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## GENEROUS CRITICISM—AND THE REVERSE.

Our readers will remember that an American firm not long ago received the contract for building and erecting the spans of the military railway bridge across the Atbara River in the Soudan, the contract being awarded to them entirely on the merits of their bid as compared with those of various English firms which were asked to compete. Not only was the American bid very much lower, but the firm undertook to do the work in a fraction of the time required by English builders.

The bridge was recently completed, and Lord Kitchener, the famous engineer-soldier of the Soudan, in speaking at the opening, complimented the builders on their work, which he said "may fairly well be considered a record achievement." He considered that they had shown "real grit" in their rapid erection of the bridge in the interior of Africa, "so far from home in the hottest months of the year and in dependence upon the labor of foreigners." Such commendation coming from a man who is not only a distinguished soldier but an experienced engineer, is significant.

In a recent issue of *Engineering* the editor reviews the history of the construction of the bridge, more particularly as it concerns the letting of the contract to an American firm, and concludes as follows: "The whole story of the Atbara bridge, relating to the foundations as well as to the superstructure, is full of interest and contains a moral which lies on the surface. The manufacturers of this country must either adopt new methods to cheapen production and increase the rapidity of the output, or they must be content to see orders given wholesale to foreign contractors with whom they cannot hope to compete. The feeble cry of favoritism, inferior material, inferior workmanship, etc., has been heard too long. Let us recognize frankly the danger that besets us and acknowledge the fact that in certain branches of industry we are commercially behind our most active competitors."

In marked contrast with these frank and manly acknowledgments of the skill and enterprise of American bridge builders is the tone adopted by one or two London journals, one of which says, "It now remains to be seen whether this bridge, built in America, on lines condemned by English engineers, will be able to stand the Atbara's rushing floods." As a matter of fact, "Atbara's rushing floods" will have no opportunity to test the stability of American workmanship, for the piers on which the American spans have just been swung are not of American construction, but were built by an Italian firm. The work of sinking the piers was done by this firm, for the reason that there was no English company in Egypt possessing the required plant for that class of work. If the piers should fail to hold up the superstructure, it will be no reflection upon the firm which built and put the latter in place.

The time was when English engineers believed themselves to be unsurpassable in their various lines of work, and it was the fashionable thing to speak lightly of American construction. For the great majority of Englishmen that day has passed, and the criticisms of such men as Lord Kitchener and the editor of *Engineering* may be taken as representative of the opinions of the English people as a whole.

## ECONOMY OF THE ELECTRIC UNDERGROUND TROLLEY.

The annual report of the Metropolitan Street Railway Company, of New York city, which has just been filed at Albany, contains some figures on the cost of operation which afford further proof of the remarkable economy of the underground trolley as compared with the use of horse power. In spite of the fact that the company did not begin to feel the benefit of the change from horse power to electricity on the Sixth and Eighth Avenues and Twenty-third Street lines until last March, the report shows that the cost of operating the system was reduced last year to from 52.3 per cent to 48.75 per cent; and it is probable that the next annual report will show a still more marked reduction. These figures should be compared with those of the

Manhattan Railway and of the Third Avenue cable system, the cable system costing 55.8 per cent of its receipts for operation, and the steam power lines of the Manhattan Railway costing 59 per cent.

It may be mentioned in this connection that the compressed air cars of the Metropolitan Company are now running on the cross-town lines, and, in view of the large amount of attention that has been drawn to the compressed air system during the past year, the comparison of the cost of operating these cars with the cost of the underground trolley cars would be of special interest. The compressed air system of car traction, as carried out by the Metropolitan Company, will form the subject of an illustrated article in an early issue of this journal.

## IN SEARCH OF AN EFFECTIVE TROLLEY CAR BRAKE.

The fact that the New York State Railway Commission is now carrying out a series of tests to determine the best form of safety brake for use on trolley and cable cars in city streets cannot fail to give genuine satisfaction. We do not know of any subject coming within the sphere of their jurisdiction which could be of greater importance to the interest of street pedestrians in our traffic-crowded cities.

