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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

TITLE TO THE PANAMA CANAL.

We learn that the Cabinet of the President, at its weekly meeting on July 1, referred the matter of this government's securing a satisfactory affirmation of the sufficiency of title to the property of the New Panama Canal Company to the Attorney-General; and it is probable that he may endeavor to secure from the French government through the Chamber of Deputies a legislative resolution which shall effectually affirm the legality of the acquisition of the canal by the United States.

There is good reason to believe that informal preliminary assurances have been received from the French government that everything will be done that is necessary to assure a perfect title. It is also expected that the Attorney-General will have access to the records of the French courts bearing on the subject, and authorization from them to secure from a higher tribunal further evidence on the sufficiency of title. The continued friendly feeling between the two governments is certain to dispose of this vital question at an early date in a manner satisfactory to the President.

We trust that the treaty negotiations which are to be undertaken with Colombia will meet with such encouragement that the preliminary arrangements will be completed by the beginning of next year. The President and Cabinet are to be commended for acting so promptly in carrying out the provisions of the law on this most urgent question.

SOLUTION OF THE BRIDGE TERMINAL PROBLEM.

Among the many plans that have recently been submitted for overcoming the crowded conditions of street car and elevated railway travel at the Brooklyn Bridge terminal, by far the most simple and effective is that which has just been proposed by William Barclay Parsons, Chief Engineer of the Rapid Transit Commission, at a recent meeting of that body. The terrible congestion at the City Hall center is due to the fact that three great systems of railroad travel meet at the entrance to the Brooklyn Bridge, and unload their passengers to swell the crowds that find their way on foot during the rush hours to the same point; in other words, the congestion is traceable to the fact that at this most important point, instead of an unbroken system of travel, converging to the bridge and passing over it without any transfer of passengers, there is a terminus of extremely limited accommodations. Evidently, the way to relieve the congestion is to break it up by removing the cause.

We have recorded, from time to time, the various plans which have been offered as a relief to the present conditions. The first one, suggested by a special commission of engineers, proposed to extend the trolley tracks northward on Manhattan Island to the other new East River bridges which are under construction, and southward to important connections further downtown, and the plan proposed would certainly have relieved the crowding. But it was radically wrong in its suggestion to carry these tracks on elevated structures, and so add to the serious disfigurement and obstruction to traffic afforded by the present elevated railways.

Mr. Parsons is convinced that any future additions to the railway system of this city must be made underground, and he proposes to secure all the advantages and avoid the drawbacks of the plan just referred to, by making connections between the present bridge and the new bridges and with the district below City Hall Park by means of subways. The proposal, briefly stated, is as follows: Commencing at the Manhattan anchorage of the Brooklyn Bridge, he would depress the railroad tracks, carrying them down on a grade of 4.5 per cent, until they reached the level of the subway tracks which are now under construction. The tracks would enter a great central, underground station, which would be available for both the present subway tracks and those which it is now proposed to bring below ground from the bridge. Here the tracks would swing to the right and to the left, some of them passing in a subway below Center Street, to a junction with the Williamsburg and Manhattan bridges, while others would be carried in a subway below Nassau Street to Maiden Lane, where they would again swing to the left to pass in a tunnel beneath the East River to Brooklyn. By this arrangement it would be possible to maintain a constant circulation of cars from Brooklyn to Manhattan Island by the present bridge, and from Manhattan Island back to Brooklyn by way of the two new bridges and the proposed Maiden Lane Subway and tunnel. The present congestion would by this arrangement be entirely relieved. Incoming and outgoing passengers would no longer crowd to a single point; since the former would alight, some of them, at City Hall Park, and others at the various points in the new subway which are nearest to their destination; while the outgoing passengers would, a large proportion of them, take the Brooklyn cars at various points on Manhattan Island, and only a limited number would walk to the present bridge terminus.

The carrying of the tracks below grade will, of course, remove the necessity for the present Brooklyn Bridge terminal station, and this unsightly structure it is proposed to remove and erect in its place a large municipal building, whose architecture will harmonize with the buildings in the vicinity. We are glad to note that on the presentation of this scheme to the Rapid Transit Commission it was heartily indorsed by all the members of that body. The estimated cost of this work being only $2,752,000, it will be seen that because of the heavy damage costs which would be necessary if elevated structures were built, the proposed trolley subway would be a very much cheaper construction; while its advantages, because of the large union underground station which would be built at the bridge, and the absolute freedom from interference with traffic, to say nothing of the avoidance of any further encumbering of the streets with unsightly elevated structures, render it by far the most practicable scheme yet presented for the solution of this important problem.

SCIENCE IN AMERICA.

