Lift Books 1890-1940

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Abstract. Most histories of vertical transportation typically examine engineers and inventors, machines and manufacturers, and the architectural and cultural impact of lifts and escalators. However, a critical aspect of this unique history, which has been rarely examined or even considered as having its own "history," is the technical literature of vertical transportation. In fact, this material has a complex history in that it is composed of four distinct bodies of literature: articles published in technical journals, papers published in the proceedings of technical societies, manufacturers' catalogs and commercial publications, and books. The latter category is the subject of this paper.

This paper will provide a survey of books on lifts published in the United States, Great Britain, Germany and Spain from 1890 to 1940. The examination of this international collection of material will reveal a remarkable global awareness of vertical transportation technology during this period. The content of each book will be assessed with regard to its primary topic or focus, organization, illustrations (type, source, etc.), and connections/relationships to other lift books. This paper will provide a critical framework for understanding and assessing this body of material, which may serve in the future as a model for examining other categories of lift literature: articles, papers, and manufacturers' publications.

INTRODUCTION

The fifty-year period between 1890 and 1940 produced the first wave of books on lifts and lift technology. The books published during this period represent a diverse collection in terms of their authors, national origins, publishers, and content. This material is conceptually positioned as one of four distinct bodies of lift literature: articles published in technical journals, papers published in the proceedings of technical societies, manufacturers' catalogs, and books. While the following examination will reveal an occasional blurring of the lines between these categories, the presence of a stand-alone book on a given topic changes our understanding of the material. This is best illustrated by the difference between reading an article in a journal and reading the same text republished in a book. The context of the journal, which includes advertisements, editorials and other articles, coupled with differences in presentation and format, subtly effects our appraisal of the content. The presence of a *book* also indicates that a publisher perceived that a market existed to justify the investment in its production. Thus, the appearance of this body of literature in the first half of the 20th century may be taken as one sign of the emerging field of lift engineering.

THE FIRST LIFT BOOKS 1890 – 1910

The weekly issues of *Le Génie Civil* published between August 29 and October 17, 1896 featured an eight-part series on lifts written by French engineers Georges Dumont & Gustave Baignères. The articles presented an overview of technology that addressed hydraulic, electro-hydraulic, and electric lifts. This approach reflected the marketplace dominance of hydraulic systems and the gradual emergence of electric lift systems. Dumont and Baignères and *Le Génie Civil* may have planned from the start to republish this series and in 1897 one of the first books on lifts appeared:

Les Ascenseurs: Ascenseurs Hydrauliques; Ascenseurs Hydrauliques avec emploi de moteurs à air comprimé, à gaz ou électriques; Ascenseurs Électriques. The full, unedited text of the articles was reprinted, accompanied by the seventy illustrations produced for *Le Génie Civil* (Fig. 1 & Fig. 2).

In 1898 the second book on lifts appeared, however now the setting was the United States and the topic was not technology but law. James A. Webb's *The Law of Passenger and Freight Elevators* offered readers an introduction to the legal issues associated with the installation and use of lifts. Webb published a second edition of his book in 1905, which was almost twice the size of the first edition – a fact that speaks to the litigious nature of American society and the cultural presence of lifts in the early 20th century. 1905 also saw the publication of a book that focused solely on hydraulic lift technology: William Baxter, Jr.'s *Hydraulic Elevators*. Baxter, an American engineer, was a prolific author and his book was primarily a collection of articles written for the *American Machinist* and the *Engineer* and published between 1900 and 1904. However, unlike Dumont and Baignères, Baxter edited and re-wrote several of his articles for the new publication. Produced by the Engineer Publishing Company (Chicago), the book was sufficiently popular to attract the attention of McGraw Hill (New York) and in 1910 they published a revised and substantially expanded edition titled *Hydraulic Elevators: Their Design, Construction, Operation, Care and Management*. Baxter's books are noteworthy for their detailed line drawings of hydraulic lift systems and their broad coverage of the American lift industry (Fig. 3).

