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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 FASTEST LONG DISTANCE TRAIN IN THE WORLD.

We are informed that a new train has lately been placed on the Paris-Calais run, for the convenience of travel between Paris and London, which is scheduled to cover the distance of 184½ miles in three hours. This very fine performance is accomplished in spite of the fact that there is a stop of four minutes at Amiens, and that the speed is greatly reduced in running through the city of Calais to the pier where passengers embark for Dover. The announcement will give no surprise to those of us who have watched with interest the development of express train service on the leading French railroads. It is only of late years that France has brought her railroad system up to a pitch of perfection in comfort and speed at which it has ranked with the best railroads of the world. The improvement has been so rapid that, for the past three or four years, the French roads have not only surpassed in speed the trains for which Great Britain has been justly noted for half a century, but they have instituted a schedule of fast passenger trains which is absolutely without a rival either in Europe or America. There are over fifty express trains on the various French railroads with a speed including stops of over 50 miles an hour, and more than half of these run at an average speed of over 55 miles an hour. They have also been running during the past two years a few trains that reach an average of 60 miles an hour, but the distance was comparatively short. The Paris-Calais run, however, is made at a higher average speed than that of any express train in France, and although the distance run without a stop is less than that covered without a stop by the Empire State Express, the fastest long-distance train in this country, the average speed, 61½ miles an hour, is 7 miles an hour greater. The weight of the regular Empire State train behind the engine is 200 tons. We have no particulars as to the weight of the French train, but it is probably something less than that. There is food for thought, in the fact that the best work on these trains is being done by the four-cylinder express engines of the compound type.

COST OF WIRELESS TELEGRAPHY.

Successive steps in the establishment of wireless telegraphy follow each other with a rapidity which is quite unprecedented in the development of a new invention. It is not many weeks since the first successful signals were transmitted across the Atlantic, and in the interim the inventor has returned to England, completed his arrangements, and is now on his way back to America for the purpose of establishing a permanent station for the regular transmission of commercial wireless messages. Furthermore, it is announced that a contract has been made with the Canadian government for the transmission of ordinary transatlantic messages for ten cents a word, with a press rate of five cents a word. In accordance with this contract, the Canadian government will contribute $80,000 toward the erection of a station in Nova Scotia. At present the rate for general messages is 25 cents; so that the general public in Canada reap the immediate benefit of a reduction in the rate of fully 60 per cent.

Thus again do we see the indomitable patience of one man bring to fruition, after years of patient investigation, another of those epoch-making inventions, which are destined from the very first to bring untold benefit to the world at large and well-earned prestige and wealth to the inventor himself. In this age of increasing travel and multiplying international interests of a political, commercial and private character, this facilitating of communication between the old and new world will be beneficial to a degree that can scarcely be estimated. To the private individual particularly, will this great cheapening of telegraphic communication be welcome, as it brings the transatlantic "cablegram" within reach of a vast number of people to whom it is an impossible luxury at the present price. It is true the commercial success of the system has yet to be demonstrated; but Mr. Marconi has been so uniformly modest and conservative in his claims, and has evidently been careful never to announce his achievements until he had proved beyond a doubt their practicability, that the public will have every confidence in the inventor's ability to carry out to the letter his contract with the Canadian government.

A 70,000 HORSE POWER PLANT.

Another notable step has been taken in the development and application of the steam turbine. The Metropolitan District Railway, London, which is about to substitute electrical traction for the old steam locomotives that for several decades have rendered travel on this line hideous, is to make use of the steam turbine in a great central generating station, which will be located at Chelsea. The minimum output will be 70,000 horse power, and the plant will consist of ten Westinghouse-Parsons steam turbines, each of 7,000 minimum horse power capacity. Not only will this be the largest aggregation of steam turbines in the world, but it is scarcely necessary to say that the turbines themselves will be by far the largest ever built. At present the 2,000-horse power turbine at the generating station of the Hartford Electric Light Company is the most powerful in existence; two are also being constructed in Europe for electric lighting at Frankfort and Milan, each of which will be of 5,000 horse power.

The advantages of a steam turbine plant for electric lighting are many and valuable. In the present case the three-phase generators, each of 5,000 kilowatts capacity, will be mounted direct on the turbine shafts, and will be driven at the high speed of 750 revolutions per minute—a high speed for electrical work, but a low speed in comparison with those to which we have been accustomed in the steam turbine. An immediate advantage of the high speed, electrically considered, is that much smaller dynamos can be employed than would be necessary if slow-speed, reciprocating steam engines were used. If our readers refer to the description of the power station of the Manhattan Elevated Railroad given in the SCIENTIFIC AMERICAN of January 11, they will notice that the electrical units used at that station are of the same capacity, namely, 5,000 kilowatts, but that the speed of revolution is only 75 per minute. Consequently the generators are huge constructions, 42 feet in diameter and 445½ tons in weight, with 40 field-magnet poles. Compare this with the compact generators in the District Railway turbine plant, which, because they revolve at ten times the speed, will require only four poles and will have an external diameter of only 9 feet. It is evident from these figures that there will be a great economy in space and material secured by the use of the steam turbine in an installation of this kind. It has been proved furthermore in the experience that has been gained with large turbine units, that the economy of steam consumption is lower than that which has been obtained with the best types of reciprocating engine, the conditions of steam generation being of course the same. It has further been shown that the economy increases with the increase in size of the unit; and hence it is reasonable to look for very favorable results from a plant made up of 5,000-horse power generators. Other advantages that would be realized are the entire absence of vibration and the absence of oil from the water of condensation.

