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NEW YORK, SATURDAY, FEBRUARY 6, 1904.

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.

NEAR COMPLETION OF THE FIRST HUDSON RIVER TUNNEL.

During the past eighteen months the work of completing the first Hudson River tunnel has made such rapid progress that only about one hundred yards remains to be excavated, before the Manhattan heading is reached. Some time in March it is likely that the officials of the New York and Jersey Railway Company will be able to make the trip—on foot, of course—from Manhattan to New Jersey below the bed of the Hudson River. Now that the ledge of rock which was encountered a few months ago, not far from the Manhattan shore, has been cut through, the shield is being driven forward at a speed that is remarkable for this class of excavation, as much as 26 feet having been covered in the twenty-four hours. A little to the south of and parallel with the tunnel that is now nearing completion, is the second tunnel, the excavation of which commenced in November of last year. The new shield that is being used on this work will progress very much faster than did the old shield, and this for several reasons. In the first place, the diameter is considerably less, and therefore the number of cubic yards to be taken out in a given distance is reduced; secondly, the excavation is taking place entirely through silt, with no rock to hinder progress; and, thirdly, the shield itself is of more modern design, more convenient to handle, and is fully seventy per cent more powerful. Already it has been pushed forward more than 1,300 feet beneath the river, and it is likely the average estimated speed of 30 feet per day will be realized if no unforeseen contingency arises.

CORROSION OF ARCHITECTURAL STEEL.

Although the report of the Insurance Experiment Station in Boston on its recent tests of steel corrosion, under conditions approximating those of steel columns in modern buildings, confirms the results of previous tests of this character, the subject is of such supreme importance that we give herewith a brief digest of the facts. Of course, the value of such experiments depends upon the correctness of the assumption that a severe trial of a short duration gives us the data from which we can argue as to the results of a less severe test, extending over a far greater period. Each specimen of steel was cleaned and incased in Portland cement concrete of varying composition. After the concrete had set for twenty-four hours in air and seven days in water, the specimens were exposed to as severe tests as could be devised, and after various lengths of time the cement casings were broken, and the steel specimens were cleaned, weighed, and measured. The conclusion is reached that if structural steel is incased in a sound covering of good concrete, it is proof against corrosion for a period of years which is so long as to make the subject of more interest to our great-grandchildren's children than to us. In other words, steel, properly covered with concrete, may be expected to last until changes in the laying out of the city, or the substitution of yet more modern construction, necessitates the removal of the building. Obviously, the life of the costly office buildings, hotels, and warehouses that are being erected in such profusion, depends not so much upon the work of the steel-maker, as upon the particular "boss" who has to watch the mixing of the cement and its application to the skeleton steelwork.

EQUABLE TEMPERATURE IN THE SUBWAY.

To those who have a natural prejudice against subway or tunnel travel, there will be a decided compensation in the comparatively equable temperature that will prevail in the New York Subway. During one of the waves of extreme cold that visited the city this winter, the chief engineer had the temperature taken at stated intervals at the street level and in the tunnel below. It was found that on January 5, when the thermometer on the street near the City Hall was one degree above zero, in the Subway below it registered 41 degrees. On the day previous, at nine o'clock in the morning, when the street temperature was 7 degrees in City Hall Park, it was 40 degrees in the Subway below. Other tests showed that when outside temperature fell anywhere below 32 degrees, it averaged about 40 degrees in the tunnel. On the other hand, it has been found that the average temperature of the tunnel in the summer time is about 65 degrees. It is scarcely necessary to explain that the sudden changes of temperature which mark the climate of New York city have not sufficient time to affect the envelop of steel, concrete, and earth surrounding the tunnel, before there is a return to normal conditions. During the winter there must necessarily be a gradual fall of the average temperature in the tunnel; but cold air that is carried in through ventilating openings and at station entrances is compensated for by the radiation of heat from the warm mass of the ground through which the tunnel is cut. In the summer time, the heat that enters the tunnel is absorbed by the same medium; and the indications are that there will be an average difference of 20 degrees between the street and the tunnel temperatures throughout the year.

AN IMPERIAL FLOATING EXHIBITION.