The expanded edition of Baxter's book was preceded in 1908 by the publication of Reginald P. Bolton's *Elevator Service* and Ludwig Hintz's *Handbuch der Aufzugstechnik*. Bolton, an English engineer who practiced in the United States from 1894 to 1942, self-published his book, which was the first work devoted to lift traffic analysis. He had developed a series of formulas and charts that were designed to provide a mathematical means and basic theory for determining a given building's transportation needs (Fig. 4). The fact that Bolton's book was self-published makes it difficult to gauge its impact, however the presence of copies in approximately thirty U.S. libraries indicates that it is reasonable to assume that it had a wide distribution. German engineer Ludwig Hintz's *Handbuch der Aufzugstechnik* provides a well-illustrated overview of belt driven, hydraulic, and electric lift systems (Fig. 5). The book also includes a discussion of lift safeties and typical local codes governing lift operation.

The first decade of the 20th century ended with the publication of two small books, both of which prompt questions about their publication history. The first, by American engineer Calvin F. Swingle, was titled *Elevators: Hydraulic and Electric* (1910). The book was described by its author as a "catechism" that included "a thorough drill regarding the construction and care of lifts and their necessary adjuncts," and instruction on "correct, and incorrect, safe, and unsafe methods to be pursued in their operation" [1]. This was an ambitious agenda for a 100-page book that measures only 6.75 x 4.5 inches. However, this little book may have derived from a larger source – its first illustration is labeled "Fig. 380 Otis Traction Elevator." Unfortunately, Swingle did not provide an explanation for this numbering convention and a connection to a larger work (perhaps an encyclopedia?) has not been found. While the second book has a greater page count (174 pages), it is even smaller in size (6.5 x 4.25 inches). Its content also prompts a very different set of questions. Titled *Ascensores Hidráulicos y Eléctricos* and written by Spanish engineer Ricardo Yesares y Blanco, the book was Volume 92 in the Manuales Gallach series (published sometime between 1900 and 1910). The book is a literal translation of Dumont and Baignères' *Les Ascenseurs* – with no acknowledgement of the original authors. It also includes identical and/or slightly re-drawn versions of the illustrations found in the original work (Fig. 6). Yesares did include an additional chapter titled "Nuevos Tipos de Ascensores Eléctricos," three new illustrations (drawings of typical Spanish lift installations), and a brief glossary of terms. This remarkable act of plagiarism appears to have gone completely unnoticed.

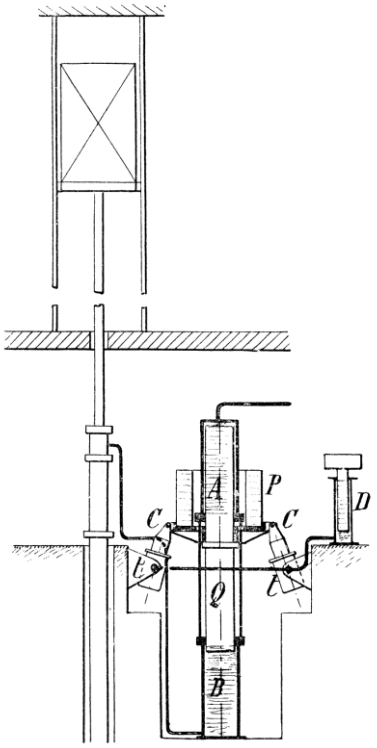


Figure 1 Ascenseur Tomasi. *Les Ascenseurs* (1897).

