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NEW YORK, SATURDAY, DECEMBER 26, 1903.

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.

PROPOSED NEW PATENT OFFICE BUILDING AT WASHINGTON.

It is a notorious fact that the present Patent Office building at Washington is quite inadequate to accommodate the growing business of the Patent Office Department. Not only so, but for a great number of years it has been necessary to find for a large amount of documentary and other material of priceless value temporary, makeshift quarters. The present building is not of fireproof construction, and it needs no multiplication of words to prove that the records of such an important institution as this should be stored where they are entirely protected from damage or absolute loss. Furthermore, the congestion of records is not the only disadvantage under which the lack of accommodation places the department, for one has only to read the annual reports of the Commissioner to be convinced that the work of the general staff has been rendered doubly onerous, and is to a certain extent delayed, by the uncomfortable crowding of the past few years. Year by year an urgent appeal has been made for the amelioration of the present conditions; but for reasons which it is difficult to exactly determine, Congress, while acting with lavish liberality toward some other institutions of far less national importance and merit than this, has so far shown no disposition to move in the matter.

The subject is once more about to be brought to the front by the introduction of a bill which will deal with the proposition in a very comprehensive manner. It is proposed to purchase the large lot of ground lying to the east of the Capitol, and located between East Capitol and B Streets, North, and between First and Second Streets, and erect thereon a monumental fireproof building at a cost of five million dollars, which shall harmonize in architecture with the adjoining Library of Congress, and shall match it in size and dignity. A magnificent square would thereby be provided, with the Capitol on one side and the Library and Patent buildings opposite. The building is to contain suitable offices for the accommodation of the Commissioner of Patents and the working force of the Patent Office, suitable rooms for the storage of records and other documentary matter, and a great "Hall of Inventions," for the display of models and designs of inventions and for their arrangement as far as may be on historical lines, so as to constitute a concrete record of the evolution and development of invention in the United States. The building, as thus erected, will bear to invention the same national relation as the present magnificent Library does to literature. The proposed plan has been submitted to the committee that has in charge the ambitious scheme for the general landscape and architectural beautification of Washington, and has received their unqualified indorsement. Indeed, such a structure would form one of the most important architectural elements in that scheme, and by its erection the United States as a nation would give worthy recognition in their capital city to Invention—a field of human activity in which, perhaps more than in any other, the United States is held, and justly held, to be pre-eminent among the nations of the earth.

Moreover, there is at the present time over five million dollars to the credit of the Patent Office in the Treasury.

BRUNEL AND THE "GREAT EASTERN."

The fascinating interest which will always attach to the "Great Eastern" has been greatly stimulated by a recent paper read by Sir William White, the new President of the British Institution of Civil Engineers. It would be difficult to find an authority better qualified to discuss the technical merits of Brunel's great ship, for Dr. White was the designer of practically the whole of the great British fleet as it floats to-day; many of our own naval designers, including Rear-Admiral Bowles, the late chief constructor of the navy, have studied under him; and no naval architect of the last thirty years has left so profound a mark upon the theory and practice of naval construction. The estimate of the merits of the "Great Eastern" formed a part of an exhaustive review of marine shipbuilding and engineering during the half century or more covered by the professional life of the speaker, and so important was the part played by this famous ship that a great part of the address was devoted exclusively to this subject.

It was at the close of the year 1851 that Brunel began to study the problem of constructing a vessel that could carry sufficient coal for a voyage to Australia and back and provide accommodation for a large number of passengers and a certain amount of cargo. Although he sought advice and assistance in all quarters, it is clear that all the leading features of the design—that is, the structure, propelling machinery, and determination of dimensions—were his own. Dr. White states that he has been familiar with the facts for many years, and that he has recently gone once more, most carefully, through Brunel's notes and reports, with the result that his admiration for the remarkable grasp and foresight displayed has been greatly increased. In fact, Brunel displayed a knowledge of principles such as no other ship designer of his day seems to have possessed, and in proof of this, reference is made to the provision of ample structural strength with a minimum of weight; to the increase of safety by watertight subdivision and cellular double bottoms; to the design of special propelling machinery and boilers with a view to economy of coal and wide radius of action; and to the selection of forms and dimensions likely to minimize resistance and produce a vessel that would be easy in a seaway.

