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MIDLANDS OFFICE :
Dairmler House, Paradise Street, Birmingham
Telephone : Midlands 0784-5

SCOTTISH OFFICE :
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Oliver Heaviside

THE centenary of the birth of OLIVER HEAVISIDE was yesterday, Thursday, marked by the Institution of Electrical Engineers at commemorative meetings recording tributes to the work of this outstanding figure in electrical history.

These activities are of special interest to THE ELECTRICIAN for whereas the genius of OLIVER HEAVISIDE was inadequately recognised by most of his contemporaries, THE ELECTRICIAN supported his theories by giving them publication. Reference to this encouragement is made in the April issue of the I.E.E. Journal where, in the leader page, is printed, "OLIVER HEAVISIDE . . . . was filling the pages of THE ELECTRICIAN with papers which were far too difficult for most of the readers of that journal. They were not alone." . . . . And it stands to the special credit of the Editor of those days, therefore, that he at any rate appreciated the contribution which OLIVER HEAVISIDE was able to make to the advancement of science.

The first appearance of the name of this now famous mathematician as a direct contributor to THE ELECTRICIAN was in 1879 but it was in 1882 that he commenced his renowned series on electromagnetic theory—reference to which was made by Prof. WILLIS JACKSON in his I.E.E. paper yesterday. A more detailed account of the collaboration with this journal in the latter part of the last century will be found on p. 1660, and we look back upon our activities of those

former days with justifiable pride.

By holding yesterday's meetings, the Institution of Electrical Engineers not only honoured a great mathematician but also a one-time member who assumed Honorary Membership rank in 1908, and who was the first recipient of the Institution's most distinguished award—the Faraday Medal. By marking the centenary, the Institution has, too, drawn the attention of the world to the debt which mankind in general owes to the work of OLIVER HEAVISIDE; a debt which, judging from the number of inquiries received by THE ELECTRICIAN with regard to the dates of publication of his work, is nowhere in doubt.

The name of OLIVER HEAVISIDE will be most associated in the public mind, perhaps, with the reflecting layer in the upper atmosphere which resulted in success attending the transatlantic wireless experiments conducted by G. MARCONI in 1901—an association shared with KENNELLY to give to the phenomenon the name—Kennelly-Heaviside Layer.

Benefiting from his theories, too, are many sides of the electrical industry which without the knowledge ventilated in the 1880's and onwards, would to-day be much lower down the ladder of success and facing a future less assured than is in fact the case. There must indeed be few fields of electrical activity where development has not at some stage been due to the observations of HEAVISIDE, and although in the realm of telecommunications acknowledgment of the fact has never been stinted, in other branches of the industry recognition, if not less readily admitted, has certainly been less public. Mathematical methods very similar to those introduced by OLIVER HEAVISIDE have to-day become part and parcel of modern circuit theory for determining the transient response of complex networks and for the analysis of servo-mechanisms, while his constant concern that the practical implications of his work should be utilised in the industry is amply illustrated (although belatedly accepted) in his advocacy of the addition of inductance to telephone and telegraph cables, as a means of improving speech and signal transmission through their conductors.

Heaviside and "The Electrician"

A Mutually-Beneficial Collaboration

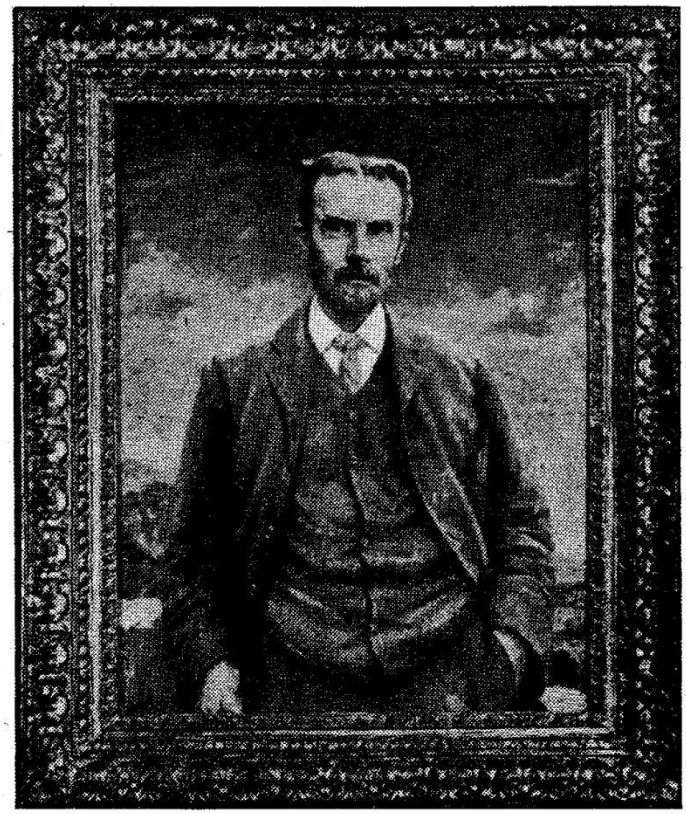
THE Centenary of the birth of Oliver Heaviside celebrated yesterday, May 18, at the Institution of Electrical Engineers, recalls the close collaboration which existed between the famous theoretician and THE ELECTRICIAN, and the days when this paper was his only champion, before the rest of the scientific world "had learned to bow to the prerogative of Heaviside's genius."

