

Printing Press Renewal: Partnership Between Engineering Design and the Libraries

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Abstract

The University of Alabama at Birmingham (UAB) Libraries are home to a Chandler & Price printing press, originally built in 1885. Unfortunately, this press was not whole or fully operational when it was acquired by the UAB Libraries in the 1970s. Among its defects, the press lacked the treadle, Pittman arm, and crankshaft to power the press, a functioning rotating ink plate, a chase for holding the type in place, and the pin that keeps the large wheel turning in time with the gears that lead the machine to function. Members from the UAB Libraries Historical Collections and Reference and Instruction teams and the Director of Engineering Design from the School of Engineering partnered with undergraduate design students for a restoration collaboration. Over the course of multiple semesters beginning in Spring 2025, design students developed solutions to return the Chandler & Price press to various stages of function, improving the continuing ability of the UAB Libraries faculty and staff to use this machine as a teaching tool. This ongoing project provides students with the opportunity to collaborate with stakeholders who are not normally consulted for traditional engineering design projects, such as museum and restoration experts. This also requires the students to not only use their traditional CAD skills to create first of their kind 3D models for this machine, but also to document their design process in ways that can be shared through various advertising media for the UAB Libraries.

Tags

engineering design, senior design, printing press, case study, undergraduate education, historical preservation

Introduction

At the University of Alabama at Birmingham (UAB), the School of Engineering has a rich history of partnering with UAB internal units and local organizations to develop novel student-created solutions to a variety of problems. For example, student groups from the UAB School of Engineering have worked hand-in-hand with local groups to create new and affordable mobility and assistive devices, simulated human tissues for medical training, and more [1], [2], [3], [4], [5], [6].

Inspired by the innovation and dedication of students in the School of Engineering, the UAB Libraries reached out to request a collaboration on the restoration of an antique machine in the library's collection – an 1885 Chandler & Price printing press. This partnership is similar to other long-standing collaborative relationships between academic libraries, the field of engineering, and historical preservation to simulate historic mechanical processes or build historically accurate replicas at other institutions. Specifically, as with the project at UAB, there are several examples of work that engineering students have done to historically build or recreate less mechanically sophisticated, hand-inked printing presses.

In 2016, four students specializing in Mechanical Engineering at Rochester Institute of Technology began a collaborative and “faithful reconstruction of an eighteenth-century English wooden common press...[and] used modern shop practices in conjunction with blacksmithing in order to produce satisfactory parts” [7]. This project forced these students to utilize the innovative skills and methods they had been taught and apply it to the recreation of a historical artifact. Similarly, in the summer of 2025, a group of Engineering capstone students from the University of Calgary created a Gutenberg-inspired wooden moving-type printing press that is now fully functional. These students worked with university faculty, and a local papermaker to ensure both historical accuracy and function, recreating a press that revolutionized book production. The student's work eventually won them a bronze medal at their annual Engineering Design Fair and took away unique insights from this project as it taught them “a lot from an engineering perspective but also quite a bit about the history of the press” [8]. These are just two examples of projects that have included both engineering expertise and historical renovation. However, it should be noted that neither of these projects did actual restoration work on a historical machine, which makes the UAB project truly unique.

While most traditional engineering undergraduate students wait until their capstone senior design experience to work with real-life clients for the first time, the Bachelor of Science in Engineering Design (BSED) program at UAB provides students with the opportunity for hands-on, client-based design problems as early as their first year of undergraduate studies. Working with the director of the BSED program, UAB librarians worked with students for three consecutive semesters on the restoration of the Chandler & Price printing press.

This case study adds to a body of literature asserting that college and university libraries can offer novel and rewarding engineering design projects for undergraduate student groups interested in restoration and preservation projects. Sharing these opportunities in professional and social contexts can bring renewed life to important historical machines and techniques that could otherwise be lost.