Of late years there has been an enormous increase in the weight and speed of street cars, due chiefly to the introduction of cable and electrical systems. While nominal speeds of six or eight miles an hour may be imposed, it is patent to everyone that the actual running speed is frequently twice as great, and where the cars weigh from eight to ten or twelve tons, as they sometimes will, it is a physical impossibility for a brakeman to make an emergency stop with the hand brake, as ordinarily fitted.

The present tests are being carried out upon a section of the Lenox Avenue underground trolley line in this city. All of the manufacturers of safety brakes have been invited to compete, and, according to one of the commissioners, twenty-two different styles of brakes are to be tested. These will be of three kinds, according as they are operated by electricity, by compressed air, or by hand; and after the trials are over the commission will approve of one or possibly two of the brakes of each kind. On the first day's trials the test was made of an electric brake designed by the General Electric Company, the electric car used weighing about 11 tons. Over a dozen tests were made at speeds of from eight to eighteen miles an hour, and an automatic speed recorder was employed to determine the speed at the time the brake was applied and the time and distance required to stop the car. A full account of these trials will be given in a subsequent issue.

It was merely a question of time before this matter was taken up in serious earnestness. The loss of life and the injuries due to pedestrians being run down by trolley cars is simply shocking, and the more shocking because a greater part of it is absolutely preventable. While, of course, many of the accidents are chargeable to carelessness on the part of the motormen, the majority of them are doubtless due to the fact that the brakes are too feeble to bring the car to a sudden stop. We direct the attention of our readers to this subject as one in which there is a good field for further investigation.

## FALL OF THE CHICAGO COLISEUM.

One of those accidents to framed steel buildings which are of all too frequent occurrence has recently taken place in Chicago, where the Coliseum, a structure 304 feet in length by 172 feet wide and 85 feet high, collapsed during erection. It seems that the work had proceeded as far as the erection of the large steel arches which carry the roof. Each arch was a three-hinged steel truss with a clear span of 150 feet, the highest point of the arch proper being 66½ feet from the ground. The arches footed on foundations of concrete which were themselves carried upon piling.

This accident, which involved the instant death of ten workmen and the injury of a large number of others, calls to mind a similar accident to the Coliseum which was being erected in Chicago in the year 1895, when the whole of the steel work collapsed. Another notable instance of this kind was the fall of the steel framework of the shed on the Wilson line pier of New York city. We discussed both these accidents at the time and pointed out, particularly in the case of the Wilson pier disaster, that the collapse was due to the lack of proper temporary bracing between the trusses during erection. It is claimed that more bracing would have been in place at the Coliseum on this occasion if the work had not been delayed by the prevalent scarcity of material; but in any case such huge arches as these at Chicago should never have been erected unless there was ample bracing at hand to give them a reasonable margin of stability. We again commend this most important question to the attention of firms who are engaged in the erection of framed steel structures, and suggest that it would be possible by a judicious use of temporary struts and ties to make absolute provision against collapse, without adding appreciably to the cost of erection.

## THE PROLONGED DISTRESS IN PORTO RICO.

A recent dispatch from General Davis regarding the extent of the Porto Rico disaster proves that the worst fears have been more than realized and that for many months it will be necessary to send a steady supply of food to the sorely stricken island. The General repeats his request that supplies be sent at the rate of a thousand tons a week until further notice. He states the most pressing need is not for lumber for building, but for food, and he thinks that the aggregate cost of the supplies which will be necessary to carry the inhabitants over the intervening period until a new crop of fruits and vegetables has been grown will, perhaps, reach a total of \$1,500,000. It seems that it is impossible to ship lumber from the coast to the interior, because of the complete wrecking of the inland roads; and the immediate efforts of the United States should, therefore, be directed to the mere question of keeping life in the bodies of the homeless people, who are already reconstructing the rough shelters which constitute the houses of the peasants in the interior. Another report states that the coffee and fruit crops as well as the small crops are entirely lost. The oranges and bananas were all thrown down, and a request is sent for the distribution of vegetable seeds of such kinds as may be easily and quickly raised.