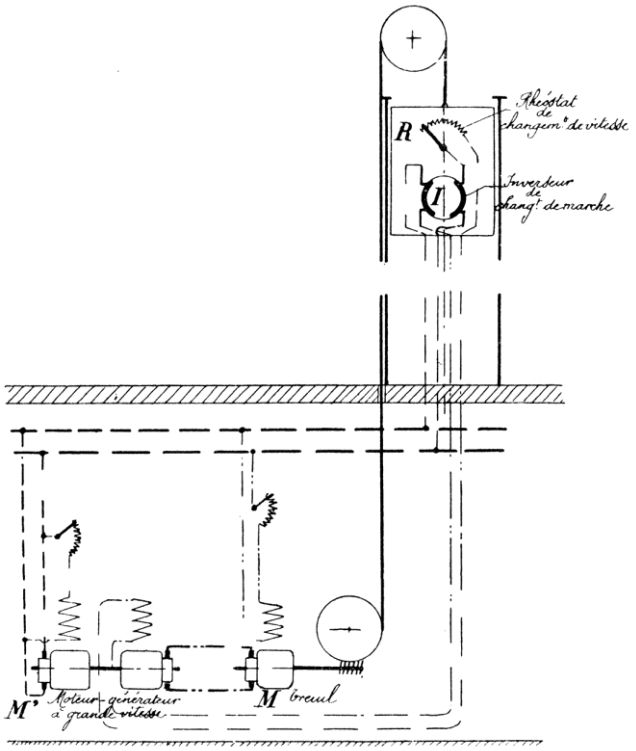


Figure 2 Otis Lift with Ward Leonard Control. *Les Ascenseurs* (1897).

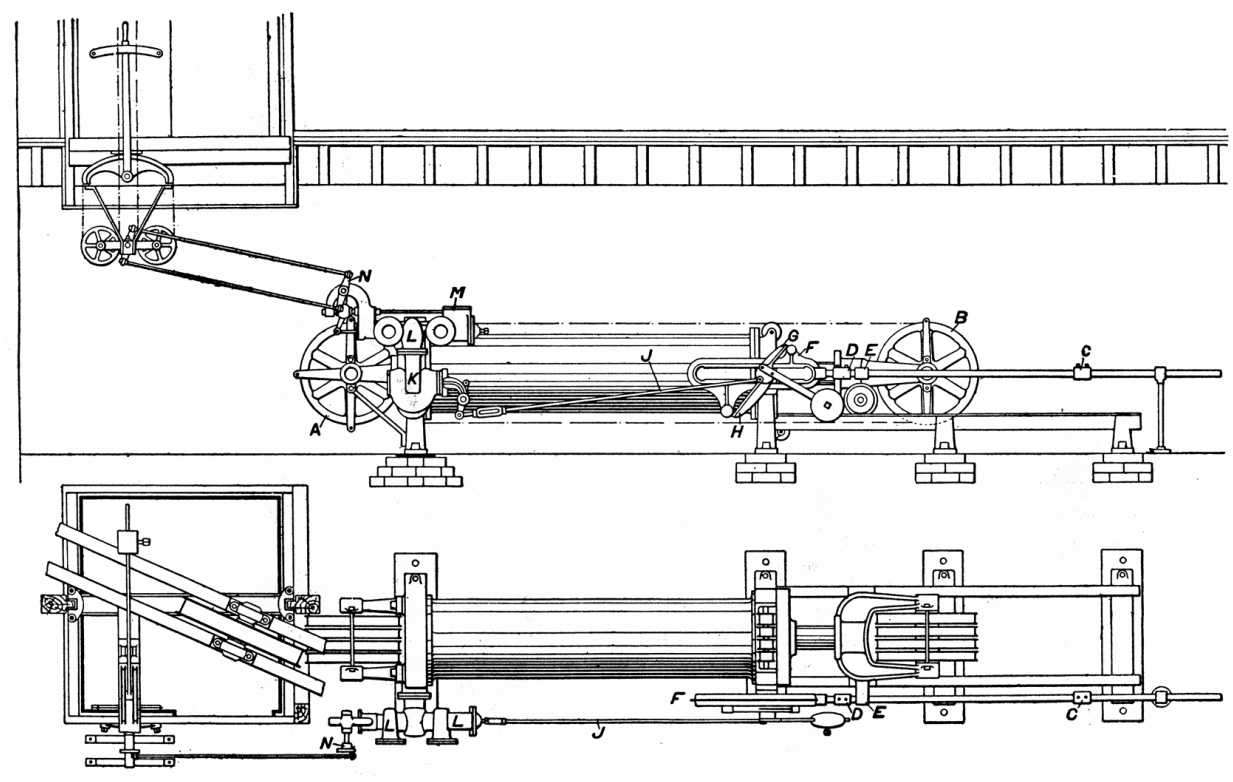


Figure 3 Horizontal Push-Type Hydraulic Engine. *Hydraulic Elevators* (1905).

