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WE PRINT at another place in this number a brief account of the spread of Mohammedanism in Africa. While we may consider its influence upon the heathenish tribes of Africa as detrimental, we must not underestimate its vast historical importance. People like the African aborigines are not roused to activity by the teachings of Christian missionaries; the appeals of the Mohammedan dervishes, which instigate their passions and arouse their warlike dispositions, are more likely to raise peaceful tribes to historical importance. The power of Mohammedanism to create commotions of vast historical importance has been frequently shown. It shows itself at present in the whole Sudan, and, notwithstanding the endeavors of all European nations, it is doubtful whether it will be possible to stay its progress and to redeem Africa from the curse of slavery. The existence of slavery is inseparably connected with that of the Mohammedan states. The present endeavors of the European powers which are directed against the East African slave-trade have some chance of success, as there are no inaccessible Mohammedan states in that region, and the slave-trade is kept up principally by a small number of individuals. Cardinal Lavigerie, to whom this movement is partly due, maintains that five hundred trained soldiers marching through the German territory by way of Unyanyembe to Udjidji, on Lake Tanganyika, could crush the slave-trade and disarm and forever disable the Arab slave-merchants; but slave-raids of some form or other will continue to exist until means of conveying goods from the interior to the coast have been found, making unnecessary the use of carriers. It seems, however, that the principal region of slave-trade, that of Sudan, must for a long time remain inaccessible to European influence.

THE ADVANCES IN ELECTRICITY IN 1888.

WHEN we contrast the present state of electric science and industry with their condition a year ago, we are struck with the remarkable advances that have been made, especially in the latter. The most important experiments bearing on the theory of electricity have been those of Hertz on the propagation of electrical disturbances, with investigations by various workers on the effect of light on various electrical phenomena. Hertz has obtained electric oscillations of a very short period, — several hundred millions in a second, — and he has shown that electro-magnet waves caused by them are propagated in the surrounding space, and are reflected and interfere with one another as do waves of light. To those who have not believed the electro-magnetic theory of light, these experiments will be of great importance: for those who have believed the theory, they will add corroborative and strengthening evidence. Our general views of the electric current have been gradually changing; and the idea of the energy of the current being transmitted through the surrounding dielectric, and entering the wire at every point, is changing our methods of treating problems of current propagation and our conceptions as to the mechanical reality that underlies the phenomenon. A number of experiments on the discharge of condensers have been made, notably by Professor Lodge, with a view of developing a theory of lightning, and of providing the best means of guarding against lightning-strokes. There grew out of Professor Lodge's experiments a warm discussion before the British Association, on lightning-conductors, in which there was shown a wide difference of opinion between 'theoretical' and 'practical' men as to the best means of protection against lightning, and the interest aroused promises to be the means of adding largely to our knowledge on the subject. The development of the alternating system of electric lighting has stimulated investigations in that direction, and a number of experiments on self and mutual induction, on induction-coils, etc., have been made.

In the application of electricity the advance has been much more striking, especially in this country. In lighting, the increase in the number of lights has been steady and rapid; and, although no radical improvements nor fundamental discoveries have been made, yet the efficiency of all of the lighting systems has been increased, and the expense reduced. In arc-lighting there have been only changes in detail of the important systems; but the number of new stations being equipped, and that have started in the last year, greatly exceeds the showing made in 1887. Incandescent lighting has progressed still more rapidly. The Edison Company has erected central stations of large capacity — up to a maximum of 50,000 lamps — in New York, Philadelphia, Chicago, and other cities, besides adding to the already long list of smaller stations. They have increased the efficiency of their incandescent lamps, and have perfected their dynamos. The returns of stations using this system have been for the year most satisfactory, and it is stated in some of the technical papers that a large amount of capital — no less than ten million dollars — has been subscribed abroad for the extension of the system. The number of electric motors that have been supplied from central stations has also largely increased. The Westinghouse Company has continued to distribute electricity by the alternating system, and has rivalled the increase of the older Edison Company. The advantages of their system for distributing to scattered points, and even in cities where overhead wires are allowed, and where the lights are not concentrated in a particular neighborhood, — the lighting of stores, halls, theatres, etc., — are apparent. The efficiency of their converters and lamps has been increased, and experiments are being carried on with a view to perfecting some motor that can be used on alternating circuits. Other companies are doing a great deal of business in a quiet way in putting in private installations for factories, offices, etc. There has

been much rivalry in electric lighting, and three of the most important companies — the Edison, the Westinghouse, and the Thomson-Houston — are at swords' points, and much of the current technical literature consists of discussions as to the merits and demerits of the various systems.

