## RETROSPECT OF THE YEAR 1905.

(*Continued from page 475.*)

the perils of fog and thick weather. Other interesting and valuable developments that may be mentioned are the use of the gyroscope to prevent excessive rolling, and also its application as a check upon the mariner's compass; and the successful introduction of an electric dead reckoner by which the course, distance sailed, and speed of a ship are automatically drawn upon a chart.

### THE TURBINE AND THE PRODUCER-GAS ENGINE.

A review of progress in the merchant marine naturally leads us to a consideration of the steam turbine, and its coming rival the producer-gas engine; for although the steam turbine received its first practical application in an electric lighting plant, its prominent introduction to the world was made in that phenomenal little steam yacht the "Turbinia." By the close of the year three vessels will be in the transatlantic service whose successful operation will have set at rest all question as to the availability of the turbine as a drive for ships of the largest class. The "Victorian" and the "Virginian" of the Allan line, each of which is 530 feet in length, are driven by turbines of 10,000 horse-power. The first-named made 19, and the second vessel 19½ knots on the trial trip, and they have broken all existing records over their own transatlantic route. The "Carmania," whose turbines are of over 21,000 horse-power, has made 20.4 knots on trial. There was trouble during the early voyages of the "Victorian;" but both of the Allan line ships are now giving excellent service. The 3,000-ton turbine-propelled ship "Loongana" gave a further demonstration of the reliability of the turbine in the course of a thirty-and-a-half day trip from Glasgow to Australia, when an average speed of 15 knots an hour was maintained throughout. This is the longest journey ever made by a turbine-propelled vessel. In the smaller classes of vessels, such as those used for river and cross channel service, the turbine has scored a signal triumph over the reciprocating engine. A comparison of the "King Edward" with a vessel similar in every respect except that of motive power, showed that while during eighty days of sailing at an average speed of 18½ knots, the steamer with reciprocating engines consumed 1,909 tons in steaming 12,106 knots, the "King Edward" with turbine engines consumed only 1,429 tons in steaming 12,116 knots. Another absolutely reliable basis of comparison has been afforded by the four new Isle of Man passenger boats, two of which have turbine, and the other two reciprocating, engines. The turbine steamer "Manxman" in the comparative trials steamed 20.3 knots on the same amount of fuel as was consumed by the reciprocating engine steamer "Antrim" when making 19.5 knots. Five gallons of lubricating oil was saved on each 60-mile-trip, and the staff of oilers was reduced from four to two. There was a saving of weight in the turbine engines of 115 tons, or 6 per cent of the total weight of the ship.. Regarding the development of the steam turbine for stationary service, it is sufficient to say that the excellent results achieved in steamship service have been repeated in the great electric light and power plants on shore. For reasons which we cannot now go into, the stationary turbine has not shown the same superior economy as the marine turbine over the reciprocating engine; but the advantages in small space occupied, small amount of lubrication, and smaller staff required have been decisive.

An event which in importance is probably destined to rank with the advent of the turbine steamer "Turbinia" was the appearance during the year of a successful steamship driven by a producer-gas engine. The system was devised by Herr Emil Capitaine. This little vessel, named after the inventor, is 60 feet in length, and is driven by its producer-gas engine at a speed of 13 miles an hour. During a ten hours' run at 13 knots speed, only 467 pounds of anthracite were consumed at a cost of $1.08. Following the producer-gas steamer we may look to see a producer-gas locomotive—this last an entirely feasible proposition. The claim of the producer-gas engine makers that a properly constructed plant will run on less than a pound of coal per horse-power per hour has recently been vindicated in a series of tests carried on by the Highland and Agricultural Society, in Great Britain, when ten complete plants were submitted for approval. Trials were made of plants of 20 and others of 8 horse-power capacity. The coal in pounds per brake horse-power per hour consumed by four 20-horse-power plants was respectively 0.93, 0.77, 0.80, and 0.83, and in four plants of 8 horse-power it was respectively 1.22, 1.13, 0.84, and 1.35, all of these being full-load trials. Regarding the prospects of the production of a successful gas turbine not much can be said; for the matter has not, as yet, progressed far beyond the experimental stage.