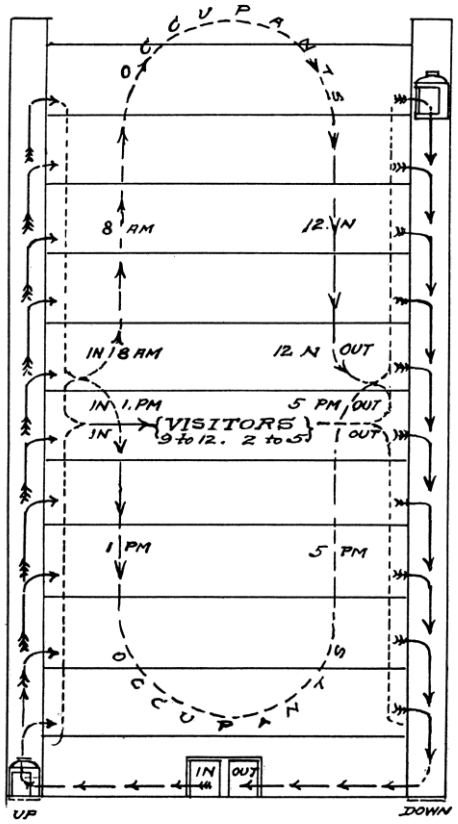


Figure 4 Division of Lift Travel. *Elevator Service* (1908).

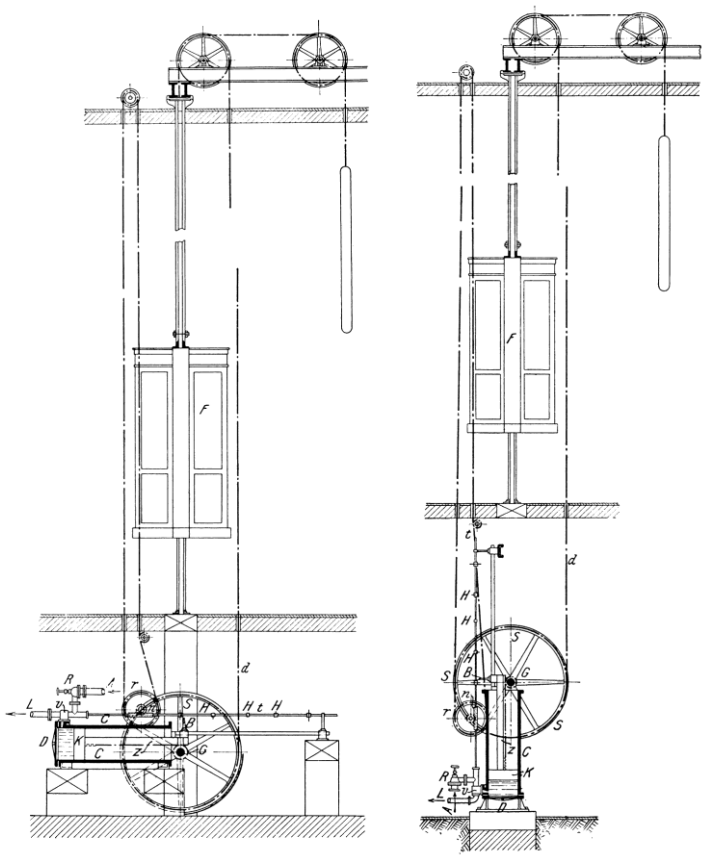
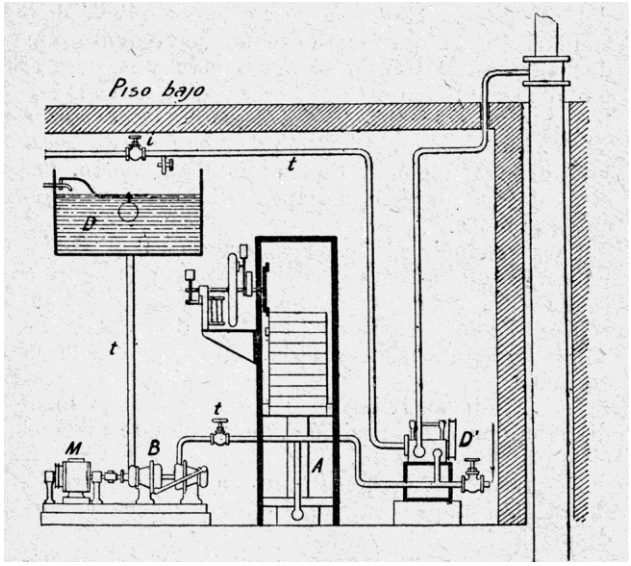