Brief History of Chandler & Price Printing Presses

General Background of the Chandler & Price Printing Presses

Methods for printing with woodblocks and moveable type date back centuries in China and East Asia, but it was the German craftsman, Johannes Gutenberg (1397? – 3 February 1468), who invented a machine for the mass production of printed texts [9]. The printing press set off an information revolution in Europe, helped spark the Renaissance and Reformation, and is still considered one of the most important inventions of all time [10], [11]. Gutenberg's wood framed press that was operated by a screw mechanism became functional around the year 1450. Though the press did not change much in its first few centuries, significant improvements came along in the nineteenth century with the Industrial Revolution [12]. The early 1800s brought the invention of the first iron presses which were faster and applied greater force than the traditional wooden machines [12]. Eventually, high-speed, steam powered, cylinder presses took over the printing of large-scale publications, such as newspapers. At the same time, the so-called "jobbing platen" press which "obtains its impression by the impact of a flat platen, the entire surface of which meets the form squarely in a single thrust" became the dominant style of press for smaller printing operations [9], [13].

The Chandler & Price company of Cleveland, Ohio, produced highly popular and widely used jobbing platens. Originally invented by George Phineas Gordon (1810-1878) in 1858, the motivation behind this press was to create a safer model that opened completely for the pressman to feed paper before closing for the next printed impression [14]. It was operated by a foot peddle, or treadle, but could alternately be run by the motion of the speed regulating flywheel. Gordon, a spiritualist, claimed that the idea came to him from Benjamin Franklin in a dream, and therefore he called it the "Franklin Press" [14]. However, Gordon's own name also became widely associated with the press, and though he died in 1878, his press survived and thrived while in production by Chandler & Price [14], [15]. The UAB Libraries are home to one such machine. Dated "March 26, 1885" on the pull handle, it is an original "Old Style" Chandler & Price press with a 10" x 15" printing plate. The company, founded in 1881 by Harrison T. Chandler and William H. Price, manufactured these jobbing platens for the printing of small jobs, such as stationary, cards, handbills, brochures, and small books [9], [15]. Their original "Old Style" (1884-1914) press can be identified by the wavy spokes on the flywheel, as opposed to the later "New Style" (1911-1964), which had straight spokes, and the even later "Craftsman" model (1921-1964), with its solid flywheel [15].

Chandler & Price dominated the printing press industry in the early 20th century [15]. In 1926, the author of a standard textbook for printing, Ralph W. Polk, writes that, "The Chandler and Price Gordon is the best known and most commonly used press. It is a strongly built machine, easy to operate, and capable of a wide range of work... it is apt to be found in most of the school printshops" [13]. However, by 1964, Chandler & Price had ceased production, their jobbing press having been supplanted by offset printing in the mid-20th century, and then by the computer and photocopier for printing small jobs [15], [16]. Nevertheless, in the art world, such

presses made a revival with the popularity of letterpress printed invitations, cards, and limited-edition books. This press was obtained in the 1970s for the instruction of hand letterpress printing as part of a growing Book Arts Program offered by Sterne Library through the UAB Division of Special Studies.

UAB Libraries Printing Press Acquisition and Use

In the late 1970s, the UAB Libraries were home to several printing presses, which were acquired for the instruction of letterpress printing classes. One Chandler & Price press was donated by a private donor on March 29, 1977, and a letter of thanks to the donor suggests it may not have been fully operational upon arrival [17]. Other presses were purchased from distributors in the mid-1970s, including two additional Chandler & Price machines acquired in 1975 [18]. Course catalogs of the UAB Division of Special Studies from 1976 and 1977 and University College Libraries Annual Report of 1978/79 show that continuing education courses (CEUs) in letterpress printing were offered to the community from at least 1976 and 1979. Starting initially with a small project such as stationary or Christmas cards, the students were later able to print short manuscripts. The Winter 1977 description notes that “Work is done on Chandler-Price presses, hand-operated printing presses.” However, a course catalog from 1983 lists no book arts classes and a letter in the university archives dated January 1979 shows that the library was already looking to donate some of the printing presses to the Art department [19], [20]. Now, 47 years later, only the Chandler & Price and a small tabletop mid- to late-20th century Kelsey Excelsior 5” x 8” press remain. The Book Arts program at Sterne Library was short-lived, but one that left us with this important artifact of printing culture.

