city might furnish these localities with sewers and pumping stations; but the cost of doing work of this kind in the thorough manner that would be necessary to make it effective would be prohibitive. Moreover, Dr. Darlington is of the opinion that complete ownership by the city of the land would not be a sure guarantee against pollution. Outside of the provision of sewers and pumping stations, or the outright purchase of the land, there is the third alternative of filtration; and it is this that the Commissioner strongly recommends. It is estimated that the first cost of sand filter beds, of a size adequate to deal with the present needs of the city, would be $17,000,000; and for this sum it would be possible to pass the whole of the supply that is now drawn from the Croton watershed through slow filtration beds, with the result that the risk of the introduction of typhoid and kindred diseases through the medium of our water supply would be practically eliminated.

Evidence of the inestimable value of filtration as a preventive of disease is afforded by the charts which accompany the Commissioner's letter. These show, in the case of Philadelphia, the low rate of typhoid fever in districts using filtered water as compared with those using water not so treated. In one district, which depended upon unfiltered water from the Delaware, the typhoid rate was high and showed wide fluctuation. In two other districts of the same city, which were supplied with water from the Schuylkill that had been passed through filter beds, a low average typhoid rate was shown, and this low rate remained practically uniform. Of the two systems of filtration that would be applicable for New York city, one employs pressure and the other depends upon gravity, the former being used where but little land is available for the filter plant, and the gravity system being used where an ample area can be obtained. In the latter system, which is the more common, water is allowed to find its way by gravity through broad, shallow beds of sand, and a considerable part of the purification is due to "beneficent" bacteria. Among the many municipal improvements that are being suggested just now for the betterment of New York city, we know of none that is deserving of more serious consideration by the authorities than this.

OUR RAILROAD SYSTEM.

Despite its vast proportions, the railroad system of the United States continues to maintain its rapid rate of growth, and the last report of the Interstate Commerce Commission shows that there are at present no indications of any such stagnation as marked the year 1893-1894. The growth is a steady and a healthy one. The total single-track railway mileage has risen to 213,904 miles, an increase during the year of 5,927 miles. These figures and those that follow represent no less than 2,104 separate railway corporations. In the service of the railways there are 46,743 locomotives, an increase of 2,872. The total number of cars is 1,798,561, an increase during the year of 45,172. Of this total, 39,752 are passenger cars, 1,692,194 freight cars, and the remainder are employed in the special service of the railroads. The work of equipping the rolling stock with train brakes and automatic couplers is in a satisfactory condition, as out of a total of over 1,800,000 locomotives and cars, over one and a half million are fitted with train brakes, and over 1,800,000 are fitted with automatic couplers. The par value of the amount of railway capital outstanding is $13,213,-124,679, which represents a capitalization of $64,265 per mile.

During the year the number of passengers carried was 715,419,682, an increase of 20,528,147, and the number of tons of freight carried was 1,309,899,165, an increase of five and a half million in the year. The net earnings of the railways amounted to $636,277,838, a decrease of $7,030,217. The amount of dividends declared during the year amounted to $222,056,595. The total number of casualties to persons on the railways for the year was 94,201, of which 10,046 represented the number of persons killed, and 84,155 the number injured. Of trainmen, 2,114 were killed and 29,275 were injured. Of switch tenders, crossing tenders, and watchmen, 229 were killed and 2,070 were injured; while of other employes, 1,289 were killed and 35,722 injured. The number of passengers killed in the course of the year was 441, and 9,111 were injured. Of these, 262 passengers were killed and 4,978 were injured in collisions and derailments. When these statistics tell us that the ratio of casualties indicates that one employe in every 357 was killed, and one in every 19 was injured, we begin to realize how serious are the risks run by those who maintain our great railroad system in constant operation. The risk to life and limb of the trainmen surely has its parallel nowhere outside of the battlefield; for we learn that in the particular year under consideration, one trainman was killed for every 120 employed, and one out of every nine was injured. This proportion of casualties, as a matter of fact, is just about one-half as great as that of the whole Japanese army during the recent war.

