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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.

## CLOSE OF THE ST. LOUIS FAIR.

The Exposition at St. Louis which was opened to the public with an attendance for the first day of about 180,000 was brought to a close on December 1, with a record of over 200,000 admissions. The closing day was marked by ceremonies expressive of the debt which the Exposition owes to the executive ability and enthusiasm of its president, the final addresses being delivered in the Plaza St. Louis, and at the foot of the Louisiana Purchase Monument, where seven months ago the Exposition was formally declared to be opened. The Exposition buildings were closed at four o'clock in the afternoon, and at midnight the splendid illuminations of Festival Hall and the Cascades slowly faded out for the last time, leaving this, the largest, most ambitious of the great international expositions, a matter of history.

Interest naturally centers at this time in the finances of this great undertaking, and according to a statement of the secretary the project, since its inception, has cost about \$22,000,000 to the Exposition Company, while the several States and Territories have expended a total of \$9,000,000. There were 18,500,000 admissions and the receipts reach a total of about \$10,000,000, which is made up of admissions and concession royalties. It was announced that when a few current accounts have been paid, most of the \$1,000,000 in hand will have been consumed, leaving only a small amount for the stockholders. From the amount of royalties collected, it is estimated that the various concessionaires must have taken in at least \$10,000,000. The entire cost of the whole fair, including the various concessions, is estimated at about \$50,000,000. With the bringing to a close of one more of these colossal expositions, the question will be asked again as to whether they pay. From the figures given above it is evident that financially they do not; but everyone who has visited this fair and taken note of the character and behavior of the multitudes that streamed through the various Exposition palaces, will surely give it as his impartial conclusion that as a great educative force, whose influence is much wider than can be measured in turnstile statistics, the last of the world's fairs must, in a broad sense, have been a profitable undertaking. One of the most instructive agencies in that dissemination of knowledge and information which an exposition is designed to afford is the local correspondence of the various papers; and as evidence of what may be accomplished in this way, we refer to the pages of the SCIENTIFIC AMERICAN and the SUPPLEMENT during the past seven months, in which can be found what is practically a complete résumé of the most valuable features in the architecture and exhibits of the Exposition. It is impossible to estimate how many millions have looked at the Exposition through the eyes of the press; but it may safely be said that the 18,500,000 registered at the gates represent but a fraction of the people who, not merely in America, but throughout the world, have by this means been made familiar with the buildings and exhibits of the Louisiana Purchase Exposition.

## BALDWIN AND SANTOS-DUMONT.

It is refreshing to meet with an enthusiast who takes such a common-sense and dispassionate view of his art as does the aeronaut, Mr. Baldwin, whose work at the St. Louis Exposition gives him the same standing among experimentalists in the dirigible balloon in this country as is held by Santos-Dumont in France. During a recent visit to this office, Mr. Baldwin paid a high tribute to the Brazilian aeronaut, stating that, in his opinion, no one man had done so much to place the airship on a practicable basis as the young Brazilian; and he took occasion to scout the idea that the failure of Santos-Dumont to appear at the World's Fair contest was due to any other cause than the malicious act of some jealous or crazy fanatic. It was his opinion that,

had the balloon not been willfully damaged, Santos-Dumont would undoubtedly have been one of the contestants and would have added very largely to the interest of the aeronautical programme. This testimony from the man who, as events proved, would have been his most active competitor, will be taken at its full significance.

It was Mr. Baldwin's opinion that the many failures of inventors of airships of the dirigible-balloon type are largely due to their lack of aeronautical experience "in the air." He himself is an old gymnast, and he attributes much of his own success to the art of balancing acquired in years of work on the tight rope. In the successful aeronaut there must be a certain amount of what might be called the instinct of equilibrium. This will enable him to almost anticipate the sudden lurches and deviations, and apply that instant correction which is necessary for successful navigation. Although all his work has been done with the gas-balloon type, Baldwin believes that the ultimate successful airship will be of the aeroplane type, and will be framed, driven, and balanced on the same principles that govern the flight of birds. He frankly admits that the dirigible balloon will never have a commercial value; but he believes that, in its perfected condition, it will come to be recognized as one of the most attractive forms of sport, taking its place with the yacht and the automobile. Incidentally, it should be mentioned that Baldwin compares the pleasure of sailing in his airship with that experienced in holding the wheel of a sailing yacht, the response to the slightest changes of the rudder being immediate and proportionate. Although he was the most successful competitor at St. Louis, he is so firmly convinced that the future of human flight lies in the direction of the aeroplane, that he has already directed his attention to this type, the practical possibilities of which were shown by the successful flight of the Wright brothers not many months ago.

## DEATH OF A FAMOUS YACHT DESIGNER.

One of the best tributes to the late G. L. Watson, the foremost yacht designer in Great Britain, is the widespread interest and regret which his death has aroused on this side of the Atlantic. His claim upon American interest is two-fold. In the first place, of the various naval architects who have designed racing yachts to compete for the "America" cup, he was unquestionably the most successful; for, although none of his yachts succeeded in winning the cup, there were two of them, "Valkyrie II." and "Shamrock II." that showed such excellent qualities as to render the successful defense of the cup uncertain until the last race of each series was won. To a more limited class of Americans Mr. Watson was well known and highly esteemed for his handsome and successful steam yachts, many of which fly the flags of our leading yacht clubs. At a time when yacht designing was still largely a matter of rule-of-thumb, Mr. Watson, who was a trained engineer, began to apply to yacht designing those scientific principles upon which yacht designing is now almost entirely conducted. That he was right was proved by his early successes. His most noted yacht was the cutter "Britannia," which did such good work in English waters against our own "Navaho" and "Vigilant." With Mr. Watson gone, the prospects of another competition for the "America" cup, at least in the near future, are very remote. Mr. Fife, the designer of the last cup challenger, has absolutely refused to build a fourth "Shamrock;" and there are no indications that among the younger naval architects in Great Britain there is any coming man who can successfully compete with our own designers in the construction of an extreme, high-powered racing craft.