We receive from time to time so many queries as to the exact dimensions of this vessel, that we take this opportunity of repeating the correct figures as taken by Dr. White from Brunel's notebook: The length over all was 693 feet, and between perpendiculars 680 feet; the extreme breadth of hull was 83 feet; the breadth over the paddle boxes, 120 feet, and the depth of the plated hull was 58 feet. The "Great Eastern" could steam at 14 knots an hour and had accommodations for 3,000 people. Compare these figures with those of the most powerful Cunard steamers of that time, which were only 285 feet in length. Nearly half a century elapsed before these dimensions were surpassed by the launch of the "Oceanic," which is 704 feet in length over all. The lines of the hull were drawn by Scott Russell, and they were based upon his well-known wave-line theory. It is evident from Brunel's notes that the estimate for engine power to obtain the desired speed of 14 knots was made by Brunel in conference with Russell. Dr. White makes the significant statement that having carefully looked into the matter in the light of personal knowledge, he is of the opinion that the estimate of power required to drive the "Great Eastern" at 14 knots on an average draft of 25 feet, is practically identical with that which would now be made for the ship if propelled by twin screws—a very remarkable result, when we bear in mind the enormous size of the "Great Eastern" in comparison with any other steamer at the time she was designed.

Furthermore, the structure of the "Great Eastern" was not merely a marvel, but considering the date of her construction it is still, in the judgment of the late chief constructor of the British navy, a most fruitful and suggestive field of study. Brunel was a bridge builder, and he carried the principles of bridge design into his ship. To him a ship had always been a girder from the time when he designed the "Great Western." In the "Great Britain," an iron ship, he introduced new structural arrangements; and that vessel did good work for forty years as a steamer; was then converted into a sailing ship, and finally did duty as a hulk in the Falkland Islands. When he began work on the "Great Eastern" he laid down the principle of construction "that no material shall be employed on any part, except at the place and in the direction and in the proportion in which it is required and can be usefully employed for the strength of the ship, and none merely for the purpose of facilitating the framing and first construction." The "Great Eastern" fully vindicated the structural theories of her designer. She carried enormous loads of submarine cables; passed without structural injury through severe storms; a gaping hole, 10 feet broad and 80 feet long, was torn by the rocks off Montauk Point through her outer skin, yet she reached New York without her passengers being aware of the damage done. In concluding his address, Dr. White sums up with the startling statement that he has most thoroughly investigated the question of the weight absorbed in the structure of the "Great Eastern," and that his conclusion is that it is considerably less than that of steel-built ships of approximately the same dimensions and of the most recent construction. After making full allowance for the greater speed, more powerful engines, and heavy superstructure of large modern passenger ships, it is concluded that the "Great Eastern" was a relatively lighter structure, and this in spite of the fact that at the time she was built only iron plates of very moderate size were available and that the plates used for the outer and inner skin were only three-quarters of an inch in thickness.

SOME EARLY SUBSCRIBERS HEARD FROM.

