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THE PANAMA AND NICARAGUA CANALS—A COMPARISON.

Elsewhere in this issue we give a comprehensive description of the Nicaragua Canal project. In our issue of February 4th will be found a similar account of the Panama Canal. In both articles it has been our aim to give an impartial statement of facts. To assist the reader in forming his own estimate of the relative merit of these two colossal undertakings we present the following comparison of the salient features of both.

HARBORS.—Panama.—At each end of the canal is a good natural harbor. Both have been in use for about half a century as the terminals of the Panama Railroad. The Bay of Limon is a magnificent land-locked harbor with deep anchorage ; the Panama harbor is shallower, and the maritime canal will have to be kept open by dredging.

Nicaragua.—Artificial harbors will have to be built at each end. At Brito the construction would involve building a 3,500 foot jetty and dredging out a 140 acre harbor to a depth of 30 feet. At Greytown a fine harbor once existed, but has since been destroyed by natural forces. An artificial harbor, protected by jetties, would have to be built in the face of the determined efforts of Nature to prevent it. It would no doubt be practicable to create the harbor ; but it would be at a cost which was estimated at $2,500,000 by the Ludlow board. To this must be added the cost of continuous dredging and of the periodical construction of protective works to prevent the shoaling of the harbor. In 1893, Major McFarland, who was sent by the Secretary of War to investigate the canal, reported to the Senate that the construction of a suitable harbor at Greytown alone would cost $9,500,000, while according to the same authority that at Brito would cost $5,000,000.

TRANSPORTATION FACILITIES.—The Panama Canal has a double track railroad extending parallel with the whole route, and terminating on each ocean at deep water piers.

Nicaragua has 9 miles of single track at its Greytown end. The other 161 miles of the route are destitute of transportation facilities. General Hains, of the Walker Board, considers that a double track standard road parallel to the route of the canal, and costing $100,000 per mile, is an indispensable prerequisite to its economical construction.

PLANT.—Panama has a plant that cost originally $30,000,000 scattered along the route, and has good accommodations provided for 15,000 men.

At Nicaragua there are five dredges, a machine shop and some storehouses at Greytown.

PROGRESS OF THE WORK.—At Panama two-fifths of the work is completed. Fifteen out of the total forty-six miles are dredged to the original width and to a depth of from 16 to 29½ feet. Work has been opened up for the full length of the canal.

At Nicaragua some 4,000 feet of the canal has been dredged to a depth of 17 feet and 30 miles of right of way has been cleared of timber.

DIFFICULT ENGINEERING PROBLEMS.—At Panama the character of the Culebra cut has been determined by tunnels and cuttings and no further trouble will take place as the work proceeds. The Chagres will be controlled by two dams, one to supply the summit level, the other to form a basin for navigation. The amount of flood, possibilities of water supply, and all necessary data have been accurately determined.

At Nicaragua, if the company's route is adopted, there will be nearly 100 dams, big and little, with a total length of 8 miles, most of which will be of earth and clay, upon a clay foundation. If the compromise route is adopted, the number of dams and their height will be reduced, but they will still be numerous. If the low level route be adopted, the earth embankments will be thrown out at the cost of extensive protective works in the lower levels where the canal passes through the delta to Greytown.

RAINFALL.—Maximum at Panama, 93 inches per year. Maximum at Nicaragua, 256 inches per year.

CLIMATE.—At Panama, deadly when the surface ground was first opened up ; but not abnormally unhealthy, now that the subsurface excavation has been reached. At Nicaragua the climate, on account of the prevailing trade winds, is at present healthy. The opening of the work may induce some fever. Save as regards the rainfall of 22 feet per year, it is probably preferable to Panama.

PROBABLE COST OF CONSTRUCTION.—Panama Canal. —Estimated cost, based on four years' survey by 150 engineers, and indorsed by an international commission, including the chief engineers of the Manchester and Kiel Canals, is $102,000,000

Nicaragua Canal. — Various and widely different schemes proposed, with a variation of 110 per cent between the highest and lowest estimates. The ranking engineer of the latest board places the ultimate cost at about $150,000,000.