A movement is on foot in Great Britain to institute a moving exhibition, which will at once remind American readers of our exhibition railroad cars, which are occasionally sent out for the purpose of introducing the natural resources of some particular State to the country at large. The scheme referred to is to dispatch a steamer loaded with specimen products of British industries on a tour of the world, the itinerary providing for a call at thirty-two colonial and foreign ports. It is expected that the exhibition will fulfill the double purpose of enabling buyers through the world to personally inspect the manufactured goods of Great Britain, and of bringing the representative of each exhibiting firm in contact with prospective customers and giving them an opportunity to learn in detail what are their peculiar requirements. The itinerary of the steamer includes the ports of Africa, India, Ceylon, Straits Settlements, China, Japan, Australasia, South America, West Indies, and Canada. It is estimated that the round-the-world trip will last about seven months. Although the idea of a floating exhibition on such an ambitious scale is novel, the broad principle is one that is already recognized in this country, and our merchants and commercial bodies will do well to keep in touch with the movement, and ascertain from the American Consul at each port how far it fulfills its purpose.

RELATIVE STRENGTH OF THE NAVAL POWERS.

The navies of the world are in a state of such progressive development, that it is difficult at any given time to state exactly what is their relative strength. In the case of two rival powers which have a number of battleships and armored cruisers under construction, it is quite possible that the balance of strength between the two depends entirely on the forwardness of the work on these new vessels. One nation may be building upon a methodical plan, which insures the delivery of so many vessels each year, while the other may be building in a desultory fashion; in the one case the new ships may be within a year of completion, in the other they may be two or three years behind time.

If we estimate the relative strength upon the basis of the total number of battleships, armored cruisers, and scouts—that is to say, all warships above 1,000 tons displacement—that are actually completed, we find that Great Britain comes first with a total of 201 ships completed, of 1,516,000 tons displacement; France second with 96 ships, of 576,000 tons displacement; Germany third with 73 ships, of 388,000 tons displacement; Russia fourth with 43 ships, of 315,000 tons displacement; United States fifth with 35 ships, of 295,000 tons displacement; Italy sixth with 38 ships, of 259,000 tons displacement; and Japan seventh with 31 ships, of 206,000 tons displacement. All of these navies, however, have a large building programme in hand; and taking them in their order, the names of the countries and the total tonnage of ships under construction are as follows: Great Britain, 351,000 tons; United States, 322,000 tons; France, 180,000 tons; Russia, 139,000 tons; Germany, 118,000 tons; Italy, 70,000 tons; and Japan, 10,000 tons.

Now it is evident that if these new ships could be completed at once, there would be a great change in the relative standing of the navies, for the United States has under construction a larger aggregate of tonnage than that of the whole of her completed navy as it stands to-day. The relative order of strength in such a case and the total tonnage displacement would be as follows: Great Britain, 1,867,000 tons; France, 756,000 tons; United States, 616,000 tons; Germany, 506,000 tons; Russia, 499,000 tons; Italy, 329,000 tons; Japan, 253,000 tons. It will thus be seen that the United States moves up from fifth to third position, with a long lead over Germany. It is interesting to note, by the way, the great preponderance of the strength of the English-speaking naval powers, Great Britain and the United States. In regard to the British navy, it is noteworthy that at her present rate of building she is greatly exceeding the mark of strength which she is popularly supposed to have set herself, namely, that her navy shall equal the combined strength of any two continental navies. As a matter of fact, were the present building programmes completed, her navy would equal in tonnage that of the three most powerful continental navies, France, Germany, and Russia, and would have 117,000 tons to the good at that; while a combination of the British and United States navies would give a total of 2,484,000 tons, which would be within 10,000 tons of equaling the total tonnage of all the other navies of note in the world, including that of Japan. On the side of the English-speaking combination, there would be the great advantages of a common tongue and great size and speed of individual ships, while a world naval combination would suffer from the enormous disadvantage of being heterogeneous in speech, race, and in the classification of its ships. We confess that while we had a general impression of the naval predominance of the English-speaking race, we were not prepared to find that the development of the navies of the two countries had so greatly outrun that of the rest of the world. To these considerations may be added the fact of the incalculable strategic advantage that the countries possess in a chain of coaling stations and dockyards scattered throughout the high seas, that would give them incomparable facilities of refuge, repair, and replenishment in the event of a world-wide conflict.

THE GRANTS OF THE CARNEGIE INSTITUTION.

The last annual meeting of the trustees of the Carnegie Institution was noteworthy for the fact that the sum of $200,000 was set apart for scientific research during the fiscal year of 1902-1903. The institution has been working silently since its inception, but none the less effectively. The grants which have been made may be considered as a most fitting recognition of scientific services rendered by the foremost living savants. Even he whose interest in science has made him familiar with the current work of many investigators, will doubtless find among the list of men who have thus been honored many whose names are unknown to him, but whose work is for all that worthy of encouragement.

It is impossible in this brief space to enumerate all the grants which have been made; for these, the reader must be referred to the last three numbers of the Scientific American Supplement, in which all the awards are given, together with a brief abstract of the scientific work done by each investigator who has been honored.

