

MAKING SCHOOLBOOKS

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The average teacher rarely sees the familiar textbook as the result of human effort to which has been added the power of highly developed intricate machines; nor does he think of it in terms of either time or money. He has little conception of the number of people who have contributed to its production,—the literary editors and advisers, the artists, the estimators, the advertising men, the salesmen, the clerks and stenographers,—to whom must be added the other workers most directly concerned in its manufacture, the manufacturing man, the compositors, the proofreaders, the engravers, the electrotypers, the pressmen, and the bookbinders. Then back of all these are the workers in the allied trades, the type founders, the ink manufacturers, the paper makers, and the machinists.

In the operation of making a schoolbook of 250 pages, the book must pass through the hands of at least fifty different people. The type used weighs about one and one-eighth tons and has been handled by as many as ten different people, often more. It requires four and one-half reams of paper, 48 x 50 stock, to print a thousand copies 6" x 9". The minimum cost is about one thousand dollars for a single first copy. After that the cost decreases with the number of copies printed. The actual cost of a book on secondary mathematics is from eight to ten dollars per page. It takes the publisher from four to eight months to produce a textbook.

Few schoolbook publishers print a complete line of school texts. In this, as in all business, specialization prevails, and

one firm, for instance, may have as its major work the publication of primary grade books; another, of high-school books; another may specialize on supplementary readers with colored illustrations; another, foreign language books. To this major work is added the publication of books on other subjects as the firm deems advisable. Few firms, it may be said, refuse any kind of work they are equipped to print and promote.

When an author has prepared a schoolbook for publication, he submits his manuscript to some firm that publishes books of the kind with which he is dealing. But before any publisher will accept it, or even give it a reading, he must be convinced that there is, or soon will be, on the part of the schools, a demand for the proposed book, and that its publication will not in any way interfere with the sale of books that his firm has already issued. He then passes the manuscript to the proper reader, for there are employed in all publishing houses readers whose duty it is to examine and pass upon manuscripts offered for publication. In addition to their regular readers, there are other readers, specialists in various subjects, whose services as they are needed are at the disposal of the publishers. The manuscript itself must be of a certain standard, must fulfill definite requirements which depend more or less upon the ideals of the publisher, and still more upon the market. The author must show in the manuscript that he knows his subject; he must express his ideas in clear, forceful English; he must write in a style adapted to the particular class of students for whom the book is intended. Many textbooks fail because the author writes "over the heads" of his readers. Other failures, especially in elementary texts, are due to an author's attempt to write down to his readers. As one editor has aptly expressed it, a successful textbook must be both "scholarly and simple."

In some cases, if his readers have seen possibilities in a manuscript, the publisher asks the author to re-write it and

submit the revised copy to him without binding himself to accept it after revision. In other instances, the manuscript is accepted contingent upon certain changes to be made by the author.

When the professional readers have reported favorably upon a manuscript, and the publisher has decided to produce the book, both the author and the publisher sign a contract. This agreement provides for all business relations, the furnishing of copy and illustrations, the maximum allowance for the author's alterations from copy, the expense of printing and selling the book, and the author's royalty. The royalty varies, although six per cent for elementary and ten per cent for high-school texts is a fair percentage.

When these preliminaries have been settled, the style and size of type for the book are selected and the page dimensions decided. The publisher will have changes to suggest, and at this stage of progress the wise author will read his manuscript again critically. All possible corrections should be made before the type is set, for after that is done all alterations due to changes in copy add to the expense. Beyond the allowance (usually about two hundred dollars) made by the publisher to cover author's changes, the author must pay the cost of alterations; and the writer who is not familiar with the printing processes may quite easily run up what he considers an exorbitant bill.

The manuscript, now called copy, is given to the compositors to put in type. While it is expected that the compositor will "follow copy," an exception is frequently made in spelling and punctuation. Many writers spell some words according to Webster, other words according to Standard or Century, and yet others according to the English spelling. Some writers make the dash do service for all punctuation marks; some do not punctuate at all; very few punctuate consistently. Most large houses have style sheets or manuals

of style to guide their compositors in their printshop requirements. For the sake of uniformity, the compositor is directed to follow shop practice in spelling and punctuation. If, however, the author objects to this, the publisher yields the point.

