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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.

## RECOMMENDATION OF THE PANAMA ROUTE.

The Isthmian Canal Commission in a supplemental report has recommended that, in view of the new situation brought about by the offer of the Panama Company to sell its properties to the United States for \$40,000,000, the sum at which they were appraised by the Commission, these properties be purchased and the canal constructed along the Panama route. This report is in no sense inconsistent with the first report of the Commission in recommendation of Nicaragua, inasmuch as it was clearly stated therein that the Panama route was excluded from consideration by the high valuation placed upon the properties by the old management of the Panama Company. Apart from this consideration, which was, of course, a fatal one, the first report of the Commission was distinctly in favor of Panama on the grounds of engineering, first cost, and cost of maintenance and operation. The findings of the supplemental report in favor of Panama are too lengthy for reproduction here, but they will be found in full in the current issue of the SUPPLEMENT. It is sufficient to say that the points enumerated in favor of Panama are those which, for several years past, we have presented in the columns of this journal.

We are free to confess that the final selection of Panama gives us unbounded satisfaction. The SCIENTIFIC AMERICAN was the first journal to publish the official plans of the location and structures of the new Panama Canal Company. From the very first time that we investigated the subject, we were satisfied that there was no question as to the proper course for the United States government to take in this matter; and we have never had a doubt throughout this long-drawn-out controversy that, when the facts came to be fully investigated, as they have now been, by an impartial and properly qualified commission of experts, final choice would be made of the shorter, better known, and more practicable route.

## THE FAULTY EMBANKMENTS OF THE JEROME PARK RESERVOIR.

Too much publicity cannot be given to the present commendable attempt on the part of the Chief Engineer of the Jerome Park Reservoir to have the plans for the construction of a large part of the reservoir embankments revised, and certain portions of the structure rebuilt in accordance with the best engineering practice. It will be remembered that last autumn Mr. Hill, the present Chief Engineer, recommended important changes in the plans, both of these embankments and of the earth-and-core-wall portion of the Croton Dam. The Board of Engineers appointed to investigate the conditions of these two structures passed favorably upon the suggested changes at the Croton Dam, but stated that they considered the existing structures and plans at Jerome Park satisfactory. The Chief Engineer has submitted a reply to that portion of the report affecting Jerome Park Reservoir, in which he gives certain extracts from the diary of the Resident Engineer who had charge of the construction of the embankments which it is proposed to rebuild, which show that the material underlying these embankments is about as bad as it could possibly be.

The embankment under discussion extends along the southerly end and easterly side of the reservoir. Its length is 2,850 feet, and for 1,200 feet, at three different places, it is built upon sand. The balance of the embankment is built upon rock foundation. The southerly end of the wall is built across a natural depression which drains down to the Harlem River. This depression is 270 feet wide, and at its deepest point there is 30 feet of quicksand between the wall and the underlying rock. Great difficulty was experienced in building the foundations across this depression. On May 20, 1897, the Resident Engineer writes in his diary: "In the core-wall trench, quicksand still causes much trouble; a large stream of water boils up in bottom and has caused settlement of the timbers. Bottom also squeezes up there and has to be

weighted with planks, etc." On June 3, 1897, he writes in his diary: "Much trouble encountered in excavating, as quicksand runs in from side almost as fast as it is excavated." On September 25, 1897, this engineer enters in his diary that he noticed two hair cracks in the completed core wall; and November 12, 1897, he states that the hair cracks in masonry have opened slightly and are being pointed over with Portland cement.

Commenting on these entries and several more which we do not quote, the Chief Engineer in his reply says: "In my opinion the building of an embankment and core wall for a reservoir upon such material and under the conditions as described is a gross violation of the rules of good practice, which prescribe that a core wall should be built either upon rock or upon solid, impervious material." Mr. Hill contends that this underlying sand is permeable by water, and that when the reservoir is filled with 23 feet of water, there will be leakage under the foundations, which may easily become so serious as to imperil the whole embankment. The facts of the case as presented in the report appear amply to sustain the position of the Chief Engineer; and in view of the importance of the reservoir, and the disastrous results to New York city should there be a failure of its embankments, we trust that the Aqueduct Commissioners will see the wisdom of carrying out the reconstruction of these walls along the lines suggested. We have personally examined some of the material taken out from below the foundations in question, and have no hesitation in saying that the underlying strata at this particular portion of the dam is about the worst that could possibly be imagined. The foundation would be a poor one even if the embankments were enclosed by rising ground; but standing as they do on one of the drainage slopes of the Harlem River, the necessity of carrying the foundations through this quicksand to solid rock should not be questioned.

## LONG DISTANCE TRANSMISSION.

To the city of San Francisco is shortly to belong the distinction of being served by considerably the longest transmission of electrical power in the world. Hydraulic-electric power has for several weeks been carried in California for a distance of over two hundred miles. The credit of this installation is due to the Bay Counties Power Company, California, whose line extends from the Colgate power house located in the Sierra Nevada Mountains to Oakland on San Francisco Bay, a distance of 142 miles. At this city the lines connect with those of the Standard Electric Company, which reach from Oakland to San José, a further distance of 42 miles, and thence to Redwood City, which is distant 191 miles from the Colgate power house. At Colgate connection is made with the lines of the Consolidated Light and Power Company, which extend to Burlingame, a further distance of 11 miles. The total distance of transmission thus accomplished is 202 miles. The completion of the high-tension line of the Standard Electric Company to San Francisco, which it was announced would be made this month, will render possible transmission from the power house in the Sierra Nevada Mountains to the sub-station in San Francisco, a distance of 220 miles. This feat, which is quite without a parallel, will be naturally compared with the Lauffen-Frankfort transmission of 110 miles, which was made in 1891, and it will be seen that the distance has been doubled in about a decade. The explanation of the great distance to which transmission has been successfully accomplished in California is to be found partly in the favorable climatic conditions of that State.

