

drome, half of which sum was to be available immediately and the remainder when required.

The flying weight of the machine complete, with that of the aéronaut, was 830 pounds; its sustaining surface, 1040 square feet. It therefore was provided with slightly greater sustaining surface and materially greater relative horse-power than the model subsequently described which flew successfully. The brake horse-power of the engine was 52; the engine itself, without cooling water, or fuel, weighed approximately 1 kilogram to the horse-power. The entire power plant, including cooling water, carburettor, battery, &c., weighed materially less than 5 pounds to the horse-power. Engines for the large machine and for a model of the large machine one-fourth of its linear dimensions were completed before the close of 1901, and they were immediately put in their respective frames, and tests of them and of their power-transmission appliances were begun.

A test of the quarter-size model in actual flight was made on August 8, 1903, when the machine worked most satisfactorily, the launching apparatus, as always heretofore, performing perfectly, while the model, being launched directly into the face of the wind, flew directly ahead on an even keel. The balancing proved to be perfect, and the power, supporting surface, guiding, and equilibrium-preserving effects of the rudder also. The weight of the model was 58 pounds, its sustaining surface 66 square feet, and the horse-power from $2\frac{1}{2}$ to 3. This was the

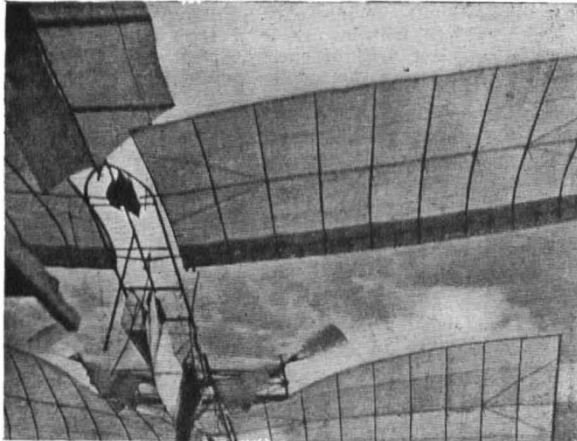


FIG. 1.—Reproduction of an instantaneous photograph, taken from the boat itself and hitherto unpublished, showing the aérodrome in motion before it had actually cleared the house boat. On the left is seen a portion of a beam, being a part of the falling ways in which the front wing was caught, while the front wing itself is seen twisted, showing that the accident was in progress before the aérodrome was free to fly.

first time in history, so far as I know, that a successful flight of a mechanically sustained flying machine was made in public.

Serious delays in the testing of the small machine were caused by changed atmospheric conditions, but they proved to be almost negligible compared with what was later experienced with the large one.

On October 7, 1903, the weather became sufficiently quiet for a test. In this, the first test, the engineer took his seat, the engine started with ease and was working without vibration at its full power of more than 50 horse, and the word being given to launch the machine, the car was released and the aérodrome sped along the track. Just as the machine left the track, those who were watching it, among whom were two representatives of the Board of Ordnance, noticed that the machine was jerked violently down at the front (being caught, as it subsequently appeared, by the falling ways) (Fig. 1), and under the full power of its engine was pulled into the water, carrying with it its engineer. When the aérodrome rose to the surface it was found that while the front sustaining surfaces had been broken by their impact with the water, yet the rear ones were comparatively uninjured. As soon as a full

examination of the launching mechanism had been made, it was found that the front portion of the machine had caught on the launching car, and that the guy post, to which were fastened the guy wires which are the main strength of the front surfaces, had been bent to a fatal extent. The machine, then, had never been free in the air, but had been pulled down as stated.

On December 8, 1903, a test was made at Arsenal Point, quite near Washington, though the site was unfavourable. The engine being started and working most satisfactorily, the order was given by the engineer to release the machine, but just as it was leaving the track another disaster, again due to the launching ways, occurred. This time the rear of the machine, in some way still unexplained, was caught by a portion of the launching car, which caused the rear sustaining surfaces to break, leaving the rear entirely without support, and it came down almost vertically into the water.

Entirely erroneous impressions have been given by the account of these experiments in the public Press, from which they have been judged, even by experts, the impression being that the machine could not sustain itself in flight. It seems proper, then, to emphasise and to reiterate, with the view of what has just been said, that the machine has never had a chance to fly at all, but that the failure occurred on its launching ways; and the question of its ability to fly is consequently, as yet, an untried one.

There have, then, been no failures so far as the actual test of the flying capacity of the machine is concerned, for it has never been free in the air at all. The failure of the financial means for continuing these expensive experiments has left the question of their result where it stood before they were undertaken, except that it has been demonstrated that engines can be built, as they have been, of little more than one-half the weight that was assigned as the possible minimum by the best builders of France and Germany; that the frame can be made strong enough to carry these engines, and that, so far as any possible prevision can extend, another flight would be successful if the launching were successful; for in this, and in this alone, so far as is known, all the trouble has come.