The press originally lived in the basement of Sterne Library where the book arts classes were taught, but it was eventually moved to a popular quiet study area on the 3rd floor. Many people passed it daily and never really noticed this impressive machine. There it remained, and there is no documentation of its further use until two catalysts drew attention to it: the library dean engaged the Historical Collections department to create an exhibition in close proximity to the press, and a History of the Book class taught through the UAB English department became increasingly interested in the materials of bookmaking. An exhibition on the history of the printing press and the Chandler & Price machine was chosen for that area, curated by faculty from the UAB Reynolds-Finley Historical Library. This exhibit was of particular interest to the History of the Book class, and to further enrich their experience, the curators researched the functionality of the press and utilized makeshift materials to replace some missing elements to get the press running (at least a little bit). We created a chase out of wood blocks purchased at a craft store and used masking tape to keep it in place. We acquired type of assorted fonts from eBay and inked the type by hand between impressions. It was not ideal, but it provided an opportunity for the students to create simple bookmarks using the press and experience that hands-on historical process.

During the experiment, it became clear that some parts significant to the press’s functionality were missing. These included ink rollers, the chase for holding the type in place, the type itself,

and perhaps most importantly, the foot treadle, shown in Figure 1. Historical research indicated this was likely removed for the installation of a motor at some point in the history of the press, similar to the automatic 1920s Chandler & Price platen owned by Museums Victoria [21]. This was practiced as early as the 1920s [22], [23]. Though the English class used the flywheel to operate the press as an alternative, it often proved difficult to complete the process because the gear mechanism was faulty and the smooth exterior of the flywheel was difficult to grip and rotate by hand. The engineering library liaison was present for one such class session and proposed pitching this as a restoration project for engineering design students.

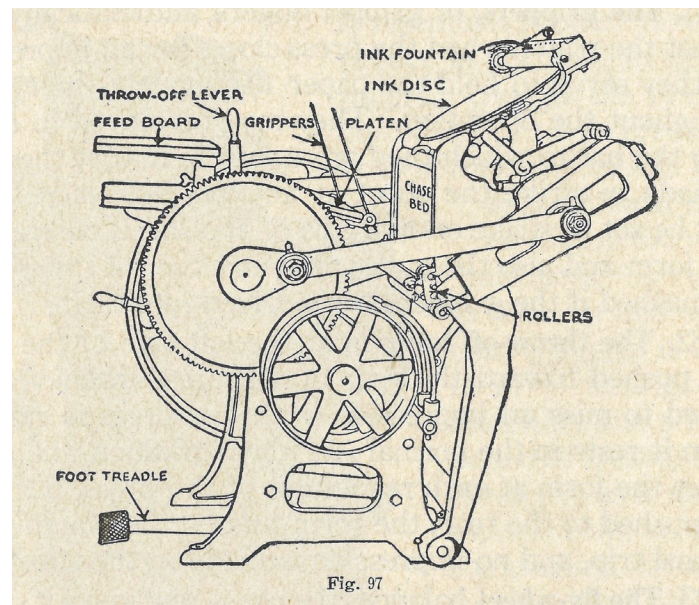


Figure 1. Diagram of the Chandler & Price Gordon Press and its parts, from Ralph W. Polk's *The Practice of Printing* [13].

The Priority of Historical Preservation

While the idea of having a functioning Chandler & Price press was enticing, the preservation of its identity as an artifact of historical value was critically important to the UAB Libraries Historical Collection team. This required constant negotiation with the students working on this restoration project. There were some aspects of the press that could be updated without losing historical integrity, such as the type of metal used in casting replacement parts, but the discovery of which facets of the machine could be approached with more modern materials and machining practices prompted regular discussions and shared decision making between the librarians and the engineering students.

Collaboration Between Libraries and Engineering Design

Faculty of the UAB School of Engineering are open to hands-on projects for their students from any unit on campus or in the local community. The restoration of the UAB Libraries Chandler & Price printing press, therefore, presented an ideal opportunity for collaboration between the UAB Libraries and the School of Engineering. This partnership is not only beneficial for the library but also addresses the 7 ABET accreditation requirements common to all engineering programs [24], listed below. Engineering students should develop and demonstrate

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The UAB School of Engineering offers an engineering design bachelor's program in addition to more traditional technical-focused engineering programs. This engineering design program provides flexible and varied experiences for students interested in maximizing their hands-on, client-facing experience during their undergraduate studies. The required engineering design courses at the core of this program are described in Table 1 below. After discussion between the engineering librarian and the course instructor, based on the timing of the collaboration and the student outcomes addressed by the various engineering design courses, EGR 317 – Engineering Design III: Project Implementation was selected as the group of students engaged with this restoration project. This would allow a total of three semesters of focus on the restoration of the Chandler & Price printing press, as many students immediately follow EGR 317 with their two-semester capstone design experience (EGR 498 and 499).