THE PROGRESS OF WIRELESS TELEGRAPHY IN GREAT BRITAIN.

The British government has recently issued the first annual report concerning the development of wireless telegraphy in that country during the first year since the passing of the Wireless Telegraphy Act. According to this regulation, it was made illegal to work or exploit, either commercially or experimentally, any system of ethereal communication without the sanction of the Postmaster-General. During the past twelve months, 73 applications for working wireless telegraph systems have been received. Of this number, 48 have been granted, 4 have been returned to their applicants for modification, as permissions were refused in the original form, 1 has been rejected in its entirety, while the remainder have not been proceeded with.

The solitary complete rejection is in connection with the Orling-Armstrong system. The reason for its refusal by the government was because the company controlling the patents proposed to establish wireless exchanges. Such a system would have interfered with the ordinary telegraphic business of the Post Office, which is a government monopoly. The act, however, as the report shows, is being liberally administered, and the government supervision that is being exercised cannot do else but tend to develop the system of communication, at the same time preventing any one system obtaining a monopoly either by unfair competition or merging processes. The report also shows the number of various systems that have been advanced to a practical stage, and that the Marconi system is by no means the only commercial and practical one. As a matter of fact, of the 73 applications received, only three concern the Marconi apparatus, and of these three licenses, one is purely for experimental purposes. The two other permissions extend to the Marconi company itself, and to Lloyd's, which is under contract to the Marconi company for the exclusive application of that system. These, however, are the only two companies that are exploiting the scheme upon a commercial basis in accepting wireless telegrams from the public; but the report shows that other principles are on the eve of commercial exploitation, or are being privately employed for business purposes.

The variety of the apparatus in vogue may be gathered from the fact that the Eastern Telegraph Company—a cable concern—are utilizing the Maskelyne system for communication between their cable station at Porthcurnow in Cornwall and their cable-repairing ships; the London, Brighton, and South Coast Railroad are adopting the instruments of the French inventor Rochefort for linking up their station at Newhaven with the French port Dieppe, on the opposite side of the English Channel; the Midland Railroad are installing the Lodge-Muirhead system, for communication across the Irish Channel between Belfast and Heysham; while two American companies, the De Forrest and Fessenden, have been granted licenses for the erection of stations in Scotland.

The Midland Railroad is also carrying out a series of experiments with the Lodge-Muirhead system for communication with trains in motion from a point near Derby, as has already been done in this country and Germany. The Marconi, De Forrest, and Fessenden companies have been granted permission for the development of communication between Great Britain and America. For this work the Marconi company intend to utilize the station at Poldhu in Cornwall, while they have also applied for permission to erect another similar station in Ireland for the same object, but this application has not yet been granted. The experiments of the two American companies will be conducted from the stations which they are erecting in Scotland. The De Forrest company also desires to establish a series of stations around the British coast, while the Lodge-Muirhead company has also applied for licenses at four important stations from a shipping point of view —Dover, the Isle of Wight, the Lizard, and the Fastnet.

During the first three months of this year, the British Post Office received 111 messages from the public for transmission to ships at sea *via* Marconi, in accordance with their agreement. Of this total, 21 messages failed to reach their destination. The incoming messages—from ships at sea for transmission to interior land post offices—aggregated 1,655 for the same period. The revenue from this source of traffic averages about $12,000 per annum. There are, however, only six shore stations and fifty ships at present replete with the Marconi apparatus, and it is recognized that the number will have to be considerably increased before the scheme can become profitable.

There is, however, every sign that wireless telegraphic communication has successfully emerged from its experimental stage, and can be extensively developed commercially. At present, however, progress is somewhat slow, owing to the high tariffs levied for the transmission of messages by this means; and until the fees are reduced so as to compare favorably with the ordinary telegraphic system, it will not become of the importance to the maritime and commercial community that its value deserves. It is anticipated, how-