

Reviews and Notices of Books.

The Electric Telegraph in British India: a Manual of Instructions for the Subordinate Officers, Artificers, and Signallers employed in the Department. By W. B. O'SHAUGHNESSY, M. D., F. R. S., Surgeon, Bengal Army, Chief Superintendent of Telegraphs to the Hon. East India Company. London: Printed by order of the Court of Directors. 1853.

THE Marquis of Dalhousie, in a despatch referring to the vast importance of obtaining increased communication throughout our Indian territory, justly remarks—"Everything all the world over moves faster now-a-days than it used to do, except the transaction of Indian business." There will soon, we hope, cease to be cause for such a complaint; for the work before us carefully unfolds one of the most happy schemes ever conceived by enterprising genius—a scheme which, even in this most utilitarian age, ranks second to none as regards either commercial interest or national benefit. There was a time—not so very many years ago—when the idea of long electric telegraph lines, even in England, was considered absurd in the extreme, and looked upon with much doubt by the constituted authorities of the day. Had any one then dreamed of surrounding

British India with one great mesh-work of electric wire, he would have been pool-pool'd for a visionary, or pitied for a madman. The violent atmospheric changes; the appalling storms and hurricanes, desolating and destroying; the rugged nature of the country; the almost impenetrable jungles; enormous rivers, many of them equalling in size and strength those of the American continent;—obstacles such as these, to say nothing of the annoyance to be anticipated from the incursions of wild animals, sufficed to make man pause ere he drew his plan upon the Indian map, and said: There shall my line pass—there shall my electric wire carry, from city to city, intelligence and thought.

The immense practical importance of such an undertaking no one denied; and the Indian government were perfectly willing to fulfil such a scheme, if it could only be proved feasible. It was reserved for Dr. O'Shaughnessy—a name that has already been associated with those of Faraday and Liebig—to remove all doubt on this subject; and in 1839, with the aid of Dr. Wallich, (then superintendent of the Botanic Gardens in Calcutta, now vice-president of the Royal Society,) he completed, in the vicinity of Calcutta, the first long line of telegraph ever constructed in any country. This line was twenty-one miles in length, and embraced 7000 feet of river circuit:—

"The experiments performed on this line removed all reasonable doubts regarding the practicability of working electric telegraphs through enormous distances—a question then, and for three years later, disputed by high authorities, and regarded generally with contemptuous scepticism."

Dr. O'Shaughnessy remarks, "it is never too late to acknowledge an obligation," and certainly great praise is due to Dr. Wallich for his conduct on that occasion. The author says:—

"He saw at a glance the marvellous future which these and simultaneous experiments in other countries foretold, and with his high name he protected the experimentalist from much of the derision which his attempts excited in the community of Calcutta."

These experiments having been completed, the line was taken down. A despatch from the Court of Directors to the Government of India, in 1850, recalled attention to the subject, and on the data afforded by certain reports from Lieut.-Col. Forbes, of the Engineers, and from Dr. O'Shaughnessy, an "experimental line of telegraph, half subterranean, half over-ground, thirty-miles in length, was directed to be constructed." This line was gradually lengthened, and being now in operation, the rate at which its construction progressed shall be given in the author's words.

"This line was commenced in October, 1851, and opened to Diamond Harbour in December of that year. In the following May a branch was led to Moyapore. In August and December it was extended to Kedgerie, eighty miles distant by the line followed; and in March, 1852, the rivers Hooghly and Huldee were crossed, and the line from Calcutta to the sea opened for official and public correspondence."

Thus this "experimental line," which has proved so eminently successful, crosses many miles of swamp and jungle, and traverses the Hooghly river 5200 feet, and the Huldee 4800 feet wide. These most satisfactory results having been duly noted, Lord Dalhousie, in April, 1852, as Governor of Bengal, laid before the Government of India a "deeply interesting minute," from which we extract the following:—

"Dr. W. B. O'Shaughnessy has submitted his last report, announcing the completion of the line of electric telegraph from Calcutta to Kedgerie. In all its parts, as well in that portion of the line which is carried underground as in that which is conducted after the European manner, its success has been complete. . . . A mechanism and a system both admirable from their simplicity, and therefore doubly valuable in India, and under the circumstances in which the telegraph will be worked, have been devised and brought into operation.

