

or other deposits of economic value. This was not difficult in the middle of the nineteenth century in a largely unexplored country of the size of the United States. The Federal Survey replaced earlier western exploratory expeditions whose rivalry and duplication of work had jeopardized government support.

Dr Manning concerns himself mainly with the period 1867 to 1894, and he describes in considerable detail what might be called the "birth pangs" of the Survey. These resulted from a variety of causes. One was the question whether the Survey should be under civilian or military control—previously, geologists had been attached to topographical surveys controlled by the army. Another cause for contention was whether the work should be limited to strictly economic objectives, rather than the advancement of geological knowledge of the country as a whole. Once the Survey got under way some geologists were carried away by the opportunities offered to increase the general knowledge of a comparatively new and rapidly developing science, irrespective of the immediate practical outcome of the work in hand. For example, it was not easy to persuade hard headed politicians that public funds should be used to accumulate large collections of fossils. Further complications arose in deciding precisely what work should be carried out by the Federal Geological Survey. Geologists cannot work without suitable maps on which to record their results, and at that time such maps were not available. Thus a decision had to be made as to whether a topographic survey should be carried out under the control of the geologists in the areas in which they were working, or whether an independent topographic survey should be established which would not necessarily cooperate with the geologists. Requests for information about water supply and advice about irrigation for farm lands caused further discussions and disruption of plans. Finally, in a country where state appointments were often subject to political considerations and nepotism, the staffing of the Survey raised problems whose solution was not helped by intense rivalries among the geologists themselves.

Dr Manning's story might have had more interest for the general reader if he had said a little more about the earlier exploratory western surveys that preceded the period with which he deals, and the early independent state geological surveys established at quite an early date in the nineteenth century. In preparing his book, the author, a historian by profession, considered it "A major duty . . . to master the science of the Survey and place that science in historical perspective". In this task, which might well merit a book of its own, he has been unsuccessful. His book is essentially a study in depth of the relations between scientists and politicians during a limited but interesting period. For his material he has searched the records and sources, published and unpublished, very thoroughly, and quotes many contemporary letters written by persons involved, which were not intended for publication. A final chapter sketches in outline the progress of the Survey from its small beginnings to the present highly organized and scientific institution that it is today, with an annual budget in 1965 of 67 million dollars.

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to most laymen, there can be little doubt that the first sustained and controlled flight in a powered machine was carried out by the Wright brothers in December 1903.

The long controversy which is unfolded in this monograph is therefore largely of historical value, although there is much of technical interest in the book, because the two aircraft of Ader's design which he claimed to have flown, the *Éole* (1890) and the *Avion III* (1897), are studied in great detail with the help of numerous diagrams and photographs. A particularly interesting feature to the engineer is the long chapter on the "Wing Movements and Flight Controls" of Ader's bat-like aircraft. The complex control movements invented by Ader are analysed in this chapter with the assistance of the Aerodynamics Department of the Royal Aircraft Establishment, Farnborough. Other historic aircraft are also included in the seventy-two well produced illustrations in the book.

As the title suggests, however, the book is concerned mainly with the flight claims of Clément Ader, in particular as to whether Ader was (a) the first man to fly in a powered aircraft (in 1890); and (b) the inventor of the Wright type of wing warping for roll control.

This study has been carried out with Mr Gibbs-Smith's usual thoroughness and one gains a very clear impression of the controversy in full detail. In a book of this kind, however, the author is in the position of judge, jury and counsel for both defence and prosecution and the reader expects impartiality of him. Despite the claim of such impartiality put forward in the preface by M. Dollfus (savant aéroplane et critique rigoureux), the weakness of this book is, in fact, the very biased approach of the author.

In both the "Introduction" and "The Ader Chronology" which immediately follows it, the author makes clear his condemnation of Ader and throughout the following chapters the claims of Ader and his advocates are ruthlessly dissected in detailed analyses of official, legal and technical evidence. As presented, this evidence alone makes a strong and convincing case against the French inventor and it is a pity that the author has thought fit to spoil his work by creating the derogatory atmosphere which pervades the book. Such terms as "palpable absurdity", "mendacity compounded" and "he (Ader) never dreamed of it" occur far too frequently and produce an ill tempered air which detracts from an otherwise excellent study. One is left with a feeling of sympathy for Clément Ader who, whatever his culpability, was a very able engineer at a time when such men were rare and deserves better than the grudging reference to his abilities that this book contains.

The book itself consists of thirty short sections plus nineteen appendices all but three of which are in French. The French text therefore covers about one third of the book, but relevant parts of the appendices are referred to in the main text and translated where necessary. To sum up, this is a most readable and interesting book to both the engineer and historian, but a more appropriate title would have been "The Case against Clément Ader".

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CASE AGAINST CLÉMENT ADER

Clément Ader

His Flight-Claims and his Place in History. By Charles Harvard Gibbs-Smith. (Science Museum, London.) Pp. x + 214. (HM Stationery Office: London, 1968.) 32s. 6d.

SINCE the birth of flight the claims of Clément Ader have been the subject of some controversy, although it is doubtful if they are of the importance to the technical world of aviation which the publication of this book would suggest. To the aeronautical engineer, and indeed

PSYCHICAL HISTORY

The Founders of Psychical Research

By Alan Gauld. Pp. xii + 387. (Routledge and Kegan Paul: London, 1968.) 50s.

IN the second half of the nineteenth century, efforts were made to establish psychical research as a form of scientific enquiry. This led to the founding of the Society for Psychical Research in 1882. Scientists of that time who were connected in one way or another with the work of the society included William Barret, William Crookes, Oliver Lodge, J. J. Thomson and Lord Rayleigh,