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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

PROSPECTIVE COMPLETION OF THE PANAMA INTEROCEANIC CANAL.

The passing of the Senate Panama canal bill without amendment on June 26 by the House of Representatives by a vote of two hundred and fifty-two in favor to eight against may be regarded as a memorable act of legislation calculated to promote the growing commercial supremacy of the United States, for it insures the construction of an inter-oceanic canal, which when finished will be used by the entire commercial world. Quickly following the passage of the bill the President completed the law by affixing his signature on June 28, thus bringing to a successful close the interocean canal discussions and controversies so long pending.

The first step to be taken by the President under the act is the negotiation of a treaty with the Colombian government, which it is thought will be completed for ratification by the Senate next December.

At the same time, it is probable all the stipulated concessions and rights of the New Panama Company will be secured.

Then the President will appoint the Isthmian Commission, subject to ratification by the Senate. When so approved, the Commission will make preparations to begin the work, let us hope within the year. It is calculated eight or nine years will be required to complete the canal.

When the work actually begins, it is evident that there will be excellent opportunities for the display of American skill and American enterprise; and no one can doubt that American devices and machinery, guided and managed by American engineers, will be able to surmount many difficulties that may arise. The work is certain to arouse national interest, especially as the plan of a popular subscription to the bonds is provided.

It shall be our aim to keep our readers informed about this great work as it progresses. Full data concerning the present state of the canal and Isthmian commission's report will be found in the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 1359, 1361, and the SCIENTIFIC AMERICAN of January 18, 1902.

A PRUSSIAN OPINION OF AMERICAN RAILWAYS.

Some two years ago the Prussian government sent to the United States a committee of official experts to study the methods of railway construction and management in this country, for the purpose of determining whether or not it would be advisable to introduce American ideas in Germany. The commission spent several months in the United States, and made elaborate studies of everything pertaining to American railway building. It was hoped that these studies would eventually be published in an official report; but the government has decided not to give to the public the results of the commission's work. Baron von Thielen, Chief of the Prussian Ministry of Railways, has, however, granted interviews, in which some of the conclusions drawn by the commission have been divulged.

It is admitted that much was learned in the United States. Especially interesting and valuable was the American plan of locomotive construction in standard types with interchangeable parts. German railways will probably soon adopt the American idea, at least to a certain extent.

But so far as freight and passenger cars are concerned, it was considered doubtful whether American practice was suitable for Germany. In the United States it is found extremely economical to haul enormous masses of freight over long distances in forty, fifty or sixty-ton freight cars. In Germany, where the amount of freight handled is much smaller, and the distance to which it is transported far shorter, the need for individualizing shipments is so general that the introduction of large American freight cars will probably be attended with serious difficulty. The old ten-ton German freight car, in the opinion of Baron von Thielen, might well give way to a car of thirty tons capacity. But enlargement beyond that limit would necessitate changes in track, switches, platforms and especially in the loading and unloading arrangements of mines, furnaces and large manufacturing plants. It is, therefore, to be inferred that the Prussian freight car of the future will have a maximum capacity of thirty tons and will be mounted on bogie trucks of the American type.

In the matter of passenger cars, the Prussian State Railways have adopted a definite model for long-distance service. A vestibule car is used, varying in length from 58 to 60 feet and running on two four-wheeled trucks. Each car is divided into compartments, with a corridor aisle running along one side. The introduction of Pullman cars has not been a success. Three Pullmans of the standard American pattern were given a trial in Germany. That they were admirably built, that they ran with remarkable smoothness and freedom from jar and noise, was admitted. Nevertheless, the German public prefers a car divided into small compartments, each accommodating six or eight passengers. American sleeping cars are no more popular than the Pullmans. The German sleeper is divided into small compartments, each containing an upper and a lower berth, and each having a separate washbowl and water supply. American drawing-room and sleeping-cars are considered much too heavy, much too richly upholstered, and, therefore, much too costly. But the cheapness of special fare on these cars is frankly admitted.

This, in brief, is the opinion of the commission. It was admitted that the American system was most admirably adapted to the United States, where long distances are to be traversed, where railways are owned by corporations who must keep a sharp eye on their rivals, where social relations are based on equality and restrictions of caste do not exist. The Prussian railway system, on the other hand, is the property of the state. After slow development from small beginnings, and after much planning and scheming, it has finally been brought to pay not only the entire interest on the Prussian debt, but to earn a yearly surplus. But it cannot be doubted that the rates for freight and first-class passenger fares are high, so high, indeed, that the farmers and inland industries are in a measure crippled.

THE NEED OF A LOCOMOTIVE SMOKE CONSUMER.

The begrimed buildings of New York city, and the vast black veil of smoke which envelops the metropolis, speak eloquently of the hardships to which the inhabitants of the Eastern States are subjected by the use of soft coal, rendered necessary by the strike of anthracite miners. So limited is the supply of hard coal, and so high its price, that the Manhattan Elevated Railroad Company, as well as the owners of large office buildings, have persisted in burning soft coal, despite the fact that the Sanitary Code of New York expressly prohibits the discharge into the atmosphere of smoke and injurious vapors. The firm stand taken by the Health Board of the city has resulted in the adoption of consumers by owners of office buildings. The evil has thereby been partly mitigated; but the Elevated Railroad Company day after day continued to discharge into the air its volumes of smoke, which, as the newspapers expressed it, "hung like a pall over the city," until the Board of Health succeeded in prohibiting the use of soft coal.