We may be permitted, however, to call attention to a few scientists, the brilliancy of whose work has been bedimmed in the glamor of the more startling discoveries which have attracted the world's attention. Among the grants made to men who are not so well known to the world as they ought to be, may be mentioned that to Mr. Lewis Boss for investigations upon the motions of brighter stars, and of all stars of whatever magnitude supposed to have motions as great as ten seconds per century, and any other stars that were especially well determined prior to 1850. The sum of $5,000 awarded to him was not too much for so extensive an investigation. Prof. George E. Hale's grant of $4,000 was well spent on the photographic study of stellar parallaxes with a 40-inch telescope. When it is considered that 114 plates containing about 350 exposures have been obtained, some idea of the value of the work may be gleaned.

New tables of the moon are urgently required for the purposes of astronomy and navigation. For a long period the problem of constructing and perfecting such tables has been delayed by an unexplained discordance between the observed motion of the moon and the motion which should result from the action of all known bodies upon it. The exact cause of this discordance cannot be recorded, because the observations made from 1750 to 1850 have never been worked up and compared with the tables. By the aid of a grant from the Carnegie Institution, Prof. Simon Newcomb was enabled to take up this work with results that will be of benefit not only to science, but to commerce as well.

Among the larger grants, must be recorded that of $10,000 to Dr. Robert Fletcher, of the Army Medical Museum, for preparing and publishing the "Index Medicus." Established in 1879, under the direction of Dr. J. S. Billings and Dr. Robert Fletcher, the Index was discontinued in 1899 for lack of pecuniary support. The scope of the work is broad. It contains in classified form, month by month, reference to everything published throughout the world which relates to medicine or public hygiene.

It is particularly gratifying to note that Prof. H. N. Morse, of Johns Hopkins University, has been awarded

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$1,500 for researches on osmotic pressure. Although osmotic pressure has been recognized for twenty-five years as one of the great forces of nature, no direct measurements have been made to furnish an adequate experimental basis for the laws supposed to govern it. Prof. Morse has been engaged for several years in attempting to overcome the difficulties which lie in the way of quantitative measurement of osmotic pressure.

Not the least important of the chemical investigations carried out under the auspices of the Carnegie Institution was the determination of values of atomic weights by Prof. Theodore W. Richards, of Harvard University. Prof. Richards has submitted a memoir, about to be published by the Carnegie Institution, containing the records of his experiments on a new method of determining compressibility. By means of this method, the compressibility of bromine, iodine, chloroform, bromoform, and other substances has been determined over a range of 700 atmospheres.

One of the most important investigations which has been carried on through the munificence of the Institution is that of Prof. Durand, of Cornell University, on ship resistance and propulsion. Very gratifying progress has been made in the preliminary measurements, speeds having been determined from distance and time records in 444 cases, and thrust turning momentum determined by integration in 655 cases.

Lastly we must mention an award of $500 to Prof. Atwater, of Wesleyan University, for researches involving the direct determination of the amount of oxygen consumed by man for sustaining the bodily functions. Readers of this journal are doubtless familiar with the elaborate series of experiments conducted by Prof. Atwater with his respiration calorimeter, experiments which have cleared away many a doubt as to the relative nutritive values of various foods. The grant to Prof. Atwater has been expended chiefly for designing and constructing or purchasing apparatus for developing methods of determining oxygen and for tests and experiments made with the apparatus. An award of $6,000 to Dr. Gamgee was made for work in the same field, in order to prepare a report on the physiology of nutrition, which was the task assigned to him. He began by inspecting European laboratories and by visiting scientific men in Europe. It goes without saying that the work of Prof. Atwater formed not the least important subject of his studies.

CARROLL DAVIDSON WRIGHT.

BY MARCUS BENJAMIN, PH.D.

The time-honored custom of alternating the selection of a representative from the sections devoted to the physical sciences with one from the sections devoted to the natural sciences, for the presidency of the American Association for the Advancement of Science, failed to prevail at the Washington meeting held last winter, when a conspicuous departure from that practice was made by the election of a distinguished representative of the section on Social and Economic Science, whose eminence was sufficient to carry him without opposition into the highest office to which an American scientist can be chosen.

Carroll D. Wright is of worthy New England ancestry, being descended on the paternal side from early English colonists, and on his mother's side from the Davidsons, who were of Scotch blood. He was born in Dunbarton, N. H., on July 28, 1840, and received an academic education. His natural inclination would have led him to college, but he early began to teach, and with such success that he soon became the assistant principal of the Mount Cæsar Seminary, in Swanzey, where he also began the study of law.