At the present season of the year, when our old subscribers send in their renewals to the SCIENTIFIC AMERICAN, the Editor receives a large number of letters which contain ever-welcome criticisms of the year's work; suggestions as to the future; and more often than not, a reference to the early acquaintance of the writer with our journal, and the period of years for which he has been a reader or subscriber. Many of the dates mentioned are so remote, so close to the year 1845, in which the first issue appeared, that the Editor decided to request those who considered themselves to be probably among the earliest subscribers, to give him the facts concerning their first connection with the paper. As a result, he has before him what must surely be one of the most unique, and in some respects one of the most pathetic, batch of letters that ever reached an editorial desk. No more convincing evidence of the genuine nature of these replies could be asked than the evidence of age that is shown in the faltering chirography of some. Of those who took the trouble to write, it is found that six have been continuous subscribers for a period of fifty-nine years, or from the very year in which the paper was started, while two others commenced their subscription in 1846, four in 1847, and two in 1849. Fourteen of our correspondents were entered on our lists during the five years from 1850 to 1855, and fifteen more date back to the period 1855-1860. In addition to these enumerated, we have received a host of answers from subscribers who have been taking the SCIENTIFIC AMERICAN continuously for periods of from twenty-five to forty-five years. Limitations of space forbid any extensive quotation from letters which could not fail to be of the greatest interest to our readers; but instead we publish in full a letter which comes to us unsolicited, and which is as welcome as it was unexpected. The Editor should be pardoned for any seeming immodesty in publishing a letter so full of good will and encouragement. The author is a well-known engineer, and was for several years the editor of a high-class technical journal in New York city. He writes as follows:

"After an intimate acquaintance with the SCIENTIFIC AMERICAN for over half a century as man and boy, I must say that, like wine and old friends, it improves with age. It has never made so good an appearance or held such a firm grip upon matters within its field as at the present time. It has a most useful versatility, and covers popular science and practical, every-day engineering without pedantry or 'words of learned length and thundering sound;' so that if a man is compelled to run, metaphorically, to keep up with the improvements of the time, he can read as he goes. If a young man is confined to one paper, for any reason at all, that one should be the SCIENTIFIC AMERICAN. It is a compendium of all that is really valuable in the trades and sciences as they are followed to-day. While I am not without a certain familiarity in the subjects covered by it, I am happy to say that there is not a single issue which I take up, wherein I do not find something which leads me to abandon views formerly held, and subscribe to the better way, the brighter light held by my lifelong friend—the SCIENTIFIC AMERICAN."

A CONVENTION ON MOSQUITO EXTERMINATION.

It seems a novel undertaking to hold a convention for the purpose of discussing the best methods of mosquito extermination and prevention.

But a very large number of persons responded to the call at the first public meeting held on this subject in this city on December 16, 1903, at the Board of Trade rooms on Broadway, corner of Fulton Street.

The meeting was to have been presided over by Hon. Franklin Murphy, Governor of New Jersey, but he was unable to attend. Hon. Robert W. De Forest, one of the vice-presidents, presided instead. The meeting was called to order by Mr. Henry Clay Weeks, who explained the object of the convention and its purposes. He was elected secretary and Mr. William J. Matheson was chosen treasurer. A permanent national organization was provided for, for the promotion of the object.

There was much interest manifested, and several papers were read on the different phases of the mosquito problem.

Among the papers were: "The World-wide Crusade," by Dr. L. O. Howard, of the Agricultural Department at Washington, D. C.; "The Sphere of Health Departments," Ernst J. Lederle, Ph.D., president of the Department of Health, city of New York; "The Work of the United States Public Health and Marine Hospital Service," Passed Assistant Surgeon J. P. Perry; The Determination of Marsh Soil Surveys," Prof. Milton.

Whitney, Chief, Division of Soils, Washington, D. C.; "What Railroads Can Do," William H. Baldwin, Jr., Esq., president L. I. R.R. Co. (Penn. R.R. Co.); "The Aesthetic Side of the Question," John Claflin, Esq., president H. B. Claflin Company, president Morristown, N. J., Improvement Society; "The Exactness of Proofs of Transmission of Malaria," William N. Berkeley, M.D., author of works on mosquitoes, New York; "How a State Appropriation May be Used," Dr. John B. Smith, New Jersey State Entomologist; "What a Rural Community Can Do," Walter C. Kerr, Esq., president Westinghouse, Church, Kerr & Co., Staten Island; "What the General Government Should Do," Frederick C. Beach, Esq., of the SCIENTIFIC AMERICAN; "What New York State Ought to Do," Dr. E. Porter Felt, State Entomologist, Albany, N. Y.; "How Far Does Extermination Exterminate," William J. Matheson, Esq., North Shore, L. I.; "The Long Distance Theory," Spencer Miller, Esq., Engineer, South Orange, N. J., Improvement Society; "Mosquito Engineering," Henry Clay Weeks, Engineer, Bayside, city of New York.