From time to time, the status of pure science in America is made the subject of more or less acrimonious discussion. One of the most trenchant opinions which has been delivered in some time on the subject, comes from the pen of Prof. Carl Barus, of Brown University, who writes in a recent number of Science with a candor that is refreshing.

Among other things, our self-distrust is sharply criticised. We are not quite certain that we have among us a great savant until we are told so by foreign scientists. Contrasting the reception accorded to a German scientist in Germany and a French scientist in France, it must be confessed that we treat our own men rather shabbily. Whenever he reads a scientific paper before some learned society, the German chemist or biologist, figuratively speaking, takes off his hat to the work of his countrymen. The Englishman waxes enthusiastic over results achieved by British men of science, and a Frenchman will pay many a graceful compliment to some scientific compatriot who has worked in the same field. That science should know little or nothing of patriotism may be true enough. The pessimistic Schopenhauer even went so far as to declare in his clever, bitter way that patriotism in science was but another form of bigotry.

But if American scientists should not flaunt the stars and stripes in the face of the foreigner, yet they should at least take a certain pride in what their countrymen have accomplished. For Americans the aristocracy of science resides in England, although it cannot be denied that the Continent too has its attractions. Prof. Barus tells us that our scientific men are apt to outgrow first the American Association, then the National Academy, and finally even their own country.

All this may seem to point to a well-devised scheme of gradation. But the question arises: Can we ever hope to reach intellectual maturity in the eyes of the world if we belittle the dignity of our own institutions? Self-confessed incompetency, says Prof. Barus, may be a virtue, but one should at least first be sure that the incompetency really exists. Although we cannot agree with the Professor in believing that if Europe were to close her gates to American scientific research, no greater blessing could befall us, we do believe that American achievements in scientific research should receive as full a meed of recognition in this country as they do in Europe.

THE "BLINDNESS" OF THE SUBMARINE.

In 1899, the largest of all submarine boats, the "Gustave Zédé," successfully withstood her first trial. The results were so satisfactory that French naval architects immediately and enthusiastically advocated the introduction of submarine craft in the French navy. Even the public showed unusual interest in the construction of these new vessels; for the Paris newspaper, Matin, received subscriptions sufficient in amount to pay for the two boats, "Français" and "Algérien." M. Lockroy, Minister of Marine, who traveled through Germany for the purpose of studying German industries, was one of the strongest advocates of the submarine boat after the "Gustave Zédé" had been placed in commission. In the Chamber of Deputies he advocated with all his ardor the building of submarines, maintaining that "once the submarine boat was blind, but now it can see." That statement must be taken with the proverbial grain of salt. Indeed, naval officers have time and again complained of the blindness of submarine boats. For that reason it is not to be wondered at that many attempts have been made to provide eyes for the new vessel.

The exact nature of the provisions that have been made have, of course, been kept secret. Indeed, every new piece of machinery that is introduced in the submarine boat is carefully concealed from the inquisitive intruder. At all events, it is quite certain that the first suggested plan of using searchlights, to dispel the submarine darkness, is not practicable, for the reason that the rays of light illuminate but a small portion of the vessel's course. Some years ago, during the diving experiments with the "Goubet," a French journalist was said to have been engaged for the purpose of bringing home to the French people the terrible efficiency of the new craft. He performed his task with startling success. He described how easily the boat sank beneath the water and rose again to the surface; how easily it was guided, and how comfortable were its accommodations. It is true that the boat never journeyed for any distance; that no torpedoes were launched, nor that any other offensive virtues were developed. But one phenomenon at least he described truthfully. He positively asserted that nothing could be seen from the interior—nothing but a mass of water.

Instead of using searchlights which would be of service only for such submarine vessels as are employed for wreckage purposes, optical instruments are provided. But these instruments must of necessity protrude from the water. That circumstance in itself is a sufficient proof of their untrustworthiness. Water is wet; and wet lenses can hardly produce clear images. The sea is almost always agitated. Even the smallest ripples may be sufficient to destroy the serviceability of the instruments used.

The optical apparatus to which we refer, and which may be generally termed "périscopes," are not by any means very recent inventions. They are almost as old as the submarine boat itself. Their efficiency has ever been doubted in all countries except France. The daily press is chiefly responsible for the exaggerated praise that has been lavished upon them; and the press accounts, in somewhat diluted form, to be sure, have filtered into the technical papers. A French technical journal, for example, publishes in a recent number an article that bears the title "La Vision dans les Bateaux Soumarins et les Submersibles." No less than six instruments are described, which are catalogued as follows:

1. Lunette de Drzewiecki.
2. Périscope du Colonel Mangin.
3. Périscope du Commandant Darrieus.
4. Lunette de M. Romazzotti.
5. Lunette de MM. Garnier et Romazzotti.
6. Lunette de Daveling et Violette.