The experiments have also given necessary information about this launching. They have shown that the method which succeeded perfectly on a smaller scale is insufficient on a larger one, and they have indicated that it is desirable that the launching should take place nearer the surface of the water, either from a track upon the shore or from a house boat large enough to enable the apparatus to be launched at any time with the wings extended and perhaps with wings independent of support from guys. But the construction of this new launching apparatus would involve further considerable expenditures that there are no present means to meet; and this, and this alone, is the cause of their apparent failure.

Failure in the aérodrome itself or its engines there has been none; and it is believed that it is at the moment of success, and when the engineering problems have been solved, that a lack of means has prevented a continuance of the work.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The number of first-year students matriculated on Saturday, October 21, was 1008. Last year at the same date the number was 884. With those matriculated during the Lent and Easter terms, the total for the civil year 1905 is 1039; but this number will be slightly increased, as several freshmen were unable to attend on Saturday. Hitherto the largest entry has been 1027, in the year 1890. The number of medical students is 117; there is also a large entry of engineering students and of candidates for the economics tripos.

The professor of mineralogy has, with the consent of the Vice-Chancellor, re-appointed Mr. A. Hutchinson, of Pembroke College, to be demonstrator in mineralogy and assistant curator for five years from January 1, 1906.

The special board for biology and geology has nominated Mr. F. A. Potts, of Trinity Hall, to use the university table at Naples for six months as from October 1, 1905.

A university lectureship in mathematics is vacant by the resignation of Mr. Jeans, who has accepted a professorship at Princeton University, New Jersey. The general board of studies will shortly proceed to appoint a lecturer to hold office from Christmas, 1905, until Michaelmas, 1910. The annual stipend is 50*l.* The lecturer will be expected to lecture on applied mathematics. Candidates are requested to send in their applications, with statements of the branches of mathematics in which they are prepared to lecture, and with testimonials if they think fit, to the Vice-Chancellor on or before November 6.

Science announces that New York University has received 5000*l.* by the will of the late William A. Wheelock.

SOME excellent views of the plant and equipment of the workshops and laboratories at Birmingham University are given in illustration of a series of articles by Mr. C. Alfred Smith in *Engineering*.

DR. ALEXANDER MCKENZIE, lecturer and senior demonstrator in the University of Birmingham, has been appointed head of the chemical department at the Birkbeck College in succession to Dr. John E. Mackenzie, who has accepted the appointment of principal of the Technical Institute, Bombay.

THE Ontario Government has selected, says *Science*, the following men to compose a commission to report on the proposed reorganisation of the University of Toronto:—Prof. Goldwin Smith, Sir William Meredith, Messrs. A. H. N. Colquhoun, Byron E. Walker, J. W. Flavelle, the Rev. Canon Cody, and the Rev. D. B. Macdonald.

THE classes in craft instruction in photography and process work at the Regent Street Polytechnic were inaugurated by a social re-union on October 17. We notice the time-table for the present session includes classes in practical and technical photography, studio operating, retouching, finishing in colours, photo-engraving, and in colour photography.

THE Bishop of Birmingham, delivering the presidential address to the members of the Midland Institute at Birmingham on October 23, took for his subject "What is an Educated Man?" He said the uneducated man is without an ideal, consciously held and deliberately striven after. He may be a specialist of trained faculty, but, if he has no general ideal enabling him to give his special subject its place in human progress as a whole, he remains a trained specialist rather than an educated man. The educated man knows something of modern scientific method and achievement. Then the world becomes to him the scene of great constant forces which admit of being guided and directed and combined to promote the purpose of human progress. A man to become educated need not have time to read much, if he reads the right books. He ought to know some one other language than his own, and enlarge his study in some other literature. A man who has read carefully any one of the works of Darwin will know what real scientific caution is, coupled with the widest power of hypothesis.

