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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 LATEST MARINE TURBINE SUCCESS.

The satisfactory completion of the trials of the turbine machinery of the "Dreadnought" has a wider significance than that of establishing the high speed of this battleship; for it marks a decided step forward in the development of the marine turbine. In the first place, the horse-power developed is considerably greater than that hitherto secured in a steamship, the largest turbine installation previous to the appearance of the "Dreadnought" being that on the Cunard liner "Carmania." Moreover, the fact that the turbines ran ahead of the contract requirements of 23,000 horse-power by an additional development of 5,000 horse-power, with a proportional increase in the speed, indicates that the serious difficulties which arose in the Allan Line steamers, and were not altogether eliminated in the "Carmania," have been now fairly well mastered. These trials, moreover, must come with a very welcome assurance to those who are responsible for the turbine engines of the "Lusitania" and "Mauretania"; for the equipment of the "Dreadnought," in which four turbines are employed on four shafts, is broadly identical with that of the new Cunard fliers, whose horse-power, however, will be three times greater. The "Dreadnought" turbines were designed to give a speed of 21 knots with 23,000 horse-power; but they actually developed 28,000 horse-power and drove the ship at a mean speed of 21½ knots, with occasional bursts of speed of 22¼ knots. The turbines of the "Lusitania" and "Mauretania" are designed to drive the vessels at 25¼ knots with 68,000 horse-power. If they exceed requirements in the same proportion as the turbines of the "Dreadnought," they should drive the new ships at a speed of from 25¾ to 26½ knots, and develop between 80,000 and 90,000 horse-power.

"CALIBER" AND "BORE."

It will be remembered that in a recent issue we explained the various uses of the term "caliber" as applied to ordnance. A correspondent now asks if we will make a similar explanation of the word "bore" as applied to shotguns; and more particularly when it is used in conjunction with a numeral, as in speaking of a 10-bore, 12-bore, or 16-bore shotgun. At the first reading, anyone who is familiar with modern rifles and heavy ordnance might think that the word "bore" here was used as a unit of length, as when we say that a 50-caliber, 6-inch, rifle is a rifle 25 feet, or fifty times the caliber (diameter of the bore), in length. But as a matter of fact, the term "bore," when applied to shotguns, is never used to indicate length, but always refers to the diameter of the bore. There is, by the way, quite an interesting scrap of history attached to the use of the term, which carries us back to an early period in the use of firearms.

In the days of our forefathers, when rifle balls were spherical, and long, cylindrical, conical-headed bullets and rifled barrels were undreamed of, the gunsmith adopted a curious but convenient method of designating the gage or diameter of the bore. He expressed it by stating how many bullets, of a size that would fit a particular musket, would go to make a pound. Thus, a 10-bore musket would be one of such a bore than ten of its bullets would go to make a pound weight; a 16-bore gun would be one whose bullets would run sixteen to the pound, and so on. Hence we get the anomaly, that the larger denomination musket has the smaller bore. Although the day of the spherical bullet has long passed away, and the only smooth-bore remaining is the shotgun, the old method of designation has been retained.

THE CARNEGIE INSTITUTION MAGNETIC SURVEY.

About twelve months have elapsed since we announced that the yacht "Galilee" of the Carnegie Institution had sailed for Hawaii, to commence her task of making a magnetic survey of the northern part of the Pacific Ocean. At the close of last year she completed her first cruise, which included the Hawaiian Islands and some of the islands which lie beyond the archipelago. On March 2 she started on a longer cruise, of some 20,000 miles of sailing, and secured the necessary magnetic observations on a voyage which included Fanning Island, the Samoan Islands, the Fiji and Marshall groups, Guam, Yokohama, and San Diego, at which port the cruise was concluded. The data thus secured is sufficient to enable the Institution to revise the existing magnetic charts of the North Pacific Ocean. It constitutes an invaluable contribution to that worldwide system of surveys by which it is hoped some day to determine the complicated laws which govern terrestrial magnetism, and thus relieve the art of navigation of one of its present sources of perplexity.

The scope of the work outlined by the Institution includes the collection of data sufficient for the revision of the magnetic charts of all the other oceans; and the yacht will shortly be dispatched on a voyage around the world, in which she will call at Valparaiso, Rio Janeiro, and Washington; cross the Atlantic to the Cape of Good Hope; and return to the Pacific by way of the Indian Ocean and the Philippines. With the elaborate observations thus secured, the Institution will be able to prepare new charts of magnetic declination embracing the complete circuit of the globe. The Institution aims at securing the necessary magnetic data in those localities where there is at present no organization engaged in surveys of this character; and as an instance of the work done by Dr. Bauer, director of the Department of Terrestrial Magnetism of the Institution, it may be mentioned that during last summer his assistants secured the needed observations at seventy stations in Canada in latitudes where hitherto few magnetic observations have been made. As the result of this work the magnetic maps of this country extend up into Canada and reach entirely across the continent.

ROADS FOR AUTOMOBILES.

The day of the much-to-be-desired special automobile roadway would seem to have come at last, for it is authoritatively announced that a company has been formed to build a special automobile course on Long Island, to be used in the annual international contest for the Vanderbilt cup, and also as a special driveway for automobilists throughout the year. The fact that the donor of the Vanderbilt cup is president of the company, and that it is promoted by some of the leading automobilists and automobile interests in the country, is a guarantee that this road will be built, possibly in time for next year's contest. Over and above the convenience and safety both of the drivers and the public which will result from the construction of such a course, this enterprise will prove to be of inestimable advantage in promoting the automobile interests of this country. When the racecourse is completed, it will be unique; for there is nothing of the kind in existence, or projected, even in Europe. Consequently, the annual Vanderbilt race will assume even greater importance than it now possesses, and the entries both for the elimination races for home manufacturers, and also of foreign contestants, will undoubtedly be larger and more representative than ever. To everyone who followed closely the races of this year, it was evident that the poor showing of the American cars was due largely to insufficient trying-out in preparation for the race; and no doubt the limited amount of trial practice was occasioned by the lack of suitable roads on which high speed could be safely maintained.

