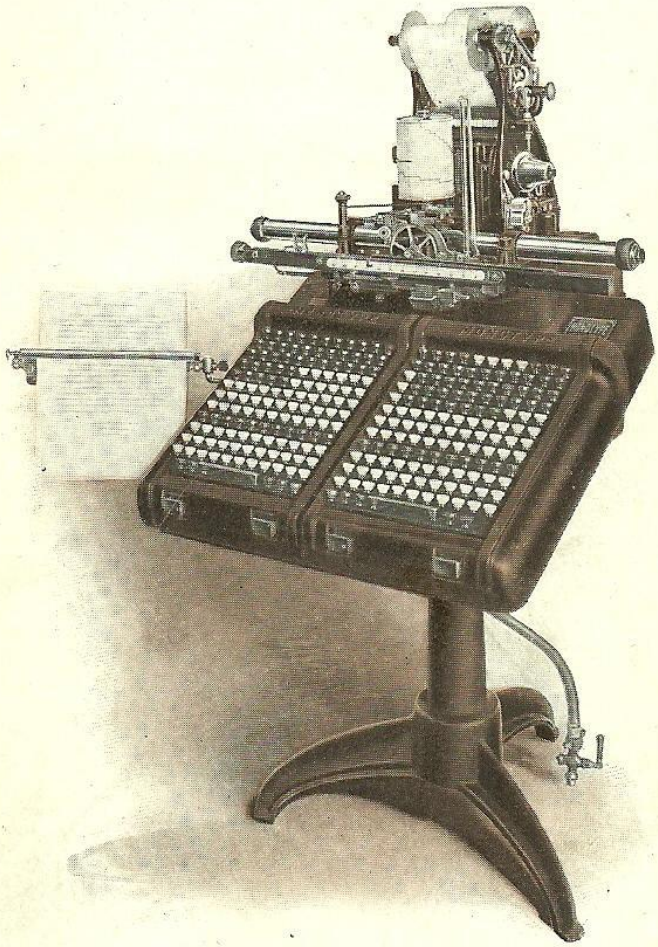
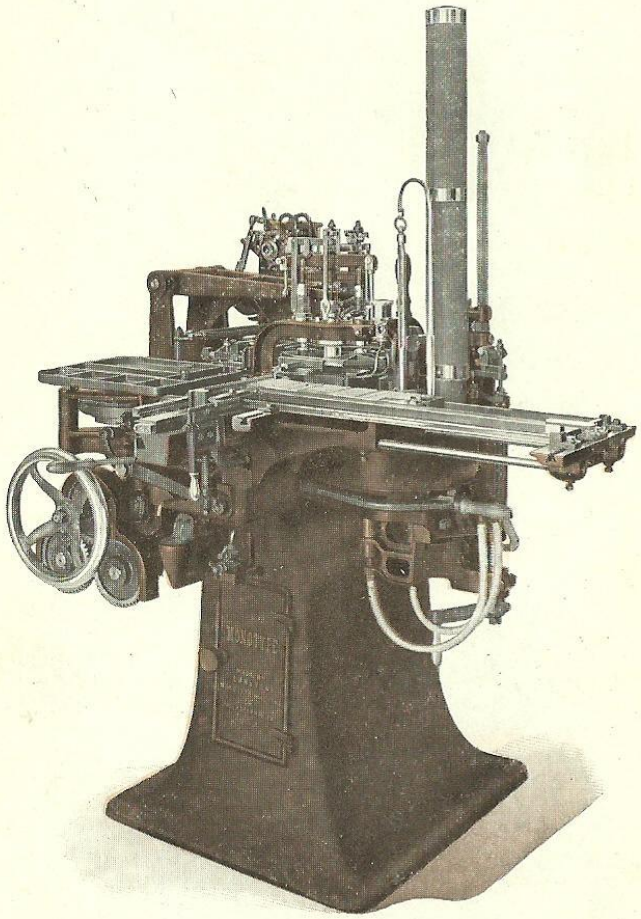
THE MONOTYPE SYSTEM

This lining was composed and cast
at one operation on the Monotype





THE MONOTYPE SYSTEM

A BOOK
FOR OWNERS AND OPERATORS
OF MONOTYPES

"The word Monotype means much more than the name of a machine; it includes a complete system of composing-room efficiency based on the work of the Monotype both as a Composing Machine and as a Type & Rule Caster"

PART I—THE MONOTYPE SYSTEM
PART II—TABULAR COMPOSITION

SECOND EDITION
REVISED AND ENLARGED

PHILADELPHIA
LANSTON MONOTYPE MACHINE CO.
1916

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TRADE MARK
MONOTYPE
Reg. U. S. Pat. Off.

PREFACE

THE word Monotype means much more than the name of a machine: It includes a complete system of composing-room efficiency based on the work of the Monotype both as a Composing Machine and as a Type & Rule Caster.

Composing-Room Efficiency can be obtained only by keeping clearly in mind this fact: *The composing-room of a printing plant is a great deal more than a place in which to operate composing machines;* it is a department maintained to produce complete pages locked-up in chases ready for printing, or electrotyping, or stereotyping.

Now, in the production of complete pages, the work of the hand compositor is quite as essential as the work of the composing machine operator, because no composing machine ever devised can eliminate the hand compositor; his work is essential for making-ready for the chases the machine-set matter and also for setting by hand the display matter used with the machine product.

Therefore, *it is not possible to obtain composing-room efficiency if the machinery used in the composing room fails to provide for the needs of the hand compositor.*

The MONOTYPE is the only composing machine that recognizes the existence of the hand compositor. It is not built upon the impossible theory that the compositor can be driven from the printing industry; instead, it provides the means for increasing his efficiency and making his work highly profitable to his employer.

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PART I

Not only does the MONOTYPE furnish a product that the compositor can correct and alter without the help of the machine operator, but also, since it is a complete type foundry, it supplies the compositor with all the equipment he requires to work efficiently—type, space material, rules, leads, and slugs.

The object of this book is to describe, without technical detail, the basic principles of the MONOTYPE, including its most important mechanisms and the manner in which the KEYBOARD operator controls the CASTING MACHINE, to illustrate graphically the various forms of simple and intricate composition, and to explain the MONOTYPE System of composing-room efficiency; to make clear these vital points:

First: That the MONOTYPE is the simplest and fastest composing machine, a machine so free from mechanical limitations that it handles the most intricate composition as easily as straight matter.

Second: That the MONOTYPE System, by increasing the efficiency of every composing-room employee, gives a much lower cost for complete pages than is possible with any other composing machine.

Third: That the MONOTYPE product is superior in quality to any other process of composition—hand or machine.

In short, this book is to supply an explanation of the MONOTYPE System and a reference book for use in solving the special problems of different offices.

We have tried not to sacrifice clearness to brevity, for our aim has been to make a book that could be read and not a "work" that must be studied. Some matter has been repeated to make each chapter as complete as necessary without

referring to other chapters. The desirable quality of brevity will be found in the glossary, wherein the various MONOTYPE terms are defined and reference made to the paragraphs where these are explained in detail. We trust that the comprehensive table of contents will be helpful to those who use this book for reference.

We would be ungrateful indeed if we did not make record of our deep obligation to all students of the MONOTYPE System, both owners and operators of machines, whose methods and suggestions have been included in this book. We may well say that the MONOTYPE System has been made by printers for printers; the makers of the MONOTYPE claim no credit for the discovery of new processes; they have but perfected new methods of using the processes that have stood the test of time. The printing industry was born when movable types were invented, and as long as quality and economy count in that great industry movable types will be used and new applications will be found for the MONOTYPE System.

L. M. M. Co.

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PART I

The Monotype System

CHAPTER I

The Separate Keyboard and Casting Machine

1 The Monotype, two machines in one, is both a type caster and a composing machine; it is the only machine that delivers new type in justified lines on ordinary galleys; it is the only mechanical means for producing printing surfaces superior to hand-set foundry type, the only composing machine that handles straight and intricate matter with equal facility. Its product is corrected and made-up the same as foundry type, it forces no changes in composing-room methods, it requires no special rules, saws, or other paraphernalia; it is built upon the principle that the printer knows best what he needs, and it gives him the type he has always used instead of "something just as good."

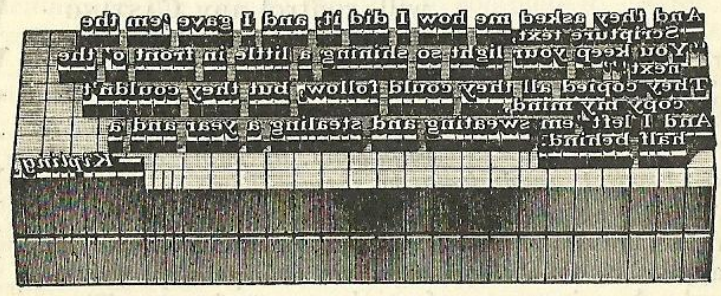


FIGURE 1

The product as a Composing Machine: New type on the galley in justified lines with high, or low, quads and spaces as desired. This picture is taken from the end of the galley on the CASTING MACHINE and shows the lines as they are delivered.

2 Composition is separated from casting by the MONOTYPE System quite as distinctly as in the days of foundry type the type foundry was separated from the composing room; the compositor who uses the MONOTYPE KEYBOARD gives no more thought to type-making than does the compositor who sets by hand type bought from a foundry. The KEYBOARD is as simple, as easy to learn, and as easy to operate as a typewriter, its KEY arrangement is the same as any universal typewriter, and no machine has a lighter or more elastic touch. The operator presses a KEY and the BOARD makes the perforations in the paper ribbon corresponding to the character struck.

When his work, or any desired portion of it, is finished, the perforated ribbon (Fig. 2) is transferred to the CASTING MACHINE. This is a complete type foundry, which may be used either for making type to be set by hand from type-cases, or, when controlled by a paper ribbon, for casting matter in justified lines of any measure up to forty-two picas (60 with the wide measure attachment applied to the CASTING MACHINE), with high, or low, quads and spaces as desired. When a paper ribbon is used, the CASTING MACHINE produces every character and space struck by the KEYBOARD operator when he perforated the ribbon, and the arrangement of these characters and the justification of the lines are exactly as he made them; in short, the ribbon controls the CASTING MACHINE, just as the paper roll on a pianola controls a piano. Thus, although the KEYBOARD operator can direct every movement of the CASTING MACHINE, the two machines are absolutely independent; they may be located together, or apart, as desired, for any ribbon will control any CASTING MACHINE at any place or at any time. *A ribbon may be saved and used again for a repeat order or, for matter that duplicates, as many casts as are desired may be made from the same ribbon.**

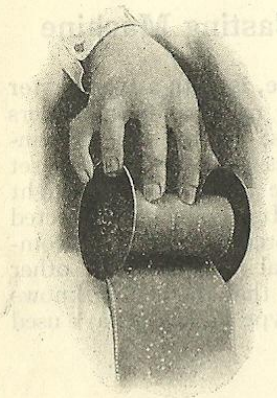


FIGURE 2

The ribbon that controls the CASTING MACHINE, and the SPOOL on which this paper is wound by the KEYBOARD.

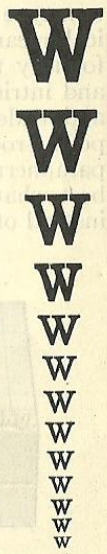


FIGURE 3

The product as a Type Caster: Type for the cases.

3 The advantages of this separation cannot be overestimated. This is an age of specialization, and the MONOTYPE applies to the composing room this principle that has made American manufacturing preëminent. The KEYBOARD operator does not have to be a compositor, a mechanic, and a metallurgist combined. Removed from the fumes and dirt of casting, he gives all his attention to the work for which he is best fitted—composition; he gives no more thought to type casting than if he were writing to a type foundry for sorts. Obvious as are the advantages of the MONOTYPE from the point of view of the KEYBOARD operator, they are at least as great from the casting side. When the CASTING MACHINE is controlled by a ribbon, it is fully as automatic as a web press. As the ribbon unwinds, the matter set by the KEYBOARD operator is delivered on ordinary galleys in perfectly justified lines of new type, with sharp, clear-cut face and deep counters

* The ribbon is "velvet" for tariff shops where the same station list is frequently used on many different tables.

—brand-new type for every job *plus* the perfection of MONOTYPE justification.