"I have visited the line, and in common with hundreds of others can bear testimony to the beautiful simplicity of the work to the regularity of its operations, and to the perfect success of it as a national experiment of the highest and most immediate moment to the interests of India."

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His lordship, moreover, "entreats" the Government to second with all its authority his lordship's "most urgent personal solicitation to the Honourable Court of Directors, that they will authorize the immediate construction of a line or lines from Calcutta to Agra, to Bombay, to Peshawur, and to Madras." There is no longer doubt about the "feasibility" of such communication. Dr. O'Shaughnessy settled that question, and we find Lord Dalhousie saying, "the experimental line has shown, not only that it is feasible, but that it may be made easy of accomplishment, rapid of execution, cheap of construction, and profitable in its returns." With such favourable evidence as this, Dr. O'Shaughnessy came to England to communicate with the Court of Directors, and assist in the despatch to India of the requisite stores and materials. He arrived at the India House on the 20th June, 1852, and found that a despatch in reply to, and sanctioning, the Governor-General's proposition which had arrived, *via* Marseilles, on the 14th, was already on the way to India. The following extract will show how this alacrity was appreciated, and give some idea of the immensity of the enterprise.

"Such rapidity in the despatch of an important measure is perhaps without a parallel in any department of Government. All subsequent steps were taken with proportionate speed. The requisite contracts were issued for all the stores before the 1st of August; sixty enlisted artificers were placed in training at Warley; an inspection of the home and foreign telegraph lines undertaken, and completed by the 15th of November; collections made of all the instruments in use in Europe and America; these pages prepared for the guidance of the persons to be employed on the works in India; and voluminous reports, with estimates and drawings, submitted from time to time on every step of these proceedings. The accompanying list of the materials and instruments ordered on the 1st of August, 1852, will show the enormous scale on which the operation was sanctioned, and the rapid rate at which the preparations have been made:—

	Tons weight.
Iron rod, No. 1, galvanised, 5-16th inch; weight per mile, half a ton; length, 5600 miles	2800
Iron screw piles, 46,000, each 76 lbs.	1560
Gutta percha covered copper wire, 700 miles	100
Iron wire, galvanised, No. 8, 500 miles	100
	Number.
Oak brackets	48,000
Galvanised wrought iron caps	48,000
Binding screws for ditto	48,000
Stone-ware insulators	96,000
Galvanised screws for ditto	96,000
Straining machines	} 20 sets of each
Wire straightening ditto	
Gutta percha tool-chests	
Sets of sundry tools	

Telegraphic instruments and samples of stores, &c., from all English offices, also from America, France, Baden, and Prussia. Electric clocks, printing presses, turning lathes, wire-drawing machines, and silk-covering, taping, and ribboning machines; from Hopkinson and Cope, London; Whitworth and Co., Manchester; Holtzappel, London; Shepherd and Son, London; Mr. Physick, of London, &c. &c. Of all the above stores and many others not included, there was not a single item manufactured or procurable on the 1st of August, 1852. The artificers are now on their voyage to the east, and in October next (1853) twenty camps of construction will be engaged in extending the web of telegraphs all over India."

In the above paragraph, which requires no comment, we are made acquainted with the author's object for writing the work at present under our notice, and certainly he has most honourably acquitted himself of the task. Constantly bearing in mind his original intention—to instruct and to guide—he has divested a by no means simple subject of much vague speculation and useless technicality, and, with a clearness of detail and perspicuity of language, which cannot be too highly extolled, he has produced a book worthy of being pondered over not only by the practical man, but by every admirer of art,—every lover of progressive science.

(To be concluded next week.)

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(Concluded from p. 150.)

THE arrangement of the work is most judicious. It is divided into five parts, plentifully interspersed with diagrams. We intend glancing at each section as briefly as the importance of the subject will permit. In Part I. the author gives "a brief exposition of the principles of electricity and magnetism," treating the subject in his own peculiarly clear and concise manner. This, however, is merely introductory, and only "intended for the information of artificers, signal pupils, &c."

"Construction of the Lines" forms the subject of Part II. This section is highly interesting. Surveys are even now being executed to determine the proportions of overground and subterranean lines. The author says:—

"The lines of electric telegraph to be constructed in British India, as at present ordered, are to extend from Calcutta to Agra, following the valley of the Ganges to Allahabad. From Agra the line will proceed by Delhi to Lahore, a branch running from Umballa to Simlah on the Himalaya. From Agra another line will proceed, *via* Indore and Nasruck, to Bombay, and from Bombay it will extend across Central India to Madras. The exact direction of the line in each province is still undetermined, but the total length to be constructed is about 3200 miles of double line."