Major Georgas, of the United States Army, addressed the convention on the work that had been done in and about the city of Havana, Cuba, which had been helpful in abating the former conditions.

Dr. Howard sent a letter describing the mosquito plague in the colonies of Great Britain. Germany and Japan were also taking measures to fight the insects.

John Claflin, who was to speak on "The Aesthetic Side," described the malarial breeding places. He stated that the Anopheles, unlike the Culex, breed only in sunlight. Concerning the drainage of a malarial swamp, he said the malaria had apparently been introduced there by Italian laborers. The Anopheles had become infected, and, in turn, transmitted malaria to the residents.

Among the vice-presidents named were: Mr. William C. Whitney; Prof. Nathaniel S. Shaler, Harvard University; Mr. Louis C. Tiffany; Mr. Otto H. Kuhn, Kuhn, Loeb & Co.; Mr. G. Waldo Smith, president of United Civic Societies of Queens Borough; Mr. Colgate Hoyt, Mr. Harvey Murdock, president North Shore, L. I., Improvement Association; Prof. Franklin W. Hooper, director Brooklyn Institute of Arts and Sciences; Prof. Charles B. Davenport, University of Chicago; Prof. L. H. Bailey, Cornell University; Mr. L. C. Weir, president Adams Express Company; Mr. A. J. Cassatt, president Pennsylvania Railroad; United States Senator John Kean, of New Jersey.

The meeting adopted resolutions recommending the appointment of a provisional committee to consider the formation of a central organization of a national character, with which local bodies might co-operate in conducting a general national crusade against the mosquito.

AN ENGLISH TEST OF THE EDISON BATTERY.

Mr. W. Hibbert read a paper on the Edison accumulator before the Institution of Electrical Engineers recently. Since the first announcement of Mr. Edison's invention nearly three years ago, very little of an authoritative nature has been published about the cell; the paper which Dr. Kennelly read in May, 1901, showed that the invention was full of promise, and further results of more extensive experiments and of practical trials have since been awaited with eagerness. A description of the cell itself was published in the SCIENTIFIC AMERICAN and SUPPLEMENT, and as it has undergone little alteration since then we need not describe it in detail here. The active materials, it will be remembered are nickel oxide and iron, and the electrolyte is a 20 per cent solution of caustic potash. The chemical changes on charge and discharge may be represented by the equation

$$\overset{\text{After charge}}{NiO_2 \mid KHOaq \mid Fe} \rightleftarrows \overset{\text{After discharge}}{NiO \mid KHO.aq \mid FeO,}$$

the electrolyte serving merely as an oxygen carrier, and not taking any actual part in the final changes of the active material, as does the sulphuric acid in the lead-lead-peroxide cell. The active materials are packed in perforated steel pockets, and the plates, though thin, are rigid and light. The construction is thoroughly mechanical throughout, and the lightness is obtained without any sacrifice of durability, which is one of the chief faults of the lighter types of lead cells. The standard size of automobile cell is 13 inches high (over all) and 5.1 x 3.5 inches horizontally. The weight is 17.8 pounds. The E. M. F. is approximately 1.35 volts, and the internal resistance 0.0013 ohm; the output at 60 amperes discharge is 210 watt-hours, the capacity working out, therefore, at 11.8 watt-hours per pound. This figure agrees very closely with those which were published originally. Dr. Kennelly put the output at about 14 watt-hours per pound. In an article in Nature it was very carefully calculated from a discharge curve which had been published that the output was 10 watt-hours per pound. The lightest lead cells in some instances approach, or even exceed, these figures, but on the average the result is considerably better than that obtainable in practice with lead accumulators. It will be seen, however, that in many other respects the Edison cell promises to prove much superior, especially for motor-car work.

