Type

A Primer of Information About the Mechanical Features of Printing Types Their Sizes, Font Schemes, &c. with a Brief Description of Their Manufacture

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TYPOGRAPHIC TECHNICAL SERIES FOR APPRENTICES—PART I. NO. 1

TYPE

A PRIMER *of* INFORMATION ABOUT THE MECHANICAL FEATURES OF PRINTING TYPES: THEIR SIZES, FONT SCHEMES, &c. WITH A BRIEF DESCRIPTION OF THEIR MANUFACTURE

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PREFACE

This treatise is the first of a series of text-books, published under the general title of *Typographic Technical Series for Apprentices*, which have been prepared under the auspices of the Committee on Education of the United Typothetae of America, for the use of printers' apprentices and students of typographic printing.

As will be noted by the table of contents, only the mechanical features of type and the usual methods of its manufacture have been considered here. No attempt has been made to review the history of type-faces or the development of type-making processes. These phases of the subject are considered in other publications of the series (see p. 36) and in supplementary reading recommended for students (p. 28).

It is not what they are but what they can be made to do under the control of trained intelligence and skilful hands that makes printer's types of importance to the world. No tools used in modern industry seem simpler than these little pieces of metal, yet they are the product of the most highly specialized skill and ingeniously perfected mechanisms. To the young printer their physical elements are matters of first concern. An understanding of these elements may be only a small part of his trade education, but it is important. The possibilities and the limitations of type can be appreciated only by thorough familiarity with the technical details and niceties provided by the modern typefounder.

A special feature of this series of technical publications is the list of Review Questions, which will be found at the end of each treatise (see pp. 29-31). These questions cover the essential points in each subject and will be of assistance to instructors, for examinations, etc. A list of the other titles of the series, as well as a statement of their plan and scope, will be found on pp. i-vii of this publication.

CONTENTS

MECHANICAL FEATURES OF TYPE

[A piece of metal type]

Printing owes its development first and chiefly to movable metal types. The so-called invention of printing was the discovery of a method of making serviceable type in quantity. The idea of a separate type for each letter of the alphabet was probably conceived long before Gutenberg's time, but it remained for him and his associates to devise an apparatus for making them quickly and accurately enough to be of practical value. That apparatus was the type mold, which experience has since proved to be the most efficient means of securing exactness and uniformity in a number of small pieces of metal.

Type is made of an alloy of lead, tin, and antimony. Its length (technically called height-to-paper) is .918 of an inch. Each type is cast separately in a mold, and has the letter or printing character in bold relief on one end.

Exact uniformity of body is necessary in order that the types, when composed in lines and pages, may be locked together by pressure at the sides so as to make a compact mass. All types in a printing form must be of the same height, so that their faces may present a uniformly level surface from which an impression may be made that will show all the characters clearly. A short type will print faintly or will not print at all, while a long one will be unduly forced into the sheet.

[Diagram of a line of metal type]

There are on an average about one hundred and fifty roman letters and other characters required in ordinary book printing. These letters are divided into a number of classes: full-body letters, ascending letters, descending letters, short letters; and in some cases, small capitals, which are larger than short letters but not so tall as capitals or ascenders. Only a few letters, like J and Q, cover nearly the entire surface on the end of the type; other letters, like B h l i, cover the upper portion chiefly and leave a blank space at the bottom; while the small letters, like a e o u v, occupy only the middle portion of the surface; still others, like g y p, cover the middle and lower portions of the surface. As all these irregular shapes must be made to appear in line with each other, the type-body on which they are made is larger than the letter. The blank parts around the face of a letter are called the counter, the shoulder, and the beard. The counter is the

shallow place between the lines of the face. The shoulder is the low flat part of the type around the face. The beard is the sloping part between the face and the shoulder.

A A, the face
B B, the serifs
C C, the counter
E, the pin-mark
F F, the beard
G, the shoulder
H, the nick
J J, the feet
K, the groove

An important feature of a type is the nick on the side of the body. In many cases there may be two, three, or even four nicks on a type. Usually all the types of a font have nicks that are identical in number and position, and when the types are composed in lines these nicks match each other and form continuous grooves on the lower part of the line of type.

The nicks serve as guides to the compositor when taking the type from the case to his composing stick, and they assist in distinguishing the types of one font or face from those of another on the same size of body.[1] Individual letters of different type faces sometimes bear such close resemblance that they are more readily distinguished by the nick or some other body-mark than by the face. A difference in alignment of nicks in a line will readily show the presence of a wrong-font letter. Typefounders sometimes make an extra nick on a few small-capitals (o s v w x z) in order to distinguish these types from the lower-case letters of the same font.

A Font of Type

A font of type is an assortment of one size and kind that is used together. It is usually all the type in the composing-room of a certain kind matching in body, nick, and face. A small font may be held in one case, but several cases may be required for a font of large quantity.

An ordinary font of roman type for book work will include these characters:

Roman Capitals—A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ

Œ

Small Capitals—A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ Œ

Lower-case Letters[2]—a b c d e f g h i j k l m n o p q r s t u v w x y z æ œ fi fl ff ffi ffl

Figures—1 2 3 4 5 6 7 8 9 0 (or oldstyle old-style: 1 2 3 4 5 6 7 8 9 0)

Marks of Punctuation—Period . comma , colon : semi-colon ; hyphen - apostrophe ’ exclamation mark ! question mark ? parenthesis (bracket [The latter two are used in pairs () [], the second type being set in reversed position.

Quotation Marks are made by two inverted commas “ at the beginning and two apostrophes ” at the end of the quoted matter. In some fonts there is a double mark |"| |"| cast on single bodies, but these are not often used.

Dashes—En – em — two-em —— three-em ———

Reference Marks—Asterisk or star * dagger † double dagger ‡ section § parallel ‖ paragraph ¶ index (hand, or fist) ☞

Braces—Two-em two-em horizontal brace three-em three-em horizontal brace pieced braces pieced brace made on em bodies, which may be extended more or less with dashes longer pieced brace

The dollar-mark $, short-and (or round-and) &, and sterling pound-mark £ are also included with all full fonts.

The character ct ligature is an old-style ligature (two joined letters cast on one type) made in some fonts of old-style faces. It is one of the many letter combinations formerly common, in imitation of the work of old manuscript writers.