In the latest estimates (it should be mentioned) the unit prices adopted are much lower for Nicaragua than they are for Panama, where dredging, for instance, is estimated to cost 50 cents a yard, as against a few cents at Nicaragua. With this disparity in prices, it is likely the relative proportion of 1 to 1½ in a comparison of the cost of the two schemes is approximately correct.

To determine the comparative advantages of the two routes, were they both completed and open to traffic, the following considerations must be noted :

LENGTH OF CANAL.—Panama, 46 miles ; Nicaragua, 170 miles.

TIME OF TRANSIT.—Panama, 15 hours ; Nicaragua, 45 hours.

EXTENT OF DANGER ZONE.—From the time a vessel is lifted above tidewater to the time she reaches tidewater at the last lock she is liable to be wrecked through the failure of the dams, lock gates, etc. At Panama the "danger zone" is 23 miles in extent ; at Nicaragua it extends for 157 miles.

SUMMIT LEVEL.—Panama, 98 feet, reached by three locks ; Nicaragua, 110 feet, reached by four locks, according to latest surveys.

ACCESSIBILITY.—Panama and Nicaragua are about equally accessible for the world at large ; but for a voyage from our Eastern to our Western seaboard Nicaragua is about 375 miles shorter. This is compensated, however, by the 30 hours extra time taken in the transit at Nicaragua as compared with Panama.

STRATEGIC VALUE.—If both canals should be declared neutral (we are committed by treaty to maintain the neutrality of Panama and ought therefore to declare the neutrality of Nicaragua), all warships, including our own, would seek the shorter canal, because of the limited time they would be within the danger zone, as explained above. A charge of dynamite at a dock gate could shut a whole fleet up in the isthmus for an indefinite period.

In summing up our somewhat lengthy consideration of the broad question of a canal across the isthmus we are free to confess that all considerations of a purely practical nature indicate that it is for the best interests of this country and the world at large that only one canal should be built and that it should be secured by the completion of the canal upon which two-fifths of the work has already been done. The problems of construction are simpler, the cost will be 50 per cent lower, and the time and risks of transit less in the case of the Panama route.

The only possible recommendation in favor of the Nicaragua scheme is the sentimental one. It will be "Our own canal, built with our own money, controlled by ourselves." Without dwelling upon the fact that such sentiments are diametrically opposed to the prevailing international conviction that such great waterways should be open to all and at all times absolutely neutral, we ask, Are we ready to spend $150,000,000 for a toy ? For if we do not gain some solid advantages from Nicaragua (not in the way of pecuniary profits, since the government may not enter commercial enterprise for gain) which cannot be offered to us by Panama, Nicaragua will be nothing more in the eyes of the world than an expression of national vanity.

But we shall gain nothing from Nicaragua. Certainly not in a strategic sense. If we build Nicaragua to let our warships through and keep other warships out, the rest of the world will see to it that Panama is built to let its warships through and keep ours out.

Furthermore, we have already guaranteed the neutrality of Panama. Hence we should be placed in the supremely ridiculous position of having spent $150,000,000 to open an exclusive canal for our navy, while we are pledged to use the very ships of that navy to keep open a rival canal for the enemy.

THE HORSELESS CARRIAGE AND PUBLIC HEALTH.

One year ago a company put thirteen horseless electric cabs for hire on the streets of New York. To-day the same company operates one hundred cabs and they are so popular that they have to be taken from the public cab stands and kept in the cab house to fill telephone and messenger orders of regular customers. Three hundred cabs are needed to fill the demand, and it is doubtful if the demand would be supplied. In addition to the cabs there are at least thirty delivery wagons, pleasure vehicles, etc., in Manhattan proper. It is probable that many hundreds will be in use another year, but the number will be limited, as horseless carriages are complicated pieces of machinery and have to be built carefully, and the factories are now crowded to their utmost.