Table 1 – ABET Accreditation Student Outcome Assessment by UAB Engineering Design Courses

Abridged ABET Accreditation Student Outcomes	EGR 117	EGR 217	EGR 317	EGR 498	EGR 499
1. Solve complex engineering problems	X	XX	XX	XX	XX
2. Apply engineering design	XX	XX	XX	X	X
3. Communicate effectively	X	XX	XX	X	X
4. Ethical & professional responsibilities			XX	X	X
5. Function effectively on a team	XX	XX	XX	X	X
6. Experiments, data analysis, & engineering judgment		XX	XX	X	X
7. Acquire new knowledge	X	X	XX	X	X

A marking of XX indicates that the student outcome is strongly addressed in the course, whereas a marking of X indicates the student outcome is reasonably addressed. The course titles are EGR 117 – Engineering Design I: Design Thinking, EGR 217 – Engineering Design II: Prototyping, EGR 317 – Engineering Design III: Project Implementation, EGR 498 & 499 – Capstone Design I & II.

This collaboration has taken place over three semesters – Spring 2025 (EGR 317), Fall 2025 (EGR 498), and Spring 2026 (EGR 499; ongoing as of the writing of this paper). All students working on this restoration have agreed that their pictures, videos, digital products, and personal reflections can be shared and used in scholarly work and publications related to the UAB Libraries’ press. The names of all students who participated in this restoration are given in the acknowledgments, along with which courses they were enrolled in while they were working on this project. The funding for this project each semester was divided between the UAB Libraries and the School of Engineering, depending on the nature of the purchase. For example, relocation of the press by professional movers and purchase of replacement items like the treadle were covered by the UAB Libraries, while the School of Engineering covered the costs more typical to a student project, including 3D printing and the use of other available internal facilities.

EGR 317 – Engineering Design & Innovation III: Project Implementation

EGR 317 is the third required engineering design course in the BSSED curriculum at UAB. In the two previous engineering design courses, EGR 117 and 217, students primarily focus on learning to work effectively as a team, communicate effectively with one another and with clients, and iteratively improve design solutions based on background research and prototype experimentation. EGR 317 requires students to complete the suite of ABET student outcomes by also incorporating greater attention to ethical and professional responsibilities. With two

semesters of engineering design in-hand, the EGR 317 students were well-equipped to begin the work on the Chandler & Price press.

Much of the EGR 317 experience with the press restoration involved assessing the current state of the press, researching the original function of the press, and returning the press to a state at which it could function to run small print jobs by hand. The EGR 317 team consisted of six students, named in the acknowledgments below. Having such a large team can lead to additional communication and scheduling issues, but a key focus on the course is developing strategies to manage differences in opinion and approach, task planning, and the establishment and fulfillment of group goals (outcome 5). Specific assignments within EGR 317 that aided in this development were modules on business tools and conflict resolution, the creation of a team performance plan, and both self- and peer-assessments of team performance.

The engineering design students were required to work directly with the UAB librarians, only one of whom was familiar with engineering design and engineering principles. The EGR 317 group also elected to locate and meet virtually with printing press experts Howard Hatch and Jared Jones from the Sacramento History Museum in Sacramento, CA [25], who helped the team realize that the UAB Libraries' press had been modified from its original treadle operation to a motorized operation and gave advice on the cleaning and routine maintenance of the machine. These interactions, both required and not, contributed significantly to the students' ability to communicate with a range of audiences and to acquire and apply new knowledge as needed (outcomes 3 and 7). The students also respected the need for the press to be restored to function without major alteration of the looks or the operation of the press (outcome 4), of particular importance due to the historical nature of the machine. These skills were demonstrated during the group's regular in-class presentations as they progressed through the course, each of which required demonstration of knowledge gained through research and incorporated feedback from previous presentations.