Many styles of roman types have italic letters to match, but the italic fonts include only capitals, lower-case, figures, and punctuation marks:

Italic Capitals—A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ Œ

Italic Lower-case—a b c d e f g h i j k l m n o p q r s t u v w x y z æ œ

Italic Figures—1 2 3 4 5 6 7 8 9 0 (old-style: 1 2 3 4 5 6 7 8 9 0)

Italic Points, etc.[3]—*. , : ; - ’ ! ?) $ &*

Small capitals are not made for italic fonts, except in rare cases. When they are needed in composition, capitals of a smaller size of type are justified into the text line.

Other extra characters, not included in ordinary fonts but which may be added when required, are accented letters (â é ë ī ō û etc.), fractions ¾ $^{5}/_{13}$ etc.), mathematical signs (+ × ÷ = etc.), superior ($^{ab\ 42}$) and inferior ($_{ab\ 12}$) letters and figures, leaders (……), commercial signs (@ ℔ ℀ ¢), and many other characters for special kinds of printing.

Fonts of advertising, jobbing, and display types usually consist of the capitals, lower-case letters, figures, and points, with occasionally a few extra characters. For many recent styles of heavy faces the founders furnish fractions, accented letters, and other special characters to match in boldness of face, but these are not included in ordinary letter-fonts.

The quantity of each character apportioned to a regular font is the estimated average required for ordinary composition in the English language. It is rare that more than a fraction of a small font can be used in any piece of composition. No general scheme can meet the needs of every kind of work; tables and statistical matter will need extra figures, directories and other lists will call for surplus capitals, dialogue matter will need more than the usual portion of commas and apostrophes for quote-marks; even plain descriptive composition will often call for extra "sorts." For these and other peculiar kinds of composition extra quantities of some characters, as well as other material, must be provided.

Ordinary roman and other faces used in large quantities are measured by weight. The proportion of letters in a 100-pound font, showing the proportions of each character, is given on the next page. Miscellaneous faces used in small quantities are put up in fonts containing a certain number of each letter, the size of the font being designated by the number of capital A's and lower-case a's it contains.

Scheme for 15-A 30-a Job Font of 12-Point [4]					
		LOWER-CASE		**POINTS**	
		a	30	period	31
CAPITALS		b	12	comma	31
A	15	c	16	colon	6
B	6	d	18	semi-colon	6
C	10	e	40	hyphen	9

D	8	f	12	apostrophe	13
E	18	g	12	!	9
F	7	h	20	?	8
G	7	i	30	(	6
H	8	j	8	**FIGURES**	
I	15	k	8	1	5
J	5	l	20	2	4
K	5	m	16	3	4
L	10	n	30	4	4
M	8	o	30	5	4
N	15	p	12	6	4
O	15	q	6	7	4
P	8	r	30	8	4
Q	3	s	30	9	5
R	15	t	30	0	6
S	15	u	16	$	4
T	15	v	8	£	5
U	8	w	12		
V	5	x	6		
W	6	y	12		
X	3	z	6		
Y	6	fi	3		
Z	3	fl	3		
&	6	ff	3		
		ffi	2		
		ffl	2		

A WEIGHT FONT

Proportion of Letters &c. in 100 lb. of Roman Type					
CAPITALS		**SMALL CAPS.**			**FIGURES**
	oz		*oz*		*oz*
A	8½			1	8

B	5
C	7½
D	6½
E	10
F	5
G	5½
H	6½
I	6
J	4½
K	4
L	6
M	7½
N	7½
O	7½
P	6
Q	2½
R	8
S	8
T	9
U	5
V	3½
W	7
X	2
Y	4½
Z	2
Æ	¾
Œ	¾
&	3½
	10 *lb*

A	2½
B	1½
C	2
D	2
E	3½
F	1½
G	1½
H	2
I	1¾
J	1¼
K	1¼
L	2
M	2¼
N	2½
O	2½
P	1¾
Q	¾
R	2¼
S	2¼
T	2½
U	1½
V	1
W	2
X	¾
Y	1¼
Z	½
Æ	¼
Œ	¼
&	1
	3 *lb*

TOTALS

LOWER CASE

	lb	*oz*
a	4	6
b	1	-
c	1	14
d	3	-
e	6	8
f	1	1
g	1	4
h	3	8
i	2	12
j	-	5
k	-	8
l	1	8
m	2	10
n	4	6
o	4	4
p	1	6
q	-	5
r	3	5
s	3	6
t	3	12
u	2	2
v	-	14
w	1	10
x	-	5
y	1	4
z	-	4
æ	-	1
œ	-	1
fi	-	5
ff	-	4

2	6½
3	5½
4	5
5	6½
6	5
7	5
8	5
9	5
0	10
$	2
£	½
	4 *lb*

POINTS

	lb	*oz*
period	1	-
comma	1	8
colon	-	2
semi-colon	-	3
hyphen	-	9
apostrophe	-	4
!	-	2
?	-	2
—	-	3
(	-	2
[	-	1
	4	4

SPACES AND QUADS

	lb	*oz*

	lb						
Capitals	10	ffi	-	4	hair	-	2
Small Capitals	3	fl	-	3	5-to-em	-	10
Lower-case	58¾	ffl	-	3	4-to-em	1	-
Figures	4				3-to-em	6	-
Points	4¼		58	12	en-quad	2	4
Spaces and quads	20				em "	1	10
					2-em "	4	2
					3-em "	4	4
	100 *lb*					20 *lb*	

Weight fonts of body type are usually put up by the founders in sections or parts of fonts as given in the above summary of totals, so that one or more of these sections may be obtained to supplement a font already in use.

It will be noted that braces, dashes, and reference-marks are omitted in the above list. These characters, like fractions, commercial signs, etc., are not now considered parts of ordinary fonts, but are put up in separate packages and must be specially ordered when wanted.

Font schemes apportioned in quantities like the foregoing are more or less closely adhered to for original packages of foundry-cast type. To insure precision, when ordering, it is necessary to state not only the quantity (by number of letters or weight) but also whether a complete font or part of a complete font (capital font, lower-case font, or figure font) is referred to.

The Sizes of Type

All printing type has, first, a name denoting its size, and second, one denoting the style of its face. For instance, the type used for the text of this book is 10-point (its size) Lining Caslon Oldstyle (the foundry name of its face).

[Diagram of type sizes]

The *size* of a type is the vertical thickness of its body—the thickness of a line up and down the page. The width of a type is its *set*. Thus a 12-point en-quad is 12-point body and 6-point set, a 10-point figure of the thickness of an en quad is 10-

point body and 5-point set, etc. The total length of a type, including feet and face, is its *height-to-paper*.