Figure 5 Indirect Hydraulic Lifts. *Handbuch der Aufzugstechnik* (1908).



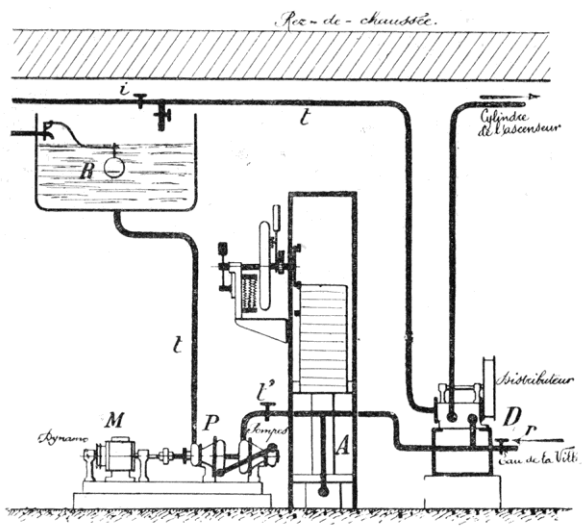


Figure 6 Roux & Combaluzier Hydro-Electric Lift System. Left: *Ascensores Hidráulicos y Eléctricos*, (1900/1920); Right: *Les Ascenseurs* (1897).

