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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.

SOME THEORIES VERIFIED.

No sooner had the electrical service of the New Haven four-track road to Stamford been put in service, than it was evident that the application of the alternating current to this trunk line, burdened as it is with an unusually heavy traffic, had been made ahead of its time; that is to say, sufficient experimental work, on a full-sized scale, had not been done to provide the necessary data for a work of such vast importance. Troubles developed in the line, in the track, and in the motors, and the continuous breakdowns in operation were in sharp contrast with the smoothness with which the third-rail electrical equipment of the New York Central Road, based as it was upon the world's twenty years of experience in direct-current traction, had operated from the day on which electric service was opened. It required no little courage on the part of the New Haven Company to jeopardize the most important section of road on its whole system, by subjecting it to an experiment of this magnitude; and the greatest credit is due them for adopting at such an early stage what, in the opinion of the most advanced electrical engineers, is destined ultimately to become the universal system for the electric operation of long-distance trunk railroads.

But if the company failed to appreciate the importance of certain fundamental principles of a mechanical kind affecting the line, the track, and the motors, they are certainly to be congratulated upon the ingenious and very effective manner in which the weak points in the system have at last been met and mastered. The failures of the trolley line were due to the adoption, with a view to stiffness, of a three-fold, triangulated line, consisting of two steel cables to which the third or trolley wire was suspended by triangles, attached at every 10 or 12 feet of the length of the line. The system proved to be stiff enough, and the rigidity aimed at was fully secured; but it involved the disadvantage that the trolley wire was unyielding at its point of attachment to the triangles, and flexible between them. Consequently the pantograph contact-shoe, thrusting vertically against the wire with a pressure of from 25 to 40 pounds, struck a hard spot every time it passed a triangle, with the result that a serious hammering was set up at these points. This induced rapid wear and frequent breakages. The difficulty has been cleverly overcome, by hanging a second wire a couple of inches below the first, and attaching it to the former midway between its points of support on the triangles. The scheme appears to be working admirably and there is a marked absence of sparking and wear, the compensating effects of the present method of suspension appearing to give a wire of uniform flexibility.

The track and motor difficulties both arose from the heavy concentration of weight on a short wheel base which characterizes the motor. This induced an excessive amount of "nosing," or lateral oscillation of the motors, which, in turn, proved very destructive to the track, tending to spread the rails and destroy the alinement. It was to this cause that the derailment of the White Mountain Express a few months ago was generally attributed. The side sway of the motors has been completely eliminated by placing a pony truck at each end, with the load compensated with that on the nearest driver. In addition to thus lengthening the wheel base, an ingenious contrivance for preventing the side movement of the body above the trucks has been introduced. It consists, in each case, of a rocker side-bearing, pivoted to the truck frame, and carrying the weight of the ends of the motor body upon a curved upper surface. This curve is struck, not from the pin upon which the rocker is pivoted, but from a point a little to the outside of the pin. The resulting action is that, if the body of the motor tends to move laterally above the truck, there is a pinching action on the side bearing tending to resist this motion exactly in proportion to its amount. The device has proved to be highly effective, the motors now riding with the steadiness of a Pullman car.

Contemporaneously with this change in the motors, the company has been laying the whole of the electric zone with four-spike tie-plates, with two plates to each tie. Furthermore, all the curvature of the road has been adjusted by adding to the superelevation of the outer rail, the effect of which is strikingly noticeable on certain curves which had become notorious among the patrons of the road for their rough riding. As far as the sensations of the passengers are concerned, that heavy jolting to the outside of the curve, which was perceptible at high speed before the elevation had been increased, has been entirely eliminated. With its line, motors, and track in such admirable order, there is nothing to prevent the New Haven Railroad Company from accelerating its service to compare with the fastest express service in Great Britain and on the Continent, where several trains are run on a schedule speed of 60 miles an hour.

LANGLEY—A TRIBUTE.

It is rarely that a great invention can be credited, from the genesis of the crude idea to the embodiment of that idea in the perfected mechanical form, to a single individual. In stamping such an invention with the name of one man as its author, we are in danger of doing injustice to many workers in the same field, whose labors have contributed more or less abundantly to the final result. The world, however, persists in giving the palm to some particular one among the many; and it has adopted the rough-and-ready method of naming inventions after the men who first succeeded in putting them into practical, working shape. Hence, we speak of Stephenson as the father of the locomotive; Fulton of the steamboat; Morse of the telegraph; Bessemer of steel; and Marconi of wireless telegraphy. Following this rule, the world will undoubtedly speak of the Wright brothers as the inventors of the man-carrying aeroplane, since they were the first to build a motor-driven flying machine, that carried a man for an extended flight. Without entering into a discussion of the merits of this system of award, the Scientific American is of the opinion that to the Wright brothers, more than any others, is due the honor of the premier position in this new sphere of locomotion.