4 Constancy of operation and continuous production are the results of separating the work of composition from casting. The KEYBOARD operator, working under the most favorable conditions, without distractions of any kind, produces more and better product than can be produced by any other process. The CASTING MACHINE runs continuously, making a type for each revolution, regardless of whether the copy be good or bad, plain or intricate, whether it be English or German, whether casting in the morning or at night. But this constancy of operation does not end with the COMPOSING MACHINE, for *the Monotype System saves delays and promotes the progress of work throughout the entire plant.**

5 The simplicity of the Keyboard is worthy of especial comment; it has been called "a cross between a punch and an adding machine"—certainly it could not be described more briefly. When a character KEY is depressed, one (or 2) of its PUNCHES is forced up by compressed air, the motive power of the BOARD, through the paper ribbon; the location of these perforations, across the ribbon, determines the characters the CASTING MACHINE will cast when these perforations are presented to it. But depressing a KEY does more than perforate the ribbon: *it automatically registers the width of the character struck* and adds this amount to the sum of the width of the characters previously struck for the line being set. Thus, the operator can tell at a glance both the number of ems already set in the line and the amount required to complete it. After striking the last character in the line, a glance at the JUSTIFYING SCALE tells

* Among the most important MONOTYPE time-savings are the following:

(*a*) **Time on corrections:** These can be made more quickly, *and cheaply*, by hand at the case than by any machine. The MONOTYPE is not like a machine that must correct its own product; never held for corrections, it is always turning out new matter. *Composition and corrections on the same job go on together in a Monotype office.*

(*b*) **Time on setting duplicate matter:** All this is pick-up for the MONOTYPE office, for the same ribbon may be recast as many times as desired.

(*c*) **Time on "open work":** The REPEATER KEY repeats any character or space on the BOARD at the rate of 25,000 keystrokes per hour. Thus the operator *"rests while he works."*

(*d*) **Time on catalog work:** Irregular outline cuts are handled as easily as straight matter by our system of "copyfitting."

(*e*) **Time in justifying cuts in type:** By the MONOTYPE method of *mounting cuts directly on the quads* all blocking of cuts and the consequent difficulty of justifying them in the type matter is eliminated.

(*f*) **Time waiting for sorts:** The owner of a MONOTYPE is his own type founder and makes *"what he wants when he wants it."*

(*g*) **Time hunting for material:** Resetting because of short fonts, "picking," and lack of spacing material are unknown in MONOTYPE offices, where *type is made so cheaply that it does not pay to pick up dropped letters from the floor, and where continuous leads and rules are automatically cast and cut to exact lengths.*

(*h*) **Time in making up pages:** Where cuts are used, or the measure is broken for any reason, it is not necessary to go to a saw, or back to a machine, for new lines that must be proofread again. *Monotype product is handled the same as hand-set type;* because of the ease with which corrections are made many MONOTYPE offices make up the job direct from the machine and save double proofreading.

(*i*) **Time in handling pages:** Tie up the pages with twelve-point MONOTYPE Tie-up Slugs (any length cast on the MONOTYPE), and the string remains on the pages when locked up in the chase.

(*j*) **Time waiting for electrotypes:** No need to use them; for long runs the MONOTYPE makes type as hard as old-fashioned foundry type—*for repeat orders the ribbon may be saved and re-run.* For jobs printed two-up, cast the ribbon twice.

(*k*) **Time in the press room:** The perfectly uniform height-to-paper of MONOTYPE type reduces make-ready to the minimum; its solidity and perfect justification insure that forms stay made ready. In case of alterations, or accidents, changes are made on press from a case of type—*no machine to stop and change to correct Monotype matter.*

the operator the JUSTIFYING KEYS he must strike to make the spaces between the words the size required to justify the line. *One look, two keystrokes, and he is ready to start the next line*—that is all there is to justification of straight matter.

6 The flexibility of the Monotype, the ease with which it handles the most intricate matter, is due to the simplicity of its justification system. Perhaps this can best be appreciated from the following: Imagine a compositor's stick with an indicator that shows, to one-sixth of a three-to-em space (one-eighteenth of an em), the amount set in any line, as well as the amount required to complete the line. Suppose that, besides the regular spaces in the printer's case, your cases contained rubber spaces that, by touching two buttons in this magic stick, would instantly expand and perfectly justify the line. And suppose that by pressing these justifying buttons, as different sections of the line were completed, these rubber spaces would expand independently to justify separately different sections of the same line. Now if you could use this stick with leaders, as described for spaces, would any kind of intricate matter have any terrors for you? This is exactly the kind of stick the MONOTYPE operator uses. *Do you wonder that we say:*

7 All that the compositor can do with his stick, and more, he can do with this KEYBOARD; he can instantly justify a line of any measure, or he can divide the full measure into several separate columns (the sum of the measures of these narrower columns equaling the full measure) and make a separate and distinct justification for each column. All these lines were composed and cast the full measure, just as this specimen reads. They were not set in separate columns and then combined, but at the end of each section the operator justified that section before beginning to set the next section of the same line. The justification is absolutely accurate for each column and full measure.

CHAPTER II

The Ribbon and the Casting Machine

8 The Casting Machine is controlled in all its operations by the perforations made in the ribbon (Fig. 2, page 2) by the thirty-one KEYBOARD PUNCHES arranged in a straight line at right angles to the travel of the paper and just beneath it. See PUNCHES 32KC1 (Plate V, at back of book, which also shows the ribbon in place on the KEYBOARD).

9 When the operator presses a KEY, he admits compressed air, the motive power of the BOARD, beneath the PISTONS, which drive the PUNCHES for the character struck through the paper, while, at the same time, the counting mechanism automatically registers the width of this character. When the KEY is released, the PAPER-FEED WHEELS, which engage the marginal perforations of the ribbon, rotate enough to advance the paper one space (one marginal perforation) into position to receive the record of the next KEY struck.

10 While consideration of the details of the CASTING MACHINE is quite unnecessary at this time (for these see our Casting Machine Book), a general understanding of the manner in which the paper ribbon controls the CASTING MACHINE will make clearer the action of the KEYBOARD. The CASTING MACHINE is also equipped with PAPER-FEED WHEELS which advance the paper one space for each of its revolutions; but the KEYBOARD PUNCHES are replaced by thirty-one PIPES that occupy exactly the same position, relative to the WHEELS, as do the KEYBOARD PUNCHES to their PAPER-FEED WHEELS.

11 After the FEED WHEELS have advanced the paper, bringing the perforations for the next character above the AIR PIPES, the AIR BAR moves down and firmly clamps the paper to the CROSS GIRT, which carries these PIPES that lead to the different mechanisms of the CASTER. The bottom of the AIR BAR, which clamps against the paper, is a piece of leather with a groove in it, to which air is admitted after the paper has been clamped. This groove, extending crosswise of the paper, is directly above the PIPES, so that, if no paper were in place, the air would pass from the groove in the leather to all the PIPES of the CASTER. Of course, with the paper in place, the air can enter only those PIPES that are uncovered by the perforations in the ribbon made by the KEYBOARD PUNCHES. After the CASTER has been set for the character to be cast, the AIR BAR lifts, shutting off the air and unclamping the paper, which is then fed forward one space and clamped again in position to admit air to the proper PIPES to produce the next character.

12 The air which enters these Pipes forces up Air Pins, and these Pins regulate the movements of the Casting Machine, causing it to *(a) bring the Matrix for the character to be cast over the*

Mold into casting position; (b) draw back the Mold Blade the proper amount to make the type-body the width required for the character to be cast.

13 Fig. 4, in which the front of the MATRIX CASE has been broken away to show clearly the MATRICES and the manner in which they are held in the CASE, shows them with the taper end of the CENTERING PIN just ready to enter the cone-hole of the MATRIX to

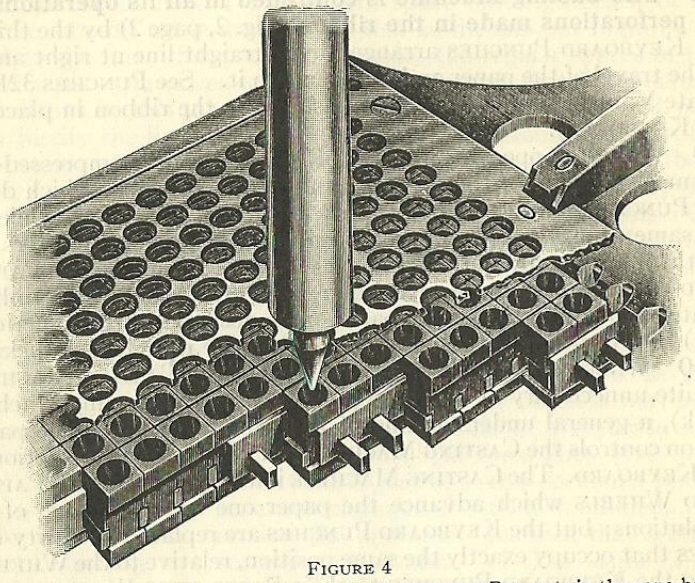


FIGURE 4

The MATRIX above the MOLD; just before the CENTERING PIN seats in the cone-hole of the MATRIX to position it accurately.

hold it in position over the opening in the MOLD while the character is being cast; for details of the MATRIX see Fig. 5, page 8. The PIN is accurately guided in its BUSHING so that, although it moves up and down, once the position of the BUSHING is adjusted for the face to be cast, the relation between the MOLD and the PIN cannot vary. The taper of the PIN fits perfectly the cone-hole of the MATRIX and, as the cone-hole in the upper end of the MATRIX and the character in the lower end are perfectly positioned, it is obvious that the CENTERING PIN, as it seats in the MATRIX, brings the MATRIX absolutely to position above the MOLD. When the MATRIX is thus positioned, the PIN and the MATRIX move down as one piece until the MATRIX seats upon the MOLD, where the PIN firmly holds it until the character is cast.

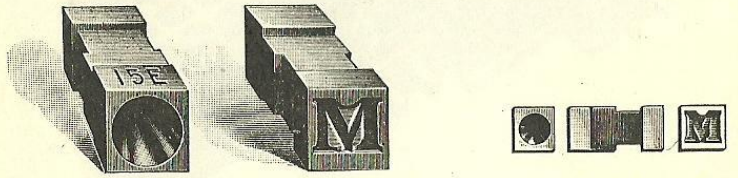
14 When the MATRIX is thus clamped in place on the MOLD (see Fig. 11, page 15, for details of MOLD), the PUMP rises so that its NOZZLE seats in the bottom of the MOLD and, through this NOZZLE, metal is forced into the MOLD and MATRIX, casting the type with a

jet attached to the center of its foot just as foundry type is cast. Then the MATRIX lifts clear of the type and the CENTERING PIN withdraws completely from the cone-hole of the MATRIX. While the type is still firmly held in the MOLD, just as it was cast, a movement of the CROSS BLOCK of the MOLD cuts the jet cleanly from the foot of the type and, as the CROSS BLOCK moves to the right, the jet is thrown back in the METAL POT and the finished type is pushed out of the MOLD into the TYPE CARRIER, which delivers it to the type channel. There the characters making up a line are assembled before the completed line is placed on the galley. While the type just cast is thus being ejected from the MOLD, the ribbon perforations are positioning the MATRIX and adjusting the MOLD for the next character to be cast. *These movements follow each other at the rate of 140, or more, finished type per minute.*

CHAPTER III

The Matrix and the Matrix Case

15 In the Monotype system the Matrix for each character is a separate unit; no two characters are ever united on the same Matrix—therein lies the secret of the typographic quality of MONOTYPE faces and their flexibility for combinations: *A Matrix for each character, each Matrix a unit, these units combined in the Matrix Case as required;* one alphabet imposes no limitations upon another; the designer of MONOTYPE faces need not strain his ingenuity to make a Roman and Italic cap I look "near-well" on the same width body (I-*I*). But important as are the artistic advantages of having "each tub stand on its own bottom," these artistic advantages are almost insignificant when the commercial advantages of the Unit MATRIX



The Cellular Matrix
(Double Size)

(Actual Size)

FIGURE 5
The MATRIX for making type on the galley in justified lines as well as for casting type for the cases.

System are considered, for, speaking within limits, the MONOTYPE user can combine any Roman with any Boldface of the same point-size and give his customer *"what he wants when he wants it;"* the examples in our Specimen Book show that the limits to the combination of the same size Roman and Boldfaces are practically *nil.* (Fig. 40, Plate III, facing page 101.)

16 Each single MATRIX (Fig. 5) is a separate unit of bronze *(not brass)* .2″ square; in its lower end is driven the character to be cast, and in the upper end is bored the cone-hole in which the taper end of the CENTERING PIN seats to bring the MATRIX absolutely to correct line, in casting position, and to hold it on the MOLD while the type is being cast. The sides of the MATRIX are slotted to fit between the teeth of the COMBS, which carry the MATRICES in rows in the MATRIX CASE. (Fig. 6, page 9.) The back of the COMB and two of its teeth inclose the MATRIX on three sides, while the back of

the next COMB closes up the fourth side. A cell is thus formed for each MATRIX, and from this fact is derived the term "Cellular" as applied to these MATRICES. It will be noted that no amount of

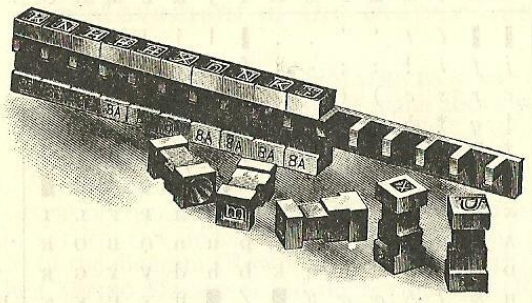


FIGURE 6
The MATRIX COMB: The MATRICES are carried between the teeth of the COMB so that each MATRIX is practically in its own MATRIX CASE. All MATRICES on the same COMB produce characters of the same width (set-size).

wear on one MATRIX can in any manner cause wear or looseness in any other MATRIX.