It is gratifying to note that the response to the appeals which have been made have been instant and generous, and we are satisfied that the actual extent of the calamity has only to be made known to provoke the sending of all the needed supplies.

## THE PRELIMINARY SPEED TRIAL OF THE "ALABAMA."

The Cramp Shipbuilding Company has made such good progress with the battleship "Alabama" that she has already been enabled to go out for her preliminary builders' trial, and the results are so satisfactory that it is reasonable to expect that this fine ship will exceed her contract speed of 16 knots by from a knot to a knot and a half when she comes to be officially tested for acceptance by the government.

Four runs were made over a measured distance of 11½ knots, and on the last attempt an average speed of 17.2 knots an hour was obtained for the whole course. The run immediately preceding this was made at the rate of 15.43 knots an hour, thus making an average speed for the two runs, under a forced draught, of 16.32 knots. The vessel was not down to her load line, but, on the other hand, her hull was foul as the result of more than twelve months spent in the waters of the Delaware River. A strong wind was blowing over the course, and this would account for the difference in the speeds of the last two runs, the first being made against, and the last with the wind. In the run out against the wind the average speed of revolution was 112, and in the run back 115. The builder, who was on board, expressed himself as greatly satisfied with the trial, and confident of exceeding the contract speed by a liberal margin.

## VELOCITY OF THE WIND.

The great hurricane which wrought such destruction to Porto Rico has furnished remarkable records of velocity. Recent advices from the Weather Bureau station at Hatteras contain some very startling figures, and prove that if we are to register the highest possible velocities of the wind, our automatic apparatus will have to be strengthened accordingly. The greatest velocity occurred shortly after noon, the 17th of August, when records were made which prove this hurricane to have been the most severe within the past seventy-five years.

It seems on the morning of August 16, easterly gales were experienced at Hatteras in which the velocity of the wind ranged from thirty-six to fifty miles an hour. At four o'clock of the morning of the 17th the wind was blowing seventy miles an hour, and at one o'clock P. M. it was ninety-three miles an hour, with extreme velocities of from 120 to 140 miles an hour. At this time the anemometer cups were blown away; but the report states that the wind probably reached an even greater force from three P. M. to seven P. M. of that day. The highest velocity previously reported at the station was eighty miles an hour; this was in April, 1889. The air pressure reached 28.62 inches at eight P. M., and this is the lowest ever recorded on the middle Atlantic coast.

## THE NEW PARCELS-POST TO GERMANY.

There was signed on August 26, by Postmaster-General Smith, for the United States, and Baron Mumm von Schwartzstein, on behalf of Germany, the first parcels-post convention between this country and any of the European nations. We have had parcels-post conventions in existence for some little time between this land and several of the Latin-American republics and West Indian islands, but this is the first convention made on our behalf with any of the first-class powers. England, France, and some others of the powers have sought to effect such an agreement with us, or we have sought them; but thus far nothing definite has come of any of the overtures, save

those with Germany, and none are now under active consideration.

A prominent official of the Post Office Department had this to say, just after the new convention was signed: "One may safely predict that both the United States and Germany will profit alike under the new arrangement. Already with the West Indies and a few countries to the south of us the United States has a creditable parcels-post arrangement which compares favorably with that of England. When it comes, however, to dealing with Europe, the situation is reversed. We have a sample-post, but that is more tantalizing than useful in most cases. Articles can have no salable value, they must not exceed 8½ or, in some cases, 12 ounces in weight, or be more than 12 inches in length, 8 inches in breadth, and 4 inches in diameter; or, if rolled, be over 6 inches in diameter. Only one article of a kind may be sent, and articles for sale are transmitted only when fully prepaid at letter rates, a regulation practically prohibitive. In view of the wonderful growth of the foreign trade of the United States, the conclusion of the convention is to be welcomed as the first step of a system by which parcels can be transported between the United States and Europe, Asia, Africa, and Australia, at rates not outrageously disproportionate to the cost of heavy freightage, thereby opening an avenue for innumerable transactions and creating an intercommunication more important, as binding people together, than the mere extent of the parcels-traffic itself would indicate."