The early printers set type by hand and our best books are yet set up by hand composition; but the greater number of our textbooks, like our daily papers, are set by a machine. This is because of the extra time and cost of hand composition, as a good hand compositor can set only about twelve hundred ems of straight matter in an hour at a wage of 57 cents. Formulas, foreign languages, technical names, and tabular matter may require three or four times as long for the original composition and many more hours for rearrangement to fit the paging.

Either the linotype or monotype may be used for setting the type. The linotype is a machine operated by means of a keyboard like that of a typewriter. The letters when pressed liberate matrices that are forced into hot metal and type is cast line by line. The machine does not produce single type, but casts slugs of metal on the face of which are the words. These slugs, which are the length of a line of type, may be cast as long as six inches. The name, lin-o-type, is a contraction of line of type¹. The linotype machine sets from four to five thousand ems per hour which costs about three dollars. Two separate machines form what is known as the monotype. One machine is used for composing, the other for casting the type. The operator of the composing machine presses a key on a keyboard which causes a perforation, corresponding to the position of the character struck, in a paper ribbon. When the work is completed, the perforated ribbon, looking like the ribbon on a piano player, is transferred to the casting machine, which produces in type every character

¹For detailed description of the linotype, see *Mechanism of the Linotype* by Jno. S. Thompson.

indicated on the ribbon. Each character is cast separately, set in a justified line of any length desired up to seven inches. Spaces, rules, leads, and quads are also cast in monotype. A monotype compositor can set about four thousand ems per hour at a cost of one dollar and thirty-five cents. The caster receives ninety cents an hour, and casts about the same number of ems per hour on one machine, but one caster operator can run three or four casting machines at the same time¹. Monotype work is better looking than linotype and also more advantageous for technical matter in which alterations or rearrangement in pages may be necessary. But hand composition is superior to either the monotype or linotype although machine composition has the advantage of both speed and low cost.

When the type has been set, it is put into a galley, a metal tray about six inches wide and twenty-four inches long. Then an impression called a galley proof is taken. For this purpose a proof press is used. The type is inked, a proof paper laid on it, and pressure applied by passing a heavy roller over the paper. The first proof is read by a proofreader who, assisted by a copyholder, compares it with the copy, sees that nothing has been omitted or inserted, and marks all typographical errors. He must see that everything is set in the style ordered; he must question on the margin of the proof any faulty sentence, any incorrect quotation, any obscure statement,—whatever seems to him wrong. The compositor corrects his errors, then a second proof, a revise, is taken and corrected. The revise with the proofreader's queries is sent to the author for his reading and correction. Sometimes a second or third revise is sent to the author. When, finally, the author returns the galley proof marked O.K., the compositor corrects the proof as marked and makes up the type into pages. He inserts the illustrations, divides the type into

¹See *The Monotype System* by Lanston for a detailed description of the monotype.

page lengths, puts in the folios, as the page numbers are called, and adds the running heads—usually the book title on the left-hand page and the title of the article or chapter on the right-hand page. These pages are then proved and read and the page proofs sent to the author.

Sometimes in making up the pages a necessity for changing the copy arises. An illustration must be placed on a different page from that planned requiring a change of the words that refer to it in the text. In tables or outlines which should not “break” or start at the bottom of a page, a few more lines of copy may be needed. Or the concluding page of a chapter may not fill one-fourth of the page. In these cases the publisher will ask the author to cut down his copy or provide more.

On reading the page proofs, the author is strongly tempted to make changes in the text, for at each reading he will find more revision needed. Additions and changes, other than those requested by the publisher, may make necessary an entirely new “make-up” for the book. Some pages may be too short, others may run over; the first line of a paragraph may become the last line on a page; the final line of a paragraph may not overlap the indentation of the following paragraph; the head line on a page may be a short line; the footnote may not now be on the proper page. But if the revision of the copy is of sufficient importance to justify it, the author makes such changes and pays by the hour for the time involved.