17 Fig. 7 shows the MATRICES in place in the MATRIX CASE, while Fig. 8, page 10, is a diagram of a CASE arranged to carry

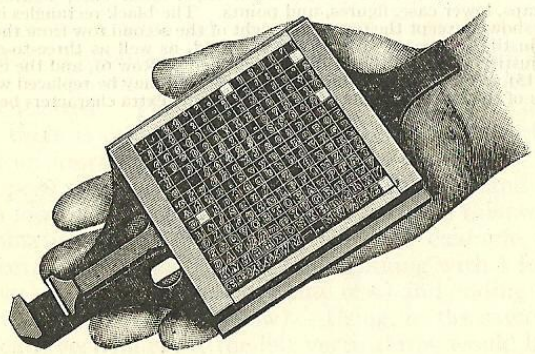


FIGURE 7
The MATRIX CASE contains 225 separate MATRICES (Fig. 5, page 8) arranged in a square of fifteen on a side.

Roman caps, small caps, lower case, figures, and points, with Italic caps, lower case, figures, and points. This diagram shows the MATRIX CASE as it would appear to one looking down upon it;

that is, upside down from operating position. It will be noted that the CASE contains 225 MATRICES arranged in a square of fifteen on a side: $15 \times 15 = 225$.

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
1	▮	▮	*l*	*t*	‘	’	.	,	▮	l	i	]	[	′	|	1
2	*j*	*f*	*i*	!	:	;	-	j	f	I	*!*	*:*	*;*	▮	▮	2
3	*c*	*r*	*s*	*e*	)	(	’	‘	r	s	t	J	*v*	°	*z*	3
4	‡	*q*	*	*b*	*g*	*o*	?	I	z	c	e	z	S	†	*?*	4
5	*I*	▮	*9*	*7*	*5*	*3*	*1*	*0*	.	9	7	5	3	1	0	5
6	C	▮	▮	*8*	*6*	*4*	*2*	$	–	$	8	6	4	2	▮	6
7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	P	F	L	T	7
8	A	*fi*	*u*	*n*	.	S	v	y	p	u	n	Q	B	O	E	8
9	D	▮	*fl*	*p*	fl	fi	q	k	b	h	d	V	Y	G	R	9
10	H	&	*J*	*S*	*œ*	*æ*	*ff*	▮	Z	▮	ff	X	U	K	N	10
11	*O*	*L*	*C*	*F*	*w*	£	æ	L	P	F	¶	M	*Z*	*Q*	*G*	11
12	*E*	&	Q	V	C	B	T	O	E	A	w	*P*	*T*	*R*	*B*	12
13	*D*	*A*	*Y*	*ffl*	*ffi*	*m*	œ	Y	U	G	R	Œ	Æ	W	*V*	13
14	*K*	*N*	*H*	ffl	ffi	X	D	N	K	H	m	&	℔	*X*	*U*	14
15	Œ	Æ	¾	¼	½	*W*	*M*	—	..	M	W	%	Œ	Æ	▮	15
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row

FIGURE 8

MATRIX CASE Arrangement: This diagram shows the CASE as it appears to one looking down on it as in Fig. 7, page 9. It shows the characters and spaces in Book Arrangement C; that is, Roman caps, small caps, lower case, figures, and points, with Italic caps, lower case, figures, and points. The black rectangles indicate spaces of the width shown, except the one at the right of the second row from the top (Row 2), from which justifying spaces, of any size required, as well as three-to-em spaces, are cast. This justifying space, the en-quad (right end of Row 6), and the em-quad (right end of Row 15) are always used, but the other spaces may be replaced with MATRICES of characters of the same width as these spaces should extra characters be required.

CHAPTER IV

The Movement of the Matrix Case

18 To bring any one of these 225 MATRICES to casting position, the MATRIX CASE moves, in a horizontal plane above the MOLD, in two directions: to the right or left, front or back. When the CASE is in place in the CASTING MACHINE, the MATRICES in the left vertical row of the diagram (Fig. 8, page 10), indicated by letters A at the top and bottom of row, are toward the back of the machine; those in the right vertical row, indicated by letters O, to the front; while the top row of the diagram (Row 1) is to the left of the operator as he faces the CASTING MACHINE, and the bottom row (Row 15) is to his right. The movements of the MATRIX CASE are directed by the perforations in the paper ribbon. Two perforations at most are required to bring any MATRIX to casting position; twenty-eight MATRICES require but one perforation, and for the em-quad no perforations are required.

19 This will be easily understood by realizing that, strictly speaking, *the perforations do not indicate characters; they indicate Matrix Case positions.* Thus, the two perforations that, with one arrangement of the MATRIX CASE, bring the letter *m* to casting position, might, with another arrangement of the MATRIX CASE, bring to casting position an entirely different character, the boldface cap **N**, for example.

20 Forget for a moment the MATRIX CASE and consider a checker-board: The simplest way to locate any square on that board is to name the two rows at the intersection of which the square in question is located. There are sixty-four squares on a checker-board, but there is only one square at the intersection of the fifth horizontal and fourth vertical rows.

21 Suppose you were playing a game of checkers and wished to record each move; of course, the easiest way to do this would be to use a combination of numbers and letters; for example, designate the eight horizontal rows by numbers, beginning with 1 for the row farthest from you (your opponent's king row) and ending with 8 for the row nearest you (your king row). Using, in the same way, letters to indicate vertical rows, the left vertical row would be A while the right row would be H. There is no difficulty now about indicating any square on the checker-board: A-1 is the upper left square; H-8 is the lower right square; that is, the square at the right end of your king row.*

* Of course, the red squares, of which this is one, are not occupied by men in a real checker game, where all pieces move diagonally on the black squares; it is hoped, however, that the reader will overlook the apparent ignorance of checkers made necessary by using the checker-board for purposes of comparison with the MATRIX CASE, where every "square" is used and where the movement may be in any direction.

22 To make perfectly clear the simplicity of this method of indicating the different squares, suppose you are playing a game of checkers, for the championship of the world, by cable with an opponent in London. As cable-messages are expensive, you would try to save all the words possible. You would, therefore, agree with your opponent that when you gave only a letter (that is, omitted the number) he would move the man you indicated down the vertical row, shown by the letter, as far as he could; that is, to horizontal row No. 8, your king row. Having come to this understanding, cabling the letter E only means just as much as if you said E-8, because he knows that *when you omit a number he is to move the piece you indicate as far as he can down the row designated by the letter.* In the same way you need not use H for the row at the right of the board because if you say 1 only, for example, he will put the piece you indicate at the right end of row 1; that is, in the square at the right end of his king row.

23 Since with this system no indicators are required for the bottom and the right vertical row, it is obvious that, if your London opponent cabled you only the name of the piece you are to move, *without either letter or number*, you would instantly put that piece in the square at the right of your king row, for you know that a letter without a number means a square in your king row (Row 8), and a number without a letter means a square in the right vertical row (Row H), so that when both number and letter are omitted the square desired is at the intersection of these two rows (H-8). Thus, with this system, seven letters and seven numbers will indicate any position on a checker-board with sixty-four squares, that is, eight squares on a side.

24 Now, to get back to the MONOTYPE MATRIX CASE, which we wish to direct, by means of perforations in our ribbon, to its 225 different positions arranged in a square of fifteen on a side. It is clear enough now that but twenty-eight PUNCHES will be required to accomplish this; that is, *fourteen to indicate horizontal rows and fourteen for vertical rows. Characters in the bottom row and also in the right vertical row will require but one perforation, while for the em-quad, located at the intersection of these rows, no perforations are required.*

CHAPTER V

The Type-Sizing Mechanism

25 On page 10, Fig. 8, is shown a diagram of the MATRIX CASE as it appears to one looking down upon it; the same diagram is here reprinted (Fig. 9), except that *each character has been given a quarter-turn in order to bring the characters in the numbered rows (1 to 15 inclusive) beneath each other*, instead of beside each other; rules have been inserted between these rows. As already explained, the numbered rows of the diagram are, in operating position, the rows extending from front to back of the MATRIX CASE; that is, each separate COMB (Fig. 6, page 9) holds the fifteen MATRICES that make up one of these numbered rows. A glance at the diagram shows that *all Matrices on the same Comb (the rows that extend front and back, operating position) produce characters on the same width body.*

Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Row
O	‖	■	z	?	0	■	T	E	R	N	G	B	V	U	■	O
N	′	■	°	†	1	2	L	O	G	K	Q	R	w	X	Æ	N
M	[	;	v	s	3	4	F	B	Y	U	Z	T	Æ	ffb	Œ	M
L	]	:	J	z	5	6	P	Q	V	x	M	P	œ	&	%	L
K	i	!	t	e	7	8	a	n	d	ff	¶	w	R	m	W	K
J	l	ı	s	c	9	$	o	u	h	■	F	A	G	H	M	J
I	■	f	r	z	.	–	g	p	b	Z	P	E	U	K	. .	I
H	,	j	‘	I	0	$	J	y	k	■	L	O	Y	N	—	H
G	.	-	’	?	1	2	x	v	q	ff	æ	T	œ	D	M	G
F	’	;	(	o	3	4	a	S	fi	æ	£	B	m	X	W	F
E	‘	:	)	g	5	6	h	.	fl	æ	w	C	ffi	ffi	½	E
D	t	!	e	b	7	8	d	n	p	S	F	V	fl	ffl	¼	D
C	l	i	s	*	9	■	y	u	fl	J	C	Q	Y	H	¾	C
B	■	f	r	q	■	■	k	fi	■	&	L	&	A	N	Æ	B
A	■	j	c	‡	I	c	x	A	D	H	O	E	D	K	Œ	A
Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Row

FIGURE 9

MATRIX CASE Arrangement: Same as Fig. 8, page 10, which see, except that the characters have been given a quarter-turn to bring the characters in the numbered rows *beneath*, instead of beside, each other.

The fact that the characters in the numbered rows are here set between rules shows that all characters in the same numbered row are cast on the same width body; that is, all MATRICES carried in the same COMB (Fig. 6, page 9) produce characters on the same width body, so that, when the MATRIX CASE moves from back to front (to produce different characters in the same numbered row), the body-size of the characters does not change.

26 This is the *only limit to the otherwise absolutely* flexible MONOTYPE MATRIX System and this limitation is more apparent than real, for, since MONOTYPE faces are so designed as to expressly meet this condition, any desirable combinations can be made without difficulty. Even the limitation that all the MATRICES on the same COMB must produce type on the same width body does not hold because, for special work, by using the JUSTIFYING-SPACE-PUNCH KEY in combination with character KEYS, as described later, the body size may be varied.

27 The Normal Wedge (Fig. 10, page 14) controls the set-sizes produced by the MOLD; that is, the amount that the MOLD BLADE is

pulled back before a type is cast. In all this explanation of the sizing mechanism, "set-size" refers to the thickness of the type-body linewise; the "point-size" (thickness of the body columnwise) is, of course, determined by the thickness of the MOLD BLADE; that is, by the point-size of the MOLD (Fig. 11, page 15) in use. (Fig. 16, page 20.)

28 The right half of the NORMAL WEDGE (as shown in Fig. 10, and also in operating position) is tapered, being thinnest at the right end. In the left half are fifteen notches in which the NORMAL-WEDGE LOCKING PIN seats to position accurately the WEDGE (after it has been brought to position) and hold it in place just as the CENTERING PIN locates and holds the MATRIX.

29 For the purposes of an explanation of this character, we may assume that the rear end of the MOLD BLADE, when the BLADE is pulled back before a type is cast, comes in direct contact with the taper end of the WEDGE, so that the opening in the MOLD (that is,

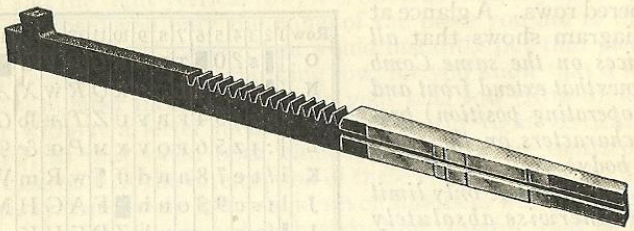


FIGURE 10

The NORMAL WEDGE which controls the width (set-size) of the characters. This moves from right to left with the MATRIX CASE to present a different WEDGE position to the MOLD for each different numbered row in the MATRIX CASE diagram, Fig. 9, page 13.

the width of the character to be cast) depends upon the position of the WEDGE. Of course, there is an interponent (the MOLD-BLADE ABUTMENT) between the BLADE and the WEDGE, but this in no way affects the principles just described.