The new convention will go into effect on October 1 next, and by it any mailable package not exceeding eleven pounds in weight may be transmitted from one to the other country at the present merchandise rate. This rate is 12 cents per pound, or fraction thereof, on parcels going from this land to Germany, and at present 2 marks and 40 pfennig (57 cents), whatever its weight, in the other direction. It is expected that a rate of 1 mark and 60 pfennig (38 cents) will be adopted by Germany for all parcels under 1 kilogramme (2 pounds 3 ounces) in weight.

This postal departure, taken in connection with the forthcoming house-registry of letters by carriers, and the new and more complete money-order blanks, just adopted, whereby the sender is enabled to retain a numbered and signed receipt for his sending, gives to the country an earnest of the wide-awake management now at the head of that department. No branch of governmental service comes more closely in touch with our every-day life, and none has it in its power to do more to satisfy the people of the efficiency of an administration. No doubt, the convention just signed with Germany will be promptly followed by like agreements with all of the great powers.

#### SCIENTIFIC CONGRESS AT COLUMBUS.

BY DR. HORACE C. HOVEY.

An analysis of the registration list of the American Association for the Advancement of Science which recently met for a week at Columbus, O., shows that the 353 fellows and members enrolled came from thirty-three different States, besides delegates from Quebec and Montreal. Ohio furnished 113 names, New York 49, the District of Columbia 22, Massachusetts 15, Pennsylvania 21, Michigan 11, and other States from one to five each. The entire list was only one-third as large as that at the Boston meeting last year. But on the other hand more actual work was done, and less time given to social festivities. The attendance exceeded 33 of the 48 meetings held during the history of the association, and the results achieved were highly gratifying.

The entire number of lectures, addresses and scientific papers read and discussed more or less was 273. Chemistry led the van with 55 papers, next came Physics with 40, then Geology and Botany with 33 each, Anthropology with 27, Social and Economic Science with 20, Zoology with 19, Mathematics and Astronomy with 14, Mechanical Science and Engineering with 15, while the remainder were in general session, or shared with the affiliated societies. It should be stated, however, that these nine affiliated societies, meeting before and after the parent association, did a great amount of work by themselves of which no mention is now made in this communication. When it is taken into consideration that the above labor for science was done during what is regarded as "vacation," and at a season when the mercury daily stood above 90° in the shade, it must be acknowledged that scientists are men of zeal and industry.

Among addresses drawing the largest audiences were those bearing on military and naval science. Prof. William S. Aldrich, of the University of Illinois, and who temporarily resigned his place to enlist as an engineer during the war with Spain, described, by the aid of the lantern, "Some Engineering Experiences with Spanish Wrecks." He was an officer on board the repair ship "Vulcan," attached to the fleet of Admiral Sampson, off Santiago de Cuba. The work done was due to the far-sighted sagacity of the Engineer-in-Chief of the Navy, Rear-Admiral G. W. Melville, who fitted out the "Vulcan" with an equipment of tools, raw materials and appliances to do what ordinarily

would have had to be done at a navy-yard. She carried lathes, planers, scrapers, bending-rolls, three brass furnaces, a five-ton foundry-cupola for smelting iron, and was able to make castings and do other foundry work in mid-ocean. Besides maintaining the efficiency of Admiral Sampson's fleet, the "Vulcan" fitted out and repaired the vessels of the Eastern squadron; repaired and fitted out the former Spanish gun-boat "Sandoval," which had been sunk by her captain and raised again by the United States steamer "Potomac." Still later the "Vulcan" overhauled in a similar manner the armored cruiser "Infanta Maria Teresa," that was floated by Hobson. This took five weeks. Then a crew of 44 men from the "Vulcan," with 77 Cuban helpers, volunteered to take the cruiser north under her own steam, convoyed by the "Vulcan" and wrecking tug "Merritt." A hurricane arising, the "Vulcan" spread 40 barrels of lard-oil on the waves, rescued the men, and then had to cut the "Teresa's" towline and let her drive on the coral shoals of Cat Island, at what was thought to be the spot where Columbus first set foot on this western hemisphere.