Based on this information and the group's assessment of the inoperable press, the students were able to select their deliverables for the semester – namely, to return the press to some function by acquiring missing parts (ink rollers) and by 3-D printing others (gear pin and chase for holding print for the press). After completing an initial engineering analysis assignment related to the press, the students progressed through a series of iterative measurements of the components of the press, prototyping potential solutions, and evaluating the effectiveness of their solutions, fulfilling outcomes 1, 2, and 6. Several of the assignments in EGR 317 reinforced these outcomes, including a patent research assignment (requiring consultation with the engineering librarian) and a simulated patent application for a device that would align blank pages for clear and reproducible prints. The students were required to meet with the client team outside of class at the beginning of the semester to discuss expectations, clarify which aspects of the budget for the project would come from the UAB Libraries and which would come from the School of Engineering, and to determine whether additional client check-in meetings would be desirable. All librarians from the client team were invited to attend each group presentation during the semester and provide feedback and clarity to the team as they progressed through the semester, although the design decisions and the attention paid to the details of the project were largely

student driven. Regular presentations and communications with the student team via email outside of class rendered formal group meetings between students and clients unnecessary for EGR 317.

During this semester of work on the UAB Libraries' printing press, the students created a 3-D printed gear pin that returned the press to function, designed 3-D printed letters that could be used with the press, added temporary hand bars to allow for easier manipulation of the flywheel until a treadle could be reattached by a future group, acquired and installed appropriately sized ink rollers, and created detailed maintenance and use documents to pass along with the kit they developed and created for the press. At the end of the Spring 2025 term, the press could be used to print, although the press could not complete a full rotation of the flywheel due to the 3-D printed chase being slightly too thick. Two of these key improvements are displayed in Figure 2.

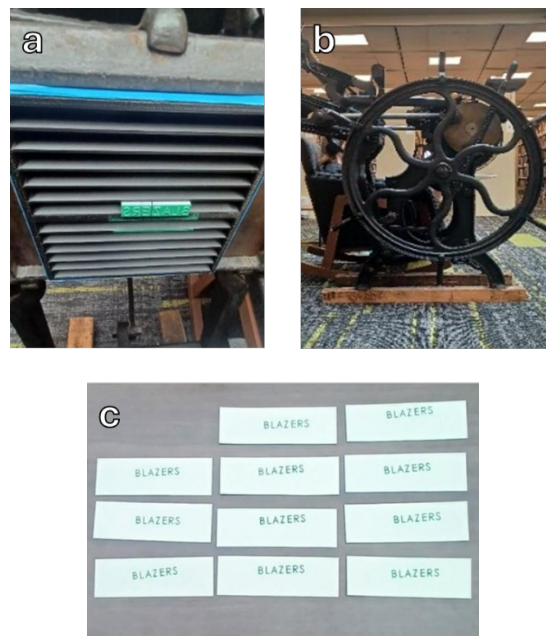


Figure 2. Improvements made to the 1885 Chandler & Price press that restored it to some level of function. These improvements included a) a 3-D printed print chase with 3-D printed letters that could be used to create small print runs and b) temporary hand bars around the flywheel of the press that allowed easier turning of the printing mechanism by hand but could be removed later without damaging the press. Inset c) gives an example of a series of prints created by hand by the student group. These figures were created by the EGR 317 group in Spring 2025 for their final report and presentation and are shared with permission.

EGR 498 & 499 – Capstone Design I & II

Undergraduate engineering programs with ABET accreditation must uphold a variety of requirements, including students having a two-semester senior design capstone experience. Pivotal to the students' development as future professional engineers, this capstone

experience is an opportunity for students to work with real-world clients to solve a problem with realistic parameters. For many students, this is their first experience working directly with clients.