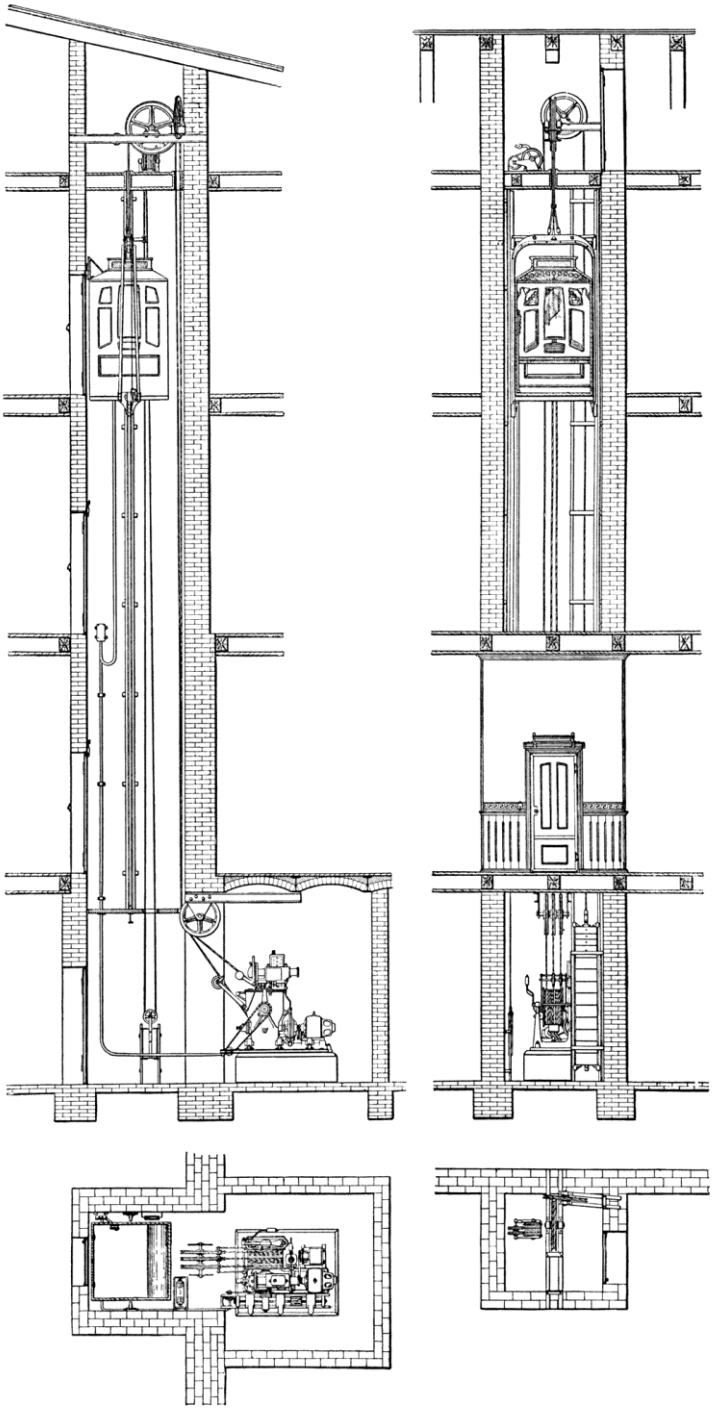


Figure 7 Electric Lift with Push Button Control. *Der Aufzugbau* (1913).

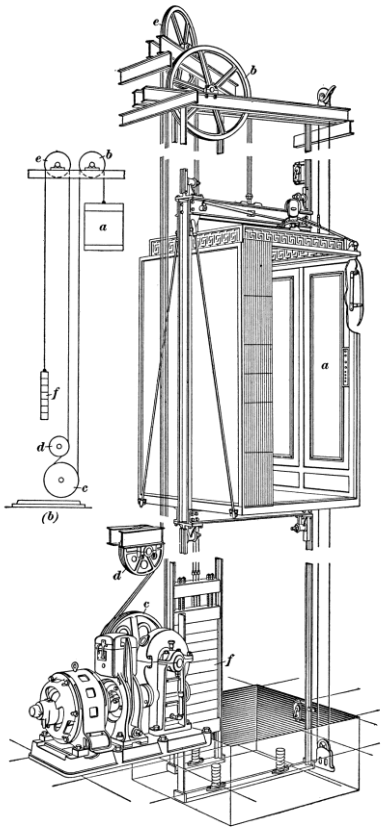


Figure 8 Electric Traction Lift. *Electric Elevators, Book I*

LIFT BOOKS 1911 - 1920

The second decade of the 20th century opened with the publication of Hugo Bethmann's *Der Aufzugbau: Ein Handbuch für das Konstruktionsbureau* (1913). This extraordinary book is 720 pages long and features 1,166 illustrations, which include line drawings and black-and-white photographs. Many of line drawings are large scale, fold out illustrations, some of which depict complete system installations (plans and sections) (Fig. 7). The book contains a comprehensive review of lift technology in Germany including hand powered, belt driven, hydraulic, and electric systems. Bethmann provided his readers with a broad technical overview of lift construction and operation as well as an introduction to the science behind the various systems. The book references over forty German companies, five American companies and one Italian company. Somewhat surprisingly the only references to French systems are brief discussions of the hydraulic lifts designed by Leon Edoux and Emile Heurtebise; Bethmann made no references to English companies or English lift systems. This is, perhaps, the most interesting book published between 1890 and 1940. While the text is clearly and precisely written, the illustrations are its most critical asset – they are beautifully drawn, highly detailed, and contain a wealth of information.

