

## Correspondence.

## Facilities for Building War Ships.

To the Editor of the SCIENTIFIC AMERICAN:

As an old reader of your valuable paper, I take the liberty to consult you about a matter which is of some interest to me, and I would ask you, if this is not an abuse of your time, to kindly send me a few lines on the point at issue.

I always thought until recently that the facilities of England in building men of war, cruisers, etc., were enormous and far beyond the corresponding facilities of the United States in particular. Now, a friend of mine, apparently well posted on these matters, assures me that the United States can, if they wish, turn out as many, as big, and as good vessels fit for war, say in three years, beginning now, as England can in the same time. This I cannot believe. From what I read, I feel pretty certain that the vessels being of the same type and of the same perfection, England can surpass the United States for the number of vessels turned out in a given time. Each of us is honest in his opinion, and we would like to know who is mistaken.

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[In answer to an inquiry sent out by the British Admiralty a few years ago to ascertain the warship building facilities of Great Britain, it was found that the whole British navy could be duplicated in two years' time. As the total tonnage of the British and United States navies is about 1,500,000 tons and 300,000 tons respectively, arguing on this basis, the capacity of the British yards is at least five times that of our own.—ED.]

## Railroading in the Philippines.

BY SPECIAL CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

No better idea of the undeveloped condition of our new Oriental colony could be conveyed than by the statement that this great island group, with an area of over 114,000 square miles and a population exceeding 20,000,000, has but a single railroad line. The only railroad line of the Philippines—the Manila and Dagupan Railway—extends for a distance of 130 miles from Manila to Dagupan, a minor port near the center of the west coast of Luzon. It thus serves as an outlet to the largest continuous area of valley lands on Luzon or elsewhere on these numerous islands.

The lack of interest in transportation facilities and in commercial and agricultural pursuits under Spanish rule is ever apparent, and this neglect is quite comprehensible to the average student of Philippine affairs. The governor-generals, always expecting a recall, had little interest in the development of the country, and all save military improvements, which were imperative, were neglected. Estimates for road making and for other internal improvements were ignored, or, if any start was actually made, the work was never completed; for the funds raised for this purpose through oppressive taxation were all misappropriated or used for improvements here in Manila.

But in spite of all this and the restrictive methods of the Spanish government regarding commerce and industry, the company which constructed the Manila and Dagupan Railway were granted quite liberal concessions. This was due probably to the hope of an increase in revenue from taxation on the road and to the advantages it would offer for transporting troops, rather than to a desire to benefit the island commercially.

The question of railroads occupied the attention of the colonial government as early as the year 1875. At that time an elaborate scheme was formulated. It provided for the construction of roads of general public utility, either by the government or by subsidized companies, under concessions granted by the home government; and for roads of private interest under concessions granted by the governor-general of the colony. But no definite move toward securing a railroad line for these islands was made until ten years later. In 1885 the Spanish government offered a subsidy of \$7,650 per mile on a specified line of 130 miles, but it was not accepted by any Spanish capitalists. The following year another and more liberal offer was made. It included a guarantee of 8 per cent annual interest on a maximum cost of \$49,643 per mile. In the fall of 1886 the offer was accepted by a number of London capitalists, and, in accordance with the terms of the concession, the line was to be completed within four years from July 22, 1887. At the end of 99 years the road, with the rolling stock, was to revert to the government without compensation.

Most of the work of construction of the road was done by native laborers, but quite a number of Chinese coolies were employed. The track is of 3 feet 6 inches gage, and steel rails weighing 45 pounds to the yard are used. The entire roadbed is very level and is quite free from cuts and curves, but has plenty of bridges, and this last was the only difficulty met with in the construction of the road. On the whole line there are at least sixty iron bridges, with cylindrical steel piers. The bridges are uniformly of 20 meter spans,

and the largest is that over the Rio Grande de la Pam-panga, which consists of six spans. The roadbed has an average elevation of about four feet above the general level and is all ballasted with fine gravel. The ties are of hard wood, which is generally cut on the islands.