Thus, when all is completed, the extent of telegraphic communication in India will exceed that of England by 200; that of France by 1200 miles; the utmost limits of the electric telegraph being, at the present time, according to Mr. Bakerwell, in Great Britain, about 3000 miles; in France, 2000; Prussia, 4000; Austria, 3000; and in America, not less than 15,000. It is a curious fact that, in England, the protection of a railway should have hitherto been considered essential to the proper maintenance of the electric telegraph; and the

fallacy of such a supposition will no doubt be proved by the working of the Indian lines, which will at all events precede the construction of railroads. There the lines must, and will differ, in several important particulars from those in England; the wires must be thicker and stronger—"in India it is rather a rod than a wire"—and placed at a much greater altitude, lest they receive damage from the crowds of monkeys and birds which are apt to congregate upon them. But space will not allow us to follow out the author's interesting details and comparisons between the various foreign and continental lines, all of which he has visited and inspected.

Part III., which treats of the "Construction of Subterranean Lines," commences with a slight sketch of the history of the subterranean system. This is a subject, which, from the time when Semmering first explained his theory to the Academy of Sciences, at Munich, to the present day, has always been replete with interest and excitement; and when we reflect that only thirty-five years ago, Mr. Ronalds, an early champion in the cause of electricity, was told by the government officials, that "telegraphs were no use in the time of peace, and that the semaphore answered all the requisite purposes," certainly we have reason to feel proud of the progressive age in which we live, and must confess, with gratitude, that science no longer slumbers.

Another curious fact may be stated relative to the origin and history of the electric telegraph. In 1816 (!) a gentleman of the name of Hill, now residing at Harrow Weald, after making many experiments, wrote to the Admiralty, stating that he had discovered a mode of communicating with the outposts, regardless of darkness or of foggy weather. A letter from Mr. Barrow appointed an interview with "the Lords." The discoverer attended, and when he explained that his plan consisted of wires conveyed through glass or earthenware pipes, to be worked by electricity, he was immediately "bowed out" as a lunatic!! In 1848 Mr. Wakley presented a petition to the House of Commons from this gentleman, in which he claimed the "discovery" of electric telegraphic communication, and prayed for compensation. The petition contained a copy of the official letter of Mr. Barrow, secretary to the Admiralty in 1816!

In April, 1839, Dr. O'Shaughnessy, in a paper published in the journal of the Asiatic Society, proposed a subterranean line for India, to be constructed of wire coated with pitch and cloth, and buried in a trench two feet deep, along the common-road. Again, in 1842, Professor Jacobi wrote thus to M. Breguet:—*Le placement des fils conducteurs dans l'air n'est qu'un pis aller; leur installation sous terre est le seul moyen parfait; mais je considéré comme une de fatalités de ma vie, la nécessité où je me suis trouvé de m'occuper de cet épineux problème.*" So the professor constructed a subterranean line from St. Petersburg to Tsarskooselo. But all these attempts failed, and all failed from one cause—imperfect insulation. But, in 1843, the discovery of gutta percha, by Dr. Montgomerie, of Singapore, formed an epoch in the history of the electric telegraph—a history, however, which, at the present time, can only be vaguely defined, and indefinitely traced through the rising mist of contending claimants to scientific discovery.

After some years of industry and study, Mr. Statham, manager of the London Gutta Percha Works, succeeded in producing the necessary coated wire, the success of which has been satisfactorily proved by the line now in operation between Dover and Calais. The great drawback to the use of this wire, and consequently to the subterranean lines in India, is its great expense; "but," says Dr. O'Shaughnessy, "costly though it be, according to its present rate of manufacture, there are certain localities in which the gutta percha covered wire must be employed, especially in India;" and he instances such cities as Agra and Delhi, where lines leading over the houses, as in Paris, would be offensive to, and interfere with, the native

habits of the people. The author doubts, however, the probability of finding a substitute for this valuable gum, and, at the same time, being fully impressed with the importance of its use, thus hints at a means to reduce its price:—

“The introduction of the Gutta Percha Tree into Bengal, and the promotion of its cultivation, are measures which would appear to deserve the attention of the Government.”