American engineers contributed two additional books published during this decade. H. Robert Cullmer's *Elevator Shaft Construction* of 1912 presents a thorough examination of this topic. The publication of this focused study speaks to the increasing complexity of lift systems, which is reflected in Cullmer's 47 illustrations of shaft details. The second book, by John S. Jallings, was similar to Bethmann's in that it offered a comprehensive review of lift types and technology. However, whereas the latter discussed systems from several countries (a discussion admittedly embedded in the context of a distinct national bias), Jallings' *Elevators: A Practical Treatise on the Development and Design of Hand, Belt, Steam, Hydraulic and Electric Elevators* focused exclusively on American developments. The two works were also similar in that Bethmann characterized his work as a kind of textbook; whereas Jallings' book had been initially published as a five-part series designed for a correspondence course on lift technology. These individual works were first published in a single volume in 1915. The first edition was 217 pages long and had 172 illustrations; a second edition appeared in 1918, which was 402 pages long with 278 illustrations. Although Jallings had added content to the book's original chapters, the dramatic increase in its size was primarily due to the addition of a new chapter titled "Equipment Design and Construction," which addressed over 50 separate topics.

LIFT BOOKS 1921 - 1940

Three authors were primarily responsible for the final group of lift books published prior to 1940: Ronald Grierson, Frederick Hymans and Fred A. Annett. In 1923 Chapman & Hall (London) published *Electric Lift Equipment for Modern Buildings: A practical Guide to its Selection, Installation, Operation, and Maintenance*, written by English engineer Ronald Grierson. The book offered readers a thorough overview of American and English lift systems, which was well-illustrated and neatly compartmentalized into twenty-four chapters and seven appendices. Grierson's blending of material gathered from both sides of the Atlantic may have also been strategic – in 1924 the Van Nostrand Company (New York) republished his book in the United States. This new publication differed from the original in three ways: the English edition had included numerous advertisements for lift companies (these were omitted from the American edition); the English edition had included a foldout drawing of a Waygood-Otis electric lift (no similar image accompanied the American edition); and the word *Lift* in the book's title was changed to *Elevator* – no other changes were made.

In 1927 German/American engineer Frederick Hymans and German engineer Axel V. Helborn co-authored *Der neuzeitliche Aufzug mit Treibscheibenantrieb: Charakterisierung, Theorie, Normung*. This was the first book devoted exclusively to traction lifts and the first to focus on the theory

behind this system. While a few prior books had included commentaries on the theory underlying the operation of various lift systems, and a few had included the requisite mathematical formulas, their primary focus had been the operational characteristics of lifts, thus they were primarily illustrated with technical drawings and photographs. In contrast, the majority of Hymans and Hellborn's ninety-nine illustrations feature graphs, charts, and analytical diagrams of discrete lift components. The partnership of Hymans and Hellborn is also curious. The book describes Hymans as a research engineer practicing in New York, while Hellborn is described as a former Engineering Manager for the Otis Elevator Company now living in Stockholm. However, in 1927 Hymans was beginning his 25th year of employment with Otis and Hellborn appears to have only worked for Otis for a short time in the early 1920s.

1927 also saw the publication of the first edition of American engineer Fred A. Annett's *Electric Elevators: Their Design, Construction, Operation and Maintenance*. Annett was an Associate Editor for *Power* magazine and his numerous articles on lifts served as the outline for the book, which addressed all types of American electric lift systems. The book's popularity, coupled with continued rapid changes in lift technology, led to the publication of an expanded second edition in 1935. One of the additions to the revised edition was a chapter titled "Selecting Elevators for Office Buildings," which included formulas and tables that addressed the complex nature of traffic analysis in large buildings. Thus Annett's books, while primarily focused on pragmatic topics, also touched on critical aspects of the science of lift design and operation. These books also featured fewer illustrations and relied more heavily on photographs than earlier works.