### THE AUTOMOBILE.

Let us hope that the parallelism between the astonishing development of the bicycle and the automobile will not hold good as regards the rapid decline of the bicycle in popularity. The fifth annual Automobile Show, held early in the year, was a splendid tribute to the development of the art of automobile construction in this country, and the very reliable service now given by the best American makes proves that we are, at last, within reach of that long-anticipated stage when the automobile enthusiast will no longer have to go abroad to secure the very best machines. If we except the racing machines, pure and simple, and the touring automobiles of the highest power, it may be said that automobiles are grouping themselves broadly under two distinct types: One, the moderate-powered and moderate-priced runabout of from 8 to 16 horse-power, and the other, the standard touring car of from 24 to 36 horse-power. It is claimed by the advocates of the last-named type that 24 to 36 horse-power is sufficient for all the ordinary exigencies of touring, and for all legitimate speeds. Contrary to expectation, there is no tendency as yet to an all-round reduction of price. Rather the tendency is to offer a better machine and to charge more for it. Mechanically, the development during the year has been upon well proved lines, and radical novelties have been conspicuous by their absence. The great international races of the year were run off successfully and without serious accident—indeed, it is noticeable that accidents in racing are decreasing in the ratio in which fatalities on the road are on the increase, for the list of automobile fatalities and casualties is growing to enormous and positively tragic proportions. The Gordon-Bennett trophy was won this year by a Richard-Brazier car driven by Leon Théry, the 341.4 miles of the course being covered at an average speed of 47½ miles an hour. The second contest for the Vanderbilt International Cup was held over the Long Island course under most favorable conditions. Although the race was won by the Frenchman Hemery on an 80-horse-power Darracq, at an average speed of 61.49 miles per hour, the sensation of the race was afforded by the Italian driver Lancia in his 110-horse-power Fiat machine, who, starting fourth, took first place at the end of the first round, and held it for seven rounds until an accident threw him temporarily out of the race. During this first 200 miles his average speed was within a fraction of 70 miles an hour, and his fastest lap of 28.3 miles was run at a speed of 72.88 miles per hour. There is a disposition on the part of the European manufacturers to discourage the perpetuation of these great road races; but their novelty and great popularity in America insure their perpetuation for at least some years to come. The annual races on the beach at Florida resulted in several world's records coming to America. Mr. Bowden in a 120-horse-power Mercedes racer of overweight, covered the mile straight-away in 32 4-5 seconds, while McDonald on a 90-horse-power Napier cut down last year's record of 6 minutes and 50 seconds for the 10 miles to 6 minutes and 15 seconds, an average speed of 96 miles an hour. A healthy sign is the increasing popularity of competitive tours to determine the relative reliability and economy of the competing cars. Chief among these during the year was the contest of touring cars for the Glidden trophy which was run off over a course from New York to the White Mountains and return, and was won by a 28 to 32 horse-power, four-cylinder Peerless car, and the six-day economy test held last month, which was won by a Reo bus carrying ten people. The total cost of running the winner for a distance of 682 miles was found to work out at the low cost of only $2.93 for each of the ten passengers carried.

