

open question in the present condition of the inquiry. The close connection with Hallstadt renders the latter view the more probable, although there is clear proof of the Greek influence from the south. This, however, it must be admitted, may belong to a later period.

In closing this review, we may congratulate Dr. Munro on his success in writing a book which is short, picturesque, and scientific; and we feel sure that he will gain his end, of attracting attention to the archæological treasures awaiting the explorer in this hitherto little-explored corner of Europe.

W. BOYD DAWKINS.

EXPERIMENTS IN MECHANICAL FLIGHT.

I HAVE been for some years engaged in investigations connected with aerodromic problems, and particularly with the theoretical conditions of mechanical flight. A portion of these have been published by me under the titles "Experiments in Aerodynamics" and "The Internal Work of the Wind," but I have not hitherto at any time described any actual trials in artificial flight.

With regard to the latter, I have desired to experiment until I reached a solution of the mechanical difficulties of the problem, which consist, it must be understood, not only in sustaining a heavy body in the air by mechanical means (although this difficulty is alone great), but also in the automatic direction of it in a horizontal and rectilinear course. These difficulties have so delayed the work, that in view of the demands upon my time, which render it uncertain how far I can personally conduct these experiments to the complete conclusion I seek, I have been led to authorise some account of the degree of success which has actually been attained, more particularly at the kind request of my friend Mr. Alexander Graham Bell, who has shown me a letter which he will communicate to you. In acceding to his wish, and while I do not at present desire to enter into details, let me add that the aerodrome, or "flying-machine" in question, is built chiefly of steel, and that it is not supported by any gas, or by any means but by its steam-engine. This is of between one and two horse-power, and it weighs, including fire-grate, boilers, and every moving part, less than seven pounds. This engine is employed in turning aerial propellers which move the aerodrome forward, so that it is sustained by the reaction of the air under its supporting surfaces.

I should, in further explanation of what Mr. Bell has said, add that owing to the small scale of construction, no means have been provided for condensing the steam after it has passed through the engine, and that owing to the consequent waste of water, the aerodrome has no means of sustaining itself in the air for more than a very short time—a difficulty which does not present itself in a larger construction where the water can be condensed and used over again. The flights described, therefore, were necessarily brief.

S. P. LANGLEY.

Through the courtesy of Mr. S. P. Langley, Secretary of the Smithsonian Institution, I have had on various occasions the privilege of witnessing his experiments with aerodromes, and especially the remarkable success attained by him in experiments made on the Potomac River on Wednesday, May 6, which led me to urge him to make public some of these results.

I had the pleasure of witnessing the successful flight of some of these aerodromes more than a year ago, but Prof. Langley's reluctance to make the results public at that time prevented me from asking him, as I have done since, to let me give an account of what I saw.

On the date named, two ascensions were made by the aerodrome, or so-called "flying machine," which I will not describe here further than to say that it appeared to me to be built almost entirely of metal, and driven by a

steam-engine which I have understood was carrying fuel and a water supply for a very brief period, and which was of extraordinary lightness.

The absolute weight of the aerodrome, including that of the engine and all appurtenances, was, as I was told, about 25 pounds, and the distance, from tip to tip, of the supporting surfaces was, as I observed, about 12 or 14 feet.

The method of propulsion was by aerial screw propellers, and there was no gas or other aid for lifting it in the air except its own internal energy.

On the occasion referred to, the aerodrome, at a given signal, started from a platform about 20 feet above the water, and rose at first directly in the face of the wind, moving at all times with remarkable steadiness, and subsequently swinging around in large curves of, perhaps, a hundred yards in diameter, and continually ascending until its steam was exhausted, when, at a lapse of about a minute and a half, and at a height which I judged to be between 80 and 100 feet in the air, the wheels ceased turning, and the machine, deprived of the aid of its propellers, to my surprise did not fall, but settled down so softly and gently that it touched the water without the least shock, and was in fact immediately ready for another trial.

In the second trial, which followed directly, it repeated in nearly every respect the actions of the first, except that the direction of its course was different. It ascended again in the face of the wind, afterwards moving steadily and continually in large curves accompanied with a rising motion and a lateral advance. Its motion was, in fact, so steady that I think a glass of water on its surface would have remained unspilled. When the steam gave out again, it repeated for a second time the experience of the first trial when the steam had ceased, and settled gently and easily down. What height it reached at this trial I cannot say, as I was not so favourably placed as in the first; but I had occasion to notice that this time its course took it over a wooded promontory, and I was relieved of some apprehension in seeing that it was already so high as to pass the tree-tops by twenty or thirty feet. It reached the water one minute and thirty-seconds from the time it started, at a measured distance of over 900 feet from the point at which it rose.

This, however, was by no means the length of its flight. I estimated from the diameter of the curve described, from the number of turns of the propellers as given by the automatic counter, after due allowance for slip, and from other measures, that the actual length of flight on each occasion was slightly over 3000 feet. It is at least safe to say that each exceeded half an English mile.

From the time and distance it will be noticed that the velocity was between twenty and twenty-five miles an hour, in a course which was constantly taking it "up hill." I may add that on a previous occasion I have seen a far higher velocity attained by the same aerodrome when its course was horizontal.

I have no desire to enter into detail further than I have done, but I cannot but add that it seems to me that no one who was present on this interesting occasion could have failed to recognise that the practicability of mechanical flight had been demonstrated.

ALEXANDER GRAHAM BELL.

THE APPROACHING CELEBRATION OF THE KELVIN JUBILEE IN GLASGOW.

IT may interest our readers to state the programme of the approaching celebration of the jubilee of Lord Kelvin as Professor of Natural Philosophy in the University of Glasgow.

On the evening of Monday, June 15, at 8.30 p.m., the University will give a conversazione, when there will be an