American type sizes conform to a graduated scale known as the point system. The unit of the system is a division of space called a *point*, which is .0138+ (approximately $\frac{1}{72}$) of an inch. Type bodies are multiples of this point.

The usual sizes are graduated by points up to 12-point. Sizes above 18-point are multiples of 6-point up to 60-point (18, 24, 30, 36, 42, 48, 54, 60). Larger sizes are 72-point, 84-point (rare), 96-point, 120-point, and 144-point, the latter being the largest type commonly cast in a mold.

The above squares show one em of the sizes stated. The letters show the size of face made on the body.
The above squares show one em of the sizes stated. The letters show the size of face made on the body.

In addition to the small sizes shown in the accompanying illustration, there are some intermediate sizes like 5½-point and 4½-point, and type as small as 3-point has been made. These are rare, however, as type smaller than 5½-point is not practicable for extended use. These small sizes are employed for special purposes, like miniature editions of books (parts of the Bible, prayer books, etc.) cut-in notes, piece-fractions, small borders, special characters, and occasional words or lines that are required to be put in the smallest possible space. The size of type known as agate (fourteen lines to an inch) is considered the common standard of measurement for newspaper and magazine advertising space.

Many plain types for books, periodicals, etc., are made only in small sizes. Certain faces are made in a few sizes only, while others are made in more or less complete series from 6-point to 48-point. The irregular sizes of 5½-point, 7-point, 9-point, and 11-point are mostly roman faces, with companion italics, and a few bolder styles for headings and other display in combination with romans of the same body. Many new faces are now made by founders in graded series from 6-point to 72-point, and in some cases even larger. Type faces adapted to many kinds of work are made in nearly all the regular sizes, while those faces designed for small and dainty work, like personal and society cards and stationery, are made only in the smaller sizes of the list.

Types are now often cast with faces larger or smaller than is commonly made on the body, such as a 12-point face on 10-point body, giving the effect of compactness; or an 8-point face made on a 10-point body, which gives a lighter appearance as if opened with 2-point leads. These are known as bastard types. Because of this irregularity in the faces of types it is difficult to know the exact

body-size of a type by merely examining a printed sheet.

Borders, ornaments, florets, and decorative characters cast on type-bodies are now made mostly in sizes based on the 6-point as the unit (6, 12, 18, 24-point, and larger multiples), but 8-point, 10-point, and 14-point sizes are sometimes used.

Before the adoption of the point system, type sizes were named in a haphazard way. Arbitrary names were given to certain sizes and in many cases types of the same name made by different founders varied so much in size that they could not be used together without great inconvenience to the printer. Some of these old names still survive and are applied to the point-system bodies which approximate the old sizes.

POINT SIZE	OLD NAME
3-point …	excelsior
4-point …	brilliant
4½-point …	diamond
5-point …	pearl
5½-point …	agate
6-point …	nonpareil
7-point …	minion
8-point …	brevier
9-point …	bourgeois
10-point …	long primer
11-point …	small pica
12-point …	pica
14-point …	english
16-point …	columbian
18-point …	great primer three-line nonpareil
20-point …	paragon
22-point …	two-line small pica
24-point …	two-line pica
28-point …	two-line english
32-point …	two-line columbian

36-point … two-line great primer
40-point … two-line paragon
44-point … meridian
48-point … canon, four-line pica

While these old names and their sizes are now nearly obsolete, young printers should learn the names and associate them with their corresponding sizes of the point system. In the foregoing list there are several intermediate sizes (16, 20, 22, 28, 32, 40, 44-point) rarely used for type of recent design. Fonts of these odd sizes may be sometimes found, and there has been a size of 15-point made, but little used. These odd sizes are, however, mostly old faces, scripts, and black-letter, originally cast on old bodies and later, after the introduction of the point system, made on new point-bodies which are nearest to their original sizes.

The point system has been applied to the width of types, as well as to the body-size; that is, the set of each type is fixed at a given number of points or fraction thereof. This method simplifies in a degree the process of accurate justification, as each line, though containing various letters and spaces, is composed of the same number of units. An advantage over the old method of unrelated widths is in the saving of time in composition, by reducing the number of different widths in the characters of the alphabet. By the old method each type had its own special width; in a complete font there might be a hundred or more different widths. By the modern point system those characters which are nearly alike in width are made on the same set, or, if different, the variation is governed by the standard unit.

Lining Type Faces

Showing irregular alignment of faces, the old method. Showing exact alignment of different faces, the modern way.

Showing irregular alignment of faces, the old method.
Showing exact alignment of different faces, the modern way.

American founders have adopted the practice of casting type-faces on uniform lining systems, variously known as American line, standard line, uniform line, etc. The earlier practice was to cast the type of a font so that the letters would align at the bottom only with their mates of the same font, without reference to any other face of type. When the compositor had occasion to use two or more

different faces of type in the same line, these faces were rarely in even alignment, but were irregularly high or low, as shown in the accompanying example [A]. This lack of uniformity made it necessary when a different face was used in the line, as is often required in jobbing and advertisements, to use thin leads, cards, or pieces of paper above and below different parts of the type-line in order to get the faces in line—an operation more or less troublesome and expensive. By the modern lining system, the faces made on any given size of body are cast to align with each other, as shown in the second example [B]. These different faces require no more adjustment than if they were all of one font.

On different sizes of type the shoulder, or blank space, at the bottom of the letter increases gradually with the size of the type, so that a word of small type placed beside a larger size must have some spacing material below as well as above to keep it in its right alignment. This necessary difference in the face-alignment of various sizes is graduated by points, in the lining system, so that when more than one size type is used in the same line the justification is made by using point-body leads. This makes the use of slips of card and paper unnecessary and secures greater accuracy and solidity of the composed page.

30-point to 6-point lined up with 1-point.
30-point to 6-point lined up with 1-point.

Faces of radically different style are not, however, all cast on the same alignment, but are classified into three groups. One group embraces the majority of type-faces, those having capitals and small letters, g y p j. Another group embraces fonts of capitals only, mostly faces known as title letters and combination lining faces which, having no descenders, may be made lower on the body. A third group includes those faces having long descenders, like script types, which must be placed high on the body.

These types show letters cast on [A] the common line, [B] title line, [C] script line.
These types show letters cast on [A] the common line, [B] title line, [C] script line.