One student from EGR 317 continued the project into his senior design sequence along with three other students new to the project. This continuity of knowledge about the project helped maintain momentum and communication between the librarians and the design students. Expectations for the depth and sophistication of the year-long senior capstone design sequence mirror those of EGR 317; due to incorporation of students from mechanical and materials engineering backgrounds, some additional accreditation criteria were considered in the development of the printing press senior design project. Ideally, the project needed to incorporate principles of engineering, basic science, and mathematics; applications of these topics to modeling, analysis, design, and realization of physical systems, components, or processes; and employing selection and design of materials, processes, or a combination of materials and processes [24]. However, students from these more traditional engineering backgrounds do not typically have the same expected mastery of all the ABET student outcomes, as highlighted in Table 1.

The combination of advanced leadership and design experience paired with students bringing strong materials and mechanical background created a powerful group for further restoration of the Chandler & Price printing press and new challenges in balancing the team's planning and collaboration (outcome 5). This more closely mirrors a more real-world scenario in which each member of the team brings unique knowledge and skills rather than a common background.

The Fall 2025 course, EGR 498 (Fall 2025), is largely intended to be a time for student groups to ideate and plan for the execution phase, which takes place largely in EGR 499 (Spring 2026). Due to the nature of the planning phase, the clients and the student group met once at the beginning of Fall 2025 to set expectations and budgetary guidelines, including the UAB Libraries committing to funding the relocation of the press to the Materials Processing and Applications Development (MPAD) in January 2026. The librarian clients were invited to attend presentations by the group and the final poster session for EGR 498; clients and students agreed that more formal meetings were not necessary for this phase of the project, although informal communication via email and occasional brief consultations with the engineering librarian for feedback and clarity were sought by the students periodically.

During the Spring 2026 course (EGR 499), the need for regular communication between the clients and the student group as the actual casting and restoration work was being completed drove the decision to set up formal monthly meetings. The student group plans to cast a replacement hook and crankshaft from an appropriate steel with the intention of maintaining as much historical accuracy to the appearance of the press as possible. Figure 3 is a computer aided design visualization of this critical part of the mechanism that drives the Chandler & Price press – the crankshaft, including the pins that students designed and will cast themselves, is light grey while the treadle and hook are black, suspended below the crankshaft. More detailed engineering drawings for the crankshaft pins, the full crankshaft, and the treadle hook are shown in Figure 4. This will allow the students to reattach the treadle, purchased by the EGR 317 group, and restore

the press to its original operation. In the process of completing this repair, the students will disassemble the press and document the construction of the press in detail, creating exploded views and detailed reports on the press that the UAB Libraries will be able to share locally and internationally for those who might have a similar press they would like to restore.

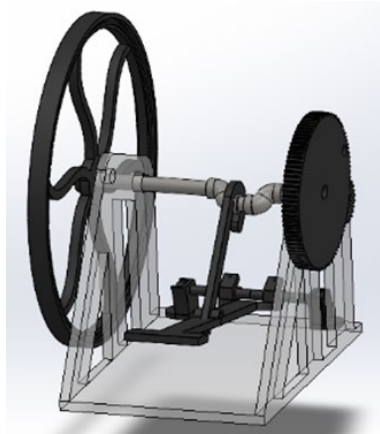


Figure 3. Student-created computer aided design 3-D rendering of the drive system of the 1885 Chandler & Price printing press, which includes the treadle, treadle hook, crankshaft, flywheel, and shaft gear. This figure was created by the senior design group during EGR 498 in Fall 2025 for their final report and presentation and is shared with permission.