The making of the illustrations deserves a word of explanation. The author furnishes the copy, either photographs or drawings, or requests the publisher to provide them at the author’s expense. The drawings may be reproduced as line engravings or half-tones. Black and white or line drawings are reproduced on zinc, briefly in the following manner: The drawing is photographed the desired size and printed on a sensitized zinc plate. The background is then etched out by

acid leaving the drawing in relief. Wash drawings and photographs are photographed on copper. This is called a half-tone.

Zinc plates print well on book paper (unsized), so they are more commonly found in schoolbooks than half-tones, which demand a highly finished paper. Colored pictures may be printed from either zinc plates or half-tones, but a separate plate must be made for each color. Different shades and tints, however, are produced not by separate plates but by printing one color over another. Wonderful results may be obtained by printing in the three cardinal colors—yellow, red and blue.

Very few books are printed directly from the type. There are several reasons for this. First, the type metal is soft, not hard enough to stand the wear of many impressions such as are necessary when printing large editions of books. In the second place, the type is needed for other work, and in the third place the cost of storage would be prohibitive if pages were left standing for later editions. Therefore, electrotypes plates are made of the pages and the book is printed from these.

Electrotypes are made thus: Pages of type, two, three, or four, depending upon the size, are locked in an iron frame called a chase. An impression of this form, as the type and chase inclosing it are called, is taken in wax, or rather in a composition resembling wax. Both the type and the wax are first coated lightly with graphite to prevent the wax from sticking to the type. The inside of the wax mould thus secured is again covered with powdered graphite which makes it a conductor of electricity. It is then suspended as the negative plate in a solution of copper sulphate. A plate of pure copper is used as the positive plate, i. e., the plate at which the current of electricity enters the bath. When the electric current flows from the copper plate through the solution to the wax mould, copper is deposited in a thin layer

on the face of the mould. When the deposit is about the thickness of a calling card, the mould is taken from the bath. The wax is removed from the copper film by hot water and hot lye, and the back of the copper shell then covered with melted lead. When the lead has cooled, it is planed down to about one-seventh of an inch in thickness. The result is a solid lead plate with copper face, an exact reproduction of the type in permanent form. The various pages are sawed apart and proved, and both plate and proof are inspected and O.K'd. The plate is examined for possible flaws that might cause difficulty in lockup or makeready and to see if it is type high. The proof is inspected to see that the face of the plate is clear and readable. If corrections must be made even in these plates, it may be done; or if necessary new plates can be made.

When the plates are ready for the press, they are made up into forms of sixteen pages or multiples of sixteen. Sometimes these plates are mounted on wood. More often the pressman locks up the form with so-called "patent" blocks, which are made of steel or wood planed evenly to about three-fourths of an inch in thickness. The electrotypes plates are then placed on these blocks and locked in place. After one form has been printed, the plates can be removed from the blocks and a second group of plates readily substituted.

Before the composition and plating are finished, the manufacturing man has ordered the paper on which the book is to be printed. Before placing the order, he must know the size of the book page, and order sheets that will cut advantageously. He must decide what bulk the book must be to make a volume of good proportions, because that determines the weight of paper to be used. The quality and finish of the paper must be chosen with reference to the nature of the illustrations—half-tones requiring a smooth surface, while zinc etchings can be printed on less highly finished paper. He must know the

number of pages in the book that he may order the exact quantity.

The book may be printed on a single-cylinder flat-bed press, which prints one side of the paper at an impression, or it may be done on perfecting presses which print both sides of the paper at once. In the flat-bed press the form is placed upon the bed which runs back and forth under the cylinder when the press is in motion. The ink is distributed to the plates from an ink fountain by means of rollers. The paper in single sheets is fed at one end of the press by a feeder, passes around the cylinder, over the plates, and emerges from the press printed on one side. When this is dry, the other side is printed in the same way. When the sheets are thoroughly dry, they are pressed in hydraulic presses which remove the indentions made by the type. The sheets are then ready for folding.

In the rotary or perfecting press, the paper is taken from a large roll between one or more pairs of cylinders. One cylinder, taking the place of the bed, has the plates curved round it. The paper passes continuously between the cylinders, thence to the folding machine, attached to the press, which cuts and folds the signatures complete, thus finishing or perfecting the work.