Of greater importance, however, than the construction of special racecourses is the provision of public roads suitable to the trying demands of general motor traffic. For it must be admitted that the surface of the present roads has shown itself to be quite unable to stand up under the severe usage imposed by automobiles and motor cars. In fact, the provision of suitable motor roads may be considered one of the most pressing problems of the present day. As far as the general public and, indeed, the automobilists themselves are concerned, the most serious difficulty is that of the abominable dust from which there seems at present to be absolutely no escape. As matters now stand, the only way in which to avoid dust-raising is to reduce speed to a point considerably below the present speed limit; and this is out of the question. The automobile has come to stay. It is an industry too vast, a sport too noble to be subjected to any restrictions which would ultimately kill its popularity.

Therefore, if the automobile may not be brought down to the road, the road must be brought up to the automobile, and some way found by which the dust horror may be mitigated, if not entirely removed.

So serious was the problem considered to be in England, that a royal commission on motor cars was appointed, which has recently presented a characteristically thorough and comprehensive report. It states that on the great main roads within a radius of 30 or 40 miles out of London, dust raised by motor cars "causes material damage, discomfort, and annoyance to users of, and dwellers by, the highways." Many instances of the depreciation of property are given. A real-estate agent testified that herbage, within fifty yards of the highway hedges, was absolutely useless, either for feeding cattle or harvesting. In one case, near Windsor, a house that was bought for $25,000 could not be used because of the dust, and was sold for $10,000. The person who bought it, thinking to make money by the bargain, could not sell the house at any price. A farmer stated that hay and grain crops were rendered injurious to live stock, and that cattle would seldom graze on pasture near the road.

Since the reduction of the speed of automobiles to that of horse-drawn vehicles (at which speed the dust nuisance would vanish) is out of the question, Lord Selby's commission set itself to find some means of holding the top dressing down upon the roads and preventing dust. In his report, an ample digest of which will be found in the current issue of the SUPPLEMENT, the attempts which have been made and are now in progress to find a suitable form of dust-preventer for motor traffic are outlined, and the merits of the various systems of roadbuilding are discussed.

The report favors the best type of macadam roads for both heavy and light motor cars. Though such roads are not dustless, they are more nearly so than the roads composed of various local stone, which is liable to be of a friable character. For roads carrying unusually heavy traffic, a special and more costly type of construction should be used, and a system of "armoring" the road with stone blocks, which is known as the Kleinpflaster and is used with success in northern Germany, is recommended. It consists of a foundation of large inverted pyramidal stones, between and above which is laid 4 or 5 inches of small broken stone. Above this is one inch of sand, and above the sand are placed carefully selected broken stones, about 3½ or 4 inches square. These are placed with a one-half inch spacing, and compacted with a lime-sand binding of heavy consistency. This road is of great strength; is practically dustless; and its life is from twenty-five to thirty years. It costs about $18,000 per mile for an 18-foot road. Outside of this, and the paved roads laid on sand foundations as used in France, the remedy for dustlessness at present seems to consist in the use of some form of liquid tar or oil; but the serious objection to oiling is that when the dust begins to fly, as it ultimately will, it is exceedingly injurious to the clothing; while the oiled surface adheres to the feet and is carried into the home, where it is destructive to rugs, carpets, etc.

According to the report, none of the various devices employed as dust-preventers has proved to be a permanent and unqualified success, although a mixture of blast furnace slag and tar, or "tarmac," is spoken of hopefully. The hope is expressed that the government, realizing that the dust problem is of national importance, will appropriate a sum of money for experimental work.

SUCCESSFUL FLIGHT OF SANTOS DUMONT'S AEROPLANE.

On October 23, after one unsuccessful trial in the morning, Santos Dumont finally, in the afternoon, drove his aeroplane through the air a distance of 150 feet at an elevation of about 20 feet from the ground. The experiment took place near Paris, and was witnessed by a crowd of people, including representatives of the Aero Club of France. When Santos Dumont shut off the power, his machine came down so heavily on its four wheels that it demolished them. Twice the distance necessary to win the Archdeacon prize was covered. This prize, a cup, was offered for the first aeroplane which flew a distance of 25 meters (82 feet). The $10,000 prize for the first flight of a kilometer in a circle has yet to be won. Complete descriptions of Santos Dumont's aeroplane and its performance were published in our issues of August 18 and October 6 last. Fitted with a 50-horse-power, eight-cylinder motor, which drives the air propeller direct at a speed of 1,500 R.P.M., a thrust of over 300 pounds was developed. This was sufficient to drive the machine and its operator—a combined weight of over 500 pounds—forward through the air at a speed of about 25 miles per hour. According to the cabled account, the stability of the machine appeared to be good, though what it will do when flown a longer distance and in a circle yet remains to be seen. At any rate, this is the first flight of a motor-driven, man-carrying aeroplane that has been witnessed by a considerable number of people. We hope, in the near future, to be able to publish a photograph showing the aeroplane in the air. In comparing the results of Santos Dumont's experiment with those which the Wright brothers claim to have attained, there is one striking fact, viz., the young Brazilian, although having an apparatus of the same general type as that used by the American experimenters, but of about one-half its weight, found that a 50-horse-power motor was necessary to drive his flier up into the air and forward through it at a speed of 25 miles per hour; while the Wrights, with a machine of twice the weight and half the power, claim