If the office buildings have found the use of smoke consumers practicable, the question naturally arises, Why is it the locomotives of the railway companies cannot be equipped with similar apparatus to prevent the contamination of the city's atmosphere? The Elevated Railway officials stated that they knew of no practical smoke consumer which could be applied to their locomotives.

The problem of burning bituminous coal in locomotives without the production of black smoke, has confronted railway engineers for some time. It has been clearly enough proved that the smoke can be almost entirely done away with by using the proper precautions in firing. Coal thrown into the firebox a half shovelful at a time, is rapidly consumed by the intense heat of the fire, and with it the smoke. But if the fuel be tossed into the firebox in large quantities, which is the practice of the indolent fireman, a thick layer is formed over the fire, which is not consumed for some minutes and which loses a goodly amount of fuel in the form of a thick smoke. How large a percentage of fuel is thus lost may be inferred from the analysis of a sample of snow, gathered ten days after it had fallen in the outskirts of Manchester, England. After melting the snow a residue was obtained which was equivalent to over 10 pounds to the acre, and which consisted of 48.6 per cent carbon, 8.9 per cent grease and 44.5 per cent ash. Another sample, taken from the heart of the city, contained nearly three times this amount of residue, or in other words, about a ton of soot per square mile a day. Waste of any kind nowadays is unpardonable; and with the world's supply of coal visibly nearing exhaustion, wanton waste of fuel is more than unpardonable.

Mechanical stokers combined with special types of firebox have been found completely to solve the smoke problem for stationary plants. Some similar arrangement has long been needed for locomotives. What is wanted is a mechanical stoker, simple in construction and practical in operation, which can be applied to a locomotive without necessitating any great alterations. Such a stoker was invented a short time ago by a former engineer of the Chesapeake & Ohio Railway. In this appliance the coal is scattered in a thin layer over the fire, thereby avoiding the constant opening of the firebox, and the consequent admission of cold air. Not only is it claimed that fuel is saved, but that nine-tenths of the thick, black smoke usually produced by hand-firing with soft coal is done away with. The provision of a simple smoke-consumer which will permit the burning of soft coal within the limits of large cities without annoyance to the inhabitants is a problem that certainly deserves the attention of American inventors. Up to the present, too little time and thought have apparently been lavished upon the subject.

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—GREAT BARRINGTON MEETING.

BY WILLIAM H. HALE, PH.D.

A notable gathering of electrical engineers was the meeting of the American Institute at the Berkshire Inn, Great Barrington, Mass., June 18 to 21, both in its social and its scientific features. Owing to the absence in Europe of President Scott, Mr. Charles P. Steinmetz, the retiring president, presided.

The first day was occupied with papers and discussions upon alternating current work, and included an account of the new generating plants of the Niagara Falls Power Company, by Mr. Harold W. Buck; other papers were by Messrs. Baum, Le Blanc and Steinmetz.

The second day of the session was devoted to papers and discussion upon electric railway work. Mr. A. H. Armstrong read a study of the heating of railway motors, in which he discussed the problem of keeping the temperature of the motive power within reasonable limits; also the operation of single cars at maximum speeds of 60 to 70 miles per hour. He finds it preferable to use the largest gear ratio and highest rate of acceleration possible for the accomplishment of the service contemplated, provided the maximum speeds are low, but that practically any rate of acceleration can be used where speeds approach a maximum of 60 miles per hour. The expense of running single cars is much greater per ton than running the trains, being more than double that required for five-car trains.

Mr. C. O. Mailloux presented notes on the plotting of speed-time curves, giving a practical and ingenious method readily applicable and obviating the necessity of complicated mathematical calculations in many cases; also an experiment with single-phase alternators on polyphase circuits, incidentally illustrating the elasticity of the polyphase system, which was recently tried successfully at Phœniz, Ariz., and which is a practical demonstration of the possibility of using single-phase alternators as the source of energy for supplying polyphase currents, both two-phase and three-phase, and also for supplying direct current to a transmission and distribution system.

Messrs. Bion J. Arnold and W. B. Potter presented comparative acceleration tests with steam locomotive and electric motor cars, showing that the latter can accelerate much more rapidly than the former, and can maintain a higher average speed with lesser maximum speeds than the former, thus consuming less energy for the run.

The efficiency of an electrical system as an average under variable load may be assumed as follows:

Engine	90 per cent	efficiency.
Alternator	92 per cent	"
High potential transmission	98 per cent	"
Transformers	97 per cent	"
Converters	92 per cent	"
Third rail	95 per cent	"

Motors, including control, 75 per cent efficiency, 51.33 per cent.

These tests were made on the main tracks of the N. Y. C. & H. R. R. R., west of Schenectady, and were for the purpose of determining the availability of electric traction in the new Park Avenue railroad tunnel in New York.

Mr. Arnold followed with an elaborate report of the method of ascertaining by means of a dynamometer car the power required to operate the trains of the N. Y. C. & H. R. R. R. between Mott Haven Junction and Grand Central Station, and the relative cost by steam and electricity.

This division consists of 5.3 miles of four-track road, of which 0.68 mile from the station is in an open cut, 2.04 through a tunnel under the street and 2.58 miles on an elevated stone and steel structure to Mott Haven Junction.

The most practical method of ascertaining the