A common class of “lining” types for job work are the combination series, or those having two or more sizes of face (capitals only) cast on bodies of the same size. Each face is made to line with the others on the same body, and all the faces are readily used in combination, with a single size of spaces and quads. In order that the type of each face may be readily distinguished, the nicks are varied in number or position—a single nick for one face, two nicks for another, etc.

American Lining System
American Lining System

Kerned Types

When the face of a letter is so large that it projects over the type-body, it is known as a kerned type. Letters of this kind are common in italic and script fonts, and there are a few letters, like f and j, in some oldstyle roman fonts which have the tip of the letter overhang. Kerned types are a source of trouble because of the ease with which these projections break off during composition, proofing, etc. Yet they cannot be entirely dispensed with, especially in italic and script faces having a definite slope, where the long letters would have wide gaps on the side (as shown in the script line above) if they were cast on bodies wide enough to hold the entire face. In some styles of upright faces having extra long descending letters g, p, q, y, these descenders may be kerned.

Showing why some letters must be made on kerned types.
Showing why some letters must be made on kerned types.

Large italic letters are sometimes mortised at the corners, instead of kerned, to allow the next letter to fit

close.
Large italic letters are sometimes mortised at the corners, instead of kerned, to allow the next letter to fit close.

Modern type-makers try, by changing the shape of the letters slightly, to avoid kerns as much as possible, because of the extra care and expense involved in casting. Too often, unfortunately, this avoidance of the kern, in order to meet mechanical convenience, is secured by sacrificing the distinctive form of the letter.

Spaces and Quads

Short metal spaces and quads (from *quadrat*, a square), used for blanks between words and elsewhere, are of various thicknesses, as illustrated below. An em is a square of type body of any size. This 10-point em □ is ten points square; a 10-point three-to-em space is one third of the em, a four-to-em is one fourth, etc. The en quad is really a thick space, though called a quad, and is equal to half the em. Larger blanks are the two-em and three-em quads, used to fill the last lines of paragraphs and other wide spaces.

10-point Spaces and Quads

The metal blanks shown here are the regular spaces and quads belonging to a font of type of the size of 10-point. They enable the compositor to obtain the many different spacings required to make lines the required length, and to properly separate words and place them wherever desired in the line. While these thicknesses of spaces are the usual kinds for sizes of type up to 12-point, larger types may have other kinds of spaces, six-to-em, eight-to-em, and even smaller divisions. The thickness of the hair space does not always bear the same proportion to the em quad; in some sizes it is one sixth of the em, in others it may be one eighth or one twelfth. Very thin spaces (copper ½-point, brass 1-point), for exact spacing and justifying, are supplied by dealers.

A space of the thickness intermediate between the three-to-em and the en quad, known as a patent space, has been made for use in book work. Although it has great advantage as a substitute for two of the thinner spaces when these are needed in spacing a line, its use has been limited and it is not included with the usual assortment furnished by dealers.

The common spaces and quads for general work, when the type itself is used for printing, are about seven-eighths of the height of the type, so that they are well below the printing surface. A type-page composed with these spaces will have a little deep hole at the top of each space. These numerous little holes present a difficult surface for making a good wax mold when an electroplate is made for printing. Where much molding is to be done, higher spaces, quads, and other blanks are provided. These high spaces and quads reach nearly to the shoulder of the type.

How Type is Made

[Diagram of a type mold]
Solid lines indicate one half of the mold. Dotted lines show the other half in position. Shaded portion represents type metal filling aperture in the mold. The molten type metal flows through the opening at A, down to the side B, where the matrix (not shown in this diagram) molds the face of the type. The tag of metal, called the jet, marked C, is cut off after casting. D is a narrow flange on the mold which forms the nick on the under surface of the type body.

The mold in which type is cast consists of two essential parts—the steel box in which the body is formed, and the matrix which contains a sunken image of the character. The matrix covers the opening at one end of the mold, and on the opposite end (which is the foot of the type) is an opening through which the melted metal is injected. A mold is made for a single body-size of type but it is adjustable sideways to correspond to the various widths of the letters in an alphabet. One mold may be used to cast, in succession, all the letters of a font of type, or it may be used to cast any number of fonts of different faces that may be made on the same body, by merely changing the matrices that form the face. The mold is made in two sections, which are fitted together so as to close up to the required width of the letter, and, after the cast is made, to open slightly in order to release the type.

Matrix
Matrix

The Matrix. There are three different methods of making type matrices. By the oldest method the first step is to cut the character on the end of a small bar of soft steel, called a punch; when this is done, the steel is hardened and it is used to stamp an impression in a bar of copper. This copper bar is a matrix in the rough, and its sides are next trimmed and squared so that it will fit the mold.

Type mold, complete, in two parts...

Type-mold complete, in two parts, but without the matrix (which is shown separately above). Position of the matrix when cast is made is indicated by the letter H on the end of the type within the mold. The upper and lower halves of the mold slide horizontally, to make the interior casting-box wide or narrow to conform to the required widths of various letters.

The second method of making a matrix is by electrotype process. The original pattern of the letter may be engraved by hand or by other operation, or it may be a perfect type-face of a previous casting. This is fitted into a small frame of brass and then held in the vat of an electro-galvanic battery, which deposits a thick film of copper around the pattern and fills the opening in the brass frame. When this electro-plating process is completed, the pattern letter is extracted and the brass frame, with its copper impression of the letter, becomes the essential feature of the matrix. It is then reinforced by riveting another plate on the back, and is trimmed and fitted to place on the mold.

A third process of making matrices is with an automatic matrix-cutting machine, in which the shape of the desired letter is cut in the face of a plate of composition metal by a small rapidly-revolving cutting point. A large pattern of the letter is placed in one part of the machine, and while the operator traces the outline with the point of a lever all the motions are duplicated in miniature by the cutting tool on the bar of metal, which becomes, when completed, a matrix.

Casting the Type. The old-time method of casting type was with hand molds, the melted metal being poured in at the foot of the mold with a small ladle while the mold was held in the hand. In the modern casting machine, the mold with its matrix, is assembled by the side of the metal pot, in which the metal is kept at a uniform temperature by means of a gas furnace.

In the center of this metal pot is a rod with a spring attachment which, at each operation of the machine, acts as a plunger to force a small stream of hot metal through a side aperture into the jet-hole of the mold. After the casting, the two parts of the mold separate slightly, the matrix is drawn away from the face of the type, and the cast is moved out; then the mold and matrix close together again and the operation is repeated. Cold water or air is circulated near the mold to keep an even temperature. The matrix for one character only is placed in the machine and when enough types have been cast, it is taken out and replaced by another, the change usually requiring but a few moments.