The merit as regards convenience and economy of the new means of transportation is patent to all, but there is another point which should not be overlooked. In a few years, the horseless vehicle will change the aspect of many of our great cities, and the new industry which has had such a struggle for existence will, in time, transform our cities. In ten years New York has witnessed remarkable changes in transportation. It has seen the old horse cars discarded for the cable, and now the cable is to make room for the underground electric system. With even the partial exit of the horse will disappear to a great extent the dust and mud and noise and the cobblestone pavements, and it will benefit the public health to an almost incalculable degree. The first point to be considered is that of street paving. Each year miles and miles of asphalt have been laid in place of the wretched cobblestone and block pavements. Of course, there are certain conditions under which asphalt pavements are not available, as on streets where the trucking is the greatest, for the trucks, which are heavy in themselves, are loaded with tons of goods, and the metallic tires cut into the asphalt. The cost of keeping a pavement in repair under such conditions is something enormous. A good example of this may be seen on a block of Chambers Street, between Broadway and Centre Street, New York ; the ruts in the asphalt pavement are very deep and repairs are constantly being made. With the introduction of the horseless wagons and "auto-trucks," steel or iron tires will undoubtedly give way to heavy rubber cushion or possibly pneumatic tires, and, at any rate, solid rubber tires would be used, in order to obtain the necessary bite upon the pavement. No matter how heavy the traffic, asphalt pavements would then be available and afford the best possible street pavement for automobile vehicles of all kinds. Cobblestones and Belgian block pavement will be renewed as fast as they wear out with asphalt, and the result will be that in time cab riding will be a positive pleasure and a bicycle can go anywhere.

The noise and clatter which makes conversation almost impossible on many streets of New York at the present time will be done away with, for horseless vehicles of all kinds are always noiseless or nearly so. This question of noise has much to do with the general health of the community. Specialists have many times expressed an opinion that the nervous diseases which exist in the city are aggravated, if not caused, in many cases, by noises incident to a great city's traffic. The bells of the new vehicles will of course be somewhat annoying at first.

A point, most important of all, connected with the displacement of the horse is undoubtedly that of the cleanliness of our streets. When we stop to analyze the dust and mud, we find that two-thirds of all of the dirt which we find in the street is caused by the horses themselves, as the dust from other sources and the attrition of the pavement is slight. Therefore, if all of the horses could be done away with, two-thirds of the dirt would disappear in its turn. While this may virtually be regarded as impossible even a great many years hence, at the same time there is no question that the greater use of the horseless carriage, wagon, and truck will produce a marked effect upon our streets. The number in use is so comparatively small at present that it cannot be reckoned with. But by the time we have two thousand horseless vehicles in the streets, we will begin to see a marked difference. The most obvious and important part of the work of street cleaning in a great city like New York is the removing of accumulations from the surface of the streets. In the late Colonel Waring's book, entitled "Street Cleaning," we find that forty per cent of the entire disbursement of the department is for sweeping and sixty per cent of the laboring force is employed in this part of the work, which is now done by hand. Machine sweeping was formerly much used, specially by contractors, but the work done by it was unsatisfactory and the dust raised even after preliminary sprinkling was very great. It is now considered by sanitary experts that there is little, if any, economy of sweeping with machines, and in the summer of 1895 the use of it in what is now known as Manhattan and the Bronx Boroughs of the city of New York was abandoned. At the present time there are 1,600 men engaged in sweeping the streets of New York. The wages of the men vary from $50 to $60 per month, depending on whether they have worked one, two, or three years for the Department. The average amount they receive is, consequently, $55 a month, or $660 per year ; this, multiplied by 1,600, gives us $1,056,000. This is the actual amount spent in sweeping alone, but in addition to this must be considered the cost of brooms and scrapers, and also carting and dumping. The 1,600 men collect 690 loads of sweepings per day, each load containing 1·5 cubic yards, so that each day 1,035 cubic yards of street sweepings are carted away to the dumps. In the New York Street Cleaning Department, 32 per cent of the appropriation goes for carting and 25 per cent of the