Of these, the first is preferred; for the paper in question assures us that "this system is exceedingly simple, and is perhaps the best." In commenting on the apparatus, it may be skeptically remarked that the arrangement is certainly simple—so simple that its efficiency may well be doubted. The original description of this instrument reads: "Elle est composée d'un tube ayant à chaque extremité un prisme droit à reflexion totale. La lunette coulisse dans un presse-étoupe. On peut la faire rentrer ou sortir du navire et, de plus, en la faisant tourner autour de son axe, on parcourt tout l'horizon." The description is certainly meager enough. No sketches are given. It is furthermore stated that the instrument is only five centimeters in diameter, and that only one eye can be used in viewing an object. Even in France this "best" optical instrument for submarine boats has been criticised; for the article concludes: "We believe that the most practical instrument would be the two-prism apparatus of Drzewiecki, provided it could be given a length of 50 centimeters and a diameter of 15 centimeters. The angle of vision would then be about 18 degrees instead of the present 4 degrees." The images are said to be clear. The inventor, Drzewiecki, is a Russian who first made his appearance in France during the nineties.

The other instruments of the list are similar in character. Mangin's périscope is 1 meter long, 30 centimeters in diameter and produces reduced distorted images. The instrument invented by Commandant Darrieus, who is said to have "commanded several (*sic*) submarine boats while he was still a lieutenant," is very similar to the Drzewiecki apparatus. The lenses are, however, somewhat differently

arranged. The angle of vision is only 4 degrees. The length of the instrument is 1 meter, and its diameter 30 centimeters.

Romazzotti designed the "Gustave Zédé." It may, therefore, be inferred that the boat is also provided with his telescope. But nothing definite is known. Romazzotti collaborated with Garnier in the invention of a telescope that may be deemed an improvement upon his own. Both apparatus are said to have an angle of vision of 20 degrees, and to have a length of 1 meter and a diameter of 30 centimeters. The contrivances of Daveling and Violette, about which no little ado was made in 1899, are merely modifications of the Garnier-Romazzotti instrument. The images are said to be small and the apparatus not easily manageable. The Italian engineers, Russo and Laurent, have also attempted to solve the problem of providing submarine boats with eyes. Their compatriot, Albrizzi, has succeeded in introducing his own instrument. Of this last contrivance nothing is known beyond the fact that it is an "improved périscope" of wide angle. Finally, the submarine telescope of Malachowski must be mentioned—an instrument which was primarily intended to reveal objects at the bottom of the sea, and which has never been practically used.

THE METRIC SYSTEM IN THE TEXTILE INDUSTRY.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Prof. Roberts Beaumont, the well-known English textile technologist, is strenuously advocating the adaptation of the metric system to the textile industries. and the publication of an international list of definitions for the various technicalities in the trade to facilitate business. At the present moment great confusion exists upon this point, since mechanics in the textile industries in various parts of the United Kingdom have a variety of terms to indicate the same subject, while the terms in America are also different, thus increasing the perplexity of the complication. For instance, the Scotsman defines his yarns as "cut;" the West of England weaver, "snap;" the Yorkshireman, "skein;" and the American, "run." When the subject is that of the "setting" or fineness of the fabric, the words "set," "reed," and "sley" are respectively employed.

Again, confusion also exists in connection with the units of length and weight. For example, in two textile districts, although a similar unit of length is in existence, the unit of weight varies. Corresponding terms are used ("cuts" of 300 yards), but the weights are 24 ounces and 26 ounces respectively. No doubt the latter were fixed by some ingenious manufacturers when secrets of the trade existed, with the object of throwing dust in the eyes of each other; for if a man in one district, in speaking to a confrere in the other district about any cloth produced, referred to the yarn as a 20-cut, it would be different in diameter to the same counts of yarn in the latter center. Further, the term "set," which is quoted 40's, or any other workable number, implies very dissimilar results in different towns, on account of the units of widths being 24¼, 36 and 37 inches respectively.

To the average mind these are sufficiently heterogeneous conditions for the manufacturer to have to contend with, but they are intensified by the trade of to-day demanding that in the same fabric, yarns of wool, worsted, cotton, and silk should be combined. The unnecessary difficulties which ensue may be briefly elucidated by considering how the weight of fabric is determined; namely, by the diameter or thickness of the yarn, and by the length of the yarn in a given area.