The Institution of Electrical Engineers yesterday marked the Centenary of the birth of Heaviside and below will be found some details of his early associations with THE ELECTRICIAN. *On the opposite page is reproduced a letter sent by Heaviside in 1874 to the then Editor of* THE ELECTRICIAN *—the late A. P. Trotter*

It was in July, 1872, that Heaviside made his debut in scientific and technical literature with an article in "The English Mechanic," followed by contributions to the "Philosophical Magazine" in 1873 and 1874 on duplex working and the application of condensers to cables, the latter paper being the first that took line terminal apparatus into account.

In 1878, he directed attention to the importance of self-induction in telephony and in February, 1879, an article on "Sensitiveness of Wheatstone's Bridge" appeared in THE ELECTRICIAN.

It was not until 1880 that the name of Oliver Heaviside again appeared in THE ELECTRICIAN when as an Associate of the Society of Telegraph Engineers he read a paper on "Resistance of Galvanometers," and was noted to have taken out several patents on "Electrical Conductors" and "Neutralising Disturbance in Cables."



In 1882, he made another contribution to THE ELECTRICIAN entitled "The Earth as a Conductor," and in the autumn of that year commenced his famous series of papers on electromagnetic theory. Some of the titles of articles appearing that year are of interest: "Current Energy"—a series; "Some Theorems in Electricity and Magnetism"—a series; "Magnetic Forces of Return Currents"; "Magnetic Forces and Electric Currents"; and "Theory of Microphone and Carbon Contacts."

In THE ELECTRICIAN of 1883 and 1884 in a series entitled "Induction of Current in Cores," he considered the whole problem of calculating the effective resistance of the inner conductor of a concentric cable—a problem which Maxwell approached for only low frequencies and few turns of a series.

Heaviside commenced his classic papers on "Electromagnetic Induction" in 1885 and they continued in the face of considerable controversy till September, 1887. In his remarkable leader of October 12, 1888, Mr. C. H. Biggs, who was then editor, referred to "the practical man who talks with good-natured pity of the mere theorist and the theorist who comes with hat in hand to the man of practice and begs to know if he is disposed to consider favourably this or that suggestion." After commenting on the dissension between Mr. Preece and Mr. Heaviside the editor concluded: "Seeing that the opinions arrived at on theoretical grounds are by no means devoid of experimental evidence, we think it unwise, to say the least, for anyone to assume an air of superior knowledge, and to assert positively that practical experience has already proved the theory to be untrue."

Happily, however, Heaviside's

Paignton Dec. 5. 94

Dear Mr Trotter. I almost think that Editors shd be included in the "other wicked people" who would "have it all their own way" At any rate I have compromised as you suggest. It spoils my "prose" though, but I can put it right again for the book. At the same time I may say that the use I made of the word "religion" is a very common one indeed, and that I was careful to put it so as not to offend any pious people by imagining an impossible state of things! I think pious people have it too much their own way too. How about making the first "religion" be "so-called religion", letting the rest stand. But it is a little

Third paragraph. But then the matter is entirely physical, & is to be considered. I will not condescend to notice any pious theories of the earth's age, not considering them worthy of it. I meant allowing to pious theories, but to the "moss grown stone", which was classified into the world once, according to a physicist. That is a physical theory, though possibly it has a pious foundation to account for it in the author's brain. (But my "religion" is also physical, due to physical causes.)

I am a little surprised at your being afraid of the parsons. They don't read The Electrician. Besides, they advance remarkably: look at Haweis, & the stuff he preaches from his pulpit. And the pious people move on too. Things are not now as they were a generation ago, when Huxley & Tyndall were attacked. Besides, no one will take any notice of me. And finally, I do not attack religion at all, but merely remark on a physical matter.

As regards my sending you this article at all, it arises from the circs. of the moment; viz. Perry's work, which he wont publish, and my work, which I cant get published (at least in the R. Soc.). So it is good both ways, as Perry took to my operators at once, and I want to observe that they have practical value, & not be snuffed out.

