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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

THE SENATE PANAMA CANAL BILL.

It is gratifying to note that the international canal question is finally to be settled in a way that we have contended was the only practical one, that is in favor of the short Panama route—a route also favored by the Isthmian Canal Commission. The Senate on the 19th instant passed the Panama Canal bill by a vote of 67 in favor to 6 against.

The radical change in sentiment as here illustrated, in comparison with the Hepburn Nicaragua House bill, may be largely accounted for by the masterly way in which the Canal Commission placed the result of its investigations before Congress, sufficient to convince many men of a practical turn of mind of the several advantages of the Panama route. In addition to this the recent terrible disaster at St. Pierre, Martinique, caused by the tremendous volcanic eruption of Mont Pelée, fixed in the minds of many the futility of constructing a canal in a region having a record for volcanic disturbances and earthquakes.

Thus when the merits of the Panama Canal became fully known and the possibility of its acquirement for a reasonable sum and the probability of securing the desired right of way on equitable terms, there was an irresistible sentiment created in its favor which is reflected in the nearly unanimous vote of the Senate. In the debate preceding the vote the shortness of the Panama Canal as compared with the Nicaragua was emphasized as one of the important points of its advantage—49 miles, as against 183. The depth is to be 35 feet. The principal provisions of the Senate bill are:

1. That the President is to acquire for the United States, at a cost not exceeding \$40,000,000, all of the rights, privileges, franchises, concessions, grants of land, rights of way, unfinished work, plants, and other property owned by the New Panama Canal Company of France on the Isthmus of Panama and all its maps, plans, drawings, records on the Isthmus of Panama and in Paris, including all the capital stock, not less, however, than 68,862 shares of the Panama Railroad Company, owned by or held for the use of said canal company, provided a satisfactory title to all of said property can be obtained.

2. That the President is to acquire from the Republic of Colombia exclusive and perpetual control of a strip of land not less than six miles wide from the Caribbean Sea to the Pacific Ocean, and the right to use and dispose of the waters thereon, and to excavate, construct, and perpetually to maintain, operate, and protect thereon a canal of such depth and capacity as will afford convenient passage of ships of the greatest tonnage and draught now in use, from the sea to the ocean; this control to include the right perpetually to maintain and operate the Panama Railroad, if the ownership thereof, or a controlling interest therein, shall have been acquired by the United States; also jurisdiction over the strip and the ports at the ends thereof, to make the necessary police and sanitary rules and regulations, and to establish judicial tribunals to enforce the same. The President also may acquire such additional territory and rights from Colombia if deemed necessary.

3. \$40,000,000 is appropriated to pay for the property of the New Panama Canal Company and a sufficient amount to pay Colombia for the territory acquired from that country for building the canal. The President is then, through the Isthmian Canal Commission, authorized by the act to proceed with the construction of the canal, utilizing as far as practicable the work already done. The canal is to be supplied with all necessary locks and other appliances. Provision is made for the construction of safe and commodious harbors at the termini of the canal, and for such works of defense as may be necessary for the safety and protection of the canal and harbors.

4. In the event that the President is unable to secure a satisfactory title to the property of the New

Panama Canal Company and the control of the necessary territory from Colombia, and after first having obtained for the United States exclusive and perpetual control by treaty of the necessary territory from Costa Rica and Nicaragua, he is then to have authority to begin the construction of the canal over the Nicaragua route on the same general conditions as apply to the Panama Canal. An appropriation is provided for compensation, through a treaty, to Costa Rica and Nicaragua for rights and concessions they are to grant.

5. An appropriation of \$10,000,000 is made to begin the project, and by a further provision all appropriations are not to exceed in the aggregate the additional sum of \$135,000,000 if the Panama route be adopted, or \$180,000,000 should the Nicaragua route be selected.

6. In any agreement made with Colombia, Nicaragua or Costa Rica the President is authorized to guarantee them the use of the canal and harbors, upon such terms as may be arranged, for all vessels owned by those countries or by their citizens.

7. An Isthmian Canal Commission of seven members is created, to be nominated by the President and confirmed by the Senate. They are to have charge of construction of the canal and are to be subject to the direction and control of the Executive. Four of the seven are to be skilled in the science of engineering, one is to be an officer of the army, and one other an officer of the navy. Authority is given for the employment of engineers from the army and civil life and other necessary persons. The commission is to make reports to the President and to give Congress such information as may be required.

8. Outside of the \$10,000,000 appropriated authority is given for the issue of \$130,000,000 2 per cent 20-year gold bonds exempt from taxation in denominations of \$20, or a multiple of that sum, to be sold at par and open to popular subscription, the proceeds to be used on the construction work as required.

The provisions above stated appear to give the President ample authority to proceed with this great work in a common-sense, business-like way, while much will depend upon the character of the Commission whom he appoints as to whether the vast expenditures necessary for construction will be reasonable and economical or extravagant. As the personnel of the Commission must be confirmed by the Senate, it is to be presumed only the best men will be selected.

The assurance that a canal is positively to be constructed on a practical and economical basis with funds provided in part by popular subscription will create a national enthusiastic interest in it and insure its success. Its commercial advantages to this and foreign countries cannot be over-estimated. We trust that the differences between the House of Representatives and the Senate may be satisfactorily adjusted by the usual conference committee in the hope that by the next celebration of Independence Day the wishes of the country in respect to this great undertaking may be carried out.

