

photographs from the original publications are linked to the colour pictures, and the captions detail former and current collections. Every identified watch and object is accompanied by a detailed description, sometimes taken from previously unknown work by Chapuis, and the source engravings used by the enamellers are reproduced if applicable. Although the greater part of the text relates directly to the watches and objects, Ian White uses a short introduction to explain his methodology, provide a list of the major collections and publications and explain the various mechanical features for Chinese-market watches. The same format is used for the subsequent chapters 6 and 7. The ensemble is quite literally breathtaking.

The book concludes with six appendices including an interview given by Loup on his return from China to *La Suisse* newspaper, an interesting description of the technique for cutting and mounting half pearls, and copies of the entries in the Sandoz Purchase Book for watches from Loup. Finally there are biographies of the makers cited in the collection.

Production of the book is of a high standard, it is printed on a heavy silk paper and bound to last. Because the illustrations are taken from numerous sources, many of which pre-date modern digital techniques, there are some slight, but not significant, variations in colour; indeed the author has made every effort to include a 'new' image if available to show the quality of workmanship at its best. Although ostensibly devoted to a single collection as the subtitle explains, this book deserves its main heading: *The Majesty of the Chinese-Market Watch*.

Simon Bull

From Celestial to Terrestrial Timekeeping. Clockmaking in the Bond Family, by Donald Saff. (AHS) 2019. Casebound, 270mm x 210mm, 440 pages, 450 illustrations, buckram cloth cover, 150gsm art silk paper, head and tail bands, silk ribbon and printed dust jacket. ISBN 978-0-901180-54-4. £35 plus postage and packaging. To order see www.ahsoc.org/shop/books

Not known widely outside the USA, this family of horologists and astronomers were important contributors to both subjects, influencing developments on each side of the Atlantic

FROM CELESTIAL TO TERRESTRIAL TIMEKEEPING

Clockmaking in the Bond Family



DONALD SAFF

Ocean. Saff has researched in detail the family origins, outlined the context in which they worked and described, exhaustively, their products. Rightly, he has devoted a substantial part to the Bond chronograph and three clocks numbered 394, 395 and 396, these being the most technically advanced and precise. There are 527 footnotes, some quite long, which are placed at the ends of chapters.

Chapter I *The Commodification of Time*. This chapter starts with an attempt to put the Bonds in historical context but, in the reviewer's opinion after several readings, it could start at the bottom of page 2 without loss to the sort of reader drawn to this book. The chapter could be seen as an extension of the introduction being so wide-ranging in dates and topics. It describes the problems of running railways using the American single track system with occasional passing loops and outlines methods of overcoming deficiencies by using accurate time keepers. It goes on to mention the first UK to USA telegraph cable.

Chapter II *An Extraordinary Family*. There is a discussion of a Bond family crest but a connection with this Boston Bond family has not been demonstrated. There is much detail of Bond's co-workers and associates of the family.

Chapter III *The Family Business*

The Bond business appears to have been established in 1893 in Boston and moved several times. Details are given of the various locations. The 1812 weight-driven Bond chronometer is described. The two-way agreement with Harvard College Observatory to receive and provide time signals is mentioned, as is the financial loss to the firm incurred as a result of employing a corrupt lawyer, later jailed. The reviewer need hardly say there is much else.

Chapter IV *From Chronometric Expeditions to the Transatlantic Cable*

Bond's involvement with the determination, by chronometer, of the longitude of Boston, Massachusetts, over the period 1848 to 1855 was considerable, Bond being sent to England to put the scheme in motion. The chronometrical determination was extended to include Halifax, Nova Scotia. It is unfortunate the account of the laying of the first telegraph cables is written from a very US perspective with only passing mention that the most successful cable laying ship was Brunel's *Great Eastern* and no mention that the cable was British, the capital raised in the UK, that partners were sixteen from the UK and nine from the USA, and that the electrical engineers were from the UK. The time response of early cables due to their high capacitance, induction and losses limited their early use for accurately determining longitude.

Chapter V *Time for New England's Railroads*

Bond supplied standard time to the railroads. Saff admits the pursuit of regulated time is a complex subject, the reviewer concurs.

Chapter VI *Break Circuits*

In the UK, we might well refer to these as 'electrical contacts' or 'electrical contact sets' and this quite detailed account covers US and European developments.

Chapter VII *Time Service, Electricity, and the role of Harvard College Observatory*

This chapter starts with the relationship between Harvard College Observatory and Bond from 1848 commencing with a commission to construct a clock with break circuits. After a discussion on telegraph lines followed by Bain, Ritchie, R.L. Jones, Gardner and Pond electric clocks amongst others, it ends with a discourse on the rates of Bond 395 and mention of the Observatory's electro-

magnetic system for correcting rates as applied by Rieffler.

