

Record

ARTHUR JOSEPH HUGHES, O.B.E., F.R.A.E.S.

ARTHUR JOSEPH HUGHES, a great navigational instrument maker, and a Fellow of this Institute, died in the late autumn of 1961. He was an octogenarian, which means that he grew to manhood during the last twenty years of Queen Victoria's reign. They were years that his contemporaries remember as a period of quietness and slow change: a period, too, in which Duty was a compelling word in nursery and schoolroom. Duty spelt Service, and service was the keynote to the life of Arthur Hughes.

He was proud to be an instrument maker, and prouder still to come by direct descent from a long line of instrument-makers. These form a group of men whose social importance has hardly been recognized. Yet how often do we ask the questions Where? When? And it is through successively refined instruments that these questions can be answered, and answered especially for the seaman in the pathless ocean and for the airman in the empty sky.

Instrument-making sprang originally from watch-making, and in England we first hear of watch-makers when the Virgin Queen Elizabeth came to the throne—a little group clustered outside Temple Bar. That was four centuries ago, and Arthur Hughes' forebears bridge half that period. We find their shops in the reign of George III, situated beside the Thames, in Limehouse and by Ratcliff Cross, where the sailors lived—a William Hughes, a Joseph or two, a James, a Henry.

And when Queen Victoria was crowned, a young Henry Hughes, recently married, moved from the waterside into the City, and opened his Navigation Warehouse in Fenchurch Street. Here were the famous premises, with the effigy of 'The Little Admiral' fixed above the side door, to which sea-officers, back from all parts of the ocean, came to gossip, and smoke, and re-equip themselves. Henry Hughes was soon Henry Hughes and Son, that Son being Alexander Hughes, father of the Arthur Joseph who has now died.

Alexander Hughes was a fertile inventor and improver of sea-instruments. He worked with Sir William Thomson, afterwards Lord Kelvin, an association which ended unfortunately in a disastrous law-suit, resulting in a monetary loss which put an end to young Arthur's schooling. However, the firm survived and grew. Early in the present century the Fenchurch Street premises were outgrown, and it became necessary to move out into Essex and start mass production. Arthur Hughes was now in command: the coming of aircraft led to a demand for new types of compasses, and here was a firm that had already specialized in boat-compasses. Next came the discovery of echo sounding, whereupon the Admiralty entrusted Messrs. Hughes with the task of Research and Development in this field.

The airman was now also needing a sextant, and after several years' work Hughes' Mark IX Averaging Sextant was accepted by the Royal Air Force, and was just in time to go into production, and keep the air-lines open, for the second world war. 'By its easy drill and use (wrote Mr. Hughes in his *Memoirs*) many thousands of amateur navigators were trained to become experts in a few months'. This instrument was, he considered, his greatest contribution to the

war. 'I have spent my life in Navigation,' he said (and quoting the long dead John Seller): 'it being indeed the beauty and bulwark of England, the wall and wealth of Britain, and the bridge that joins it to the Universe'. Like John Seller, his predecessor in instrument-making by three centuries, Arthur Joseph Hughes will not be forgotten by navigators whom he served.

E. G. R. Taylor

CHARLES SUMNER DURST, O.B.E.

CHARLES SUMNER DURST, meteorologist and a Fellow of the Institute and sometime member of its Council, died on Christmas day 1961. His work in meteorology began at the age of thirty-one when he joined the Meteorological Office after service in the first world war, and continued without interruption until his death over forty years later. Throughout this period he was remarkable for a profusion of original ideas on whatever aspect of meteorology he came into contact with, and he pursued many of these ideas over long years, or returned to them as opportunity permitted. In the earlier part of his career his official duties included periods of work on marine meteorology, examination of candidates for flying and navigational licences, and weather forecasting, as well as other branches of meteorology. Early in the second world war he was put in charge of a new branch of the Meteorological Office which had been formed to deal with enquiries from military planning staffs and others, and was later promoted to Assistant Director. In this position he himself wrote, or supervised the production of, a large number of detailed aviation reports covering practically the whole theatre of military operations; his climatological knowledge in this respect was unrivalled and among other papers it led to his contribution to the *Compendium of Meteorology* (American Met. Soc., Boston, 1951). Another subject to which he gave much attention at this time was the meteorology of airfields, a summary of which was published under that title (H.M.S.O., 1949).

As regards his impact, both on meteorology itself and on matters relating to air navigation, he will perhaps be best remembered for his pioneer work in relation to wind. An early example of this interest is contained in his part in the research on wind structure carried out by Meteorological Office staff at the Royal Airship Works, Cardington, Beds., the results of which were published in *Geophysical Memoir* No. 54 (H.M.S.O., 1932). Well before the end of the second world war enquiries began to come in from civil aviation sources regarding the effect of wind on the operation of long distance transport aircraft. In cooperation with the late C. E. P. Brooks and others Durst developed the statistics of wind and their application to air-route planning. Fundamental for this work was the representation of the three-dimensional field of wind over the globe by means of only two parameters—the mean vector wind at any point over a month or season, and its standard vector deviation. Durst had for long protested against the unrepresentativeness of pilot balloon observations, which can be made only in clear weather, and it was not until about 1940 that this method began to be superseded by the present radio methods. These made possible the accurate mapping of upper winds on a world-wide scale, in which Durst himself played a large part. In addition to the application to route planning, Durst also investigated the variation of wind in space and time. For this purpose it was necessary to develop the theory of the correlation of vectors, which was done in collaboration with G. H. Gilbert. Another of his interests was the forecasting of