During the early 1930s Frederick Hymans continued to write about lifts and the result was a series of short books designed for a correspondence course: *Electric Traction Elevators* (1931), *Elevator Hatchway Equipment* (1931), *Electric Elevator Motors* (1931), *Electric Elevator Operation* (1931), and *Care and Maintenance of Electric Elevators* (1934). These books were published as a two-volume set (*Electric Elevators, Book I* and *Electric Elevators, Book II*) in 1934. These works also primarily focused on electric traction lifts, however they were, in almost every aspect, the polar opposite of his earlier theoretical work. The new books offered readers a pragmatic understanding of traction lifts and are filled, as was the case with similar works, with detailed drawings of lift systems and components (Fig. 8).

The final book published during this period was English engineer Reginald S. Phillips' *Electric Lifts: A manual on the Current Practice in the Installation Working, and Maintenance of Lifts* (1939). This book was, essentially, the English equivalent of Annett's 1935 book, with the focus shifted to the British lift industry. An important difference between the two books was Phillips' explicit reference to the Building Industries National Council's 1935 *Code of Practice for the Installation of Lifts and Escalators*. Phillips' stated that he had adopted, "as far as possible," the terminology found in the Code of Practice and that "most of the safety measures embodied in the code" where "carried into" his book [2]. Although Annett was familiar with the *A17 Safety Code for Elevators Dumbwaiters and Escalators* (the third edition of which appeared in 1931) he made no references to the U.S. code. Phillips' book continued to serve as reference book for lift engineering throughout much of the 20th century: five new editions were published between 1947 and 1973.

CONCLUSION

This brief survey illustrates the diversity of lifts books published between 1890 and 1940, which included general textbooks, specialized technical works, the first book on lift traffic science, and the first book devoted to the technical theories of traction lifts. Of course, to fully appreciate the power of these works they must be studied, read, and compared. This is best accomplished in the "old fashioned" or "analog" method of obtaining information – holding the physical book in your hands and reading the text, taking the time required to carefully fold out and study the larger images, and thumbing back-and-forth between chapters and images. I have the pleasure (and good fortune) of

owning original copies of all but two of the books examined for this paper. The care with which these books were written and illustrated represents the author's and publisher's desire to produce valuable resources for the growing number of lift engineers and other professionals associated with the vertical transportation industry.

A "read" through these books also reveals that, apparently, some things never change. The topics of safety, energy consumption, and lift traffic efficiency were perceived as critical aspects of lift design – much as they are today. There was also a subtle awareness that, perhaps, as soon as a book was published innovations in lift design would render some (or much) of the text obsolete. None-the-less, the importance of these books lies in their preserving the historical record of successful (and failed) ideas, which chart the origins of many of the theories that continue to guide contemporary lift design and operation. Finally, I am well aware, and perhaps even hopeful, that readers of this paper may be quick to note that I "missed" an important book published during this period. Nothing would make me happier than to be able to expand the bibliography provided below and thus enhance my understanding of this important chapter in lift history.

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BIOGRAPHICAL DETAILS

Dr. Gray is the Senior Associate Dean in the College of Arts + Architecture and a Professor of Architectural History in the School of Architecture at UNC Charlotte. He received his Ph.D. in architectural history from Cornell University, Masters in architectural history from the University of Virginia, and undergraduate degrees in architecture from Iowa State University. He is the author of *From Ascending Rooms to Express Elevators: A History of the Passenger Elevator in the 19th Century*. Since 2003 he has written monthly articles on the history of vertical transportation for *Elevator World* magazine. Current projects include a book on the history of escalators and moving sidewalks. He has appeared on the History Channel in *Modern Marvels – Building a Skyscraper* (2004), on PBS in *NOVA: Trapped in an Elevator* (2010) and has been interviewed by BBC 4 Radio – *The Indispensables: Lifts* (2004) and by the BBC World Service – *The Why Factor:* "Why do we behave so oddly inside lifts/elevators?" (2012).