low notes than with high—because, though the rotating apparatus always produces a siren effect, the intensity of this effect is very small at low speeds. A very curious case occurs when $m = n$ (*i.e.*, the siren giving the same note as the pipe), for then the first harmonic comes in very marked.

8. Note on a Mode of Producing Sounds of very great intensity. By Professor Tait.

Two years ago I had an opportunity of making from the deck of the steamer “Pharos” some observations on the performance of the fog-siren at Sanda, off the Mull of Cantire. The instrument is worked by air at about $1\frac{1}{4}$ atmospheres pressure; and, though driven by a powerful air-engine, sounds for 7 seconds only per minute. One obvious defect of such an arrangement I saw to be the waste of energy in producing a current of air through the trumpet of the siren along with the oscillations. It then occurred to me that a regular alternation of puffing and sucking—exactly analogous to the air-disturbance produced by a drum—must be a much less costly source of sound. I have since constructed a siren on this double action principle, the air in the trumpet, which acts as a resonator, being put alternately in connection with reservoirs of compressed and rarefied air. The small model has given very good results, and a larger one is in progress. The only defect which my model showed was a waste of energy in the form of pulsations in the tubes leading to the exhausted receiver and to that containing compressed air. This can be very greatly reduced, but I do not yet see how to get rid of it entirely, unless it be possible to make both receivers so exactly as to act as additional resonators to the siren. If this can be carried out in practice there will be no energy spent except in sound. It is obvious that the principle just described is approximated to in practice whenever steam is employed in a siren:—the vacuum being produced by the condensation of the steam.

Another device of a somewhat different character was suggested to me by the experiments described in the preceding paper. After trying, without much success, to reduce the intensity of the siren notes by filing the edges of the apertures, it occurred to me that I

might usefully *intensify* them. I therefore had copper plates soldered perpendicularly to the revolving disc, so as to increase instead of diminishing the virtual thickness of the edges of the apertures. The result was very striking. Such a siren gives a sound whose intensity is not sensibly increased by a powerful blast from an organ bellows. It produces strong currents of air through the holes in the fixed disc, whose direction in general depends upon the direction in which the rotating disc is made to revolve; and especially does so when the copper plates are inclined to the surface of that disc. When the discs are both furnished with these plates, turned in opposite directions, the result is still more striking. Various other modifications have occurred to me, and are now under trial, especially one for producing currents alternately in opposite directions through the holes.

By bringing up a flat plate towards the instrument, the quality of the sound is altered in a remarkable manner, and to such an extent that it seems well adapted for rapid Morse-signalling. As this instrument requires no work to be spent except in turning it, a very large number may be kept continuously at work at once by the same expenditure of power as is required for the intermittent roaring of a single fog-siren.

The following Gentlemen were duly elected Fellows of the Society :—

JAMES R. STEWART, M.A. Oxon., 10 Minto Street.

JOHN ARCHIBALD CAMPBELL, M.D., Garland's Asylum, Carlisle.