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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.

## PANAMA CANAL AND THE TEHUANTEPEC RAILROAD.

Not by any means the least of the important services rendered by the late Chief Engineer of the Panama Canal, Mr. John F. Wallace, was the word of warning which he sounded in a recent address with regard to the strong competition with which the canal will be confronted by the completion of the Tehuantepec Railroad. This railroad, which is being built in the interests of British capitalists, extends for a distance of 176 miles across the isthmus at Tehuantepec. According to Mr. Wallace, it is being built in a most substantial manner and provided with the very best facilities, equipment, etc., with a view to its handling a large amount of traffic at a minimum cost per ton. Wharves, warehouses, modern methods of loading and unloading, etc., will enable this railroad to conduct a profitable business at a rate not to exceed \$2 a ton from ship hold to ship hold. The time from ship to ship should not exceed an average of two days.

It is assumed that modern cargo steamers can carry the average run of ocean freights with profit at the rate of \$1 per thousand miles. On this basis comparison is made, first with transit by way of the Suez Canal, and then by way of the Panama Canal. From New York to Sydney, Australia, the saving in distance by way of the Tehuantepec Railroad would be 5,700 miles, and any railroad rate across the isthmus at Tehuantepec less than \$5.75 per ton should take this business from the Suez route. There would also be saved the time that it requires an ordinary cargo vessel to steam 5,700 miles, minus the time required to transfer the freight across the isthmus by rail. Allowing a maximum of four days for the isthmian transit, this would make an actual saving of time of at least fifteen days. From New Orleans to Hong Kong, the saving over Suez would be 4,800 miles, and twelve to fourteen days in time, with a yield to the Tehuantepec Railroad of \$4.80 a ton on the basis of equivalent charges by the Suez route. From New Orleans to Yokohama, the saving over the Suez route would be 8,400 miles, and twenty-four days in time, with the ability to charge \$8.40 on an equivalent basis with Suez. As there is little question that this railroad can handle freight from ship to ship for \$2 a ton or less, its ability to build up an extensive business to the Far East in competition with the Suez route is plainly evident.

Mr. Wallace then compares the Tehuantepec route with that by way of the Panama Canal, on the assumption that \$1 per ton will carry ocean freights 1,000 miles, and that \$1 per ton will be the minimum rate for transit through the canal. From New York to San Francisco the saving by Tehuantepec will be 1,200 miles, which would yield \$2.20 as a maximum rate to the Tehuantepec Railroad. From New Orleans to Hong Kong the saving would be 2,000 miles, and five days in time, yielding the railroad a maximum charge of \$3 per ton. From New Orleans to Sydney, Australia, 1,400 miles would be saved, and a maximum charge of \$2.40 rendered possible; while from New Orleans to San Francisco there would be a saving of 1,800 miles.

From the above considerations it is evident that, in the years which will elapse before the completion of the Panama Canal, the Tehuantepec Railroad will undoubtedly build up a large and profitable business, which it will be difficult thereafter to divert back to the Panama route. The author of the paper, who is himself a former general manager of one of our largest railroads, considers that the remedy lies in the provision at Panama immediately of the proper facilities and equipment for the development of the maximum efficiency of that railroad, and the institution of a flat rate of not more than \$2 a ton, and possibly as low as \$1.50, in order to prevent other lines from diverting traffic from that route, and to encourage and expand the traffic which is tributary to it. Such a rate would immediately enable us to compete with the Suez Canal on all traffic from the United States ports to the Far East, and from the ports of Europe to those of Aus-

tralia, Japan, China, and all points east of Singapore. On the basis of the above figures, Mr. Wallace is certainly justified in his statement that the failure of the United States to improve and utilize the Panama Railroad to its full capacity, and do it at once, may seriously affect the value of our Panama investment, which has already reached a total of \$70,000,000.