The coming of the civil war was a serious event to the young men of New England, and Wright was quick to offer his services to his country, enlisting as a private in the Fourteenth New Hampshire Volunteers, of which in 1864 he became the commanding officer.

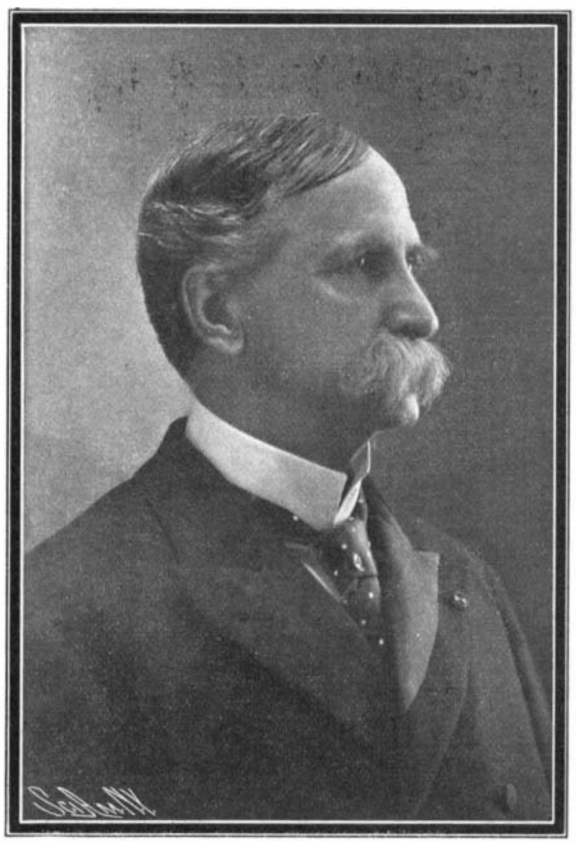
At the close of the war he returned to his chosen profession, and in 1865 he was admitted to the bar of Keene, N. H. He selected patent law as his specialty, and settled in Massachusetts. For ten years he devoted himself to the practice of his profession, in which he was thoroughly successful. Meanwhile, Col. Wright's marked influence over men was made conspicuous in his new home by his election, in 1871, to the Massachusetts Senate, in which body he served for three years, rendering valuable services, and especially as chairman of the Committee on Military Affairs.

His ability was so evident that it commended itself to the governor of Massachusetts, who in June, 1873, at the close of his senatorial career, appointed him chief of the Massachusetts Bureau of Statistics of Labor, which office he then held until 1888, also during that period taking the decennial census of Massachusetts in 1875 and again in 1885. In addition, he was supervisor of the United States census for the State of Massachusetts in 1880, and subsequently a special agent of that work to investigate and report on the factory system.

In January, 1885, he was called by President Arthur to the higher office of National Commissioner of Labor in Washington, which place he still holds, although he will soon retire to actively fill the presidency of Clark University, in Worcester, Mass., to which he was elected in 1902. In addition to the regular duties of his office, President Cleveland intrusted the completion of the eleventh census to him in 1893, in charge of which work he remained until 1897.

No event in recent years in the history of the United States is comparable in importance with the agreement made during the autumn of 1902, on the part of the coal miners of Pennsylvania on one hand and the operators on the other, to submit their differences to arbitration, and with this agreement Col. Wright had much to do. It may be well, however, to emphasize the fact that the many years of experience in treating similar matters in his annual reports had given Col. Wright a wide range of knowledge, and also it must be remembered that in 1894 he had had much practical experience, for he served as chief of a commission that was appointed to investigate the strike in Chicago during that year. It was therefore most natural, when the great strike in the coal regions of Pennsylvania began to be felt by the public, and the necessity of bringing it to an immediate end was apparent, that President Roosevelt at once turned to Col. Wright as the best and most competent intermediary. During the preliminary arrangements, Col. Wright was in constant consultation with the President, and on the creation of the Anthracite Strike Commission he became its recorder. He more than anyone else guided the deliberations which so happily caused the termination of that terrible strike.

Col. Wright's knowledge of social economics has



CARROLL DAVIDSON WRIGHT.

been taken advantage of by educational institutions, especially in Washington, for he has served as honorary professor in the Catholic University of America since 1895, and he has also held the chair of statistics and social economics in the school of comparative jurisprudence and diplomacy of Columbian University since its foundation. Harvard, Johns Hopkins, Michigan, Northwestern, Brown, and Dartmouth, have invited him at different times to deliver courses of lectures before their students. In other ways he has also been active, and conspicuous among these is his selection by Mr. Carnegie to serve as a trustee of the richly endowed Carnegie Institution in Washington.