Sheets printed on the flat-bed press must be folded after they leave the press. This is usually done in sixteen page sections, or double sixteens, each section having a signature, either a number or letter, on the bottom of the first page. This is to guide the collector in gathering the sections. Formerly, all folding was done by hand. Now it is largely done by machines, each of which if equipped with automatic feeders can do the work of a dozen persons folding by hand.

Gathering, next in order, consists of collecting sets of signatures, one of each, to make a complete book. The

books are made solid by passing through a heavy press called a smashing machine.

The book goes next to the collator who examines its signature by signature to see if everything is in its proper place before it is sewed. The sewing is done by machinery. Each signature is sewed independently, one signature after another, one book after another, fifteen to eighteen thousand signatures being done by one machine in a day. The continuous row is then cut apart into single books. The end papers, used for cover linings are cut double the size of the paper page, folded, and then pasted along one side of the folded edge to the edge of the outside signatures. The book is then smashed and the top, front, and bottom edges of the leaves trimmed in one operation.

After the edges are trimmed, the book is rounded and backed. The process of rounding makes the back of the book convex and the front concave. Backing makes the groove on which the cover is hinged. In machine-made books the rounding and backing are done by a machine in a single operation, three hundred and eighty per hour. A strip of coarsely-woven crash which laps over each side an inch or more is glued to the back, and a piece of paper as wide as the back is glued to the cloth. This makes the back stiff and prevents breaking. The book is now ready for the cover.

The boards are cut longer and wider than the leaves of the book as they extend about one-eighth of an inch over the head, front, and tail edges of the leaves. The cloth is cut to the required size, its inside covered with glue, and the boards laid on in the proper place. The cover edges are folded over the boards. This is done by hand at a rate of ninety-one per hour.

The covers are next decorated. In some cases this consists only of lettering in black, colors, or gold; in others it may include a decorative unit or be wholly pictorial in style. The

cover design is photographed. Then a brass die, or sometimes a steel die for large editions of schoolbooks, is made by etching in much the same manner as a zinc etching is made for an illustration. A separate plate is made for each color desired. If the decoration is to be in gold, the workman lays the gold leaf in position and stamps the design through it with the hot die. If the design is to be put on in ink, the die is printed by a stamping press, somewhat similar to a printing press, but smaller.

The cover is next slipped on the book, and the crash cloth and the end papers pasted to the inside of the cover boards. The back is not pasted to the cover, as the cloth and lining papers hold it securely.

"On or before the day of publication" a claim for copyright with the title of the book must be filed in the Copyright Office of the Library of Congress at Washington. If this is not done, the book is not accorded the protection of the copyright law.

The Register of Copyrights furnishes free upon request application blanks, which the applicant fills out and returns with fees inclosed. Fifty cents is the fee for filing if the applicant is a citizen or resident of this country; one dollar if he is a foreigner. Fifty cents additional is charged if the applicant desires a sealed copy of the record entered at the Copyright Office. The applicant must state on the blank provided how the volume is to be classed, whether book, drama, or periodical; the name and address of the applicant, whether he is the author or proprietor, the name of the author or proprietor, in what country the book was printed, and whether the copyright is to cover the whole or only a part of the book. A print or proof of the title page must be pasted on a blank page of the form. When the blank is properly filled out and the fees have been received, the Copyright Office makes a record of the claim and returns a receipt.

As soon as a book has been printed, a few copies are sent to the bindery to be bound in advance of the rest. Two of these copies are next sent "on or before the day of publication" for deposit in the Copyright Office.

When the sealed copy of the record and the receipt for the two copies have been returned, the author or publisher knows that his copyright is secure. The author has protection under the copyright law for twenty-eight years, which under certain conditions may be extended fourteen years more. The copyright, unlike a patent, is not a complete protection, as it only records the claim of the author, and any infringement of the author's rights must be settled in the courts.

Finally, in the forms prescribed by law, the book must have on its title page or on the page following, "Entered according to the Act of Congress in the year 1918 by John Doe in the Office of the Library of Congress" or "Copyright, 1918, by John Doe."

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