30 The same mechanism that moves the Matrix Case from left to right also moves the Normal Wedge and, consequently, for all practical purposes, the CASE and WEDGE may be considered to be united. When the CASE moves, to the right or left, to present a different row of MATRICES to the MOLD, the WEDGE moves with the CASE. Refer again to the diagram showing the MATRIX CASE (Fig. 9, page 13) and note that the thickest characters are in Row 15—the row presented to the MOLD when the CASE has moved *as far to the left as possible*. Fig. 10 shows that the thinnest part of the NORMAL WEDGE is at its right end; that is, the end in casting position when the WEDGE (which moves with the CASE) is *as far to the left as possible*. In the same way, when the CASE moves to the right to present the *thinnest* characters to the MOLD, the WEDGE also

moves to the right to present its *thickest* part to the MOLD BLADE, reducing the amount the BLADE can pull back and consequently the MOLD opening.

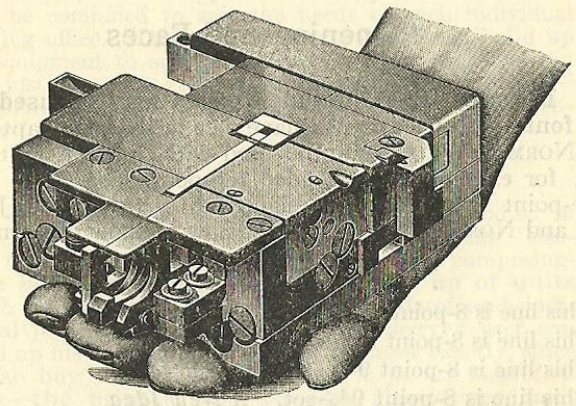


FIGURE 11

The MOLD: At the right of the cut is shown the COUPLING on the CROSS BLOCK that attaches it to the TYPE CARRIER; in operating position this COUPLING is to the left. The MOLD BLADE is shown at the front (at the back in operating position); the amount this is drawn back (that is, the width the character is cast) is determined by the position of the NORMAL WEDGE (Fig. 10, page 14).

31 A different NORMAL WEDGE is required for each different set, but the same WEDGE is used for type-faces of the same set, whether or not they be of the same point-size; thus, the same WEDGE might be used for an extended ten-point face and a condensed twelve-point. It is, however, a matter of but a few seconds to change WEDGES at the CASTER.

CHAPTER VI

"Opening-up" Faces

32 Different size Normal Wedges may be used with the same font of Matrices. We have seen in the last chapter that the same NORMAL WEDGE may be used with different fonts of MATRICES; for example, an extended ten-point face and a condensed twelve-point face may be designed to use the same JUSTIFYING SCALE and NORMAL WEDGE; let us now see how different NORMAL

This line is 8-point 8½-set. *A New Idea*
This line is 8-point 8¾-set. *A New Idea*
This line is 8-point 9- set. *A New Idea*
This line is 8-point 9¼-set. *A New Idea*

This line is 10-point 10- set. *A New Idea*
This line is 10-point 10¼-set. *A New Idea*
This line is 10-point 10½-set. *A New Idea*
This line is 10-point 10¾-set. *A New Idea*

This line is 11-point 11- set. *A New Idea*
This line is 11-point 11¼-set. *A New Idea*
This line is 11-point 11½-set. *A New Idea*
This line is 11-point 11¾-set. *A New Idea*
This line is 11-point 12- set. *A New Idea*

FIGURE 12

The first line of each point-size shows the face on its normal set (cast with the NORMAL WEDGE for which the face is designed), while the following lines show the effect of "opening-up" the face by quarter-sets by casting it with a NORMAL WEDGE of larger set. The spaces between words are three-to-em of the set used in all cases.

WEDGES, and their corresponding JUSTIFYING SCALES, may be used to "stretch" a face and make it more extended. Of course, the bronze MATRICES are not actually "stretched" nor is the cut of the letters altered, but just as the same font of MATRICES may be used with MOLDS larger than the point-size of the face, to cast it on *larger size body*, to lead the face (increase the distance between lines), larger size NORMAL WEDGES may be used with the same font of MATRICES to cast the characters on *wider bodies* and "open-up" the face (increase the space between letters) and lead the face linewise.

Eight-point faces—eight-and-one-half-set

A NEW IDEA in machinery has been embodied in the latest construction of the MONOTYPE, for, like "elastic" book cases, modern filing cabinets and composing-room furniture, **the Monotype is built up of units** which may be combined to suit the needs of each individual printing office. Thus, the MONOTYPE user can build up his equipment to suit his business exactly, since he can buy just *the units required to fit his individual needs*—**the printer who chooses Monotypes uses "made-to-order" machines.**

Same eight-point faces—eight-and-three-quarters-set

A NEW IDEA in machinery has been embodied in the latest construction of the MONOTYPE, for, like "elastic" book cases, modern filing cabinets and composing-room furniture, **the Monotype is built up of units** which may be combined to suit the needs of each individual printing office. Thus, the MONOTYPE user can build up his equipment to suit his business exactly, since he can buy just *the units required to fit his individual needs*—**the printer who chooses Monotypes uses "made-to-order" machines.**

Same eight-point faces—nine-set

A NEW IDEA in machinery has been embodied in the latest construction of the MONOTYPE, for, like "elastic" book cases, modern filing cabinets and composing-room furniture, **the Monotype is built up of units** which may be combined to suit the needs of each individual printing office. Thus, the MONOTYPE user can build up his equipment to suit his business exactly, since he can buy just *the units required to fit his individual needs*—**the printer who chooses Monotypes uses "made-to-order" machines.**

Same eight-point faces—nine-and-one-quarter-set

A NEW IDEA in machinery has been embodied in the latest construction of the MONOTYPE, for, like "elastic" book cases, modern filing cabinets and composing-room furniture, **the Monotype is built up of units** which may be combined to suit the needs of each individual printing office. Thus, the MONOTYPE user can build up his equipment to suit his business exactly, since he can buy just *the units required to fit his individual needs*—**the printer who chooses Monotypes uses "made-to-order" machines.**

FIGURE 13

"Opening-up" a face: The same matter cast from the same font of MATRICES with four different size NORMAL WEDGES. At the top the Roman and Boldface are shown cast with the NORMAL WEDGE for which they are designed (8½-set); that is, the smallest size WEDGE with which these MATRICES can be used; beneath this the faces are shown "opened-up" one-quarter-set (cast with 8¾-set WEDGE), then one-half-set, and the bottom specimen shows the faces "opened-up" three-quarters-set.

NOTE: *The Justifying Scale and Normal Wedge must always correspond; that is, the same size Normal Wedge must be used in casting a ribbon as the Justifying Scale used in perforating it.*

33 Fig. 12, page 16, shows the effect of using larger size NORMAL WEDGES with the same MATRICES in eight-, ten-, and eleven-point. While thus "opening-up" a face sacrifices somewhat the very close fitting so characteristic of MONOTYPE faces, the result is not displeasing even when an eight-point face is "opened-up" three-quarters of a set (¶50); that is, made almost ten per cent. fatter, because *the amount added to each letter of the font,* when a larger size NORMAL WEDGE is used, *is proportional to the width of the letters;* thus, three times as much "linewise leading" is added to the cap "M" (18-unit

Ten-point No. 97J with No. 8A "opened-up" one-quarter-set

THE MONOTYPE user may combine almost any Boldface with any Roman; consequently, he does not have to "rebuy" his Roman matrices whenever he wishes to use a new combination of Boldface and Roman—"He buys what he wants when he wants it."

FIGURE 14

A Roman face "opened-up" one-quarter-set to combine with a Boldface. This combination of faces was cast with a ten-and-one-quarter-set WEDGE because that is the set of the Boldface (97J); the Roman (8A) is designed for use with a ten-set WEDGE.

Ten-point No. 28J with No. 8A "opened-up" one-half-set

THE MONOTYPE is the only machine for typographic work by the off-set press process because it (a) furnishes new type of absolutely uniform height-to-paper; (b) Monotype faces may be "opened up" (the white space between the letters may be increased).

FIGURE 15

The Roman face (8A) is "opened-up" one-half-set, for this specimen was composed and cast with ten-and-one-half-set SCALE and WEDGE to permit the use of Boldface (28J).

letter) as to the lower case "f" (6-unit letter). Of course, the larger the point-size of a face the more it can be "opened-up" without sacrificing its appearance, and, whenever possible, a face should be leaded (cast on larger size body) when it is cast with a larger size WEDGE; that is, the face should be "opened-up" both columnwise (pointwise) and linewise (setwise).

34 Fig. 13, page 17, shows the same matter cast from the same font of MATRICES with four different size NORMAL WEDGES, beginning at the top with the WEDGE for which this face is designed and increasing by quarter-sets. "Opening-up" faces in this manner is another exclusive advantage of the MONOTYPE, for this cannot be done by any other composing machine or with foundry type. The

ability to "open-up" faces—"*to make the face fit the space*"—is of great value, for it enables the MONOTYPE user to decrease the number of words to the page, when desirable either for artistic or for commercial reasons.

35 "Opening-up" one face in combining two faces: It is often desirable to use a Boldface more extended than the Roman face with which it is to be composed in combination; that is, to carry in the same MATRIX CASE a set of Roman MATRICES designed for use with one NORMAL WEDGE and Boldface MATRICES for use with a *larger* size WEDGE. In such a case we use the JUSTIFYING SCALE and NORMAL WEDGE for the wider face and "open-up" the other face to correspond to this. Fig. 14, page 18, shows a Roman face "opened-up" one-quarter-set so that it may be used in combination with a Boldface designed for use with a quarter-set larger WEDGE. Fig. 15, page 18, shows a similar combination in which the Roman is "opened-up" one-half-set.*

36 Using the Line Counter to determine whether to lead a face or cast it on its own size Mold:† In connection with "opening-up" faces it is of interest to note another exclusive MONOTYPE feature. In composing booklets and small catalogs that must make a given number of pages, the question often arises whether to lead the face by using a larger size MOLD to "open-up" the job. The MONOTYPE user never guesses about this; after the job has been keyboarded he determines from the KEYBOARD LINE COUNTER (Plate V, at back of book) the number of lines it makes; knowing the space it must fill, he can tell positively whether to use the same size MOLD at the CASTING MACHINE, or lead the face one point by using, for example, a nine- instead of an eight-point MOLD, or to cast the face on a body two points larger. Again he "*makes the face fit the space.*"

---

* While a face can be cast with any larger set NORMAL WEDGE it is, of course, *impossible to cast a face on a smaller set* than the one for which it is designed—the set given in the Specimen Book. MONOTYPE faces are so closely fitted (so little space between letters) that if a face were cast even a quarter of a set small, the faces would overhang the bodies so that the type cast could not be locked up.

† This can, of course, be predetermined from the copy by means of our set-ems system, as described in our book, "Copyfitting."

CHAPTER VII

Point-Size, Set-Size, Height-to-Paper

37 Point-size is the width of a type-body measured "columnwise." (Fig. 16.)

38 Set-size is the width of a type-body measured "linewise." (Fig. 16.)

39 Height-to-paper is the distance from the surface on which the feet of the type rest to its face; that is, the surface which takes the ink and prints on the paper. (Fig. 16.)

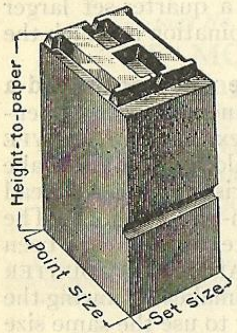


FIGURE 16
A type and its dimensions.

40 *Point-size and set-size are measured in points*—the printer's unit of length. This is derived from the inch, which is divided (approximately) into seventy-two points. Twelve points make a pica and six picas ($6 \times 12 = 72$) are assumed to make an inch. This is not absolutely correct, for, to avoid a repeating decimal, the pica is fixed as .166″; whereas if there were exactly six picas to the inch, the figure six would repeat to infinity.

41 The point, one-twelfth of a pica, is in all calculations assumed to be .0138″.

42 Height-to-paper is not measured in points but in thousandths of an inch.

CHAPTER VIII

The Unit System

43 Monotype type is self-spacing; this explains the almost incredible ease with which the Monotype operator composes the most difficult tabular matter. The set-sizes of all characters in the same font bear a fixed relation to one another. For example, Fig. 17 shows at a glance that the width of *one* cap M equals *three* j's, *three* f's, *two* a's, *two* o's, *two* g's, *two* x's.

44 The designer of MONOTYPE faces divides the basic character of the font (the cap M) into eighteen equal parts, using one of these parts as his unit of measurement in determining the width of all the other characters in this font. Thus, Fig. 17 shows that the cap M is three times as wide as either the j or f and twice as wide as a, o, g, or x; that is, if the cap M be divided into eighteen parts, or units, j and f will each be six units wide, while a, o, g, and x are all nine-unit characters.