Much as we should like to dwell upon the contents of the remaining sections,—Parts IV. and V.,—our limits will only allow us to briefly notice their leading features. In Part IV. we are made acquainted with the “Instruments and Offices,” as they exist at present on the Calcutta and Kedgeree line, and as they will exist, it is hoped, ultimately over India. In superintending the construction of the above-mentioned line it was the constant endeavour of Dr. O’Shaughnessy to do away with all needless complications, and simplify the machinery as much as possible, and this was the secret of his great success. He soon found that the “complex and delicate apparatus, employed in England, France, and America, was of very little use in India.”

The storms which prevail from March to October in Bengal, and the “strong constant current of natural electricity” flowing in the north and south lines, played all kinds of tricks with the needles, reversing or destroying their polarity, and causing endless vexation and trouble. “Our sole alternative,” says the author, “became accordingly the simplification of the instruments or abandonment of the undertaking.” So the instruments were simplified, and proved fully effectual for all occasions. We will give one extract to show the efficacious manner in which even the night correspondence is conducted at present:—

“As an instance, we may adduce a visit made by the Superintendent of Marine, Captain Rogers, by order of the Governor-General, at eleven p.m., on the night of February 14, 1852, to the Calcutta office, to learn if the *Phlegethon* steam-vessel had landed a despatch from the King of Ava at the Diamond harbour post office. In four minutes the answer was obtained from Diamond harbour, although all the signallers were in bed and asleep, and no sentry posted when Captain Rogers entered the Calcutta office.”

Experiment, however, must yet determine, on the completion of the first long line in India, what instrument will be best adapted for general use. Through the liberality of the Court of Directors of the East India Company, a fine collection has been formed in duplicate of nearly all the instruments actually in use in England and other countries; and some have been added which have not been as yet tested by actual experience, but which are considered of good promise.

The “Miscellaneous Details” which fill Part V., including the “Crossing of Rivers by Masts,” the “Precautions on Lines during Hurricanes,” and last, though by no means least in general interest, the rates of charges for messages, and pay, and pensions, on the English, American, French, and Belgium establishments, afford information not at present too easily obtainable; whilst the “Laws affecting Telegraphs” in various countries cannot be otherwise than perused with benefit. The brave, manly tone in which the author details the dangers which must necessarily beset the employes on the lines during storms and hurricanes, cannot be too highly admired; and whilst he speaks solemnly of accidents to be feared, and encouragingly of precautions to be observed during these awful visitations, he earnestly asserts the necessity of discipline being steadily maintained, and of every duty being fearlessly and conscientiously fulfilled.

The Appendices, of which there are five, contain also most important statistical information, which cannot fail to impress the mind both with wonder and admiration—wonder at the vast magnitude and promised good of the projected undertaking—admiration at that unconquerable will, which, through sunshine and cloud—through hope and disappointment—through difficulties the most disheartening, and want of encouragement

at first almost amounting to scorn—never once swerved from its conscientious task, but progressed boldly onwards to the triumph of its inevitable accomplishment.

Our necessarily imperfect and somewhat long though we trust not tedious—notice of this clever work must now draw to a close; and since the subject of which it treats is one of universal importance, it will no doubt soon be more fully discussed, and its history and progress publicly known. In this hope we conclude our extracts with the following prophetic words of the author:—

“The history of the telegraph in India must convince every one employed, that, while unavoidable failures are looked upon with indulgence, successful exertion is certain of proportionate reward. Let us all then vie with each other in the execution of our exciting task, and indulge in the hope that we may be spared to witness the miracle of Calcutta and Bombay exchanging despatches in minutes instead of weeks—when the answer may arrive from one thousand miles before the ink is dry on the record of the question—and when persons more than that distance from each other can communicate more quickly than the inmates of different rooms in the same house.”

As reviewers, we will now take leave of this exceedingly interesting work. Of Dr. O’Shaughnessy himself we can speak in the highest terms of praise. Twenty years since, he was one of the staff of THE LANCET, and often have we had reason to be proud of the great ability that he displayed. Had he remained in Europe, not any man could have surpassed him in the department of science to which he then devoted his extraordinary powers of mind. He is a man of honour and a gentleman; and the Indian Government may exult in having found a man endowed with such unusual qualifications for carrying into execution a scheme of operations which would reflect credit on the most enlightened government in the universe. Long may Dr. O’Shaughnessy live to witness the triumph of his sagacity and profoundly scientific labours!