Chapter VIII *The Chronograph, the 'Spring Governor' and the Conical Pendulums*

This contains a very thorough general account of the development of the chronograph which device has had such profound effect on science and technology. The appearance of the Bond chronograph at the Crystal Palace Exhibition of 1851 had a considerable impact on those learned persons who saw it and subsequently the accuracy of astronomical observations was transformed. Included is a description of Bond's compensation balance. There follows details of his spring governor and its applications to telescope drives. These improvements were quickly adopted by others including Dent working for Airy.

Chapter IX *Failed Experiments: Isodynamic Escapement and Multiple Pendulums*

This describes the background to, and development of, the isodynamic escapement. This is followed by an analysis of its faults. Bond's use of multiple pendulums is then outlined along with the problems encountered.

Chapter X *Bond's variation on Denison's Escapement*

Bond developed the gravity escapement and the author discusses the ways in which he attempted to lessen the influence of the going train on the force required to unlock it. A particular joy are the reproductions of original drawings and the photographs of various wooden patterns for clock components, both originals being uncommon survivors. This is an interesting chapter.

Chapter XI *The Trio: Bond Numbers 394, 395 and 396*

This chapter of sixty-seven pages includes eighty-eight footnotes and compares and contrasts the three most precise clocks fitted with W. F. Bond's detached gravity escapement. Of necessity, there is much detail of what were Bond's finest clocks.

Page 215 Shop tools: The principal tools are mentioned but the many hundreds that survive are not dealt with at all. Not mentioned is that these represent a substantial capital investment. It is unlikely the Bower wheel engine cost less than £20, Stubs is known to have spent £42 on one made in London in the early 1800s. The pinion engine and fusee engine are both Lancashire-made, as are many

other Bond workshop tools, but this is not mentioned. One could surmise that during the visit to Liverpool by Bond in connection with the determination of the longitude of Boston, USA, the personal contacts made were used to great advantage when equipping his workshop.

Page 216: The Leylands of Prescott are called watchmakers in the text, but signed their tools Leyland, Clockmaker and both the 1851 and 1861 Census returns for Prescott record them thus.

Page 221: The arrangement of three images of the escapements of clocks 394, 395, 396 to enable direct comparison is excellent and this is not meant to detract from the rest.

The bibliography, occupying 20 pages, is wide-ranging.

The appendices, headed by letters of the alphabet, require all twenty-six. To pick a few, A is 'Entries from Bond & Son daybooks relating to time distribution'. Although appendix E gives a selective genealogy there is no family tree and detail of the eighteenth-century English Bond family is vague. K 'Original chronometer instructions, dating between 1896 and 1903'. R is 'Bond and Son original notes on Bond nos. 394, 395, 396'. T is 'Drawings and diagram of clocks Nos 137,152, and 396, by Richard Ketchen', here the reviewer is concerned that thread pitches are given as exact numbers of Threads Per Inch because when those on clock 395 were measured by travelling microscope they were only approximations to standard pitches (Ch XI footnote 52). Y is 'Diagrams by E.B. Gent, October 1978', being of clock 395.

The eleven+ pages of index provide a useful way into the text.

Don Saff is to be congratulated on his assiduous approach to the research which has formed the foundation of this work and the AHS are to be thanked for encouraging the production, to such a high standard, of such pieces of scholarship. There is much of great interest to students of precision horology and it is refreshing to have an American view. The book has to be read to appreciate the amount of information contained therein. It is known the author has produced a video of clock 395 running, it is hoped he will make this available to purchasers of his book. Videos of 396 can currently be seen on YouTube.

R. John Griffiths



Von Augenwendern und Schnappautomaten. Die Welt der Uhrenmännchen und Figuren Uhren von 1635 bis 1960, by Frank Haverkamp and Beatrice Techen. Justus von Liebig Verlag, Darmstadt 2018. ISBN 978-3-87390-409-5. German language, 342 pages, 320 x 220mm, with 145 full page colour photographs. Price €46 hardback. The publisher ships only within Germany: www.liebig-verlag.de. International orders may be placed alternatively with the Buchhandlung Walther König in Berlin: www.buchhandlung-walther-koenig.de

The main title of this book will be eye-catching for those interested in Black Forest horology, where the well-known types *Augenwender* (normally a picture clock where the eyes of a person or animal turn from side to side) and *Schnappautomat* (a simple type of automaton with a mouth snapping shut to each strike of the hour) are usually associated with full sized wall clocks. As clarified however by the subtitle, the book is concerned not with full sized clocks but with decorative figurines who themselves hold a small clock. Some of these indeed combine the *Augenwender* and *Schnappautomat* features.