Mr. Hibbert's tests were made partly under laboratory conditions and partly on the road. Discharge curves taken in the laboratory show that the Edison cell possesses in a remarkable degree one very desirable characteristic, namely, that of giving a good output in ampere hours when discharged at heavy discharge rates. Taking the normal discharge current as 30 or 40 amperes, the curves show that more than 80 per cent of the normal ampere-hours can be obtained when discharging at so high a current even as 200 amperes. A lead cell under similar conditions would probably not give more than 50 per cent of its normal output. Experiments on the road showed that this result could be obtained under practical conditions. A 32-mile run was made from Leicester to Northampton against a head wind all the way; on the level the current varied from 55 to 60 amperes, as against the usual 40; uphill it was from 90 to 100 amperes, and on one occasion rose above 150 amperes. The total discharge came out as 190 ampere-hours, the normal standing discharge being 160 ampere-hours. The battery had been fully charged before the start, 242 ampere-hours having been put in in 1 hour and 20 minutes. This particular case shows that there is an extra discharge—30 ampere-hours in this instance—which can be got from the cell; it is due to the fact that the voltage at the end of the discharge does not continue to drop rapidly, but, when it has fallen to about half a volt, becomes steady again for another hour. There is, in consequence, a reserve capacity which, though not generally used, may prove very valuable in emergencies such as the above.

Some other results obtained by Mr. Hibbert may be quoted. A cell after being short circuited for 48 hours, recovered its original capacity after two charges, and was apparently none the worse for this severe treatment. Experiments on the rate of charging were tried, and showed that high charging currents can be safely used. A fully discharged cell was recharged for an hour at 177 amperes; 124 ampere-hours, or 70 per cent of the charge, were obtained on discharge at 60 amperes. Experiments on the road confirmed this result, 70 per cent of the charge being obtained after charging at 200 amperes. The efficiency of the cell is not quite so good as that of a lead cell; the following figures were obtained under different conditions: at 30 amperes charge and discharge 66 per cent, at 60 amperes 60 per cent, at 100 amperes charge and 60 amperes discharge 56 per cent, and at 177 amperes charge and 60 amperes discharge about 50 per cent. On the other hand, the cell endures a period of rest before discharge well, and also does not suffer if allowed to stand discharged for some time. If discharged immediately after charge a somewhat large discharge is obtained, but after two days' rest a discharge of 155 ampere hours is given; a further twenty-four days' rest only had the effect of diminishing the discharge to 125 ampere hours, or 80 per cent of the discharge after the two days' rest.

The trials on the road were made in a runabout with a battery of 38 cells, weighing about 700 pounds; the total weight, with two persons, was about 2,000 pounds. The trials were planned to afford answers to the following questions:

(1) Is the capacity the same on the road as in the laboratory?

(2) Will the battery stand excessive discharges on the road?

(3) Will it take a rapid charge and utilize it on the road?

(4) Will it recover after lying discharged for some time?

(5) Does the capacity fall off by reason of the shaking?

(6) What attention is required?

The experiments which we have already quoted show that the answer to the first four questions is in the affirmative. With regard to the fifth question, the results were very satisfactory. The car had run 400 miles before Mr. Hibbert took it over; its capacity was then 159 ampere-hours on standing discharge. Mr. Hibbert ran it in all 500 miles in the course of a month, and at the end of that time the capacity on standing discharge was 158 ampere-hours, showing, therefore, no appreciable deterioration. As regards attention, Mr. Hibbert found very little to be required; none of the terminals worked loose or showed signs of getting unduly warm with the heavy charging currents sometimes used. The only matter that had to be attended to was the replenishing with distilled water which was required after every five or six charges.

The general results of Mr. Hibbert's tests are most encouraging; the only point on which further information is required is durability, but all the evidence is in favor of this proving satisfactory. It certainly seems as if the hopes aroused by Dr. Kennelly's paper are within measurable distance of realization.