Prof. C. E. Munroe gave a stereopticon lecture, complimentary to the citizens of Columbus, on the "Application of Modern Explosives." After describing the manufacture of gun-cotton and fulminate of mercury, as carried on at the United States torpedo station, he said that the so-called smokeless powders were mixtures, but he had made a powder of a single substance that could be formed into suitable grains, namely, cellulose nitrate of the highest degree, pure as ivory, which would burn freely, but could not be detonated. This principle was adopted by the Russian government and our own navy and a factory established in 1892. Italy, Germany, France and England adopted smokeless powders, and it seems unpardonable that they should not have been made available for our own service when we were drawn into war with Spain. Among recently invented high explosives is "joveite," extensively tested at Indian Head. A shell loaded with joveite weighing 523 pounds was fired against a Harveyized-steel plate 14½ inches thick of the United States steamer "Kentucky," and completely perforated the plate. Another penetrated 12 inches and burst, breaking the armor plate. No explosive effect has equaled this in intensity. Yet the government has not through responsible officials adopted a high explosive charge for its armor-piercing shells. For ten years Dr. Munroe has been urging the step. He also demonstrated that high explosives might be used in saving as well as in destroying life and property. He gave in closing a detailed description of the destruction of Flood Rock in the New York Harbor.

The section of Botany set aside an entire day to commemorate the life and services of the Columbus botanist, William Sullivant, whose portraits, sketches, and specimens were exhibited, and the results of whose labors were set forth in a series of interesting addresses. Members of his family, and also of the family of his brother, Mr. Joseph Sullivant, and of Leo Lesquereux, who were associated with him, were present. Among the speakers were Profs. Earle, Underwood, Barnes, Hallick, Best, Kellerman, and Mrs. Britton. The field in which Mr. Sullivant won special fame was with the mosses, twelve of which bear his name. Here he was undoubtedly the highest authority, and recognized as such at home and abroad. The exercises were in the Botanical Hall.

Useful and highly appropriate was Dr. Orton's address on the Geology of Columbus and Vicinity. He spoke of the glacial drifts and the source of their material. He showed that boulder clay is largely derived from the comminution of black slate, the remnants of which appear in North Columbus. This unique theory was originated by Hon. J. H. Klippart. The boulders that abound here have been traced to the rocks in place along the Northern lakes. Some of them are known to have come from Lake Ontario. Most surprising is the presence of masses of native copper, some of which are in the University Museum. He directed attention to beds of slate that had been pushed by the ice into folds and wrinkles like those found in the Allegheny Mountains. He described the limestones of the region, and the bone-beds whose contents have attracted so much attention. In connection with the several geological excursions Prof. Orton also gave useful charts and diagrams. Nearly every visitor inspected with delight and profit the objects displayed in the Orton Museum, particularly the Mastodon, Megalonyx and other gigantic creatures, which are not cast, but originals. There are huge logs from petrified forests, besides numerous small and beautiful specimens of fossil corals, trilobites, crinoids and shells.

We listened in vain for any discussion of "liquid air," a matter exciting such interest at the present time, and that certainly should have received a degree of attention, especially as notable progress has been claimed for its manufacture and use during the past year.