There are several kinds of type-casting machines in use, such as hand casters, steam casters, and automatic casters. The older style is the hand caster, which is operated by a small wheel with a handle attached. Steam casters are operated by

mechanical power (originally steam power).

When type is cast by a hand machine it is unfinished, as a piece of metal called the jet still adheres to the bottom of each type. This jet is broken off, and the types are set in long lines and fastened in a narrow channel, face down. A small plane smooths away the rough surface caused by breaking off the jet. This leaves a shallow groove on the bottom of each type and allows it to stand squarely on its feet. The types also have slight burs and sharp edges of metal which must be rubbed off before they are ready for inspection and for the font-room. Type cast on the older “steam” machines require the jet to be broken off after the casting, and the final finishing of the type is done afterward by other operations. These finishing touches are done mostly by hand, with the aid of a polishing stone or a small dressing wheel.

On the automatic machine, which is the modern method of casting type, breaking off the jet, rubbing, dressing, etc., are all accomplished automatically on the machine, the types coming out in a continuous line practically ready for the compositor’s case.

The foregoing describes in a general way the methods of making type by the regular founders. There is now a great deal of type made by automatic composing and casting machines installed directly in many composing rooms.

Two distinctive styles of these machines are now extensively used—the Linotype and the Monotype. Both of these have reached a high degree of efficiency because of their nice mechanisms, based on the principle of automatically operated molds, matrices, and delivery devices.

In the Linotype the matrices for a desired line of words are assembled side by side and the line is cast in one piece.

In the Monotype the mechanism automatically and rapidly adjusts the matrix of the desired letters one at a time over the mold, and each type is cast and moved along into lines and then into a column on a galley.

The Linotype

Four-Magazine Linotype Machine
Four-Magazine Linotype Machine

The Linotype (line-o’-type) consists of a mechanism for assembling brass dies or matrices in lines, presenting them in front of a mold in which a type-high metal bar, or slug, is cast, and returning the matrices to their respective channels for use again. The brass matrices have the characters of the alphabet, figures, points, etc., sunk into their edges; these are held in a magazine, which is an arrangement of channels in an inclined position above a keyboard. By the pressing of a key the required matrix is released, which drops and is carried into place by a small belt. Wedge-shaped space-bands are also controlled by a key, and when sufficient matrices and space-bands are assembled to make the line a bell rings. By operating a lever the line of matrices then moves in front of the mold inserted in the side of a wheel and behind which is a pot of melted metal.

By the next operation the space-bands are pushed between the words, thus spreading them to the measure. The line justified, a plunger in the metal-pot forces a quantity of metal into the mold and against the line of matrices, forming a metal strip or slug with the letters in relief on one edge. After the cast is made, a turn of the mold-wheel and other mechanism shaves off the surplus metal on the foot of the slug and pushes it between knife-edges, where it is trimmed on the sides, and is then pushed on to a galley. The melting of the metal is done by a small gas furnace under the metal-pot.

After the matrices have been used for the line they are lifted by an arm to the top of the machine and distributed again, each character in its particular channel in the magazine. The matrices for each character have a set of notches or teeth different from every other character; and as they are moved along the distributing apparatus by horizontal screws each matrix reaches a point where its notches are matched and it drops into the top of its channel. There are a number of matrices of each character, and the arrangement of the machine is such that three lines of matrices may be kept in operation at once—one being assembled, one at the casting mold, and the third being distributed.

The work of the operator is to manipulate the keyboard and, at the end of each line, move a lever which engages the mechanism that carries the assembled line to the mold. All other operations are performed by mechanical power.

The Monotype

Monotype Keyboard
Monotype Keyboard

The Lanston Monotype is a type-casting machine which produces separate types set in lines of any length, up to sixty ems pica, spaced and justified. It is in two parts—a keyboard and a casting machine. The function of the keyboard section is to punch a series of holes in a moving strip of paper, which unwinds from one spool to another, passing under a series of punches in its journey. The punches are operated by pressing the keys on the keyboard, the result of this operation being a roll of perforated paper ribbon. This ribbon is then taken to the casting machine, which contains a pot for melted metal, a stationary mold for the size of type to be cast, and a matrix-plate. The matrix-plate is about five inches square, and has on its face depressed images or matrices of each letter and character of the font. The perforated strip of paper, when fed to its place, controls the movement of the matrix-plate, so that the required letter is adjusted exactly in place over the mold, while the melted metal is squirted in to form the type. The type then moves away and takes its proper place in the line, until the line is completed, when it is automatically moved out on to a galley.

The Monotype keyboard, being an entirely separate machine, may be and usually is operated in any place away from the casting apparatus and work may be executed on it anytime before casting. The perforated roll may be fed through any number of times to produce duplicate castings of the matter, and a matrix-plate for a different face may be used if desired. In the casting of the line the proper spaces are cast with it, the spacing needed to justify each line being indicated on the perforated record during composition on the keyboard.

Monotype Casting Machine
Monotype Casting Machine

A peculiarity of Monotype composition is that, while the keyboard produces the perforated roll in the usual sequence from beginning to end of the story, the casting machine reverses the process by starting at the end of the composition and finishing up with the beginning.

Ingredients of Type Metal

The metal used for casting type is a mixture of lead (five parts), antimony (two parts), tin (one part), and sometimes a small addition of copper. Lead forms the

chief part of all type metal, as it melts easily and fuses readily with other metals; but lead alone is too soft for the service required of type. Antimony is brittle and gives hardness, and tin is added to impart toughness. Lead and antimony in approximately these proportions make an alloy which has the unusual quality of expanding slightly, instead of shrinking, when cooling, thus permitting a full, sharp cast in all parts of the mold. Tin flows readily when melted and increases the smoothness of the cast on the surface of the mold. A small quantity of copper may sometimes be added to give still greater toughness.

The metal used for small sizes of type is commonly harder than that used for the large sizes, the softness of the metal gradually increasing with the size of type made. Script types and faces with delicate lines are usually cast with metal a little harder than that used for the normal and bolder faces.

The foregoing refers more particularly to type cast by the regular foundries. The metal used in automatic casting machines, like the Monotype, contains a larger proportion of lead and less antimony; while the metal used for casting line-slugs in the Linotype machine is composed of still larger proportion of lead and very little of the other two metals. Stereotype metal and metals used for leads, slugs, furniture, etc., are largely lead.