## SUPERHEATED STEAM IN RAILWAY SERVICE.

It is among the possibilities of the future that superheated steam will take the place of compounding as a means of increasing the efficiency of the steam locomotive. Considering that it is of very recent introduction, at least as far as its extensive and successful use is concerned, the locomotive superheater is making rapid progress; moreover, its development has been marked, as far as we know, by no serious failures, while from many quarters there come the announcements of exceedingly good results. One of the latest and most significant endorsements is that given by Mr. H. H. Vaughan, in a paper presented at the April meeting of the New York Railroad Club, dealing with the results obtained on the Canadian Pacific Railway, where the superheater is in extensive use, no less than 186 engines having been built, or now being constructed, of the superheater type.

The comparative data were obtained from a large number of consolidated and ten-wheel engines, which are identical, except for the fact that some of them are compound, and the others are simple engines with superheaters. The types of superheaters used are the Schmidt fire-tube and one designed by the mechanical engineer of the Canadian Pacific, and the author of the paper. The data were obtained while these engines were performing the same service on the same divisions of the road. Compounding has become, during the past few years, firmly established for freight service, and on account of the high cost of coal there would be no question as to its continuance, had not the superheater been applied to locomotives with simple engines. The records show that on the four sections of the road on which the records had extended over a sufficient period of time to give reliable comparison, the simple engines with superheaters consumed, on the respective divisions, 85 per cent, 87 per cent, 83 per cent, and as low as 76 per cent, of the amount of coal consumed by the compound engines under similar conditions of service.

The failure of one class of superheater locomotives to show as good results as the others, the figures being respectively 97, 100, 96, and 82 per cent, serves to bring out the fact that the gain in economy is commensurate with the increase of the amount of superheat; for this particular class of engine was using only 20 degrees of superheat, as against 80 to 100 degrees in the class which showed such marked superiority to the compound. The results are so encouraging that on the new engines now under construction the proportions of the superheating surface will be increased. The system is found to be particularly advantageous in passenger service, and thus far in the operation of these locomotives no serious counterbalancing disadvantages have been developed.

## REBUILDING THE RUSSIAN NAVY.

The construction programme for the rebuilding of the Russian navy, which was recently sanctioned by the Czar and is to be spread over a term of nine years, would seem to indicate that the Russians have not themselves drawn from the experience of the late war the same cardinal lessons as Japan and the other naval powers; for in the list of battleships and cruisers which are to be laid down there does not appear to be a single vessel of the type of the "Dreadnought," or our own "Michigan"—that is to say, the type of ship in which the intermediate battery is abolished and the main armament consists entirely of guns of heavy caliber. According to the Neue Freie Presse, the programme includes twelve battleships, fifteen cruisers, forty-six torpedo-boat destroyers, eighteen torpedo boats, ten submarines, seven gunboats, nine monitors, and one mining ship, or 118 vessels in all. These ships are allotted as follows: For the Baltic Sea fleet there will be nine turret ships of about 16,500 tons displacement, carrying four heavy, fourteen intermediate guns, and fifty-six rapid-fire guns—a very modest battery for this late day; four cruisers of 12,000 tons, each carrying forty quick-firing guns; eighteen 300-ton torpedo boats; a mining ship of the type of the "Yenisei," and ten submarines. For the Black Sea fleet, there will be built three 12,500-ton battleships to carry four 12-inch guns, four 7½-inch, twelve 6-inch, and a number of quick-firers; seven first-class cruisers of 12,750 tons, which is about the size of the "Gromoboi;" four second-class cruisers of about the size of the "Pallada," but having two to four knots greater speed, and twenty-eight 350-ton torpedo boats. That Russia has given up, for the present, at least, any idea of a powerful fleet in the Far East, is shown by the fact that for that station only six coast gunboats of 1,000 tons displacement are to be built, and nine shallow-draft gunboats for use on the rivers of northern

Siberia. The total cost is estimated at about \$200,000,000, which is to be allotted in nine annual installments. Adding this to the sum required annually for the current expenses of the navy, we find that the Russian naval budget for the next nine years will amount to \$80,000,000.