The rolling stock is very light as compared with that of our railroads. The locomotives appear to be little superior in speed or capacity to the "jerk water" or "dinkey" locomotives in use about mines and manufacturing in the United States. They are of less than ten tons weight and the passenger cars are correspondingly small. These carriages are of an English type and are of three classes, all being divided into three compartments, with a gangway running along on the outside. Each apartment will seat eight passengers. The few first-class passengers are comfortably seated in cane chairs, and the second and third class carriages have wooden bench-like seats. The second-class cars are the more comfortable of the two, as they are seldom crowded, while those of the third class are usually filled with natives carrying great baskets or bundles.

At present there are three passenger and three freight trains each way daily, but only one of the trains carries mail. The passenger trains cover the 130 miles between Manila and Dagupan in eight hours. A passenger train is usually composed of eight or ten carriages, of which more than half are usually of the third class. The passenger rates range from two cents per mile for third-class to five cents per mile for first-class passage. The station houses and other buildings along the line are very complete, owing to a requirement of the Spanish authorities. The Manila depot is a well arranged two-story building 70 by 45 feet, with car sheds 325 feet long. It covers four tracks, but the entire structure is built of wood. The general offices of the road are located on the second floor, while the first floor is quite similar to American station houses. There are twenty-eight other station houses on the road, and, while they differ somewhat as to size, they are of a uniform type. There are good freight sheds at all stations.

The machine shops and engine houses of the road are located at Calococan, four miles from Manila, and here General Manager Higgins has his residence. With the exception of the general manager and a few English overseers and one or two Spanish station masters, the road is operated by natives. There are native station masters, telegraph operators, clerks, engineers, trainmen, mechanics, and laborers, and all of these work for very low wages. Twenty dollars in gold is a large salary for a station master or clerk, and the trainmen receive but little more than half this amount. But the natives give good satisfaction in every capacity in which they are employed, in spite of their inclination to make extra money when the chance is presented.

As to the original cost of the road there are few reliable statistics, and its present financial standing is unknown to others than the officials. But it is evident that the cost of construction per mile must have been much lighter than the cost of similar roads would be in America, and the running expenses are much lower. From all appearances the road is at present in a very flourishing condition, and since the capture of Manila the traffic has been heavier than ever before.

This single railroad line of our new Oriental colony traverses some of the finest country to be found in all these islands. For probably 90 miles it runs diagonally across a continuous level or slightly rolling area, separated from the sea and hemmed in by mountain ranges which in places rise to the height of 5,000 feet. The northwestern corner of the valley opens on the shallow gulf of Lingayen, whereon is situated Dagupan, the terminus of the road. On the southern end this ideal valley region is bounded by Manila Bay, the Pasig River, and Lake Bai, the most important lake in these islands. In this valley region and the bordering mountain region is included all of the six provinces wherein was begun the Spanish subjugation of these islands, and to-day they are the most important part of Luzon. These are Manila, Bulacan, Pampanga, Tarlac, Nueva Ecija, and Pangasinan, all of which are traversed by the Manila and Dagupan road.

The scenery along the line of this railroad is most picturesque. For fifteen miles out of Manila the land rises in irregular, long, sloping hills, scarcely half a hundred feet in height. On one hand is a succession of rice fields, and on the other the hillsides are terraced with queer native bamboo huts. At Calococan are seen the first real signs of civilization. Twenty-five miles from Manila is Malolos, the capital of the so-called Filipino Republic. Like many other native towns, it is stretched out for a considerable distance among the bamboos and ponds. Between Malolos and Calumpit, a distance of nine miles, there are twelve bridges across streams of sufficient volume to be called rivers. Ten miles from Calumpit is San Fernando, and ere we reach this place we have left behind the bordering hills of Manila Bay. Twenty miles beyond San Fernando we pass through a cut about 300 yards long and 30 feet deep, the only one of any consequence on the road, and here at Bamban we have reached the mountains. Beyond Bamban the landscape changes,

and coconut groves begin to supplant the bamboo flats. Tarlac is one of the most important towns on the road. It is located in the province of Tarlac.