### AERIAL NAVIGATION.

In a resurvey of the progress of aerial navigation during the past year, we draw attention to the encouraging and significant fact that effort is being directed increasingly to the development of the aeroplane as distinguished from the balloon-supported type of airship. The SCIENTIFIC AMERICAN has always claimed that, because of the inexorable limitations put upon the navigable balloon by the enormous atmospheric resistance encountered by the gas bag, a resistance which increases as something more than the square of velocity, we must look to the perfected aeroplane for the solution of the problem of mechanical flight; or, rather shall we say, of mechanical flight that will be of practical and commercial value. At the same time, the fact remains that the only successful "flying" that has been done this year, as in previous years, is to be credited to the balloon type. Young Knabenshue, Baldwin's former assistant, has built an airship very much on the lines of the Baldwin machine, with which he has given successful exhibitions throughout the States, none of which brought him more widespread recognition than his successful flights over predetermined courses above Manhattan Island. Santos-Dumont is out with a new machine "No. 14;" but, apparently, he has made no public demonstrations with it. The Barton airship, a huge structure, 180 feet in length by 40 feet diameter, made a trial trip on July 22, when the vessel ascended with five aeronauts. A thirty-mile wind was blowing, against which the ship was just able to hold its own. The vessel showed that it was controllable; but the performance was scarcely commensurate with the great size and power of the machine. Among the many aeroplane experiments recorded during the year are that of Archdeacon which was a failure; and the two attempted flights of Montgomery, the first of which was successful, and the second of which, because of the collapse of the machine, cost the aeronaut his life. The Alvares aeroplane, which is modeled after the outspread wings of a bird when in flight, was given a fairly successful test, but not under full-sized working conditions, nor with any operator on board. The Gillespie aeroplane, which is supposed to be driven over the earth on its carrying wheels until it reaches a velocity at which it will rise into the air, has been designed with a view to absolutely preventing the "diving" propensities which have proved so fatal in previous machines. Some extremely interesting and fairly successful experiments have been made in which the actual wings of birds, or aeroplanes built up of birds' feathers, have been employed, some of the built-up wings being as much as 12 feet in length. The Ludlow aeroplane experiments in this city have attracted considerable attention, and one successful flight was achieved. One of the most important balloon achievements of recent years was the winning of the long-distance balloon race from Liege to Julich in the Rhenish provinces. The English balloon, "Vivian III.," which won the race, made most of the journey at a height of 16,000 feet above the earth, and in a wind that was frequently blowing at 50 miles an hour. The future of aerial navigation, as we have said, is bound up with the success of the aeroplane, and the most promising results to date were those obtained last year by the Wright brothers, one of whom made a flight of over half a mile in a power-propelled machine. It is gratifying to know that during the present year they have been carrying on their investigations.

## Correspondence.

### Teaching Science.

To the Editor of the SCIENTIFIC AMERICAN:

May I take a little more of your space to say a few words in reply to Mr. Andrews's letter in your issue of November 18? Some of Mr. Andrews's points are excellently taken, and I heartily agree with his main contention, that one should not exact too much of schoolboys. But if he will reread my letter, he will notice that at Trinity College, the candidates for admission are not expected to offer Physics, though they may attempt to pass off Physics I., and they can hardly expect to be asked questions easier than those the freshmen have to pass on. This plan of allowing students to pass off the first college course through their knowledge obtained in school is by no means confined to Trinity, and wherever this is the case, they must be measured by college standards. If this standard is too high, then why do the schools allow their graduates to attempt the impossible?

But I will go still further than that in reasserting the claims, based on the entrance papers that have come under my notice, that even the really elementary aspect of the subject is taught unsatisfactorily in many schools.

The fundamental principles are ignored or lost in a maze of confusing and mechanically followed experiments, and what should be a splendid background for the more mature treatment of physics as pursued in college, has only resulted in confusing and incapacitating the student. I do not claim that this is universal, but much too frequent; and in my own experience I find (except in a few shining exceptions) very little difference between the pupil who had physics before and the one who is grappling with the subject for the first time; and sometimes even the latter is the better student, because he is not tempted to count on the rather hazy recollections of his school course.

If then Physics is to be taught in schools, let it be clearly understood whether the aim is to give the equivalent of the first college course, or whether it is to be a really primary treatment. In the former case it should certainly be taught as in college, and I think that is possible with pupils over sixteen years of age. Otherwise let it be a real foundation for more advanced work, and not a mere kindergarten based on physics.

Whether this foundation course should be recognized in the entrance examinations of a college, or not, is another question, which I do not propose to discuss here.

I heartily indorse Mr. Andrews's view that a physics teacher requires more constant training than a teacher in many other branches, and that it is necessarily harder to find good ones. But I am still convinced that too much laboratory, and too few problems and explanations, account for much of the inefficiency in school teaching. The inductive method is absurd in an elementary course, but that is too large a subject to go into here.

HENRY A. PERKINS.

Trinity College, Jarvis Physical Laboratory, Hartford, Conn., November 24, 1905.