There is another benefit derived from the use of the steam turbine in an electrical power plant; we refer to the perfectly uniform turning moment. It is well understood that in a system which generates three-phase currents for transmission and conversion at substations, it is of importance to secure as perfect an angular velocity of the engine and generator as possible. Should there be any variation, there is a confusion of the phases which, if it exceeds a certain degree, is liable to throw the rotary converters out of step and tie up the line. In the Metropolitan Street Railway plant, it will be remembered, the problem is solved by placing the two cranks at an angle of 135 degrees with each other, so as to secure eight impulses at equal intervals in each revolution of the shaft. In the steam turbine, the dead center of the reciprocating engine is of course entirely eliminated, and there is a perfectly constant turning moment throughout the entire revolution. As regards the question of speed regulation, under the fluctuating load imposed on a central electrical power station, such as this, the turbine is well equipped, the steam being admitted to it in a series of well-regulated and continuous admissions, which at full load are so close as to constitute what is practically a continuous feed. Finally, the turbine has a distinct advantage from the fact that a much higher vacuum can be used than is possible in the case of the reciprocating engine, the exhaust from the lower-pressure turbine being at zero.

There is no denying that the question of both the steam engine and the electric generator for large central power plants has reached an extremely interesting if not critical stage. The compact steam turbine and four-pole generator running at 750 revolutions per minute stand out in very strong contrast to the giant four-cylinder reciprocating engine and the 40-pole, 445-ton generator running at only 75 revolutions per minute. One or other of these is bound to become the permanent type for future work of this kind; and we must confess that judged by its past performance and its future promise, the turbo-electric plant would seem to be the standard for the future. Unless the matter of equipping the central power station for the Rapid Transit Subway has progressed too far to admit of any change of plans, the Commissioners and their engineers should carefully weigh the merits of the turbo-electric installation before committing themselves to the erection of one more of the costly reciprocating-engine power stations, of which three have been built lately in this city.

HOW VARIOUS COUNTRIES SUBSIDIZE THEIR MERCANTILE MARINE.

In view of the interest aroused in our shipping subsidy bill to be brought before Congress during the next session, it is interesting to observe the various means adopted by European nations to encourage their mercantile marine. The steamship lines of Great Britain receive no state assistance beyond, in certain cases, a subvention, which is in reality too insignificant to be worthy of notice, for employing particular vessels as auxiliary cruisers in time of war, and for postal work. Since, however, the carriage of mails involves the allocation of a certain amount of space for the mail bags, and officials attached thereto, and is somewhat similar to freight, this payment can scarcely be termed a subsidy. The German lines are the most heavily state-subsidized steamship lines in the world, and but for this government assistance, it is very doubtful if Germany would have attained its present position in the mercantile marine among the maritime nations of the world. Certainly no fast steamships such as the "Deutschland," "Kronprinz Wilhelm," and "Kaiser Wilhelm der Grosse," would have come into existence. The total imperial subsidy granted by Germany to steamship lines amounts to $1,737,500 per annum, and is distributed among the North German Lloyd, of Bremen, and the German East Africa Company, at Hamburg. There is in addition to this a small imperial subsidy granted for a service recently established to compete for the West African trade. The German East Africa line receives $337,500 a year for a fortnightly service circumnavigating Africa in alternate directions. The North German Lloyd receives $825,000 per annum for a fortnightly service direct to China and Japan, and $575,000 for a monthly service to Australia. In addition to this there is an amount of $325,000 paid to the Hamburg-American and North German Lloyd companies for the carriage of mails. As before stated, the British government extends no pecuniary assistance to the various steamship lines, beyond a postal subvention, though it is often erroneously stated that this remuneration is equivalent to a subsidy. Comparison therefore between a German and English steamship company is scarcely possible. Both the P. & O., the largest steamship company in Great Britain, and the North German Lloyd run a large fleet of vessels in addition to those employed exclusively in carrying mails on the Australian and Eastern service. The total tonnage of the North German Lloyd fleet at the end of 1900 was 405,987 tons, and that of the Peninsular and Oriental Company, of London, 340,000 tons. The P. & O. Company receive the sum of $1,750,000 per annum for a fortnightly service from Brindisi to Shanghai, a weekly service from Brindisi to Bombay, and a fortnightly service from Brindisi to Adelaide. Of this sum approximately $425,000 is allotted to the Australian service, Brindisi to Adelaide, covering about 9,100 miles, including ports of call. If 2,500 miles, about the distance from London to Brindisi—the P. & O. are obliged to run to Brindisi to pick up the mails—and 1,075 miles, representing the mileage from Adelaide to Sydney, are added, a total distance of 12,675 miles, the nearest possible approach to an absolutely comparative basis is obtained. The North German Lloyd receive $575,000 per annum for a monthy service from Bremerhaven to Sydney, a distance of about 13,100 miles, including ports of call. The P. & O. Company run fifty-two voyages in a year, and the North German Lloyd run under their contract, at least twenty-six voyages a year. This works out at 66.105 cents per mile for the P. & O. and Orient companies, and $1.68819 per mile for the North German Lloyd. And as the Colonies and India contribute from their postal receipts a sum equal to half the total P. & O. postal subsidy of $1,750,000, it is not perhaps too much to assume that the British Post Office collects at least a similar amount from the carriage of mails outward, the deduction being that the postal matter carried by the P. & O. pays for itself, and is no burden whatever upon the British taxpayer. The North German Lloyd have within the last two years, distributed dividends of 7 per cent and 8½ per cent. The P. & O. average a divi-