THREE PHASE TRACTION IN AMERICA.

The announcement that the Whitney syndicate has joined hands with Ganz & Co., of Buda-Pesth, is fraught with more promise for the future of electric traction in the United States than many of us may be willing to admit. For years the Buda-Pesth firm has been identified with the growth of electrical traction in Europe. Not only did it install the first underground trolley, but it developed the three-phase system for roads of standard gage.

The number of electrical roads in this country of standard dimensions can be counted on the fingers of one hand. Probably, without exception, all of them use the direct current. In Europe, on the other hand, the foremost electrical engineers have adopted the alternating current, with results that have been most gratifying from the standpoint of economy and efficiency.

Readers of the SCIENTIFIC AMERICAN will recall the article we published some time ago on the Valtellina road, in Italy. That road was converted from steam to electrical traction by the Buda-Pesth firm. After having been in continuous operation for over one year and a half, the company was able to announce that the three-phase electrical equipment had cut down the operating expenses fifteen per cent. Unfortunately, the Valtellina line had hardly been opened, when the London underground contracts were let. In the bitter fight in which Mr. Yerkes and the American advocates of the direct current finally triumphed, the merits of the three-phase system were ably and strongly put forth by its adherents. The Board of Directors of the London Underground, after a careful investigation, decided in favor of the three-phase system. But the strenuous protests of the Americans resulted in the submission of the controversy to a board of arbitrators, who rather weakly decided that the Buda-Pesth plan was too new.

It may be that the London controversy, however, brought home to the Whitney syndicate the merits of

three-phase traction. At all events, it is encouraging to find that American engineers are willing to try a system of which as yet they know next to nothing, and which has been offered to them as a vast improvement on their own; and it speaks well for the Buda-Pesth firm if sagacious American men of wealth are willing to invest millions in a plan which originated in Europe and developed there to its present importance.

TWO REMARKABLE RAILWAY RUNS FROM NEW YORK TO CHICAGO.

Probably no more praiseworthy feat is recorded in the annals of American railroading than the performance of the trains sent by the New York Central and Pennsylvania Railroads over the roads between New York and Chicago. At a speed which sometimes exceeded 80 miles an hour, and which averaged some 50 miles an hour including all stops, these trains, traveling east and west, covered the respective distances of 980 and 912 miles three minutes ahead of the schedule time of 20 hours.

With these two remarkable records, American railroads hold the record for fast, long runs. On the Orleans & Midi Railroad, the Sud express travels 486 miles from Paris to Bayonne in 8 hours 59 minutes, averaging 54.13 miles an hour. That is probably the fastest train in the world for the distance. But the length of track is little more than half that traversed on the shortest route between New York and Chicago. Other famous European runs that deserve mention are those made in England by the East Coast express and the West Coast express. The former runs to Edinburgh, and the latter to Glasgow from London. Both travel at an average speed of 50 miles an hour; but the distance covered is only about 400 miles.

It is difficult to award the palm to either of these new American trains. The New York Central's express covered a longer distance at a higher average speed than the Pennsylvania train. On the other hand, the Pennsylvania train, although its route was shorter and its average speed not more than 45½ miles an hour, encountered heavy grades in crossing the Alleghany Mountains. The officials of both roads claim that the journey from New York to Chicago could easily be covered in 18 hours.

GOVERNMENT IRRIGATION.

One of the best measures that has become a law in the beginning of this twentieth century is the scheme providing for the irrigation of the thousands of square miles of arid lands located in our Western States and Territories under government supervision, embodied in the bill recently passed and signed by the President and known as the Irrigation Bill.

The bill is based on the idea that the proceeds of sales of public lands shall be assigned from year to year to the building of irrigation works under contracts approved by the Secretary of the Interior, but only when there is sufficient money on hand to insure the completion of the work.

According to Mr. Newlands, the Representative from Nevada who has promoted the legislation on this subject, this bill is very complete and comprehensive in its scope and automatic (so to speak) in its plan of action.

It is estimated that during the next thirty years at least \$150,000,000 from the proceeds of the sale of lands will be available without further appropriations for public irrigation works.

The bill makes the present receipts from public lands, including those of the last fiscal year, stated to amount now to some \$6,000,000, immediately available and the average annual sum of \$3,000,000 (likely to be constantly increased) can be used each year for a steady continuation and enlargement of any work for which contracts are made.

The plan further provides against the acquirement of large tracts of land by individuals or companies by limiting the area to be owned by one person to 160 acres, subject to the provisions of the national homestead law, including its limitations, charges and conditions.

At least half of the arid land so acquired must be improved by irrigation and the owner must reside on or near the land.

After a plan of irrigation of a tract of land owned by several parties has been completed at government expense and the works are in order, the owners will be required to pay back to the government in not less than ten annual installments the estimated cost of the construction of the works, the money so paid to be returned to the general reclamation fund. Eight hours is fixed as a day's work, and Chinese labor is forbidden.

The public arid and semiarid lands mentioned are in the Territories and States of Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington and Wyoming.

The effect of the bill should be to encourage the settlement of the great wastes in a few of the States and greatly to increase their agricultural products. The