M
jjj
fff
aa
oo
gg
xx

FIGURE 17
Illustrates the relation between characters of the same font: Thus, M (18-unit character) is the same width as *three* j's or f's (6-unit characters), or *two* a's, o's, g's, or x's (9-unit characters).

45 Experience has shown that the following allotment of units to the fifteen rows of the MATRIX CASE (Fig. 18, page 22) best meets all requirements: 5 6 7 8 9 9 9 10 10 11 12 13 14 15 18; that is, one row for each unit size from five to eighteen inclusive, excepting that there are three nine-unit rows, two ten-unit rows, and that the sixteen- and seventeen-unit sizes are omitted. For offices specializing on tabular work the KEYBOARD is adjusted to provide four nine-unit rows.

46 Fig. 18, page 22, is the MATRIX CASE Diagram (same as Fig. 8, page 10) except that it shows (in the left column of the illustration) the unit values of the different rows of MATRICES; as previously explained, all MATRICES on the same COMB (the numbered rows of the diagram) are of the same unit value.*

47 The diagram (Fig. 18) makes clear the relation that exists between different characters of the same font, and the relative sizes of the different characters in the font. With the MONOTYPE System, however, it is just as easy to determine the actual set-size of a character in thousandths of an inch: *Since the width of any character in a font is proportional to the width of the cap M of the font,*

* This diagram, as well as all of the following explanation, refers to the standard arrangement of unit-rows, but for special work these unit values may be altered by a simple change at the KEYBOARD which will be explained later.

it is obvious that, if we state the set-size of this cap M in points, we know the width of every character in the font.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
5	1	▌	▌	*l*	*t*	‘	’	.	,	▌	l	i	]	[	′	|	1
6	2	*j*	*f*	*i*	!	:	;	-	j	f	ı	*l*	*:*	*;*	▌	▌	2
7	3	*c*	*r*	*s*	*e*	)	(	’	‘	r	s	t	J	*v*	°	*z*	3
8	4	‡	*q*	*	*b*	*g*	*o*	?	I	z	c	e	z	s	†	*?*	4
9	5	*I*	▌	*9*	*7*	*5*	*3*	*1*	*0*	.	9	7	5	3	1	0	5
9	6	c	▌	▌	*8*	*6*	*4*	*2*	$	–	$	8	6	4	2	▌	6
9	7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	P	F	L	T	7
10	8	A	*fi*	*u*	*n*	.	S	v	y	p	u	n	Q	B	O	E	8
10	9	D	▌	*fl*	*p*	fl	fi	q	k	b	h	d	V	Y	G	R	9
11	10	H	&	*J*	*S*	*æ*	*æ*	*ff*	▌	Z	▌	ff	X	U	K	N	10
12	11	*O*	*L*	*C*	*F*	*w*	£	æ	L	P	F	¶	M	*Z*	*Q*	*G*	11
13	12	*E*	&	Q	V	C	B	T	O	E	A	w	*P*	*T*	*R*	*B*	12
14	13	*D*	*A*	*Y*	*ffl*	*ffi*	*m*	œ	Y	U	G	R	Œ	Æ	w	*V*	13
15	14	*K*	*N*	*H*	ffl	ffi	X	D	N	K	H	m	&	lb	*X*	*U*	14
18	15	Œ	Æ	¾	¼	½	*W*	*M*	—	. .	M	W	%	Œ	Æ	▌	15
Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row

FIGURE 18

MATRIX CASE Arrangement; same as Fig. 8, page 10, except that it shows the unit values of the numbered rows; that is, of the MATRICES carried on the same COMB, see Fig. 6, page 9. These numbered rows are horizontal in the above diagram, but lie from front to back in operating position. This diagram illustrates the standard arrangement of Roman and Italic with the standard arrangement of unit-rows; viz., 5 6 7 8 9 9 9 10 10 11 12 13 14 15 18.

48 The set-size of the cap M (18-unit character) of different MONOTYPE fonts is expressed in points, just as the body-size is expressed in points. Therefore, when we speak of an eight-point eight-set face, we mean a face with the cap M on a body eight points square; thus, □.

49 Since we know the relation existing between this cap M and all the other characters of its font, we do much more than express the size of the cap M when we say its face is "eight-set," for this states just as clearly that the lower case a, o, g, and x (9-unit characters) are four points wide and, in the same way, shows the set-size of every character in the font.

50 The set of a face indicates whether the face is extended or condensed, and the set of a face is expressed by the width in points, and fractions of a point, of the eighteen-unit characters of the face.

51 *While set is expressed in points, set-size and point-size are quite independent and must never be confused.* It is customary, not alone in the composing room, to use the unit of measurement, without any words of explanation, to express one dimension of an object; for example, a half-inch drill means a tool that makes a hole one-half inch in diameter. An eight-point face means a face the point-size of which is eight points, but, just as we would express another dimension, the length of that drill in inches, we use points also to express the set-size of this eight-point face.

MMMMMMMMMM
MMMMMMMMMM

FIGURE 19

Set-size is absolutely independent of *point*-size: The upper line of the illustration shows ten cap M's of *eight* point 64J, a seven-and-one-quarter-set face, while the lower line shows that the same number of cap M's of *six* point 98J, also a seven-and-one-quarter-set face, are exactly equal in width.

52 Fig. 19 demonstrates that set and point are absolutely independent; it shows two seven-and-one-quarter-set faces, one an extended six-point face (6 point No. 98J), and the other a condensed eight-point (8 point No. 64J). While there is a difference of two points in the point-size of these two faces, the set-sizes of the same characters in these two fonts are identical.

CHAPTER IX

Calculation of Unit Sizes

53 In making special MATRIX CASE Arrangements it is often desirable to know the value, in thousandths of an inch, of different units of different sets. While the Table of Type Sizes, Fig. 21, Plate I, facing page 27, shows these at a glance, the method of figuring this table will be of interest. This table also gives, at the top, the size in thousandths of an inch of the different point-size bodies from five- to twelve-point inclusive.

54 The set-size of any eighteen-unit character in any twelve-set font is one pica (12 points); that is, .166″ (¶40). If it were possible to make a one-set face, the eighteen-unit characters of this one-set face would be one-twelfth as wide as the eighteen-unit characters of twelve-set, thus:

.166″ ÷ 12 = eighteen units of one-set, which may be expressed thus:

$$\frac{.166''}{12}$$

55 One-unit-of-one-set would be one-eighteenth of this size (18 units of 1-set), or

$$\frac{.166''}{12} \div 18 = \frac{.166''}{12 \times 18} = \frac{.166''}{216} = .0007685'', \text{ one-unit-of-one-set}$$

56 Knowing the size of one-unit-of-one-set, to find the size of one unit of any set multiply the value of one-unit-of-one-set (.0007685″) by the set desired; to find the size of any number of units of this set multiply this product (1 unit of its set) by the required number of units.

57 Rule: *To find the size, in thousandths of an inch, of any number of units of any set multiply the product of these two (set and units) by .0007685″.*

58 Examples:

(*a*) Find the size of nine units of eight-set.

9 × 8 = 72
.0007685″ × 72 = .0553320″
Nine units of eight-set = .0553″

.0007685″
72
15370
53795
.0553320″

(*b*) Find the size of six units of twelve-set.

6 × 12 = 72
.0007685″ × 72 = .0553320″
Six units of twelve-set = .0553″

See (*a*) above for multiplication of one-unit-of-one-set by 72.

It will be noted that (*a*) and (*b*) both equal the same amount (.0553″)

because in both cases the product of set and units equals the same amount (72). Thus:

9 × 8 = 72 and 6 × 12 = 72

59 Rule: *Any two characters are of the same set-size (have the same width bodies) if the number of units in one, multiplied by its set, equals the number of units in the other, multiplied by its set. Therefore any Matrix may be inserted in a Matrix Case provided the Set Factor (¶60) of the new Matrix equals, or is less than, the Set Factor of the Matrix replaced.*

60 Set Factor: *The set of the font to which any character belongs, multiplied by the unit-row in which it is carried, is called the Set Factor of the character.* See Fig. 20, Plate I, facing page 26, for Table of Set Factors; that is, the product of set and units, from three to twenty-two inclusive, for all sets from five to twelve-and-one-half inclusive.

61 If the Set Factors be equal, the new character will be cast on exactly the size body for which it was designed. If the new character's Set Factor be less, the MOLD opening will be greater than when this character is cast on its proper body, and therefore the type will be cast with a shoulder to the left of the character on the type-body itself; that is, to the left of the character in print. The size of this shoulder equals the difference in Set Factors multiplied by one-unit-of-one-set (.0007685″). In many cases this shoulder is not in the least objectionable, and in some special work (to bear away from a rule, for example) it is an advantage.*

62 If the Set Factor of the new character be greater than the Set Factor of the character it replaces, the MOLD BLADE will not be pulled back far enough and the character would be cast with a kern to the left of its type-body. *This, of course, is not permissible, since this kern would interfere with the character next to it.*

63 Rule: *Given the Set Factor of a Matrix, to determine for any set the unit-row of the Matrix Case in which to carry this Matrix, divide this Set Factor by the set to be used; the result is the unit-row required. If the result of this division contains a fraction, use the next larger unit-row.*

64 Example: The Set Factor of a MATRIX is 80: in what row of a nine-set MATRIX CASE must this MATRIX be carried?

80 ÷ 9 = 8.8

Therefore put the MATRIX in the nine-unit row.

65 Summary: While this book is called "The MONOTYPE System," practically all the matter that its title covers is contained in ¶43 to ¶64 inclusive ("The Unit System" and "Calculation of Unit Sizes"), for the rest of the book deals with mechanisms, explaining the manner in which the KEYBOARD registers units and the CASTING MACHINE makes them. In view, therefore, of the importance of these two sections, the beginner should not go further until these points are clearly understood:

* As the operator faces the CASTER, the nicks in the type are toward his right hand, and any shoulder added to the type-body is cast on the side that, in this position, is furthest from him (toward the back of the machine). This is called the left side of the type because, as the compositor sets type in his stick, the nick is furthest from him, and the side to which a shoulder may be added by the CASTING MACHINE is, therefore, toward the compositor's left.

66 *First:* The MATRICES on the same COMB in the MATRIX CASE (the numbered rows on the Diagram, page 10) produce characters of the same set-size.

67 *Second:* The width of the characters produced by MATRICES on the same COMB bears a fixed ratio to the width of the widest characters in the MATRIX CASE; that is, those produced by the MATRICES on the right-hand COMB when facing the CASE in operating position.

68 *Third:* If the widest character of a font be divided into eighteen equal parts, or units, the unit values of the COMBS of the MATRIX CASE from left to right (operating position) are: 5 6 7 8 9 9 9 10 10 11 12 13 14 15 18. All standard faces are designed for this arrangement of unit-rows; for special work this may be altered by a simple change of the KEYBOARD and a special NORMAL WEDGE.

69 *Fourth:* The actual size of these units depends upon the set of the face in use.

70 *Fifth:* The set of a face indicates whether it is condensed or extended and is expressed by the width in points (and fractions of a point, if necessary) of the widest (18-unit) characters of the face.

71 *Sixth:* While set is thus expressed in points, there is no relation whatever between set-size and point-size. Set expresses the width of the letter (linewise); point expresses the depth (columnwise).

Table of Set Factors

SET FACTOR is the set multiplied by unit width; thus, the set factor for a character made for the ten-unit row of eight-set is eighty (10×8=80). (¶63.)