Wood Type

Large types, such as are used for posters and large bills, are made of wood. The smallest size for practical use is 48-point, or 4-line pica. Sizes of wood type are multiples of the pica, and are so named, as 8-line, 10-line, etc. They are much cheaper than metal types, though not as durable or satisfactory for printing. The wood commonly used is maple, and the letter is made on the end of the grain. It must be well seasoned and polished. Pine and other soft woods are used for very large sizes of wood type and poster engravings.

The manner of cutting the letter is by routing away the blank parts with a small rapidly-revolving cutter. The strip of wood, large enough to make several letters, and planed type-high, is placed in a machine equipped with a pantagraph apparatus. A pattern letter is put in place, and over this a guide-point is moved. On another part of the machine is the revolving cutting tool. As the guide-point is moved over the pattern its motions are duplicated on the block under the cutting tool, which cuts away the wood. When the letters on a block are thus

routed out, they are sawed apart, the finishing touches given, and the letters oiled.

SUPPLEMENTARY READING

The Invention of Printing. By Theodore L. De Vinne. Oswald Publishing Co., New York. Cloth, 557 pp. $6.

Plain Printing Types. By Theodore L. De Vinne. Oswald Publishing Co., New York. Cloth, 476 pp. $2.

The Monotype System. Published by the Lanston Monotype Machine Co., Philadelphia. 294 pp. and diagrams.

The Mechanism of the Linotype. By John S. Thompson. The Inland Printer Co., Chicago. 216 pp. $2.

History of Composing Machines. By John S. Thompson. The Inland Printer Co., Chicago. Cloth, 557 pp. $2.

Specimen Books of American Type Founders Co.; H. C. Hansen, Boston; Barnhart Brothers & Spindler, Chicago; Keystone Type Foundry, Philadelphia.

REVIEW QUESTIONS

SUGGESTIONS TO STUDENTS AND INSTRUCTORS

The following questions, based on the contents of this pamphlet, are intended to serve (1) as a guide to the study of the text, (2) as an aid to the student in putting the information contained into definite statements without actually memorizing the text, (3) as a means of securing from the student a reproduction of the information in his own words.

A careful following of the questions by the reader will insure full acquaintance with every part of the text, avoiding the accidental omission of what might be of value. These primers are so condensed that nothing should be omitted.

In teaching from these books it is very important that these questions and such others as may occur to the teacher, should be made the basis of frequent written work, and of final examinations.

The importance of written work cannot be overstated. It not only assures knowledge of material but the power to express that knowledge correctly and in good form.

If this written work can be submitted to the teacher in printed form it will be doubly useful.

QUESTIONS

1. What was the so-called invention of printing?

2. What was Gutenberg’s contribution to printing?

3. Describe a type.

4. Upon what does the utility of type depend? Why?

5. How many different characters are required in ordinary book printing?

6. Into what classes are they divided?

7. How much of the surface of a type is covered by the letter?

8. How is the type body related in size to the letter face? Why?

9. What are the blank parts around the face of the letter called?

10. Describe each part.

11. What is the nick and what is its use?

12. What is a font of type?

13. In what is it kept for the compositor’s use?

14. What characters are included in an ordinary font of roman type for book work?

15. What can you say about small capitals?

16. What can you say about other extra characters?

17. What characters do fonts of advertising and jobbing type include?

18. Name some other characters supplied by the foundries?

19. What determines the number of characters of the various sorts in a font of type?

20. Is there any rule fitting all kinds of composition?

21. Mention some special kinds of composition and tell what extra sorts each demands.

22. How are ordinary faces measured when used in large quantities?

23. How are job fonts designated?

24. To what kind of type do these schemes apply?

25. What are the three measurements for type?

26. What is the “size” of a type?

27. What is the “set” of a type?

28. Describe the point system.

29. What are the usual sizes of type?

30. What other sizes are made and for what are they used?

31. What determines the choice of sizes for any particular face?

32. What are bastard types?

33. Can you always tell the size of type used by examining a printed page? Why?

34. What is meant by height-to-paper?

35. How were types described before the adoption of the point system?

36. Give the old names in common use and the approximate equivalents in points.

37. What can you say of 16, 20, 22, 28, and 40-point sizes?

38. What are the advantages of the application of the point system to the width of type?

39. What is meant by “lining” type faces?

40. What is the chief advantage of the lining system?

41. What is needed when a word of small type is placed beside a word of large type? Why?

42. How is the line justified?

43. Into what groups are type faces divided for aligning purposes?

44. What are “combination series” of lining types?

45. What are kerned types?

46. How is kerning avoided?

47. What are the advantages and disadvantages of these expedients?

48. What is an em quad?

49. Describe the spaces used in type composition.

50. Describe the mold used in type casting.

51. Describe the three methods of making the matrix.

52. What was the old method of casting type?

53. What is the modern method?

54. Describe the different kinds of type-casting machines.

55. Describe the finishing of type after casting.

56. How is type made outside the type foundries?

57. What is a Linotype?

58. What does a Linotype produce?

59. Describe briefly the operation of a Linotype.

60. How are Linotype matrices distributed?

61. What does the operator have to do?

62. What is a Monotype?

63. What does a Monotype do?

64. What are the essential differences between a Monotype and a Linotype?

65. Describe the operation of the Monotype keyboard.

66. Describe the operation of the casting machine.

67. What peculiarity has the Monotype?

68. What is type made of?

69. What are the qualities of the several ingredients?

70. What can you say of the uses of different metals in the type foundries?

71. What sort of type metal is used in composing machines?

72. What other material is used for type?

73. For what purpose is it used?

74. How is this kind of type made?

GLOSSARY OF TERMS RELATING TO TYPE

The numbers in parentheses refer to preceding pages in the text, where further information about the different subjects may be found.

AGATE—A small size of type, about 5½-point. (14)

ASCENDING LETTERS—The tall letters of the lower-case alphabet. (7)

ANTIMONY—One of the ingredients of type-metal; a silver-white, hard crystalline metallic substance, used in chemistry and medicine, as well as in industrial arts. (26)

BASTARD TYPES—Those with faces larger or smaller than is commonly made on a type-body. (15)

BEARD—The beveled space below the face of a type. (15)

BODY—The piece of metal upon which the face is cast. (7, 8, 13)

BODY SIZE—The size of a type considered from top to bottom of the letter. (13)

BODY TYPE—The kinds of type, mostly roman faces, used for plain composition in paragraphs or pages of one face; text letter.

