your Aberdeen stone monuments which are well worth investigation.

I hope, also, that Aberdonians will see that the necessary work is done. How I wish I could be with you to help in it, and renew the pleasures you allowed my wife and myself to feel, going about among the relics of a long bygone past in your most modern motor car.

Always sincerely yours,
NORMAN LOCKYER.

APPLICATIONS OF THE MICROPHONE PRINCIPLE.

AN interesting booklet upon applications of the microphone principle has been written by Messrs. Jensen and Sieveking, of the physical laboratories in Hamburg and Karlsruhe.[1] By the term "microphone principle" the authors mean all those phenomena which are due to the change of ohmic resistance between loose contacts. The memoir contains a very exhaustive collection of what is to be found scattered in scientific literature from the time of Munck of Rosenschoeld, to the present day. The explanation that in loose contacts the nearer approach of the particles resulting from the application of pressure is the cause of the diminished resistance observed, is ascribed to du Moncel and Beetz, who gave it almost simultaneously, though independently. Among the early practical applications of this property of loose contacts was Hughes's induction balance, which is so well known that no lengthy reference need be given here. A less known though also interesting application may, however, be mentioned, namely, the demonstration of nodes and antinodes in acoustic waves in cylindrical vessels. By lowering a small microphone into the cylinder, Fossati succeeded in locating the position of the nodes and antinodes by means of a telephone receiver connected with the microphone. The sound waves impinging against the loose contacts produce a rasping sound in the telephone, which vanishes when the microphone reaches the position of a node. In a darkened room minute sparks may be seen between the microphone plates when the microphone is in the position of an antinode.

Another acoustic application of the microphone made quite recently by Hebb is the determination of the velocity of sound. He uses two parabolic mirrors facing each other, and placed on the same axis. The one is fixed, and the other can be moved to a greater or lesser distance. In the focus of the first or fixed mirror is placed a tuning fork and a microphone, in the focus of the movable mirror a second microphone. The secondary of an induction coil having two primary windings is connected to a telephone. The primary windings are connected each with a battery and one of the microphones. The sound waves of the tuning fork act directly on the microphone next to it, and the reflected sound waves on the microphone in the movable mirror. It is easy to see that the loudness of the tone given out by the telephone depends on the frequency of the tuning fork, the distance between the two mirrors, and the velocity of sound. If both microphones receive antinodes at the same time, the tone is loudest, and if there is a phase difference of half a period between them the tone is weakest. Now the phase difference depends on the distance between the mirrors, the length of the acoustic wave, and the frequency. By first carefully determining the latter, and then finding the position of strongest and weakest sound, Hebb was able to determine with great accuracy the velocity of sound. He found it to be 331.29 metres, the probable mean error being only 0.04 m.

The attempts to use the microphone in seismography do not seem to have led to any practical or trustworthy result. Rossi, in 1887, used a microphone consisting of a silver plate and pointed lever in his underground observatory near Rome, and noticed that the telephone gave out sounds which were unmistakably the effect of seismic movements, and when afterwards the apparatus was tranferred to Vesuvius and came under Palmieri's observation, a general agreement between the sounds in the telephone and the records of the seismograph was observed, but the difficulty of separating sounds due to other causes seems to have stood in the way of further developments. Nevertheless, the authors think that the microphone may be made a seismographic instrument of great sensitiveness.

An ingenious application of the microphone for the detection of fire-damp has been made in France by Hardy. If the sound waves of two pipes of equal pitch impinge on microphones connected in series with a telephone a clear note is heard, but if one of the pipes emits a but slightly different note there will be beats heard in the telephone. Now if one pipe is on the bank and the other underground, the latter, if there be fire-damp, will be blown with air of a different density and emit a different note. The telephone, by sounding beats, will then give warning of the presence of fire-damp. The apparatus when tested with coal gas showed great sensitiveness. An admixture of but 0.1 per cent. gave three beats in twenty seconds, and an admixture of 1 per cent. gave thirty beats in twenty seconds.

The memoir deals very fully with the use of the microphone in telephony, including the production of graphic records such as are given by the instruments of Nernst, Lieben, Poulsen, and others. Also the use of the microphone in wireless telephony is touched upon. The most directly useful part of the memoir is, however, a very full account of the work done by a large number of experimenters in order to ascertain the best composition of the material forming the loose contact of the microphone, its mass, area of contact, specific pressure, and other determining factors as regards strength and clearness of sound.

The connection between the microphone and wireless telegraphy is not obvious, and the authors deal with this part of their subject very briefly. One sentence is, however, so interesting that it may, in conclusion of this short review, be quoted verbatim. The authors say:—"Already in 1879 Hughes has used the influence of spark discharges on microphonic resistances for wireless telegraphy over a distance of 400 meters."

GISBERT KAPP.

[1] Anwendungen des Mikrophonprinzips." By Chr. Jensen and H. Sieveking. (Hamburg: Graefe and Sille.)

SIR EDWARD J. REED, K.C.B., F.R.S.

THE death of Sir Edward James Reed on November 30 brought a long, useful, and highly distinguished career to a close. He was in his seventy-seventh year—full of activity, with mind as vigorous, and interests in life and work as keen, as ever. He was an active worker to the end. For the greater part of the last half-century he was the most prominent naval architect of his time. His influence during that long and important period in the progress of naval construction was one of the most potent forces that shaped its development and improvement. That influence was exerted, not only by his work and teaching, but also by constant and earnest efforts from his earliest days to promote the scientific education and training of young men