Set-Size	Unit-Size 3	4	5	6	7	8	9	10	11	12	Set-Size	Unit-Size 13	14	15	16	17	18	19	20	21	22	Set-Size
5	15.0	20.0	25.0	30.0	35.0	40.0	**45.0**	50.0	55.0	60.0	5	65.0	70.0	75.0	80.0	85.0	**90.0**	95.0	100.0	105.0	110.0	5
5¼	15.8	21.0	26.3	31.5	36.8	42.0	**47.3**	52.5	57.8	63.0	5¼	68.3	73.5	78.8	84.0	89.3	**94.5**	99.8	105.0	110.3	115.5	5¼
5½	16.5	22.0	27.5	33.0	38.5	44.0	**49.5**	55.0	60.5	66.0	5½	71.5	77.0	82.5	88.0	93.5	**99.0**	104.5	110.0	115.5	121.0	5½
5¾	17.3	23.0	28.6	34.5	40.3	46.0	**51.8**	57.5	63.3	69.0	5¾	74.8	80.5	86.3	92.0	97.8	**103.5**	109.3	115.0	120.8	126.5	5¾
6	18.0	24.0	30.0	36.0	42.0	48.0	**54.0**	60.0	66.0	72.0	6	78.0	84.0	90.0	96.0	102.0	**108.0**	114.0	120.0	126.0	132.0	6
6¼	18.8	25.0	31.3	37.5	43.8	50.0	**56.3**	62.5	68.8	75.0	6¼	81.3	87.5	93.8	100.0	106.3	**112.5**	118.8	125.0	131.3	137.5	6¼
6½	19.5	26.0	32.5	39.0	45.5	52.0	**58.5**	65.0	71.5	78.0	6½	84.5	91.0	97.5	104.0	110.5	**117.0**	123.5	130.0	136.5	143.0	6½
6¾	20.3	27.0	33.8	40.5	47.3	54.0	**60.8**	67.5	74.3	81.0	6¾	87.8	94.5	101.3	108.0	114.8	**121.5**	128.3	135.0	141.8	148.5	6¾
	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17	18	19	20	21	22	
7	21.0	28.0	35.0	42.0	49.0	56.0	**63.0**	70.0	77.0	84.0	7	91.0	98.0	105.0	112.0	119.0	**126.0**	133.0	140.0	147.0	154.0	7
7¼	21.8	29.0	36.3	43.5	50.8	58.0	**65.3**	72.5	79.8	87.0	7¼	94.3	101.5	108.8	116.0	123.3	**130.5**	137.8	145.0	152.3	159.5	7¼
7½	22.5	30.0	37.5	45.0	52.5	60.0	**67.5**	75.0	82.5	90.0	7½	97.5	105.0	112.5	120.0	127.5	**135.0**	142.5	150.0	157.5	165.0	7½
7¾	23.3	31.0	38.8	46.5	54.3	62.0	**69.8**	77.5	85.3	93.0	7¾	100.8	108.5	116.3	124.0	131.8	**139.5**	147.3	155.0	162.8	170.5	7¾
8	24.0	32.0	40.0	48.0	56.0	64.0	**72.0**	80.0	88.0	96.0	8	104.0	112.0	120.0	128.0	136.0	**144.0**	152.0	160.0	168.0	176.0	8
8¼	24.8	33.0	41.3	49.5	57.8	66.0	**74.3**	82.5	90.8	99.0	8¼	107.3	115.5	123.8	132.0	140.3	**148.5**	156.8	165.0	173.3	181.5	8¼
8½	25.5	34.0	42.5	51.0	59.5	68.0	**76.5**	85.0	93.5	102.0	8½	110.5	119.0	127.5	136.0	144.5	**153.0**	161.5	170.0	178.5	187.0	8½
8¾	26.3	35.0	43.8	52.5	61.3	70.0	**78.8**	87.5	96.3	105.0	8¾	113.8	122.5	131.3	140.0	148.8	**157.5**	166.3	175.0	183.8	192.5	8¾
	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17	18	19	20	21	22	
9	27.0	36.0	45.0	54.0	63.0	72.0	**81.0**	90.0	99.0	108.0	9	117.0	126.0	135.0	144.0	153.0	**162.0**	171.0	180.0	189.0	198.0	9
9¼	27.8	37.0	46.3	55.5	64.8	74.0	**83.3**	92.5	101.8	111.0	9¼	120.3	129.5	138.8	148.0	157.3	**166.5**	175.8	185.0	194.3	203.5	9¼
9½	28.5	38.0	47.5	57.0	66.5	76.0	**85.5**	95.0	104.5	114.0	9½	123.5	133.0	142.5	152.0	161.5	**171.0**	180.5	190.0	199.5	209.0	9½
9¾	29.3	39.0	48.8	58.5	68.3	78.0	**87.8**	97.5	107.3	117.0	9¾	126.8	136.5	146.3	156.0	165.8	**175.5**	185.3	195.0	204.8	214.5	9¾
10	30.0	40.0	50.0	60.0	70.0	80.0	**90.0**	100.0	110.0	120.0	10	130.0	140.0	150.0	160.0	170.0	**180.0**	190.0	200.0	210.0	220.0	10
10¼	30.8	41.0	51.3	61.5	71.8	82.0	**92.3**	102.5	112.8	123.0	10¼	133.3	143.5	153.8	164.0	174.3	**184.5**	194.8	205.0	215.3	225.5	10¼
10½	31.5	42.0	52.5	63.0	73.5	84.0	**94.5**	105.0	115.5	126.0	10½	136.5	147.0	157.5	168.0	178.5	**189.0**	199.5	210.0	220.5	231.0	10½
10¾	32.3	43.0	53.8	64.5	75.3	86.0	**96.8**	107.5	118.3	129.0	10¾	139.8	150.5	161.3	172.0	182.8	**193.5**	204.3	215.0	225.8	236.5	10¾
	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17	18	19	20	21	22	
11	33.0	44.0	55.0	66.0	77.0	88.0	**99.0**	110.0	121.0	132.0	11	143.0	154.0	165.0	176.0	187.0	**198.0**	209.0	220.0	231.0	242.0	11
11¼	33.8	45.0	56.3	67.5	78.8	90.0	**101.3**	112.5	123.8	135.0	11¼	146.3	157.5	168.8	180.0	191.3	**202.5**	213.8	225.0	236.3	247.5	11¼
11½	34.5	46.0	57.5	69.0	80.5	92.0	**103.5**	115.0	126.5	138.0	11½	149.5	161.0	172.5	184.0	195.5	**207.0**	218.5	230.0	241.5	253.0	11½
11¾	35.3	47.0	58.8	70.5	82.3	94.0	**105.8**	117.5	129.3	141.0	11¾	152.8	164.5	176.3	188.0	199.8	**211.5**	223.3	235.0	246.8	258.5	11¾
12	36.0	48.0	60.0	72.0	84.0	96.0	**108.0**	120.0	132.0	144.0	12	156.0	168.0	180.0	192.0	204.0	**216.0**	228.0	240.0	252.0	264.0	12
12¼	36.8	49.0	61.3	73.5	85.8	98.0	**110.3**	122.5	134.8	147.0	12¼	159.3	171.5	183.8	196.0	208.3	**220.5**	232.8	245.0	257.3	269.5	12¼
12½	37.5	50.0	62.5	75.0	87.5	100.0	**112.5**	125.0	137.5	150.0	12½	162.5	175.0	187.5	200.0	212.5	**225.0**	237.5	250.0	262.5	275.0	12½
Set-Size	3	4	5	6	7	8	9	10	11	12	Set-Size	13	14	15	16	17	18	19	20	21	22	Set-Size
	Unit-Size											Unit-Size										

FIGURE 20

PLATE I

CHAPTER X

Justification

72 Before considering "Justification" re-read ¶6 and ¶7, "The Flexibility of the MONOTYPE." The printer who for the first time sees examples of justification like ¶7 ought not to be blamed for believing that such results can be produced only by a system of justification both complicated and mysterious, a system that requires the making of intricate and brain-racking calculations.

73 There is, however, no mystery about MONOTYPE justification, and the difference between it and hand justification lies not in methods but in results. MONOTYPE justification is perfection; the spacing is mathematically accurate and the length of line is exact; hand justification can never be perfect, for, even if the compositor take infinite pains and time, the spaces between the words in the same line will vary in size and some of the lines will be tighter than others.

74 Hand justification must vary, for, in setting type by hand, the compositor puts spaces between the words as he builds them up in his stick. After he has completed the last word, or syllable, the line is, of course, shorter than the measure for which his stick is set, and this shortage he must distribute over the spaces in the line, either by replacing these with larger size spaces or by inserting thin spaces. He tries to divide the shortage by the number of spaces in the line and add this to each space, but, because he has a limited assortment of different size spaces with which to work, he can never accomplish this division exactly.

75 What the hand compositor does approximately the MONOTYPE operator does exactly: he puts spaces of the same size (4 units) between the words by striking the JUSTIFYING-SPACE BAR and, like the hand compositor, he finds, after striking the last character in the line, that these spaces between words are too small; that is, the line is short of the measure. He distributes this shortage over the justifying spaces, not by going back over the line and changing these spaces, but by striking two KEYS, which the KEYBOARD automatically selects for him. Result: The amount the line is short is divided exactly by the number of spaces in the line and this quotient is added to each justifying space, making all justifying spaces in the line the same size and all lines the exact length required.

76 The KEYS that thus increase the size of the spaces to justify the line are the red KEYS (with white numbers) located in two rows at the top of the BOARD, fifteen in a row, and numbered from 1 to 15 inclusive. The function of these KEYS is to control the space-sizing mechanism of the CASTING MACHINE.

Table of Type Sizes

BASED ON PICA = 0.166″ | 5- Point = .0692″ | 7-Point = .0968″ | 10-Point = .1383″
1-Point = .01383″ | 5½-Point = .0761″ | 8-Point = .1107″ | 11-Point = .1522″
1-Unit-of-1-Set = .0007685″ | 6- Point = .0830″ | 9-Point = .1245″ | 12-Point = .1660″

Set-Size	Unit-Size 1	2	3	4	5	6	7	8	9	10	11	Set-Size	Unit-Size 12	13	14	15	16	17	18	19	20	21	22	Set-Size
5	.00384	.0077	.0115	.0154	.0192	.0231	.0269	.0307	**.0346**	.0384	.0423	5	.0461	.0500	.0538	.0576	.0615	.0653	**.0692**	.0730	.0769	.0807	.0845	5
5¼	.00403	.0081	.0121	.0161	.0202	.0242	.0282	.0323	**.0363**	.0403	.0444	5¼	.0484	.0525	.0565	.0605	.0646	.0686	**.0726**	.0767	.0807	.0847	.0888	5¼
5½	.00423	.0085	.0127	.0169	.0211	.0254	.0296	.0338	**.0380**	.0423	.0465	5½	.0507	.0549	.0592	.0634	.0676	.0719	**.0761**	.0803	.0845	.0888	.0930	5½
5¾	.00442	.0088	.0133	.0177	.0221	.0265	.0309	.0354	**.0398**	.0442	.0486	5¾	.0530	.0574	.0619	.0663	.0707	.0751	**.0795**	.0840	.0884	.0928	.0972	5¾
6	.00461	.0092	.0138	.0184	.0231	.0277	.0323	.0369	**.0415**	.0461	.0507	6	.0553	.0599	.0646	.0692	.0738	.0784	**.0830**	.0876	.0922	.0968	.1014	6
6¼	.00480	.0096	.0144	.0192	.0240	.0288	.0336	.0384	**.0432**	.0480	.0528	6¼	.0576	.0624	.0672	.0720	.0769	.0817	**.0865**	.0913	.0961	.1009	.1057	6¼
6½	.00500	.0100	.0150	.0200	.0250	.0300	.0350	.0400	**.0450**	.0500	.0549	6½	.0599	.0649	.0699	.0749	.0799	.0849	**.0899**	.0949	.0999	.1049	.1099	6½
6¾	.00519	.0104	.0156	.0207	.0259	.0311	.0363	.0415	**.0467**	.0519	.0571	6¾	.0622	.0674	.0726	.0778	.0830	.0882	**.0934**	.0986	.1037	.1089	.1141	6¾
	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20	21	22	
7	.00538	.0108	.0161	.0215	.0269	.0323	.0377	.0430	**.0484**	.0538	.0592	7	.0646	.0699	.0753	.0807	.0861	.0915	**.0968**	.1022	.1076	.1130	.1184	7
7¼	.00557	.0111	.0167	.0223	.0279	.0334	.0390	.0446	**.0501**	.0557	.0613	7¼	.0669	.0724	.0780	.0836	.0892	.0947	**.1003**	.1059	.1114	.1170	.1226	7¼
7½	.00576	.0115	.0173	.0231	.0288	.0346	.0403	.0461	**.0519**	.0576	.0634	7½	.0692	.0749	.0807	.0865	.0922	.0980	**.1038**	.1095	.1153	.1210	.1268	7½
7¾	.00596	.0119	.0179	.0238	.0298	.0357	.0417	.0476	**.0536**	.0596	.0655	7¾	.0715	.0774	.0834	.0893	.0953	.1013	**.1072**	.1132	.1191	.1251	.1310	7¾
8	.00615	.0123	.0184	.0246	.0307	.0369	.0430	.0492	**.0553**	.0615	.0676	8	.0738	.0799	.0861	.0922	.0984	.1045	**.1107**	.1168	.1230	.1291	.1353	8
8¼	.00634	.0127	.0190	.0254	.0317	.0380	.0444	.0507	**.0571**	.0634	.0697	8¼	.0761	.0824	.0888	.0951	.1014	.1078	**.1141**	.1205	.1268	.1331	.1395	8¼
8½	.00653	.0131	.0196	.0261	.0327	.0392	.0457	.0523	**.0588**	.0653	.0719	8½	.0784	.0849	.0915	.0980	.1045	.1111	**.1176**	.1241	.1307	.1372	.1437	8½
8¾	.00672	.0134	.0202	.0269	.0336	.0403	.0471	.0538	**.0605**	.0672	.0740	8¾	.0807	.0874	.0941	.1009	.1076	.1143	**.1210**	.1278	.1345	.1412	.1479	8¾
	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20	21	22	
9	.00692	.0138	.0207	.0277	.0346	.0415	.0484	.0553	**.0622**	.0692	.0761	9	.0830	.0899	.0968	.1037	.1107	.1176	**.1245**	.1314	.1383	.1452	.1522	9
9¼	.00711	.0142	.0213	.0284	.0355	.0427	.0498	.0569	**.0640**	.0711	.0782	9¼	.0853	.0924	.0995	.1066	.1137	.1208	**.1280**	.1351	.1422	.1493	.1564	9¼
9½	.00730	.0146	.0219	.0292	.0365	.0438	.0511	.0584	**.0657**	.0730	.0803	9½	.0876	.0949	.1022	.1095	.1168	.1241	**.1314**	.1387	.1460	.1533	.1606	9½
9¾	.00749	.0150	.0225	.0300	.0375	.0450	.0525	.0599	**.0674**	.0749	.0824	9¾	.0899	.0974	.1049	.1124	.1199	.1274	**.1349**	.1424	.1499	.1574	.1648	9¾
10	.00769	.0154	.0231	.0307	.0384	.0461	.0538	.0615	**.0692**	.0769	.0845	10	.0922	.0999	.1076	.1153	.1230	.1306	**.1383**	.1460	.1537	.1614	.1691	10
10¼	.00788	.0158	.0236	.0315	.0394	.0473	.0551	.0630	**.0709**	.0788	.0867	10¼	.0945	.1024	.1103	.1182	.1260	.1339	**.1418**	.1497	.1576	.1654	.1733	10¼
10½	.00807	.0161	.0242	.0323	.0403	.0484	.0565	.0646	**.0726**	.0807	.0888	10½	.0968	.1049	.1130	.1210	.1291	.1372	**.1453**	.1533	.1614	.1695	.1775	10½
10¾	.00826	.0165	.0248	.0330	.0413	.0496	.0578	.0661	**.0744**	.0826	.0909	10¾	.0991	.1074	.1157	.1239	.1322	.1404	**.1487**	.1570	.1652	.1735	.1818	10¾
	1	2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20	21	22	
11	.00845	.0169	.0254	.0338	.0423	.0507	.0592	.0676	**.0761**	.0845	.0930	11	.1014	.1099	.1184	.1268	.1353	.1437	**.1522**	.1606	.1691	.1775	.1860	11
11¼	.00865	.0173	.0259	.0346	.0432	.0519	.0605	.0692	**.0778**	.0865	.0951	11¼	.1037	.1124	.1210	.1297	.1383	.1470	**.1556**	.1643	.1729	.1816	.1902	11¼
11½	.00884	.0177	.0265	.0354	.0442	.0530	.0619	.0707	**.0795**	.0884	.0972	11½	.1061	.1149	.1237	.1326	.1414	.1502	**.1591**	.1679	.1768	.1856	.1944	11½
11¾	.00903	.0181	.0271	.0361	.0452	.0542	.0632	.0722	**.0813**	.0903	.0993	11¾	.1084	.1174	.1264	.1355	.1445	.1535	**.1625**	.1716	.1806	.1896	.1987	11¾
12	.00922	.0184	.0277	.0369	.0461	.0553	.0646	.0738	**.0830**	.0922	.1014	12	.1107	.1199	.1291	.1383	.1476	.1568	**.1660**	.1752	.1844	.1937	.2029	12
12¼	.00941	.0188	.0282	.0377	.0471	.0565	.0659	.0753	**.0847**	.0941	.1036	12¼	.1130	.1224	.1318	.1412	.1506	.1600	**.1695**	.1789	.1883	.1977	.2071	12¼
12½	.00961	.0192	.0288	.0384	.0480	.0576	.0672	.0769	**.0865**	.0961	.1057	12½	.1153	.1249	.1345	.1441	.1537	.1633	**.1729**	.1825	.1921	.2017	.2113	12½
Set-Size	1	2	3	4	5	6	7	8	9	10	11	Set-Size	12	13	14	15	16	17	18	19	20	21	22	Set-Size
	Unit-Size												Unit-Size											