BORDERS—Characters cast in type, which may be adjustable in many ways, as for marginal lines, panels, and other decorative uses. (15)

BOURGEOIS—An old size of type, about 9-point.

BRASS TYPE—For stamping book covers, etc. Ordinary type-metal cannot endure the heat which must be applied for stamping gold leaf, or printing on hard, rough surfaces. Brass types are more expensive as well as more durable.

BREVIER—An old size of type nearly equal to 8-point. (15)

CANON—An old size of type approximately 48-point. (15)

CAP.—Abbreviation for capital letter; s.c. or sm.cap., small capital.

COPPER-FACED TYPE—New type coated by electric action, depositing a thin film

of copper, to make it more durable.

COPPER THIN SPACES—Extra thin spaces for justifying lines. (19)

CORNER QUADS—Blanks cast in this shape  matching 6-point and 12-point quads; placed outside the corners of pages with mitered brass rules to keep the joints in place.

COUNTER—The blank space within the lines of a letter or other character. (8)

DESCENDING LETTERS—Those which have part of the face below the regular alignment, g, p, y. (8)

DIAMOND—A small size of type, equal to about 4½-point. (15)

DISPLAY TYPE—A general term meaning the kinds of type made for advertising, title pages, and other composition in which different sizes and faces are used; in distinction from body type.

EM—The square of a type body. En, half the width of the square. (19)

EXTENDED, EXPANDED—An extra wide face of type.

FACE—That part of a type or printing surface which leaves its impression upon the sheet. (8)

FEET—The bottom of the type body. (8)

FONT—A complete assortment of type of one size and face. (9)

FURNITURE—A general term applied to pieces of soft metal, steel, or wood, used to fill the large blank spaces in a printing form; made in different sizes based upon a 12-point (pica) unit.

GREAT PRIMER—An old size of type nearly equal to 18-point. (15)

HAIR SPACES—Very thin spaces. (19)

HEIGHT-TO-PAPER—The length of a type from top to bottom, including feet and face. This is not measured by points, but by thousandths of an inch. See Type-high. (7, 13)

HIGH SPACES AND QUADS—Used in type composition when the page is to be molded for electrotyping. (20)

HIGH-TO-LINE—When the face of a type is above the regular alignment of the other letters in the line; when below the alignment it is low-to-line. (17)

HOLLOW QUADS—Large blanks are sometimes cast with hollow parts to make them lighter and to economize metal. See Quotations.

ITALIC—The style of letters that *slope forward*, in distinction from upright, or roman, letters. (10)

JET—The waste metal at the bottom of a type when it is first cast, being the metal which cools in the aperture of the mold. (22)

JOB FONT—A small assortment of type. (11)

JOB TYPE—The kinds used for miscellaneous work, usually in small fonts, in distinction from book type, body letter, etc.

KERNED TYPES—Those which have a small part of the face projecting over the body. (18)

LAYING TYPE—Putting a font of type into cases.

LEADERS—Dots or short dashes placed at intervals in open lines to guide the eye, as in indexes, price-lists, etc. They are cast like quads for sizes of type most used. Leaders are also made of brass.

LETTER—Sometimes this word is used to mean type. Letter-press printing, that done with type. Letter foundry, a type foundry.

LINING TYPE—The exact alignment at top or bottom of the face on a type-body. (16-18)

LINOTYPE—A machine for casting type in solid lines. (23)

LONG PRIMER—An old size of type nearly equal to 10-point. (15)

LOW-TO-PAPER—Said of a type when it does not come up to the height of its mates; opposite of high-to-paper. (7)

LOW SPACES AND QUADS—Those used for ordinary composition, about seven-eighths of the length of the type. (20)

LOWER-CASE—The small letters of the alphabet. (9)

MATRIX—The shallow mold in which the face of a type is cast. (21)

MINION—An old size of type, about 7-point. (15)

MONOTYPE—A machine for casting and composing type. (25)

MORTISED TYPE—When some part of the body is cut away, either in the interior or on the sides, to allow the insertion of another letter, or to fit closer to an adjoining type. (18)

MUSIC TYPE—An assortment of characters cast in type for printing music scores.

NICK—The notch on the side of a type. (8) In fonts made for use on the Unitype composing machine each character has nicks in different position and combination from every other character, to fit its special channel, in order to control the various characters in the operation of the machine. Thus the nicks in a line of Unitype matter show great irregularity.

NONPAREIL—Old name for size of type equal to 6-point; half pica (15)

OFF ITS FEET—Type must stand squarely upright in order to give a good impression; when it leans one way or the other it is off its feet.

PARAGON—An old size of type, about 20-point (15)

PATENT SPACE—A type space thicker than three-to-em and less than the en-quad. (19)

PEARL—An old size of type, about 5-point. (15)

PI—Types of different kinds mixed up in confusion.

PICA—Old name, but still commonly used, for a size of type equal to 12-point. (15) A common unit of measurement in typography.

PIECE FRACTIONS—Fractions made up of two or more types; the numerator and denominator cast separately, usually on bodies half the size of the whole numbers or the type with which they are used. Sometimes called split fractions.

PIN-MARK—The little mark sometimes seen on the side of foundry-made type. (8)

POINT SYSTEM—The standard system of type bodies, based on the point as a unit; in America the point is .0138 of an inch. Calculations are simplified ordinarily by assuming the point as $^{1}\!/_{72}$ of an inch. (13)

Poster Type—Large sizes for billboard printing, mostly made of wood. (27)

Punch—In typefounding, an original die of a letter or character cut on the end of a steel bar, used to make a matrix. (21)

Quads—Metal blanks used for large spaces in composing type. (19)

Quotations—Large hollow quads; similar to metal furniture.

Rubber Type—Cast with a vulcanized-rubber face mounted on short metal bodies; not used in ordinary typographic printing, but classed with rubber hand stamps.

Script—A general name for that class of type designed to imitate handwriting. (18)

Sectional Type—A style of type now in disuse, in which each letter was made in two parts, the upper half being separate from the lower. Any letter or character cast in two or more parts.

Serif—The short cross-line or tick at the end of the main strokes in roman letters. (8)

Set—The width of a type. (13)

Shoulder—The blank space on the top of a type not covered by the letter; specifically, the space above and below the letter, the space on the side being designated by typefounders as side-bearings. (8)

Small Caps—A secondary set of capitals made for fonts intended for book work. They are slightly larger than the small (lower-case) letters, but smaller than the regular capitals. See the side-headings in this glossary. (9, 10, 12)

Small Pica—An old size of type nearly equal to 11-point. (15)

Spaces—Thin metal blanks used to separate words in a line. (19)

Sort—Any particular letter or character of a font, in distinction from the complete assortment. “Out of sorts,” when some needed letters of a font are missing.