But the "kissing bug" was not forgotten, being ably treated by Dr. L. O. Howard, United States Entomologist, in a learned paper entitled "On Some Heterop-

terous Insects Formerly Responsible for Spider-bite Stories." He said that while, after several years of investigation, he had failed to verify by proof even a single case of serious or fatal spider-bite, he found that several bugs belonging to the Reduviidae do inflict painful wounds. He described particularly the *Reduvius personatus*, an imported European species, the *Melanolestes picipes* and *M. abdominalis*, allied native species, and two varieties of *Rahusus*, and several kinds of *Conorhinus*, all of which occur in this country, and whose bites have often been attributed to spiders. He regarded the "kissing bug" craze as phenomenal, and largely due to stories told by the newspapers, based on a comparatively small number of actual cases. It reminded him of the tarantula frenzy that was once epidemic in Europe, with remarkable psychological manifestations, which had thus been reproduced this year in a mild form. Curious instances were told of nervous and even hysterical symptoms that had been produced by simple mosquito bites. The paper was accompanied by an exhibition of specimens and drawings.

#### SCIENCE NOTES.

Sir Edward Frankland, the distinguished English chemist, died in Norway on August 9.

According to *The Chemical News*, Prof. Dewar has succeeded in solidifying hydrogen into a glassy, transparent mass.

Among the great advantages which are claimed for American teas is their absence from sophistication and coloring matter. In the article which we published on the subject a few weeks ago, "dyeing tea" should have been "drying tea." There is no coloring material used at the Pinehurst establishment.

The results of a series of experiments made by German dairy experts show that milk that has been heated for fifteen minutes at 75° C. scarcely loses any of its capacity of being converted into cheese. An addition of calcium chloride shortens the time required by the rennet to coagulate the milk, the action of the salt being in proportion to the amount added.

The work upon the site of the so-called "Palace of Theodoric," at Ravenna, a most interesting building, has now been completed. It seems that the palace dates from an earlier period than that of the great Goth, and it was probably erected by the Exarchs during their residence at Ravenna, and there are signs of its having been used as a barracks for soldiers.

Prof. Cleveland Abbe, in his interesting address on "The Relations of Physics and Astronomy to the Mechanic Arts," and published in the current SUPPLEMENT, says that the demand for measurements of the highest attainable accuracy is characteristic of the study of astronomy and physics, and always keeps in excess of the art of construction. This is only one of the cases where science stimulates the mechanical arts.

The French have the exclusive right to carry on researches in Persia, but half of the finds are to belong to that country. Explorations are now being carried on at Susa, the old capital of the Chaldean kingdom. As the relics are dug up they are sent to Teheran, where they are divided. The Persian government does not care for such finds and sells its share to dealers. This results in the scattering of much valuable material.

According to the *Papier Zeitung*, where it is desired to avoid black specks in paper made in the smoke-laden atmosphere of a manufacturing district, the only effective remedy is the filtration of the air through a woven fabric of fine texture. At Schering's works, in Berlin, where photographic sensitized paper and plates are made, a circulation of air is maintained by drawing in air through cloth filters and expelling the same through powerful ventilators in the roof.

At the present time Portugal with its few colonies and with its great load of debt is not a very important figure on the international stage, yet there was a time when it outranked all others as a commercial and colonizing power, and to that age belonged Vasco da Gama, and his quadracentenary was celebrated a few days ago. On August 29, 1499, he entered the harbor of Lisbon after having doubled the Cape of Good Hope and reaching Calicut on the Malabar coast of India. He was made Viceroy of India in 1524. His discoveries opened the way for the Portuguese empire in India and for other colonizers in the far East.

The International Physical Congress will be held at Paris, from the 6th to the 12th of August, 1900, under the patronage of the French government. It immediately precedes the International Electrical Congress. The subject of the papers, reports and discussions have not been definitely settled as yet. They will involve: 1. The definition and fixing of certain units (pressure, scale of hardness, quantity of heat, photometric magnitudes, constants of saccharimetry, scale of the spectrum, electric units not yet defined, etc.) 2. The bibliography of physics. 3. National laboratories. Visits to the Exposition, to laboratories and workshops and lectures on certain new subjects will also form a part of the programme of the Congress.