A copy of the annual report of the Glasgow and West of Scotland Technical College has been received. The total expenditure to date on the site, building, and equipment of the first section of the new building, the memorial stone of which was laid by the King two and a half years ago, has been 163,060*l.*; the building and equipment fund now stands at 209,763*l.*, of which 198,845*l.* has been received. The small balance available after payment of the liabilities already incurred is not sufficient to enable the governors to proceed with the remaining section of the building, but it is hoped that they will soon be placed in a position to complete the scheme originally proposed. In addition to the subscriptions to the building and equipment fund, the college will receive a legacy of 20,000*l.* under the will of the late Mr. James Donald, and also the residue of his estate. This welcome addition to the resources of the college is to be used in the development of the facilities already existing for the study of chemistry and mechanics. The scheme for the coordination of certain of the continuation classes conducted by the school boards of Glasgow and Govan with the corresponding classes in the college was in force during last session, but did not work so satisfactorily as was anticipated. The necessity

for a closer linking together of the two systems was felt, and an officer of the college has been appointed as superintendent of the continuation classes concerned,—whose principal duty is to keep in close touch with the teachers, both of the college and the school boards, and whose active mediation will, it is hoped, secure the carrying out of the scheme of work agreed upon.

SOCIETIES AND ACADEMIES.

LONDON.

Entomological Society, October 5.—Mr. F. Merrifield, president, in the chair.—Mr. E. Harrie showed living larvæ of *Cordylomera saturalis*, taken from a log of mahogany imported from the Sekondi district of the Gold Coast, together with the perfect beetle, which was dead at the time the discovery was made.—Mr. A. T. Rose exhibited a remarkable melanic specimen of *Catocala nupta*, taken by Mr. Lewis in his garden at Hornsey, N., in September. The coloration of the lower wings was of a dull brown, and all the markings of the upper wings were strongly intensified.—Mr. N. H. Joy brought for exhibition Coleoptera taken during a three days' trip to Lundy Island in August, including *Melanophthalma distinguenda*, Con., a species new to Britain; *Stenus ossium* var. *insularis*, a variety apparently new to science; and *Ceuthorrhynchus contractus* var. *palipes*, Crotch, peculiar to the island. One hundred and sixty-three species were taken on the island, about eighty of which are not recorded in Wollaston's and F. Smith's lists of Lundy Coleoptera.—Mr. A. Sich showed examples of *Argyresthia illuminatella*, Z., two of the four specimens taken near Hailsham, Sussex, on June 15 this year. They were beaten off Pinus, and until examined with a lens were supposed to be *Ocnerostoma piniariella*, of which species two were also exhibited for comparison.—Mr. W. J. Lucas exhibited the larva, cocoon, and the subsequent imago of an "ant-lion," *Myrmeleo formicarius*, from two Spanish larvæ given him by Dr. T. A. Chapman last autumn. The difference in size between the small larva and the large perfect insect was remarkable. He also showed a living ♀ of the rather scarce grasshopper *Stenobothrus rufipes*, taken in the New Forest at the end of August, and kept alive by feeding on grass.—Mr. G. C. Champion exhibited several examples of *Lymexylon navale*, L., from the New Forest, where it was not often found.—Mr. A. H. Jones showed series of *Lycæna argus* (*aegon*, Schiff.), var. *hypochiona*, taken on the North Downs this year, approaching the form of *L. argyrognomon* taken not uncommonly in the Rhone Valley. Together with these he had arranged for comparison typical British *L. argus*, L., L. var. *corsica*, from Tattone, Corsica, and a series of *L. argyrognomon*, Brgstr. (*argus*, auctorum), from Chippis, near Sierre.—Colonel J. W. Yerbury exhibited specimens of *Hammerschmidia ferruginea*, Fln., from Nethy Bridge, the first authentic British specimens; also *Microdon latifrons*, Lw., a specimen of which, taken at Nethy Bridge June 18, 1900, he had wrongly identified as *M. devius*, and under this name it was recorded in Verrall's "British Flies"; and of *Chamaesyphus scaevoides*, Fln., a single specimen swept on June 15 in the Abernethy Forest near Forest Lodge.—Mr. H. J. Turner exhibited series of four species of the genus *Coleophora*, *C. alcyonipennella*, *C. lixella*, *C. albitarsella*, and *C. badipennella*, together with the larval cases mounted *in situ* on the ruined leaves of their respective food plants. He also exhibited living larvæ and their cases, of *Goniodoma limoniella* on *Statice limonium*, *Coleophora obtusella* on *Juncus maritimus*, and *C. glaucicolella* (?) on *Juncus glaucus*, found in the Isle of Wight.—Commander J. J. Walker read a paper by Mr. A. M. Lea entitled "The Blind Coleoptera of Australia and Tasmania," and exhibited specimens of *Ilaphanus stephensi*, Macl., from Watson's Bay, Sydney, N.S.W., and *Phycochus graniceps*, Broun, and *P. sulcipennis*, Lea, from Hobart, Tasmania.

MANCHESTER.

Literary and Philosophical Society, October 17.—Sir William H. Bailey, president, in the chair.—The "shadow bands" seen during the total eclipse observed at Burgos, in Old Castile, on August 30: T. Thorp.—Inaugural address: the President (see p. 637).