## THE DISCOVERY OF THE ANCIENT HEBREW TEMPLE OF ONIAS IN EGYPT.

One of the most valuable discoveries of the British School of Archaeology in Egypt during the past winter season was the identification of the ancient Hebrew Temple of Onias by Prof. Flinders Petrie. When the persecution of the Jews by Antiochus caused them to flee, many of the fugitives settled in a remote corner in the east of the delta, and in this sanctuary Onias IV., of the high priests, erected a temple after the design of that at Jerusalem, in order that this spot might serve as a rallying point for those in flight. This temple is duly mentioned by the historian Josephus, who states that it was erected on the site of an old Egyptian town. Some time ago it was realized that the position of this settlement was the town of Tel el Yehudiyeh, which is some 18 miles north of Cairo, but it has been left to Prof. Petrie to prove the identity of the location conclusively, and in this work he has found the closest corroboration, even to the minutest particulars, of the statements set forth by Josephus.

Prof. Petrie has published an account of his discoveries and thus another interesting link in Jewish history has been established. The ancient name of this town was Leontopolis, in honor of the lion-headed goddess "Bubastis," and this fact was irrefutably shown by the discovery of the statue of an admiral of the Mediterranean fleet of Psametek II., representing him holding a shrine of the goddess in question. Josephus also states that the place is "full of materials," a fact fully borne out by the finding of an extensive stone-built ditch, about one mile in length, extending round the ancient Egyptian town, and which would have furnished Onias with ample constructional material for his temple. Outside the confines of the town is a huge mound which constitutes quite an important landmark for miles around, and on investigation Prof. Petrie finds that its height is practically in accordance with the dimensions mentioned by Josephus, it being over fifty-nine Greek cubits above the level of the surrounding plain, the Jewish historian's figures being sixty cubits in height. Examination of the pottery that was found within this mound identifies it with the second century B. C., while the coins which have been brought to light are of the period of Ptolemy Philometor, whom Josephus states granted the whole settlement, while a sherd unearthed with building accounts, bearing among other names that of Abram, affords convincing testimony that Jews were employed. Under these circumstances the well-known archaeologist who has carried out the excavations is firmly convinced that this is the site upon which Onias erected his temple.

The ground plan of this settlement is roughly a right-angled triangle, and it was strongly fortified. On the eastern side was an eastern wall of stone 767 feet in length by at least 20 feet in height, and terminating in bastions at the ends. The entrance was at the west acute angle, while the temple was at the south point. The hypotenuse of the triangle was formed of an inwardly curving wall not less than 20 feet in thickness, rising to a height of 68 feet, at an angle of over 60 degrees, to support the temple, entry to the court of which was attained by means of a stairway 14 feet in width in the eastern wall.

The settlement covered an area ranging from three to four acres in extent, and the sacred edifice was exactly half the size of the Temple erected in Jerusalem by King Solomon. The rough lines of the structure built by Onias are now only visible owing to the vandalism of the natives in quest of earth, but about twenty years ago the walls were standing and the pavements and pillars were then extant. Prof. Petrie finds that the inner court of the Temple was 64 feet in length by 24 feet in width, while the outer court was 45 feet long by 32 feet wide, inside measurements. The architecture was Corinthian with Syrian features in the battlements. When the natives first commenced excavating earth from the site some years ago vast quantities of burnt bones were revealed, and the probability is that they were the remains of the daily sacrifices. Evidences of this have been discovered in the foundations, since in the lower part have been unearthed on all sides huge cylinders of pottery sunk in the ground in which the sacrifices were celebrated, fresh earth being thrown upon each fire offering, in order to smother it, so that traces of sacrificial rites remain alternate with layers of earth. Unfortunately, however, the valuable work carried on by the school is hampered by the lack of funds, which is a regrettable fact, since the evidences of wanton destructiveness upon this site show the imperative nature of carrying out the excavation and research work in Egypt upon a thorough and more extensive scale than is at present possible.