Suppose that in the fabric there are compound threads, say of wool, worsted, and mercerized cotton. Here at once three systems of counting yarns have to be dealt with—the woolen by the yards per drachm, the worsted by the hanks of 840 yards per pound—resulting in several calculations before the actual counts of the three-fold thread can be ascertained. It is remarkable that the trade should for such a period have endured these unsatisfactory methods, and that firms of this country should hitherto have not only practised them, but rather enhanced their complexity by the coining of other words and equivalents, such as "runs" and "grains." Our experts are now, however, making a strong stand for the adoption of the metric system, and a standard unit of counts, whatever the kinds of yarn spun.

The committee appointed by Congress to examine into the systems of coinage, weights, and measures have recently issued their report, which embodies the views of the principals of the textile schools of this country. The decision of the International Congress, held at the Paris Exposition in 1900, on this very same subject is approved by the committee, namely, one universal system of counting yarns, the basis of which would be that a No. 1 yarn would be a length of 1 meter weighing 1 gramme; or in other words, a length of 1 kilometer weighing 1 kilogramme. This method is identical in principle to the Yorkshire "skein," in which a 1's yarn is equivalent to a length of 1 yard weighing 1 drachm.

In a statement which was read before the Associated Chambers of Commerce in London in 1895, Prof. Beaumont suggested that a fixed number of meters (1 kilometer) should be taken as a unit of length, and the kilogramme as the basis of weight. This is exactly the method that was subsequently recommended by the Paris Congress of 1900, and now advocated by the textile technologists of this country. An alternative system advanced in 1895 was the use of a constant length, say 10 or 100 meters, and a variable weight, the counts being indicated by the weight of the yarn in grammes. It is important to differentiate between these two bases on which yarns may be calculated; in one there is a variable length and constant weight, and in the other, a constant length and a variable weight. The latter suggestion has one element in its favor, for in calculating folded yarns it is only necessary to add them together, whereas in systems where the length varies and the weight is constant, the calculations have to be done by fractions.

The question as to which system should be utilized is one for the experts to determine when all technicalities have been adequately considered, but it is in the interests of the trade that the metric system should be practised, and that "counts" should have the same meaning of whatever fiber—cotton, flax, wool, silk, etc.—the threads may be composed. Such a standardization of lengths and weights would be of universal value, and would considerably facilitate business in this industry between America and England.

THE FRENCH ALCOHOL AUTOMOBILE ENDURANCE TEST.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

It will be remembered that the French Minister of Agriculture organized a series of official tests of alcohol automobiles, the route being laid out through the north of France, starting from Paris. The races were held under unusually trying circumstances, as it rained the whole time and the roads were in consequence very muddy. It was, in fact, an endurance test for the chauffeurs as well as for the machines. Notwithstanding the bad weather, the race was quite a success and the machines, all of which used alcohol as fuel, did remarkably well. This has been the first official test of alcohol automobiles and it will no doubt be followed by others. A speed and a consumption test were held. The route started from Paris, reaching the north coast at Boulogne, following along the coast to Dieppe, then returning to Paris, the total distance being 571 miles. This is the first great speed test of the year, and shows how the new racing machines behave on a long course. Last year the racing cars weighed from 2000 to 4000 pounds, but this year's models are lighter, and do not much exceed 2000 pounds. Maurice Farman carried off the honors of the race and made the record of 72.28 kilometers (44.8 miles) an hour on a Panhard & Levassor car. Marcellin came second (speed, 41.5 miles an hour) on a Darracq light machine, and Jarrot third on a Panhard. In the automobile class four Serpollet steam machines made the best time after Farman and Jarrot, using flash boilers heated by an alcohol flame. The consumption test followed a somewhat shorter route, a distance of 452 miles. Here the consumption of alcohol per ton-kilometer was the important point and speed was a secondary matter. The filling and measuring of the tanks was carried out by a commission headed by M. Famechon. The results are of interest as showing the amount of alcohol used; this amount varies considerably in the different types. The best performance belongs to the Chenard & Walcker automobile class car, which consumed but 65.3 cu. cm. of alcohol (50 per cent mixture) per ton-kilometer. In the light-weight class the Delahaye stood first at 92.2 cu. cm. per ton-kilometer.

THE SECOND PARIS AUTOMOBILE EXPOSITION.