But as regards using them systematically, all I propose is to use them as they turn up naturally in the course of the electromagnetic investigations, not entering upon the abstruseities of the general theory, wh. is in a tentative state.

I know you didn't write that editorial. It isn't your style, though it may partly express your views. I say partly, because I am afraid you like my methods as little as the Cambridge!

Yours very truly
Oliver Heaviside.

vindication was to come in January, 1889, when the Society of Telegraph Engineers changed its name to the Institution of Electrical Engineers, and Lord Kelvin, taking the chair, agreed that in his early theory he had not taken electromagnetic induction in cable transmission into account at all. "But it has been worked out by Mr. O. Heaviside, who has pointed out and accentuated this result of his mathematical theory—that electromagnetic induction is a positive benefit; it helps to carry the current. It is the same kind of benefit that mass is to a body, shoved along against a viscous resistance."

Electromagnetic Theory Series

Meanwhile, in 1887, the "Philosophical Magazine" reported that no one read Heaviside's articles, and in 1888, another editor complained that only a few professors could understand them. Even the Royal Society complained in 1891 of the stiffness of one of his papers. However, in January, 1891, THE ELECTRICIAN commented in its editorial concerning a new series of articles by Heaviside: "Although much of Mr. Heaviside's previous contributions to THE ELECTRICIAN appealed to a rather limited class of reader, both from the nature of the work and its treatment, we believe that as time goes on it will be found that this work possessed highly valuable and original qualities, and that he was one of the first to appreciate the importance of certain matters which are now being forced strongly on the attention of those he calls "practicians." Mr. Heaviside promises to make the present series of articles as far as possible, intelligible to readers who do not possess a very copious armoury of mathematical weapons and we do not doubt that a good deal can be accomplished in the cause of truth by a little algebra plus a great deal of common sense."

Definition of Impedance

It is interesting to recall that in the symposium of papers on the M.K.S. system of units held at the Institution of Electrical Engineers on March 30, many references were made to Heaviside's papers on "Electromagnetic Theory" appearing in THE ELECTRICIAN of 1893, while Dr. Murray, the Oxford lexicographer, when appealing in 1899 for the derivation of the term "Impedance" was referred to THE ELECTRICIAN of July 23, 1896.

In addition to the articles which Heaviside contributed to this journal, a rich store of wit and learning is contained in the very voluminous correspondence which appeared over his signature from time to time. Thus in January, 1886, on the subject of "The Rise and Progress of Nomenclature" he remarks: "Mac, tom, bob and dick are all good names for units. Ohm and volt are admirable. But ampere shortened to am or amp is abominable. Better make it père; then it will do. Was not Ampère the father of electrodynamics?" Defending himself against Mr. Preece in October, 1888, he writes: "Although Mr. Preece in the presence of some distinguished mathematicians recently boasted that he made mathematics his slave, yet it is not wholly improbable that he is a very striking and remarkable example of the opposite procedure and that Mr. Preece's knowledge of the manner of transmission of signals, though it may not be 'extensive,' is certainly 'peculiar.'"

One other letter may perhaps be permitted an extract, his first to appear in THE ELECTRICIAN of 1883. Correcting an error in one of his articles he apologises: "It was written without thought. Now I come to think of it, the mental stagnation was produced by an overdose of M—k, proving life to be not worth living. Quite recovered next day, under counteracting influence of most excellent green peas at 6d. per peck (raised to 8d. by the mercenary vendor on hearing them praised)."

An example of his handwriting which affords a typical illustration of his forceful style appears on the preceding page in a letter written to the late Mr. A. P. Trotter, the Editor of THE ELECTRICIAN at that time.

"More than a Genius"

On his death in February, 1925, at the age of 75, an appreciation by Sir Oliver Lodge, F.R.S., acknowledged the debt that science and mathematics owed to this "genius of exceptional ability, who flooded the columns of THE ELECTRICIAN with remarkable but ill-understood papers." In the same issue the editorial comment went further in declaring "Heaviside to electrical engineers at any rate, was something more than a genius, he was a legend. No one now doubts his enduring fame. No one has doubted it for many years. The relations of this journal with Heaviside and his work were close. Those responsible for its control in those early days realised the value of what he was doing, and, undeterred by hope of gain and in the face of criticism, gave publicity to what is now seen to be a theory of fundamental importance. We need take no credit to ourselves for doing this. It was our duty. But it is pleasant to be able to record that we were justified. A chapter is closed; but a new chapter is opened. Among much uncertainty nothing is surer than that Heaviside's name will live for evermore in the gallery of scientific heroes."