## STEEL TRACKWAY ON STREETS.

The steel trackway which was laid a few years ago on Murray Street, in New York city, has been removed to make way for a pavement of wooden blocks; but it will be unfortunate if this fact is allowed to raise any doubts as to the value of steel trackway, provided it is used under conditions suitable to its operation. In the present case, the track consisted of a pair of 12-inch channels, laid with their flanges below the surface and with upper face flush with the roadway. The channels were supported on broken stone which rested on a macadamized bottom that was surfaced with gravel. The location of this track and the peculiar circumstances surrounding it were altogether unfavorable to a test of its good qualities. In the first place, it was only about 400 feet in length, and it was laid on a street, one side of which was almost constantly encumbered by trucks that were engaged in loading or unloading from the adjoining buildings. This forced the traffic to the opposite side of the street, and rendered it often more convenient for a truckman to use the cobblestone surface than the smoother-running steel trackway. There is not the slightest question that the reduction in traction resistance when a loaded truck was being pulled up the Murray Street hill on the trackway was very much less than if the same load were hauled on the rough granite pavement. With the

repaving of the street with wood, the difference in traction resistance was, of course, greatly reduced, and no doubt the authorities acted wisely in not relaying the steel track.

We have always considered that the province for the steel track for highways was to be found in country districts, where the local material for road-building was poor and the difficulty of maintaining a surface suitable to heavy traffic was great. The system should prove particularly valuable on long hills and, indeed, a suggestion of its utility is found in the fact that on the old coaching roads in Europe, stone paved trackways were sometimes laid on steep hills on which the traffic was heavy, with a view to reducing tractive resistance.

## METEOROLOGICAL OBSERVATORIES AT SEA.

At the St. Petersburg meeting of the International Commission on Scientific Aeronautics, reports were received of progress in a new field which, in the opinion of the commission, will in future attract much attention.

At the first meeting of the commission in Strasburg, in 1898, Prof. Rotch, director of the Blue Hill Observatory, near Boston, pointed out the pressing need of observations of the higher strata of the atmosphere over the ocean which covers two-thirds of the globe. Councilor Assmann, director of the Prussian aeronautical observatory in Berlin, took up the idea, and his assistant, Prof. Berson, elaborated, with Rotch, the plan of an expedition to make observations on the Atlantic, but the plan was not carried out owing to lack of funds and the impossibility of securing a vessel.

Prof. Hergesell, chief of the Alsace-Lorraine weather service, was the first to use kites to carry self-registering instruments aloft over the water. His first experiments, on the Lake of Constance in 1900, were followed by some very successful ones made by Berson and Elias on a trip to the North Cape.

Last year Teisserenc de Bort, well known through his extensive observations by means of kites and captive balloons at Trappes, near Paris, erected an observatory at Viborg on the northern point of Jutland, a site virtually oceanic, though selected chiefly because it lies in a main track of atmospheric low pressures.

But it was reserved for Prof. Hergesell to institute a series of systematic observations at sea. Last spring he succeeded in interesting Prince Albert of Monaco in the subject. In April, in the Mediterranean, eleven kite ascensions were made with the aid of the deep-sea sounding apparatus on board the Prince's yacht, and the following positive data were obtained:

In anticyclones (high pressures) the vertical distribution of temperature differed from the normal distribution over land areas, but the data are not sufficient to establish the law of variation. The velocity of the wind decreased very rapidly with increasing elevation and an almost perfect calm was found at a height of a few hundred meters. In cyclones (low pressures) the conditions were found to be the same as on land.

Off the Corsican coast regularly alternating land and sea breezes facilitated the ascensions, but here, also, a sudden lull was observed at a height of 200 meters. Off the northern point of Corsica atmospheric eddies caused the pull of the kite to fluctuate between 0 and 80 kilogrammes and the kites were often carried away by gusts.

The success of this experimental series induced the Prince of Monaco to equip his yacht with a complete kite-flying outfit and to undertake an Atlantic cruise in July. In the interim the yacht, with the Prince and Prof. Hergesell aboard, visited the Kiel regatta, where the German Emperor became so greatly interested in the experiments that he had the "Hohenzollern" and the "Sleipner" equipped with kite-flying apparatus for their northern cruise.

The Atlantic cruise of the "Alice," the Prince of Monaco's yacht, extended from the latitude of Oporto southwardly to the Canaries, and occupied four weeks. The kite frequently rose higher than 2,500 meters and once as high as 4,510 meters. After Hergesell's departure the Prince continued the experiments and attained a height of 6,000 meters. In the latitude of Gibraltar the trade-wind was observed as a uniform eddyless northeast wind of 6 or 7 meters per second, accompanied by the characteristic trade-wind clouds, elongated cumuli. Above 500 meters there was a sudden lull to two or three meters per second. The kite was allowed to lie upon the uniform lower wind as on a cushion while a great length of line was paid out. Then by hauling in rapidly the kite could be sent very high. The anti-trade which, according to earlier observations at Teneriffe, blows strongly from the south-east at great elevations, was not found up to the height of 4,510 meters, but a slight easterly breeze replaced the strong northeast wind observed below. In the moist lower strata the temperature was found to decrease by 0.5 deg. C. for each 100 meters of ascent. At a height of 500 meters a layer of almost uniform temperature, 1,100 meters thick, was met. Above this, again, there was a decrease of 1 deg. C. for each 100 meters rise. The relative humidity was found nearly constant at 75 to 80 per cent in the zone of the trades.