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laboring force is employed upon the work of carting, from which it will be seen that the cost is very great. Of course, only a part of the expense of carting should be charged to removal of the street sweepings, for garbage, ashes, paper, and refuse must also be carted away; at the same time, the expense of moving 690 loads to the dumps and afterward carrying the same on scows to sea and dumping amounts to a great deal. The average cost for disposing of the sweepings and refuse in 1896 was 17·9 cents per cubic yard from deck scows, and on the dumping scows the cost was slightly less. The capacity of a modern self-propelled automatic dumping boat like the Delehanty boat "Cinderella" is 500 cubic yards. With the advent of the horseless carriage a considerable portion of the sum spent in sweeping, carting, and dumping dust and mud from the streets would be saved. This is a general proposition, which at the present time cannot be reduced to figures, but it is very safe to say that several hundred thousand dollars per year will be saved on street sweeping if 50 per cent of our vehicles were actuated by motors.

The question of health must be also considered. In summer, the dry dust rises in clouds and attacks the delicate membranes of the nasal passages and throat, producing irritation and coughing. Mud consists, of course, in sweepings which are made into a sirupy mass with the aid of water, and if the dry dust is bad, the mud is infinitely worse. When the streets are practically relieved from so-called "dust," it will be a boon to every housewife. Costly draperies and curtains are damaged each year by the dust from the street, and often windows are closed on this account when they should be opened to properly air and ventilate the house. With the advent of streets which are clean and which can be kept clean with a minimum of expense, it is probable it will tend to greater neatness on the part of the community at large, for it is a true fact that cleanliness breeds cleanliness.

FIBER PLANTS FROM OUR NEW POSSESSIONS.

Commercially there are thirty or forty species of fiber plants found throughout the world, but botanically there are over one thousand species the fiber of which can be made more or less useful in the arts and industries. Each country has its special fiber plants, which it tries hard to use as successfully as those imported from other lands, and there are plenty of instances where governments and private individuals have spent fortunes in trying to bolster up artificially an agricultural industry of fiber production that should never have been encouraged. The rage for finding new fibrous plants in this country that would supplant in the industrial world those that have been used since the world began has had its day, and the more sensible view is now being accepted of obtaining the fiber from the country where it can best be raised. A good many of the best fiber plants have been introduced in this country, and their culture is being pursued with more or less success; but, after all, our manufacturers depend mainly upon other countries for their supply of raw material.

In view of the territorial changes produced by the war, the fiber industry is of peculiar interest to the farming and manufacturing world. The islands affected by the war are all noted for the fiber plants raised on them; and taken together—that is, Porto Rico, Cuba, and the Philippines—they produce a large bulk of the best plants, except cotton, used in a commercial and manufacturing way for their fiber. Manila hemp has long been familiar wherever civilization exists; sisal hemp comes from Cuba, in times of peace, as largely as from Yucatan or the Bahamas; Cuba bast is essential to the millinery trade of the world; and Sunn hemp and cebu hemp are but trade varieties that come from the same islands.

The Philippines, in particular, are rich in fiber plants, with possibilities for development and expansion scarcely conceivable. Throughout the archipelago, it is estimated, all the fiber used in the manufacturing world could be produced at a cost that would annihilate similar industries anywhere else in the East. This is not entirely true, however, for neither cotton nor flax could ever find a foothold in the Philippines to compete with the United States. Our cotton is already seeking Eastern markets in ever increasing proportions, and great prospects are anticipated for this trade. But in turn we must secure our hemp and jute, and other fiber material, from the lands where they best grow.