## ADVANCE OF THE MARINE TURBINE

It was inevitable that the success of the "King Edward" during the past season should encourage the construction of other turbine-propelled vessels; hence, we are not surprised to learn that another river passenger steamer similar to the "King Edward" has been ordered. The new craft will be of large dimensions and will have one knot more speed, or 21½ knots an hour, and the horse power will be about 4,000. The absence of vibration is, of course, a strong recommendation for the application of turbine propulsion to the steam yacht, for here comfort is a prime consideration, and we note that orders have been placed for turbine engines for three yachts of high speed. One of these, which is being built for a New York owner, will be a 1,400-ton yacht of 3,500 horse power. Of the other two, which are being built for British owners, one will be of 700 tons displacement and 15 knots speed, and the other, which is to be constructed on the lines of a torpedo boat, and carry Yarrow water-tube boilers, is to be of 170 tons and will attain a speed of 24 knots. The next step in the application of turbine propulsion should be the construction of an ocean-going steamer of 4,000 or 5,000 tons displacement. With a ship of this size it would be possible to determine with pretty close certainty whether the equipment of a 10,000 or 15,000-ton liner with turbine engines would be a profitable experiment.

## THE SHIP SUBSIDY BILL.

It sometimes happens that in response to the question, "What's in a name?" we have to answer, "Just everything." There is now up for discussion in Congress a measure which we do not hesitate to designate as one of the most important ever brought before that body, that is in danger of suffering shipwreck simply and solely because of the unfortunate name which it carries. Unfortunately a large number of the American people have conceived a violent prejudice against the term "subsidy." Apparently they look upon subsidizing as a kind of alms-giving, a sort of feudal scattering of largess, with the difference that the recipients, instead of being supposedly impoverished and helpless, are among the powerful and wealthy of the land. As a matter of fact, shipping subsidies mean nothing of the kind. They are based upon the conviction that between the individual ship-owner and the nation at large there is, in respect of the up-building and extending of the shipping industry, with all the indirect and enormous national benefits that are to be derived therefrom, a profound community of interest. It is realized that the assistance given by the nation to the ship-owner is to be temporary only, and that in its intrinsic value it is altogether disproportionate to the great and lasting national advantages to be derived from the rehabilitation of the merchant marine.

In discussing the subject it is best, at the outset, to distinguish clearly between our "lake and coastwise" and our "deep-sea" shipping. The former is wonderfully prosperous; the latter is not; and the difference is due to that very condition of things which the pending subsidy bill is expected to remedy. Our lake and coastwise shipping is protected against foreign competition by an ironclad law which prohibits foreign ships engaging in the lake and coastwise trade; and the stimulating effect of this law is seen in the fact that this branch of the shipping interests of the country is in a flourishing condition, and although it is highly remunerative, there has been a steady reduction of rates. In 1870 it cost as high as \$3.50 to transport a ton of freight from Lake Superior to ports on Lake Erie, while to-day the ruling rate is from 60 cents to \$1 per ton.

Our merchant marine, on the other hand, is in direct competition with that of foreign nations, who are able to build and operate their ships so much more cheaply than ourselves that it is out of the question to compete successfully against them; and the object of the ship subsidy bill is to make up, by a certain schedule of payments to the ship-owners, the actual loss to which they would be exposed were they to attempt competition on a large scale with foreign ship-owners. The proposal to extend government aid is qualified by the understanding that such assistance is only to be rendered until we have moved up to our proper position among the maritime nations of the world. Long before our deep-sea shipping has increased to the magnitude of the lake and coastwise shipping, the cheapening of the cost of production which we may reasonably expect to follow the introduction of American labor-saving devices into shipyard work, will place us in a position where we can compete successfully with foreign shipyards. By that time the ship-building industry will be strong enough to hold its own without government assistance. The sum spent in subsidies should be looked upon as a very small price to pay for the multiplied benefits that will accrue from the resumption of our former proud position as the leading maritime nation of the world.

Our present disadvantageous position is shown by the following facts: While the raw materials of ship construction cost but little more in this country than abroad, the cost of labor is so much greater that the final cost per ton of the vessel at the time of launching is 20 per cent more here than abroad. From the report of the Commissioner of Navigation on the subject, we learn that the cheapest cargo steamer ever built in this country, the "Pleiades," of 3,750 tons and 9¾ knots speed, cost \$275,000, while the British cargo steamer "Masconomo," of 4,200 tons and 10 knots speed, cost only \$217,000. The annual charges on the "Pleiades" are \$44,000; on the "Masconomo," \$34,240. The total annual wages for the crew of the "Pleiades" amount to \$14,588; while the total annual wages on the larger ship amount to only \$11,751. As a result of the Commissioner of Navigation's inquiry, it was shown that there is an average difference in favor of Great Britain of 20 per cent in the cost of constructing cargo steamers, and of 33½ per cent in the cost of operation.

Under such conditions profitable competition with Europe is simply out of the question, and American capital has naturally found its way into the protected and highly remunerative coastwise shipbuilding and carrying trade. As the result of our withdrawal from, or rather failure to enter, the competition for the world's carrying trade, we are paying out annually the huge sum of \$200,000,000 to foreign ship-owners for carrying our great and growing volume of exports to foreign countries. In the presence of this start-