The second exposition of automobiles and stationary motors was held in the vast Galerie des Machines and was even a greater success than the former show. On one side were the exhibits of automobiles and on the other the stationary motors. The center of the hall was occupied by an elliptical race track, on which the automobiles could be put through their evolutions. The racers which had made the north circuit test were all on exhibition, including the Delahaye which had three machines entered, the Gillet-Forest, Panhard and all the leading makes. The Gobron-Brillie Company had an immense ore-hauling wagon, built for a mining company of France. The Serpollet cars were on exhibition, including the famous "Easter Egg" racer which made the speed record at Nice. The alcohol-electric car of M. Krieger is among the novelties; it carries a De Dion motor, as well as an electric outfit with batteries. President Loubet, who is much interested in the subject of alcohol, made an official visit to the show. M. Dupuy, the Minister of Agriculture, is trying, by a series of tests and expositions, to develop the alcohol industry in France. In fact, nearly all the leading automobile firms have arranged their motors so as to use either alcohol or gasoline by a simple change in the carburetion, and the success of the alcohol motor has been strikingly brought out in the north circuit tests which were recently made.

ANALYSIS OF MONT PELEE'S VOLCANIC DUST.

The steamships that escaped from the ill-starred islands of Martinique and St. Vincent after the disastrous eruptions of Mont Pelée and La Souffrière, were literally deluged with the sand that spurted from the volcanoes. One of our correspondents, Mr. A. E. Outerbridge, Jr., of Philadelphia, Pa., assures us that the decks of the steamship "Korona" were covered with a layer of sand three inches in depth, some hours after she left Barbados on the 7th of May, at which time she was about ninety miles distant from St. Vincent.

As a partial recompense for the terrible destruction of their property, it was hoped by the planters that the volcanic dust might contain soil-enriching phosphates. Tradition says that after the dust-shower which accompanied the eruption of 1812 the sugar cane flourished in the West Indies as never before. The remarkable crops harvested in the years immediately following 1812 were attributed to the presence of phosphate and potash salts in the dust.

But the planters of the present day will be doomed to disappointment. Mr. Outerbridge furnishes us with a very full analysis of the sand discharged by the Martinique volcano, from which it appears that the Barbados soils will profit little by this most recent eruption. The sand contains but a small percentage of potash and phosphoric anhydride. In a hundred parts of the dust that fell on May 7, only 0.675 part of potash and 0.141 part of phosphoric anhydride were found. Other constituents of the dust (alumina, titanium oxide, iron oxide, lime, magnesia, soda, etc.) are already contained in abundance in West Indian soils. The planters have merely reason to congratulate themselves that the sand contains no injurious substances and that the texture of the soil may be somewhat improved by the incorporation of the dust with the surface layers.

That the eruption of 1812 was less violent than that of 1902 is indicated by the fact that the dust of the former is composed of much finer particles than that of the latter. The dust of 1902 is almost entirely volcanic glass.

A sample of sand sent to us by Mr. Outerbridge is of rare microscopic interest. Many of the nodules have long spider webs of volcanic glass radiating in spirals, closely resembling those of "mineral wool."

The amount of dust which fell upon the island of Barbados on May 7 and 8 is variously estimated at from one million to two million tons.

THE PARIS-VIENNA AUTOMOBILE RACE.

The automobile race from Paris to Vienna has been run at last, the event taking place on the 27th, 28th and 29th of last month. One hundred and thirty vehicles made the start, but a number of the best chauffeurs were obliged to quit the race after the first day's run, because of accidents. The total distance of 782 miles was divided into three stages, one of which was covered each day. The best time was made by Renault in a machine of his own manufacture, which weighed about 1000 pounds and which completed the journey in 15 hours, 22 minutes actual running time. This is an average speed of 51¼ miles per hour, or as fast as that of many of our express trains. When one considers that in order to maintain this average M. Renault had to go far faster at various times in order to make up for reduced speed in the more difficult places, one is struck with the speeding power of his automobile; but far more striking even than this were its enduring qualities. The roads traversed were some of the worst in Europe, and the route of the final stage of the journey passed directly over the Altberg, a mountain 5000 feet in height, with deep snow on the summit.

The prizes were awarded to the winners as follows: Marcel Renault (light weight class, Renault machine), first; Henri Farman (heavy weight class, Panhard), second; Edmond (light weight class, Darracq), third; Maurice Farman (heavy weight, Panhard), fourth; Zborowski (heavy weight, Mercedes), fifth. Mr. S. F. Edge, an Englishman, won the international cup, reaching Innsbruck, Austria, ahead of his French competitors.

The winning of the contest by a light weight machine was a surprise to many. It is said, however, that the framework of the heavy machines and other parts of their minor mechanism were too light to carry the heavy and powerful motors. As there was a limit of 2250 pounds in the heavy weight class, many of the manufacturers were obliged to sacrifice to weight in some parts that were thus not strong enough to carry the tremendous strains. The contest certainly proved that a light vehicle has as good or perhaps a better chance in long distance traveling over rough roads.