FIGURE 21

PLATE I

77 As the paper is perforated at the KEYBOARD, it is wound on a SPOOL from which the paper unwinds when it is placed in the CASTING MACHINE; thus, the *last* perforations made at the KEYBOARD are the *first* perforations presented to the CASTING MACHINE. But the last perforations in a line are produced by the JUSTIFYING KEYS, therefore, before the CASTING MACHINE makes the first type in a line, it sets its space-sizing mechanism, so that the spaces it makes for this line will be of the size required to justify the line exactly.

78 The PUNCHES for these justifying perforations are larger than those for characters, to indicate the end of the line; they do not produce characters but (*a*) adjust the space-sizing mechanism; (*b*) lock the pump mechanism so that no characters are cast while the space-sizing mechanism is being set; (*c*) operate the galley mechanism; that is, the same perforations that determine the space size for the next line to be cast also cause the CASTING MACHINE to pull the line just cast out of the type channel and to place it on the galley.

79 Can you imagine a man gifted with "second-sight" setting type—a compositor who knew, before he started to set a line, the proper size spaces to put between the words of that line so that it would be justified exactly when he put in his stick the last letter of the last word? That is the kind of compositor the MONOTYPE CASTING MACHINE is, for it knows before it starts to set a line the proper size spaces to use to justify this line exactly.

80 To accomplish this the KEYBOARD measures the width of each character struck, adds this to the characters preceding it in the line, and, after the last character in the line has been struck, subtracts this total from the total measure to obtain the shortage. Besides measuring the shortage, it counts the justifying spaces over which this shortage is to be distributed. To make this distribution (determine the JUSTIFYING KEYS to strike) the operator makes no calculations whatever; he notes the two numbers on the JUSTIFYING SCALE indicated by its POINTER. In short, he looks at the SCALE, strikes two KEYS—the line is justified and he is ready to begin composition on the next one.*

81 The operator may use this justifying mechanism in a variety of ways: (*a*) he may justify a line of straight matter as described; (*b*) he may independently justify different sections of the same line as shown in ¶7; (*c*) he may combine, in the same line, justifying and fixed spaces (the size of these latter is not affected by the JUSTIFYING KEYS); for example, he may center a heading (see running head on this page, "*The Monotype System*") by justifying spaces at the right and left of it and use fixed spaces between the words of the heading to obtain uniform spacing for all heads; (*d*) he may increase the width of any desired character, just as the size of the justifying space is increased, by striking this character with the

* The JUSTIFYING SCALE revolves automatically at the end of the line; on earlier KEYBOARDS not equipped with the automatic revolution of the JUSTIFYING SCALE the operator must press a KEY, at the end of the line, to revolve the SCALE before reading the two numbers from it.

JUSTIFYING-SPACE-PUNCH KEY (¶218) so that it will be cast with justification added.

82 The justifying mechanism may be divided into two parts: (*a*) The counting mechanism that records the size of the characters and the number of justifying spaces; (*b*) the calculating mechanism that makes the division to indicate the JUSTIFYING KEYS required for this combination of shortage and justifying spaces.

CHAPTER XI

The Counting Mechanism

83 Speaking broadly, the counting mechanism includes (*a*) the unit registering mechanism, which measures the width of each character as struck (in units of the set of its face), and adds this number of units to the sum of the units of the characters preceding it in the line, in order that the counting mechanism may indicate the amount required to complete the line; (*b*) the mechanism for counting the justifying spaces, and (*c*) the calculating mechanism which determines, after the line is completed, the amount that must be added to each justifying space to spread the total amount the line is short over all the justifying spaces in the line. It will be clearer, however, to consider now only (*a*) and (*b*); that is, the mechanism for measuring the number of units the line is short (after the last character in it has been struck) and the mechanism for counting the number of justifying spaces in the line to which this amount required for justification must be added.*

84 Before considering the details of the counting mechanism, let us first "review" the punching mechanism, because, in addition to perforating the paper, this controls the counting mechanism: The perforations in the ribbon serve a double purpose at the CASTING MACHINE: (*a*) they determine the movement of the MATRIX CASE so that the required MATRIX is brought to casting position; (*b*) they cause the NORMAL WEDGE to move (with the MATRIX CASE) to the position required to make the MOLD opening the proper size for the body of the character to be cast from the MATRIX brought to position by these perforations.

85 The BARS that operate these PUNCHES, that determine the movement of the NORMAL WEDGE and, consequently, the number of units in each type-body, control also the counting mechanism. Thus, if a KEY be struck to perforate the ribbon for a seven-unit character, its PUNCH BAR rises and (*a*) forces its PUNCH through the paper, to make the perforation that brings the WEDGE to the seven-unit position on the CASTER; (*b*) causes the counting mechanism of the KEYBOARD to register these seven units.

86 The Two Space Bars, at the bottom of the right and left KEYBANKS, which produce justifying spaces, also operate a PUNCH BAR that is connected with the counting mechanism in the same manner as the PUNCH BARS that control the movement of the

* As already explained (¶81), the MONOTYPE operator may justify different sections of the same line separately and, as will be explained later, he may, in tabular work, justify the line, or sections of it, by using spaces of fixed size that are cast the same size as counted by the KEYBOARD (not increased like justifying spaces), but in this explanation of the counting and the calculating mechanisms we will consider only the justification of lines of straight matter (the lines of this page), leaving the special uses of these mechanisms to be taken up after their principles have been explained.

NORMAL WEDGE. The justifying spaces produced by the SPACE BARS are counted by the counting mechanism as though they were four-unit fixed spaces; their actual size (the size they are cast) is determined by the JUSTIFYING KEYS struck at the end of the line (¶75). The SPACE BARS will not put more than twenty justifying spaces in the same line; after either, or both, BARS have been struck twenty times for the same line (and continuing for that line), they produce six-unit fixed spaces instead of justifying spaces (¶103). The BOARD may be adjusted so that the SPACE BARS will not produce justifying spaces: To cut out the justifying space mechanism, pull forward the KNURLED HEAD 16KA5 (Plate V, at back of book) and the SPACE BARS will produce six-unit spaces only. When the KNURLED HEAD is pushed in, the SPACE BARS again produce justifying spaces. This change from justifying to fixed spaces by pulling out the KNURLED HEAD may be made at any time and as many times in the line as desired. See Plate V, front view of upper part of KEYBOARD, at back of book, to which all the following symbols refer. For full details and illustrations of these mechanisms see our book, "The Mechanism of the Monotype Style D Keyboard."

87 Consider first that portion of the counting mechanism that registers the unit width of the characters as their KEYS are struck. Reduced to its simplest terms, this consists of the UNIT WHEEL a35KB1 (Plate V) and an escapement to regulate the amount the WHEEL revolves when a KEY is struck.

88 The Unit Wheel a35KB1, a gear with 162 teeth, is urged to revolve (in the direction *opposite to* the hands of a clock—*contra-clockwise)* by its DRIVING RACK, which is forced to the left by the air pressure in its CYLINDER 36KB1 acting upon the DRIVING-RACK PISTON. This RACK drives the UNIT WHEEL by a PINION on the UNIT-WHEEL SHAFT a35KB2. (See also ¶94.)

89 The Unit-wheel Pawl a38KB1 is seated in the UNIT WHEEL as shown in Plate V, locking it and preventing it from rotating, except when a KEY is depressed. The PAWL then lifts and the WHEEL (driven by its RACK) revolves *contra-clockwise* until as many of its teeth have passed the PAWL as there are units in the character struck.

90 The Unit Rack c26KB1 is the second member of the UNIT WHEEL escapement, the PAWL being the first. When a KEY is depressed, the RACK moves up and engages the WHEEL, and, *after the Rack is fully seated in the Wheel,* the PAWL lifts, permitting the UNIT WHEEL to revolve and drive the UNIT RACK to the right.

91 The Unit-rack Stops 31KB1 complete this mechanism for measuring the number of units in each character struck, for, when a KEY is depressed, one of these STOPS rises in the path of the UNIT RACK and stops its movement to the right and consequently the rotation of the UNIT WHEEL.

92 The Punch Bars a33KC1 carrying the PUNCHES that control the movement of the NORMAL WEDGE, and also the PUNCH operated by the SPACE BARS, are connected with these STOPS. Thus, when the Roman cap H is struck, the perforation is made to

bring the NORMAL WEDGE into position to produce a fifteen-unit character. When this PUNCH BAR rises, to make this perforation, it lifts the fifteen-unit STOP into position to stop the movement of the UNIT RACK to the right. When fifteen teeth of the WHEEL have passed under the PAWL, the RACK hits the fifteen-unit STOP and, since the RACK can move no further, the UNIT WHEEL, which is driving the RACK, stops revolving. When the KEY for this Roman cap H (15-unit character), that caused the UNIT WHEEL to revolve fifteen spaces, is released, the PAWL moves down, seating in a space fifteen spaces to the right of the one it occupied before the cap H was struck. After the PAWL has firmly seated in the WHEEL and locked it, the UNIT RACK moves down, out from mesh with the WHEEL, and is returned, by a SPRING acting through a LEVER, to its position of rest at the left end of its stroke, where it remains until the next KEY is struck, when it again rises and engages the WHEEL.