There are over thirty species of fiber plants that can be raised in this country, but most of them are unimportant in the commercial world, and most of the others thrive only very indifferently in the United States. Should we, however, extend our colonial possessions so that in time they included Cuba and the Philippine Islands, as well as Porto Rico, we would be the greatest fiber producing country on the globe. We would hold the key to the world's supply of raw material for textile manufacturing, as well as for many other products. Under the intelligent and judicious management of American capital and brains, these fiber products could easily be doubled in quantity and value. The world would soon be richer in raw material for one of the largest branches of the manufacturing industry.

At present the leading vegetable fiber that is imported into the United States, according to statistics of 1897, is sisal grass. Most of this sisal grass comes to us from Cuba, Yucatan, and the Bahamas. Attempts have been made to introduce its culture in Florida, and with some success; but its superior growth in its native islands, and their close proximity to the United States, will forever preclude it from becoming an important industry here.

Next to sisal grass comes Manila hemp in commercial importance. The imports of this amount to nearly $4,000,000 annually. This hemp has also been experimented with in this country, and in other lands, but the world's trade will always look for its main supply to the islands of the East, where it flourishes as naturally as cotton does in our Southern States. It can be produced and shipped to this country cheaper than our farmers can raise it at home. Cebu hemp comes from the Philippine Islands also, and is merely a trade variety that has its useful purpose in the manufactures.

Jute and "jute butts" stand third on the list of imported fiber plants. Jute comes from a variety of countries. Originally India controlled the trade in jute, but the West Indies and Cuba have entered the market in competition with her, and they are lusty rivals that cannot be ignored. The possibilities of Cuba in this line are only partly appreciated, for rebellions and wars have so long agitated the island that little experiment has been made in anything outside of sugar and tobacco growing. An appreciative era now dawning upon the island may prove many things only dreamed vaguely of heretofore. The value of "jute butts" imported into this country runs considerably over a million dollars. In all between nineteen and twenty million dollars' worth of vegetable fibers are imported into the United States each year in the raw condition. Manufactured into articles of use, several times as many millions would hardly represent the full value. Flax manufactures alone represent some years $12,000,000 in imports, and other fibrous goods mount well up into the millions.

Since 1890 the Department of Agriculture has been engaged in making experiments with fiber plants in various parts of this country, and farmers have been encouraged to grow certain fiber plants for manufacturing purposes. Nearly all of the commercial fiber plants have been tested by the Department experts, and some of them have been recommended for general culture. This movement, started seven or eight years ago, has not exactly proved all that the inaugurators of it anticipated. Ramie has been raised to some extent in Florida; sisal hemp from Yucatan has been established in a limited way in parts of the same State, and a little impetus has been given to the rejuvenation of flax culture—one of the oldest agricultural products in this country. Great efforts have also been made to utilize some of the plants that grow naturally here for fiber manufacturing. Thus the palmetto fiber and vegetable hair of the Spanish moss growing on the trees of the Southern States have found some use that makes the product of fair value. Several of the leading varieties of palms in Florida have been cultivated for the fiber in their stalks and leaves, and the palmettoes have been utilized for making brushes and brooms. Jute culture has been extended so that we produce annually a fair crop. Yet this weed is natural to this country, and some varieties are the finest and best grown in the world.

It is possible to double the annual production of fiber plants in the United States, and thus increase the manufactures; but the history of many of our agricultural products hardly warrants one in predicting that we can raise successfully most of the fiber plants needed in this land. The flax industry was at one time an important industry in New England; but it has steadily declined for half a century now, because farmers could put their land to more profitable use in raising other crops. No amount of push and energy has ever been able to renew this industry, although spasmodic efforts have frequently been attempted. There was plenty of land in the world where flax throve better than in the United States, and it could be cultivated cheaper there than in this country.

Likewise the hemp industry in the South has been declining ever since 1870. It flourished and expanded in the early sixties, and just prior to the rebellion it was an important industry, promising in time to rank second only to cotton. But sisal and manila hemp appeared in the market, and the Southern hemp could not compete with them. Our hemp lost its position in the manufacturing world, and sisal and manila were soon used in its place. No amount of study and experiment could rejuvenate the decadent industry.