Having said this much, however, we hasten to assert that there has never been a field of experiment in which the inventor was pressed so hard by the holder of second place—to which position the late richly-gifted and too-little-appreciated Prof. Langley of the Smithsonian Institution is undoubtedly entitled. To this proposition no one will give readier and more loyal assent than the Wright brothers themselves; for they would probably be the first to admit that, had it not been for the elaborate researches in aerodynamics of Prof. Langley, and the rich mine of information contained in his published work, "Experiments in Aerodynamics," their successful flights at Dayton, Kitty Hawk, Washington, and Paris might never have been made. Furthermore, it is the belief of those who are qualified by their knowledge of the history of the art and of the particular facts in this case to express an opinion, that, had it not been for an accident during launching, Prof. Langley's aerodrome would probably have been the first machine to fly with a man on board—this belief being based upon the uniform success attained by the successive models with which Langley experimented in the neighborhood of Washington.

It is rarely that the experimentalist embodies in himself both the theoretical and practical elements of success in such full measure as did Langley. Not only did he enunciate the principles of flight, but he illustrated those principles in mechanical forms that betrayed an unusual amount of technical skill. He was the first to formulate the laws of flight and explain them so clearly that an intelligent mechanic would be able to build a flying machine that could fly. Mr. Octave Chanute, one of the leading authorities on aviation, writing in 1896 of Langley's investigations, said: "In my judgment the principal contributions thus far made by Dr. Langley to the science of aerodynamics consist in his having given the physicist and searchers firm ground to stand upon concerning the fundamental and much-disputed question of air resistances and reaction. . . . Now, for the first time, searchers are enabled to calculate the sustaining power, the resistance, and the center of pressure of a plane, with confidence that they are not far wrong." Previous to Langley's researches, it was believed that the resistance to a flying machine would increase in some multiple ratio of the speed, and that, because of the excessive power required, and the consequent increase of weight, flight at any high speed would be inherently impossible; but Langley's investigations led him to formulate that most important law, that within certain limits the higher speeds are more economical of power than the lower ones. In other words, he proved that at high speeds the planes would pass over the successive areas of air so rapidly that there would not be time for its inertia to be overcome, the conditions being approximately similar to those of a skater passing swiftly over a thin layer of ice.

Langley's earliest interest in the subject of mechanical flight dates from the period, over a quarter of a century ago, when he was director of the Allegheny Observatory. At that time he was attracted by the studies of Lanchester, in which he set forth the results of his study of the flight of birds; and following the example of that investigator, he made a study of the resistance and supporting power of various plane surfaces, by mounting them upon a rotating table. The results of these experiments were published in the work upon aerodynamics to which we have referred above.

Having formulated the laws of mechanical flight, Langley set about the construction of a flying machine; and he was at once confronted with the disconcerting fact that there was no motor available of anything approaching the light weight per horse-power that was necessary to drive his machine. Nothing daunted, and in spite of the fact that he was not an engineer by training, he designed and made, largely with his own hands, a steam engine and boiler which weighed only about four pounds per horse-power, a feat which, in itself, marked him as a man of uncommon mechanical ingenuity. He succeeded in making this model fly for a distance of over half a mile above the waters of the Potomac, this being the first flight accomplished by a motor-driven machine. Ultimately Congress granted him an appropriation of $50,000 for the prosecution of his work; and with this backing and the help of his talented assistant, Mr. Manly, he built his celebrated aerodrome. His failure to continue his experiments was due solely to the exhaustion of his own and the government funds; and was not in any sense a confession of failure. But it was taken as such by a certain section of the press. Undoubtedly the outrageous criticism and ridicule to which he was subjected, on the very eve of success, contributed largely to his premature death.

WANTED: A SANITARY RAILWAY CAR.

One of the papers read before the Tuberculosis Congress at Washington dealt with the subject of the unsanitary railway car. Since the improvements suggested by the writer of the paper deserve the consideration of the inventor, we present the following abstract of his remarks:

The points that need attention in a Pullman car are the bedding, the ventilation of the berth when made up, the use of the wash basin for teeth-cleaning, the use of common drinking glasses, etc. Theoretically, the danger from the blankets has been diminished by the use of a third sheet as a counterpane, but practically this third sheet is of little if any protective value. The sleeping berth is generally made up with two blankets for covers. This is too much for the ordinary sleeper at all times, and the result is that one or both blankets are thrown back. To throw off one or both blankets necessitates the throwing back of the third or upper sheet. Thereupon it ceases to afford any protection for the blankets. A long upper sheet to turn back over the blankets at the top is far better than the third sheet. This is a matter more for the porter that the inventor to consider.

The lack of ventilation in the lower berth when made up is simply beyond description. This can and should be corrected, and here the inventor can do much. It will undoubtedly mean a change in car construction, but this can and should be met from this time on in all new cars.

Arrangements should be made so that it might be possible to clean one's teeth without spitting into the basins provided for lavatory purposes. Here again the inventor can help.

According to the Far Eastern Review, a Chinese gentleman named Hu Chuen has obtained a patent on an improved method of wireless telegraphy, simplifying the methods hitherto in use. The system has been recommended by Chinese authorities for the reason that it makes use only of domestic Chinese materials of lower cost than imported articles, and it is also simpler to operate. At the test of the equipment at Canton it was pronounced a success. Detailed information as to the workings of the new system, however, are not as yet at hand.