His contributions to science have been large, and include more than fifty annual reports, together with many pamphlets and monographs on social and economic topics. His larger works are "The Factory System of the United States," "Relation of Political Economy to the Labor Question," "History of Wages and Prices in Massachusetts, 1752-1883," "The Industrial Evolution of the United States," and "Outline of Practical Sociology."

Dartmouth has conferred upon him the degree of Ph.D., and Wesleyan, Clark, and Tufts that of LL.D. He is one of the very few corresponding members of the Institute of France in this country, an honorary member of the Imperial Academy of Science of Russia, a member of the International Statistical Institute and of the International Institute of Sociology, and an honorary member of the Royal Statistical Society of Great Britain. At home he succeeded Gen. Francis A. Walker as president of the American Statistical Society, and he is a leading member of the American Social Science Association, a councilor of the American Economic Association, and a member of the American Academy of Political and Social Science.

He joined the American Association for the Advancement of Science at its second Washington meeting in 1891, and in 1894 was made a fellow. Col. Wright continued to take an active interest in the section on Social and Economic Science, of which he became chairman in 1902, as well as vice-president of the association. He presented at the Washington meeting a retiring address on "The Psychology of the Labor Question," and he will preside at the meeting to be held this week in St. Louis.

In the years to come it is his hope that he may be permitted to live in Worcester, Mass., a well-known educational center, and there, as president of the university to which he has been called, pass the remaining years of his life in giving from the rich stores of his accumulated knowledge and experience to those who shall have the honor of listening to the wisdom from his lips. Fortunate, indeed, will be those who shall have that privilege.

PREVENTING FROST ON SHOW WINDOWS IN WINTER.

During winter weather many shopkeepers experience more or less difficulty in keeping their show windows free from the ice that in low temperature tends to defeat the object of the display. No doubt all of the devices for keeping glass clear of ice, published from time to time in the journals, have received a fair test, with varying satisfaction. A writer in one of the foreign drug journals, apparently a druggist who has experienced the rigors of high latitudes, insists that none of the ordinary schemes are of much use, and that the only certain remedy for the opaque deposit of solid water is a double layer of glass with a sufficient airspace between. He states that applications of glycerine, alcohol, and other solutions are of no avail in extreme weather and that, in any case, they must be so frequently renewed that they become extremely troublesome. In the northern portions of Russia, where zero weather is sufficiently common, experience has taught the owners of show windows that the only effective protection is a three-inch air space between two panes of glass. The outer sash is rendered as nearly tight as possible by calking the chinks and pasting strips of paper over the crevices. The glass is then carefully cleaned and dried on a clear, mild day, and a second sash, fitted with the same care to prevent all circulation of air, is inserted about 3 inches within the first. The double panes are said to obstruct the view very little. The physical cause of the deposit of moisture and ice upon windows is the difference in temperature between the surface of the glass and the air bearing a relatively high proportion of moisture, which comes in contact with it. As long as the glass is as warm as the circulating air, there will be no deposit, nor when its temperature is higher than the dew-point of the moist air. Warm air is able to carry a much larger proportion of water than cold air, and the problem therefore resolves itself into a question of keeping the glass warm or the air dry.

A small electric fan in the window two or three feet away seems to answer this purpose well. Probably the moisture is all dried off, hence leaving nothing to freeze; anyway, the glass is perfectly dry and clear.

DISPERSION OF FOGS BY ELECTRICITY.

Sir Oliver Lodge has tried at Liverpool to disperse fogs, using for this purpose a Wimshurst influence machine which discharged by means of a bundle of points into the air. A very high potential is necessary, and to increase the surface a large gas flame was used to supplement the points. On one occasion the discharge of electricity from the flame was sufficient to keep a clear space of fifty or sixty yards radius in a dense fog. Although these experiments were promising, the Wimhurst machine did not seem suitable for everyday use, and there was no other generator which would give a sufficiently high direct voltage to do the work. To overcome this difficulty, Sir Oliver now uses the rectifying properties of the Cooper Hewitt mercury vapor lamp . . . This arrangement gave him unidirectional sparks two or three inches long, and was very effective in laboratory experiments. To dispel the fog in a circle of fifty or sixty yards' radius is a noteworthy performance, but the general application of this method seems to be rather far off. The cleared area will have to be extended much more than sixty yards from the discharge station before the system can be of use in harbors or at sea, thus necessitating the use of very high voltages, such as are at present impracticable. There are, however, waterways—such as the Manchester Canal or the Chicago River, in which the channel is narrow and the traffic very great—where a system of dispelling fogs only slightly better than this would be very useful. It is to be hoped that Sir Oliver will carry on his work and will be able to report much more successful experiments before long.

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