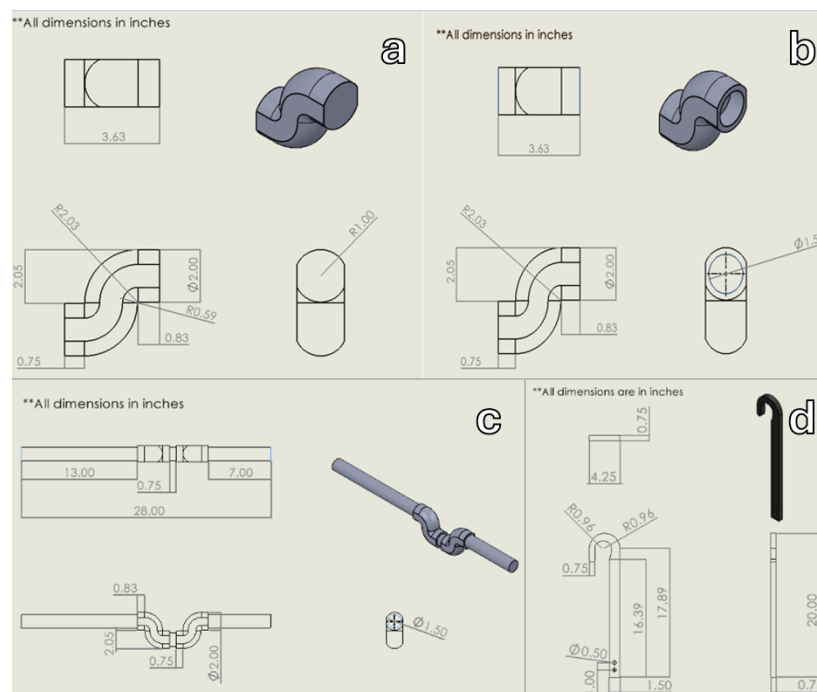


Figure 4. Component detail engineering diagrams for the parts of the 1885 Chandler & Price press drive system that are being cast or otherwise created by senior design students during Spring 2026. These

specific components are a) crankpin before boring, b) crankpin after 1.5” boring to allow for attachment to purchased connecting steel rod, c) completed crankshaft including two of the pins in Figure 4b, and d) the treadle hook. These figures were created by the senior design group during EGR 498 in Fall 2025 for their final report and presentation and are shared with permission.

Research and considerations for solutions took place at greater depth and complexity in EGR 498 & 499. Students and librarians had more detailed discussions about which safety principles and upgrades could be incorporated without losing historical integrity and how to provide signage and messaging to prevent potential safety issues once the machine was returned to public display at Sterne Library (outcome 2). The mechanical and materials engineering students also conducted much more technical research on appropriate materials (outcome 7) and calculations of force for flywheel operation to refine crankshaft design (outcomes 1, 6). Finally, senior capstone students have greater access to advanced casting and refinement using the UAB MPAD facilities. During the final semester of senior capstone design (EGR 499; Spring 2026), students will meet with librarians monthly to provide updates and explanations of progress and alterations to established plans (outcomes 3, 4).

The capstone design group is projected to have part fabrication and machine repair completed by April 2026. The Chandler & Price press will be returned to its home on the third floor of Sterne Library at this time. The senior capstone course for BSED, mechanical, and materials engineering students culminate in a final poster presentation and demonstration at media day, an annual event showcasing capstone design projects that is advertised to the public.

Future of Printing Press at UAB Libraries

At the UAB Libraries, there are current efforts to find new ways to partner with the engineering students, including the printing press collaboration. This project offered a unique juxtaposition between students who used current engineering methods and librarians who prioritized more traditional historical preservation efforts. In the process, the two groups built a connection that will foster additional future projects. The engineering design students in EGR 317 and in their senior capstone experience have documented their progress with the printing press through media elements including video and photographs that the UAB Libraries can use for social media promotion to invite future students to find creative ways to collaborate.

Another long-term goal for the printing press project is to provide UAB students from a variety of disciplines including the arts and humanities, such as the History of the Book class, to gain hands-on experiential learning about the history of printing and to physically interact with an important historical artifact. At the University of Illinois Urbana-Champaign, faculty members encourage students to engage with a refurbished hand press and two letterpresses they have to better connect to history and enhance its impact [26]. Similarly, to our Chandler & Price machine, UI had the hand press and used it for printmaking classes before moving it to the School of Information Sciences, where it was more of a museum artifact than an actual learning tool. Seeing the educational potential of this machine, Ryan Cordell, professor of information sciences and of English, facilitated the relocation of the press to a book arts studio and the

refurbishment of the press for instruction. Considering the ongoing popularity of both the studio and the press itself, Cordell discussed the impact that this type of hands on experience has on students, but also the personal joy it gives him, stating that “one of the reasons I really like doing this work is that it is somewhere between art and engineering...Its creative but also very precise” [26]. Similarly, we hope that working with the Chandler & Price press, students can participate in unique learning experiences and develop a greater appreciation for the rich history held within the UAB Libraries.

Acknowledgments

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