But it is in the extension of power-distribution by means of electricity that the year has been most memorable. Large numbers of electric motors have been installed for supplying powers from $\frac{1}{10}$ to 40 or 50 horse-power, and these are fed from the local lighting companies, and have displaced small steam and gas engines. The uses to which they have been applied are innumerable, and they are increasing in favor as their economy and efficiency become more apparent. More ambitious installations have been carried out in the Western mining districts; the most noteworthy being the power plants at Aspen, Col., and on the Feather River in California, where the Sprague Company has transmitted power (in the last case a distance of nine miles), and at Virginia City, where the Brush Company has just effected an installation. Electric street-railways have more than kept pace with stationary motor-work. The first large road equipped was the Richmond road of the Sprague Company, the largest and most difficult installation that had ever been attempted. After numerous disappointments, and after overcoming difficulties that would have disheartened any less energetic and efficient company, the road was successfully opened in March, and has been running without interruption ever since. There is little doubt that to the success of this tramway is due the boom in electric-motor cars, that has given the Sprague and other companies a business even greater than their large capacity. The Sprague Company has finished or is equipping thirty street-railways; the Thomson-Houston Company, as many more; while the Daft Company has under way or finished a dozen or fifteen. All of these roads have overhead wires to convey the current from the dynamos to the motors. It is probable that the ultimate system of street-car traction will be by storage-batteries on the car, supplying current to motors beneath them, geared to the axles. During the year there has been little progress in this system of traction. One or two cars are being run in New York, in Philadelphia, and in some of the Western cities. The progress has hardly, however, been satisfactory. The present type of storage-cell is heavy and inefficient, and rapidly deteriorates; and the year has not seen the introduction, either here or abroad, of any new type of battery, nor any marked improvement in the old. For exceptionally favorable roads, where there are very light grades, storage-battery cars will cost about the same as horses, or perhaps a little less; but there are few such in the States.

No important inventions in industrial electricity have been developed during the year, although several very promising ones have been patented, and are being improved and tested. The Tesla motor for alternating currents is being developed by the Westinghouse Company; several plans for continuous-current conversion are being experimented on; new types of storage-battery have been described, and will possibly prove successful. Nothing important has been done in the telephone line. In telegraphy Professor Gray has developed a writing-telegraph, which will possibly do what is claimed for it, but which seems very complicated.

There has been much patent litigation, and important decisions have been rendered here and abroad. In an English suit Edison's fundamental patent on carbon filaments for incandescent lamps was badly damaged, although the decision has been appealed from, and it is again being tried. The patents of the Westinghouse Company for the alternating system have been decided against, both in England and this country. The Supreme Court has decided that the government has the right to bring suit against the Bell Telephone Company to annul Bell's patent, but this decision is of interest only as establishing the general right of the government to bring such a suit. A number of important suits are pending on patents for storage-batteries, incandescent lamps, systems of distribution, etc.; and after the holidays a case before the Supreme Court will decide whether Edison's fundamental patents on electric lighting have expired with the limit of the foreign patents.

On the whole, the year has been one of solid advance and improvement, but with no startling development nor revolutionary discovery.

THE SCIENTIFIC WORK OF THE JOHNS HOPKINS UNIVERSITY.

IN considering the scientific work at the university, President Gilman laid emphasis, in his recent annual report, on those parts of the work which are of widest interest, especially on the investigations and publications which have been encouraged, and the opportunities afforded for the education of advanced students. The trustees and the faculty of such an institution need frequently to recur to general principles, ask themselves what they have undertaken to do, and carefully weigh the results of their labors. Accordingly a brief restatement of some of the considerations by which they have been influenced introduces the record of the year. Far more important than the formal lectures and recitations of a university are the intellectual influences which it affords, — the attractions of its libraries and laboratories; the spirit which animates the professors; the conditions upon which degrees, fellowships, and other academic honors are bestowed; the connection existing between the studies of the place and the studies that are in progress in other seats of learning; and the prospects which are open to young men of character and scholarship at the end of their courses. The university which imparts to a large number of students good impulses, disciplines them with thorough training, encourages them with judicious counsel, and upholds before them lofty ideals, becomes an agency of great power in the advancement of the general welfare. It annually sends to every part of the land, into all the professions, into professorships, masterships, and other leaderships, those who are likely to be centres of light and influence in their various states.

The opening of this university occurred in 1876, at a time when many careful writers were engaged in the study of the progress of the United States during the first hundred years of national life. Important articles then published, on the state of the arts and sciences in America, and on the condition of American education, were carefully considered by those who were engaged in planning the new institutions in Baltimore. Among such papers there was one entitled 'Abstract Science in America,' by Professor Newcomb, which indicated "the points of view from which our claims to be an intellectual nation look very slender indeed." The writer acknowledged the excellent quality of the work which was done by the leaders of American science, while he lamented the want of encouragement to engage in such labors. He declared that "we are deficient in the number of men actively devoted to scientific research of the higher types, in public recognition of the labors of those who are so engaged, in the machinery for making the public acquainted with their labors and their wants, and in the preliminary means for publishing their researches." He continued to say, —

"Each of these deficiencies is to a certain extent both cause and an effect of the others. The want of public recognition and appreciation is due partly to a want of system and organization, partly to the paucity of scientific publications. The paucity of research is largely due to the want of adequate reward in public estimation and recognition; while the paucity of scientific publications is due to the want of an adequate number of supporters. The supply of any one of these deficiencies would, to a certain extent, remedy all the others; and, until one or more are so remedied, it is hopeless to expect any great improvement. In other intellectual nations, science has a fostering mother, — in Germany the universities, in France the government, in England the scientific societies; and, if science could find one here, it would speedily flourish. The only one it can look to here is the educated public; and, if that public would find some way of expressing in a public and official manner its generous appreciation of the labors of American investigators, we should have the best entering wedge for supplying all the wants of our science.

"The other way in which help could be most effectively given at small expense is by the support of two or three first-class journals of exact science. We say exact science, because this is the department which is worst supplied in this respect. Taking mathematics at one extreme, and medicine at the other, we can pretty accurately gauge the exactness of each science by the difficulty its cultivators find in supporting journals devoted to it. It may seem like reducing our thesis to the ridiculous to say that our wants in this