Sort Order—A request for some particular character of a font.

Two-line Letter—A large letter covering two lines of the adjoining text, used

for initials at the beginning of paragraphs. Two-line figures, used for displaying price-figures in advertisements, etc.

TYPE-HIGH—Of the standard height of type; said of an electrotype or engraving that is the right height to accompany type. (7)

TYPE METAL—A composition of lead, tin, and antimony. (26)

TYPOGRAPHY—The process of printing with forms composed of movable types and small relief blocks.

WEIGHT FONT—A complete assortment of type measured by its weight instead of by the number of each letter. (12)

WEIGHT OF TYPE—Four square inches of type, composed solid, weigh approximately one pound. Thus, to find the weight of any given amount of type composition, find the number of square inches and divide by four.

One pound of type (about 4 square inches) contains the following number of ems (solid) of the different sizes:

18-point 64 ems
12-point 144 ems
11-point 170 ems
10-point 207 ems
9-point 256 ems
8-point 324 ems
7-point 423 ems
6-point 576 ems

TYPOGRAPHIC TECHNICAL SERIES FOR APPRENTICES

THE following list of publications, comprising the TYPOGRAPHIC TECHNICAL SERIES FOR APPRENTICES, has been prepared under the supervision of the Committee on Education of the United Typothetae of America for use in trade classes, in course of printing instruction, and by individuals.

Each publication has been compiled by a competent author or group of authors, and carefully edited, the purpose being to provide the printers of the United States—employers, journeymen, and apprentices—with a comprehensive series of handy and inexpensive compendiums of reliable, up-to-date information upon the various branches and specialties of the printing craft, all arranged in orderly fashion for progressive study.

The publications of the series are of uniform size, 5 × 8 inches. Their general make-up, in typography, illustrations, etc., has been, as far as practicable, kept in harmony throughout. A brief synopsis of the particular contents and other chief features of each volume will be found under each title in the following list.

Each topic is treated in a concise manner, the aim being to embody in each publication as completely as possible all the rudimentary information and essential facts necessary to an understanding of the subject. Care has been taken to make all statements accurate and clear, with the purpose of bringing essential information within the understanding of beginners in the different fields of study. Wherever practicable, simple and well-defined drawings and illustrations have been used to assist in giving additional clearness to the text.

In order that the pamphlets may be of the greatest possible help for use in trade-school classes and for self-instruction, each title is accompanied by a list of Review Questions covering essential items of the subject matter. A short Glossary of technical terms belonging to the subject or department treated is also added to many of the books.

These are the Official Text-books of the United Typothetae of America.

Address all orders and inquiries to COMMITTEE ON EDUCATION, UNITED TYPOTHETAE

OF AMERICA, CHICAGO, ILLINOIS, U. S. A.

PART I—*Types, Tools, Machines, and Materials*

Relating to the mechanical features of printing types; their sizes, font schemes, etc., with a brief description of their manufacture. 44 pp.; illustrated; 74 review questions; glossary.

2. **Compositors' Tools and Materials** By A. A. Stewart

A primer of information about composing sticks, galleys, leads, brass rules, cutting and mitering machines, etc. 47 pp.; illustrated; 50 review questions; glossary.

3. **Type Cases, Composing Room Furniture** By A. A. Stewart

A primer of information about type cases, work stands, cabinets, case racks, galley racks, standing galleys, etc. 43 pp.; illustrated; 33 review questions; glossary.

4. **Imposing Tables and Lock-up Appliances** By A. A. Stewart

Describing the tools and materials used in locking up forms for the press, including some modern utilities for special purposes. 59 pp.; illustrated; 70 review questions; glossary.

5. **Proof Presses** By A. A. Stewart

A primer of information about the customary methods and machines for taking printers' proofs. 40 pp.; illustrated; 41 review questions; glossary.

6. **Platen Printing Presses** By Daniel Baker

A primer of information regarding the history and mechanical construction of platen printing presses, from the original hand press to the modern job press, to which is added a chapter on automatic presses of small size. 51 pp.; illustrated; 49 review questions; glossary.

7. **Cylinder Printing Presses** By Herbert L. Baker

Being a study of the mechanism and operation of the principal types of cylinder printing machines. 64 pp.; illustrated; 47 review questions; glossary.

8. **Mechanical Feeders and Folders** By William E. Spurrier

The history and operation of modern feeding and folding machines; with hints on their care and adjustments. Illustrated; review questions; glossary.

9. **Power for Machinery in Printing Houses** By Carl F. Scott

A treatise on the methods of applying power to printing presses and allied machinery with particular reference to electric drive. 53 pp.; illustrated; 69 review questions; glossary.

10. **Paper Cutting Machines** By Niel Gray, Jr.

A primer of information about paper and card trimmers, hand-lever cutters, power cutters, and other automatic machines for cutting paper. 70 pp.; illustrated; 115 review questions; glossary.

11. **Printers' Rollers** By A. A. Stewart

A primer of information about the composition, manufacture, and care of inking rollers. 46 pp.; illustrated; 61 review questions; glossary.

12. **Printing Inks** By Philip Ruxton

Their composition, properties and manufacture (reprinted by permission from Circular No. 53, United States Bureau of Standards); together with some helpful suggestions about the everyday use of printing inks by Philip Ruxton. 80 pp.; 100 review questions; glossary.

13. **How Paper is Made** By William Bond Wheelwright

A primer of information about the materials and processes of manufacturing paper for printing and writing. 68 pp.; illustrated; 62 review questions; glossary.

14. **Relief Engravings** By Joseph P. Donovan

Brief history and non-technical description of modern methods of

engraving; woodcut, zinc plate, halftone; kind of copy for reproduction; things to remember when ordering engravings. Illustrated; review questions; glossary.

15. **Electrotyping and Stereotyping** By Harris B. Hatch and A. A. Stewart

A primer of information about the processes of electrotyping and stereotyping. 94 pp.; illustrated; 129 review questions; glossaries.

PART II—*Hand and Machine Composition*

16. **Typesetting** By A. A. Stewart

A handbook for beginners, giving information about justifying, spacing, correcting, and other matters relating to typesetting. Illustrated; review questions; glossary.

17. **Printers' Proofs** By A. A. Stewart

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