FINAL WORLD'S FAIR DIVIDEND.

The World's Columbian Exposition of 1893 does not seem to have proved such an abject financial failure after all. At the last meeting of the Board of Directors a final dividend of 4.65 per cent on the capital stock was declared.

The dividend is equal to 46½ cents per share, and is payable on March 1, 1904. The transfer books of the stock company close on January 2, 1904.

The dividend will be paid by check to stockholders of record on the secretary's book. The circular to the stockholders states that a small surplus will remain after paying this dividend, but that it will be so small that it will not pay to divide it. It is being retained to cover cost of possible litigation.

All the stockholders are asked to relinquish their claims upon the surplus, so that it may be donated for some public object by the board of directors. The stock is widely distributed. Many of the certificates are framed and hung on the walls of the owners' homes.

The shareholders were paid a dividend of $1 per share soon after the exposition closed. With this coming distribution the return from an investment of $10, the cost of each share, will be $2.46.

TO OUR SUBSCRIBERS.

This is the last issue of the year—the fifty-eighth of the SCIENTIFIC AMERICAN'S life. Since the subscription of many a subscriber expires with the present number, it will not be amiss to call attention to the fact that the sending of the paper will be discontinued if the subscription be not renewed. In order to avoid any interruption in the receipt of the paper, subscriptions should be renewed before the publication of the next issue. To those who are not familiar with the SUPPLEMENT a word may not be out of place. The SUPPLEMENT contains articles too long for insertion in the SCIENTIFIC AMERICAN, as well as translations from foreign periodicals, the information contained in which would otherwise be inaccessible. By taking the SCIENTIFIC AMERICAN and SUPPLEMENT the subscriber receives the benefit of a reduction in the subscription price.

THE CURRENT SUPPLEMENT.

The current SUPPLEMENT, No. 1460, opens with an article by the London correspondent of the SCIENTIFIC AMERICAN on the highest tunnel in Europe, a tunnel which is to be found on the line of the Albula-Engadin Railway, Switzerland. Prof. Berthelot presents an interesting summary of the relation between the intensity of the voltaic current and the manifestation of the electrolytic output. An exhaustive description of the Lake submarine boat will be found in the SUPPLEMENT, an elaboration of the article elsewhere published in the present issue of the SCIENTIFIC AMERICAN. Recent excavations at Gigthis are described and illustrated. The Wilde lecture on the Atomic Theory is concluded. An excellent description of the Renard dynamometric fan for measuring the power of gasoline motors will doubtless interest chauffeurs. Emile Guarini presents an account of the single-phase traction experiments conducted by the Union Electrical Company, of Berlin.

EIFFEL TOWER TO BE DISMANTLED.

An engineering feat of no small importance will be the razing of the Eiffel Tower in Paris, for this renowned structure is doomed to disappear from the Champ de Mars. The concession for the building of the tower will expire in 1910, and probably nothing would be done in the immediate future if it were not for the fact that, like the famous Tower of Pisa, it is beginning to lean to one side. In the case of the Tower of Pisa, the center of gravity is not far displaced, since the tower was purposely built in that position. But with the Eiffel Tower the case is different, since it was designed to stand erect, and any great amount of declination will displace the center of gravity to a point dangerously near the outside of the base.

DISTRIBUTION OF THE NOBEL PRIZES.

The Nobel peace prize has been awarded to the Hon. W. R. Cremer, M. P., publisher of the Arbitrator, of London, for his work in behalf of international arbitration.

A new telegraph cable connecting Great Britain with Australia via Cape Colony is being constructed. Already the first section to the Cape has been laid. The next section will be carried across the Indian Ocean to Mauritius, thence to the Keeling Islands, and from there to Perth, in Western Australia. When this new line is completed there will be three distinct cable routes to Australia from Great Britain via India, the recently laid Pacific cable, and this new one via the Cape, respectively, thus affording adequate alternative routes should any one or two be interrupted or cut by any agency.