The remaining forty-five miles of the road to Dagupan runs through flat land, well drained, and there is a succession of rice fields, cane fields and coconut groves. The only important town on this part of the road is Bayambang on the river Agno. The English firm of Smith, Bell & Co. have a large rice mill there, and at Calasias, the next station to Dagupan, are made the finest of the Manila hats. Such are the scenes along the only railroad line in the Philippines, and in spite of its insignificance this road has done much toward improving the country through which it passes. Ere long American energy and capital will begin the grand work of development so long delayed through Spanish misrule, and the toot of the American locomotive, echoing through the bamboo jungles and coconut groves, will soon awaken these oppressed islands from their long sleep.

## Science Notes.

A telegram has been received from Sydney by the Royal Society. It states that the boring in the coral atoll of Funafuti had been discontinued after reaching a depth of 1,114 feet. The cores were obtained and the material traversed was described as a "coral reef rock."

A bill authorizing the use of voting machines has been introduced in the Legislature of Illinois, and it is claimed that the Chicago Board of Election Commissioners has promised to give machines a trial if the Legislature gives it authority to do so. It is probable that the bill will pass.

The Automobile Club de France announces a competition of motor carriages actuated by storage batteries. Exhaustive tests will be made on the life of the cells and on their efficiency. Account will also be taken of their weight and the facility of operating and the cost of maintenance.

A repetition of the serious accident which occurred over a year ago at Garrison's, on the Hudson River Railroad, has occurred in England, on the London and Northwestern Railway. Between Chester and Holyhead the track runs close to the seashore. During a gale which occurred at night the track gave way while a goods train was passing, precipitating the engine and several cars into the sea, and the engine was found on end. It is thought that the tide carried away the sea wall and ballast before the train reached the scene of the accident.

The Crehore-Squire Company, of Cleveland, O., has been capitalized for a capital of \$1,000,000. The promoters of the new company state that they will adopt the system invented by Messrs. Crehore and Squire, which will tend to revolutionize telegraphy. Col. Squire stated that they expected to put up wires throughout the country and that they had sent as high as four thousand words a minute by the system. It was tried by the government about six months ago and over three thousand words a minute were sent at that time.

The present director of the New York State Museum, Albany, and his associates, are, without exception, warmly interested in securing a more active co-operation of the museum and its staff with the teachers of science in the colleges and schools of the State, which the peculiar circumstances of the museum have heretofore made impracticable, and will be very glad of suggestions from teachers in any institution in the University. Science teachers ought to feel some measure of responsibility for notifying the museum of matters of interest in their locality and acting as associate or honorary members of the museum staff, the scientific officers of which will in turn be glad, as far as practicable, to visit schools where their services are requested, and give advice and suggestions regarding collections, field work, and other matters of interest.

We have before referred to the Marine Salts Company, which was going to extract gold from sea water (see the SCIENTIFIC AMERICAN for August 13, 1898). Mr. Pack, the Assayer of the United States Mint, in San Francisco, has made some interesting experiments in this line, which are reported in The Mining Press of that city. He finds gold in the water of the ocean only in solution amounting to about 0.5 of a grain to the ton; in value about 2 cents. The gold in the water of San Francisco Bay contained probably about twice that amount, though largely in a finely divided state, only a portion being in solution. The quantity of gold and silver actually contained in the ocean water and the possibility of profitably extracting them has been for a long time under discussion. In 1872 Sonstadt discovered gold in sea water and reported it to be less than a grain to the ton. Prof. Liversidge, in a paper read before the New South Wales Royal Society, estimates the sea water of the coast in that region to contain a very small amount of gold to the ton, namely, 0.5 of a grain. Mr. Pack's figures agree admirably with those of Prof. Liversidge. In view of the small value of the yield of gold per ton, it is extraordinary that people could be so deceived as to invest money in so crazy a scheme.