While there are undoubtedly many native fiber plants growing in this country that will be found useful in many industries, it will be impossible to make them compete with the low-priced fibers that come from many of the tropical and semi-tropical islands. Nor shall we ever be able to introduce these foreign plants into this country so that their culture will prove successful enough to supply us with the raw material for all of our manufactures. The world will still look to the Philippines, the West Indies, Cuba, Central America, and China and India for the fiber plants that supply material for cheap clothing, bagging, rope, and similar products.

In the islands that have been acquired from Spain, however, we have the soil and climate to produce all the fiber plants that are lacking in this country. Their resources in this respect are so great that they could soon supply the world with all the raw material used for cheap textile goods, cordage, nets, and kindred necessities. In Porto Rico alone we could raise successfully a dozen of the leading fiber plants, while in Cuba and the Philippines there are many peculiar only to those islands. In the future development of these countries, if under American tutelage, the fiber industry will easily be one of the leading industries.

G. E. WALSH.

TESTING OF CHILDREN'S STRENGTH.

A scientific investigation of the physical strength of the Chicago school children is to be undertaken by the Board of Education of that city, and the results which they obtain will be used as a standard for the treatment of pupils as to their capacity for mental endurance and physical exercise. It is thought that the results would be very important and serve to revolutionize the methods which are now in vogue. The theory of the test is to determine what is known as the "fatigue period" of a child, or that period of its life at which its energies are at the lowest ebb and, therefore, the time when its school work should not be pressed. The scheme will be put in operation at one of the largest elementary schools, in which at least one thousand children are taught. The pupils will be weighed and measured and will be examined, for the purpose of determining their physical condition. A test will then be made of the strength and endurance powers of the muscles of the child. This will be done by the special psychological instrument called the "ergograph," adapted for the purpose.

PULLMAN.

The dream of the late George M. Pullman of establishing a model industrial town will soon become a thing of the past, as the model town of Pullman, Ill., will soon lose its peculiar identity and will become a free community, and the anomaly of a city within a city is now at an end. The Pullman Palace Car Company has accepted the decision of the Supreme Court of Illinois, sustaining the contention of the Attorney-General, and the terms of the decree are now being prepared. This decree will divorce the great corporation from everything save the business of building cars. The churches, schools, hotels, arcade, market house, public library, and some 2,000 brick residences will have to be sold to the highest bidder, and the brick works will pass from the control of the company and the streets themselves will now be controlled by the authorities of the city of Chicago. Preference will be given to employes in purchasing the homes which they now occupy.

GREAT ACTIVITY IN THE STEEL TRADE.

The steel mills of the United States are now doing an enormous business. The Illinois Steel Company has sold its entire output of steel rails for the year. This amounts to not less than 650,000 tons. A maker of agricultural implements recently purchased 10,000 tons of bar iron in one week, and all branches of the iron and steel trade seem to feel the general prosperity of the country.

GREAT STEEL AND WIRE COMBINATION.

It is announced by the officials of the American Steel and Wire Company that the principal steel and wire interests of the United States are to be consolidated into a new corporation to be known as the American Steel Wire Company. The new company will be capitalized for $90,000,000. The consolidation will include a large number of the principal wire manufacturers of the United States.

WHEN a train is rounding a curve, the ordinary locomotive headlight points off into the surrounding country, and is useless. A mechanical engineer of a Western railway devised an attachment by means of which the light is maintained in line with the track. The light is mounted on a turnable which is rotated through the proper angle by a cable passing around pulleys and leading to the two piston rods of a small double-acting air cylinder. The motion of the piston is regulated by a valve in the cab, the air pressure being taken from the air brake system. The headlight turns on inclines so arranged that when the headlight travels up the incline it will have bearings on the two quarters on which it travels. The object of this is to return the headlight to its normal position automatically when the air is released. The device has been practically tested.

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