93 *This escapement is absolutely positive; either the Pawl or the Rack is always fully seated in the Wheel.* BOARDS equipped with the Repeater Unit (Chapter XLIX, page 221) prove that *it will work without a skip*, even at the rate of 25,000 ems per hour, *unless the operator slurs—fails to take his finger off one Key before hitting the next.*

94 The graduations on the Unit Wheel indicate half-ems: The front face of the UNIT WHEEL is graduated at every ninth space, dividing the 162 teeth into eighteen sections, each one representing nine units (one-half em); these graduations enable the operator to read the number of units required to revolve the WHEEL any number of units desired. The movement of the WHEEL is always counted from the right tooth of the PAWL; thus, if this be seated in a graduated space, the BOARD is said to register even ems (or half-ems). If now a nine-unit character be struck, the WHEEL will revolve nine spaces and the right tooth of the PAWL will seat in the graduated space to the right of the one it occupied before this nine-unit character was struck; if an eighteen-unit character be struck, the PAWL will seat in the second graduated space to the right.

95 If, instead of being seated in a graduated space, the right tooth of the PAWL is in any other space—say the fifth to the left of a graduated space—and a fifteen-unit character be struck, the WHEEL will revolve and two graduations will pass under the right tooth of the PAWL before it seats in the first space to the right of this second graduation. This will be clear from the following: To register this fifteen-unit character the WHEEL revolves fifteen spaces (15=5+9+1); that is, five spaces bring the first graduation under the right tooth of the PAWL, nine spaces bring the second, and one more space (to the right of this graduation) completes the fifteen units of this character.

96 The Unit Indicator a25KB1 enables the operator to tell at a glance the number of spaces the WHEEL must revolve to seat the right tooth of the PAWL in a graduated space. When this tooth is in a graduated space, a graduation on the WHEEL coincides with the zero of the UNIT INDICATOR; when the right tooth of the PAWL is six spaces to the left of a graduated space, a graduation of the WHEEL coincides with the six of the UNIT INDICATOR. Thus, *the figure indicated on the Unit Indicator by a Unit Wheel graduation is the unit size of the space (or character) that must be struck to bring the Board to even ems (or half-ems); that is, to seat the right tooth of the Unit-wheel Pawl in a graduated space.*

97 The above provides for measuring and counting the unit width of each character and space as struck; there are eighteen units to an em, and, to measure the whole line, a means is required of registering the ems added to the line as well as the units that make up these ems.

98 The Em Rack 4KB1 is driven by a PINION on the SHAFT of the UNIT WHEEL and, therefore, the movement of the RACK is proportional to the movement of the UNIT WHEEL. Thus, when a seven-unit character is struck, the WHEEL revolves seven spaces and the RACK moves to the right seven-eighteenths of an em. This movement of the RACK is measured, on the EM SCALE, by the EM-RACK POINTER a4KB3.

99 The Em Scale a9KB1 is a strip of celluloid divided into sixty-five ems, and each em is subdivided into half-ems. Its chief function is to measure the amount required to complete the line, and therefore, since the EM RACK moves to the right as the line progresses, its zero is at the right end. The SCALE is made of celluloid, so that the operator can mark upon it with a pencil* the width of columns of tabular work, to indicate the points in the line at which he must justify and also the different figure columns of the table. The relation between the UNIT WHEEL and the EM RACK is such that, *when the Unit Indicator indicates zero (right tooth of the Pawl is in a graduated space of the Unit Wheel), the Em-rack Pointer coincides with an em (or half-em) graduation of the Em Scale.*

100 The number of ems and units required to complete the line, or any section of it, are shown by the EM SCALE and UNIT INDICATOR: Thus, if the EM-RACK POINTER be between three and three and one-half ems, and a graduation of the WHEEL coincides with the figure 8 of the UNIT INDICATOR, we know that three ems and eight units are required to complete the line. If now we strike the eight-unit space once and the em-quad three times, the EM RACK will move to the right until its POINTER coincides exactly with the zero of the EM SCALE, at which point the right tooth of the PAWL is, of course, seated in a graduated space of the WHEEL. The BOARD is now at zero, the line is complete, and no expansion of the justifying spaces is required to justify it, since there is no remainder to be spread over these spaces. *When the line ends exactly at zero (requiring no justification), the Justifying Scale will indicate the Justifying Keys that must be struck to cause the Casting Machine to make these justifying spaces the same size as the Keyboard has counted them; that is, four units of the set in use.*

* For marking the EM SCALE use a china-marking pencil, for its marks may be easily erased with a dry cloth. These pencils may be obtained in various colors, red, blue, and black, and the different colors will be found helpful in tabular matter. The paper-wound pencils are most satisfactory, for the crayon does not crumble when sharpened, as is apt to be the case with wooden china-marking pencils. Do not mark the EM SCALE with a lead-pencil, for erasing these marks will in time destroy the SCALE'S graduations.

101 As has been stated, the counting mechanism consists of two parts: (*a*) the mechanism for measuring the number of units the line is short, (*b*) the mechanism for counting the number of justifying spaces in the line over which this shortage must be distributed. Now that mechanism (*a*) is clearly understood, mechanism (*b*) will present no difficulties.

102 The Justifying Scale 10KB1 (also Fig. 22, page 38) indicates the number of justifying spaces in the line, just as the EM SCALE shows the number of ems. The lines that run around the surface of the SCALE divide it into twenty rings and each indicates a justifying space, exactly the same as each graduation on the EM SCALE indicates a half-em. For detailed description of the SCALE and its uses see ¶111 to ¶122 inclusive.

103 The Justifying-scale Pointer a14KB1 corresponds to the EM-RACK POINTER, for it indicates justifying spaces on the JUSTIFYING SCALE, by its movement up this SCALE, just as the EM-RACK POINTER indicates ems and half-ems by moving across the EM SCALE. The JUSTIFYING-SCALE POINTER is operated by either SPACE BAR (right or left KEYBANK) and rises one space on its SCALE whenever either SPACE BAR is struck, and at the same time the counting mechanism registers four units. The maximum number of justifying spaces that can be used in the same line is twenty, but, by a simple automatic device, when the POINTER has risen to the top of its stroke (counted the twentieth justifying space in the line), the SPACE BARS no longer produce justifying spaces, but instead perforate the paper for fixed spaces six units wide. Thus, the twentieth time the SPACE BAR is struck for the same line it records a justifying space, which is registered as four units; the twenty-first time, and thereafter for this line, the SPACE BAR records six-unit spaces.

104 The Restoring Key (the right green KEY at the bottom of the BOARD) is used to "restore" the counting mechanism to position to register the next line after a finished line has been justified. When this KEY is depressed, the UNIT-WHEEL PAWL lifts clear of the WHEEL and the air is cut off from the right UNIT-WHEEL DRIVING CYLINDER and admitted to the left DRIVING CYLINDER. Thus, while the RESTORING KEY is held down, the air pressure acts upon the PISTON at the left end of the UNIT-WHEEL DRIVING RACK and, as this RACK moves to the right, it rotates the UNIT WHEEL right-handed *(clockwise)* or opposite to its movement when counting units. As the UNIT WHEEL thus revolves to the right, it drives the EM RACK to the left, until this RACK strikes the EM-RACK STOP, which has been set for the measure required. The RESTORING KEY is now released and the PAWL seats in the UNIT WHEEL, locking it in position ready to count the units in the next line to be set. In the mean time (when the RESTORING KEY was first depressed) the JUSTIFYING-SCALE POINTER has dropped to the bottom of its stroke so that it is ready to count the justifying spaces in the next line.

105 The lower row of Justifying Keys may also be called RESTORING KEYS, for any KEY in that row does the work of the RESTORING KEY. When the operator completes a line, he justifies

it by striking, first, a KEY in the top row of JUSTIFYING KEYS, and then a KEY in the bottom row. By arranging these KEYS in the bottom row to restore, as well as justify, he is saved the trouble of depressing the RESTORING KEY, which, consequently, is used for special tabular work only (¶207), in which the BOARD can not be restored by a KEY in the lower row of JUSTIFYING KEYS. When it is desired to restore by the RESTORING KEY, instead of by the lower row of JUSTIFYING KEYS, the operator has only to turn the small VALVE HANDLE 29KC17 at the left side of the bottom of the PAPER TOWER; when this HANDLE points to the rear, the BOARD is restored by the lower row of JUSTIFYING KEYS; when the HANDLE points to the left, the BOARD is restored by the green RESTORING KEY.

CHAPTER XII

The Calculating Mechanism

106 The means for determining the amount that each justifying space must be increased to take care of the amount the line is short, after the last character in it is struck, is so simple that it seems almost a misnomer to speak of it as the "calculating mechanism." This has been done to separate it from the counting mechanism, although it would be quite as accurate to call a table for computing interest a "calculating mechanism."

107 Since the student of the MONOTYPE very naturally looks for both complication and mystery in its "calculating mechanism," he can quickly be agreeably surprised if he will forget the MONOTYPE for a moment and consider figuring interest. To determine the amount of interest our savings bank owes us, we must know three things: (*a*) the rate of interest the bank pays; (*b*) the amount of our money it has; (*c*) the length of time it has had it. In our school days we learned how, these three factors being given, to figure the amount of interest resulting; our calculations were more or less accurate and always took time. No bank clerk calculates interest—he reads it out of a book. These books contain tables calculated for different rates of interest. If a bank clerk wants to know the interest at five and one-half per cent. on $135 for ninety days, he turns to his table of five and one-half per cent. interest, looks down the side of this table until he comes to $135, and follows this line across the table until it intersects the column giving interest for ninety days. He has his answer while we would be looking for a piece of paper on which to figure it.

108 In exactly the same way the MONOTYPE operator uses previously calculated tables when he wants to know, in setting a six-and-one-half-set face, how much he must increase the size of the justifying spaces, which the KEYBOARD has registered as four units of six-and-one-half-set, in order to justify a line that is forty-seven units short and contains fifteen justifying spaces.

109 But the MONOTYPE operator has an even easier time than the bank clerk, for he does not have to find a table and then run his finger over this in two directions to find the justification required. The MONOTYPE operator's table is the JUSTIFYING SCALE (Fig. 22, page 38, and Plate V, at back of book), a cylinder which revolves about its axis automatically at the end of the line. After the last character for a line has been struck, the SCALE has revolved the proper amount and stopped; the SCALE POINTER indicates two numbers on the SCALE; the upper one of these two numbers indicates the KEY in the top row of JUSTIFYING KEYS, the lower number, the KEY in the lower row of JUSTIFYING KEYS (the red KEYS at the

top of the BOARD numbered from 1 to 15) that the operator must strike to record the justification for this line.

110 Of course, the JUSTIFYING SCALE and KEYS may be used in a great variety of ingenious ways for setting intricate matter, but for straight matter, all the operation of the "calculating mechanism" amounts to is—read two numbers, strike two KEYS. For detailed description of setting straight matter, beginning the take, justifying, etc., see Setting Straight Matter, Chapter XXXIX, page 150.

CHAPTER XIII

The Justifying Scale

111 The Justifying Scale is a cylinder, the surface of which is a celluloid-coated card held by aluminum heads at the top and bottom (Fig. 22). The bottom head engages pins in the JUSTIFYING-SCALE PINION, so that when the PINION moves, the SCALE moves with it, turning about the JUSTIFYING-SCALE SPINDLE. The SCALE revolves automatically at the end of the line, and the amount it revolves measures the number of units the line is short, *provided this be not more than seventy-one units*. A different SCALE is, of course, required for each set. In changing the SCALES the operator lifts the SCALE previously in use from the driving PINION and replaces it with the SCALE of the same set as the face he is about to compose.

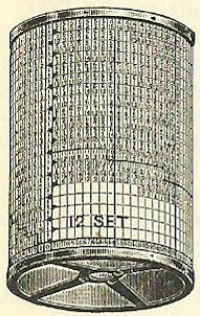


FIGURE 22
A JUSTIFYING SCALE.

112 To change Justifying Scales: Figs. 153, 154, and 155 (Operating Adjustments, Plate X, at back of book) show the correct method of changing SCALES; the SCALES must be handled carefully, for if the lower head be bent, the SCALE will not indicate the justification correctly. SCALES not in use should be kept in their boxes.

113 The surface of the SCALE is divided into rectangles by the lines that run around the SCALE and the lines that run up and down it: See Plate VI, at back of book, which shows an unmounted eight-and-one-half-set SCALE. The columns made by the vertical lines represent units of the same set as the SCALE; the spaces made by the horizontal lines represent justifying spaces. Thus, if the EM-RACK POINTER (¶98) be within four ems of zero (that is, if the line be less than 72 units short), the number at the bottom of the vertical column indicated by the JUSTIFYING-SCALE POINTER always shows the number of units the line is short.

114 The method of determining from the reading of the EM SCALE and UNIT INDICATOR the number of ems and units the line is short is explained in ¶100. The JUSTIFYING SCALE indicates even more quickly this shortage *in units*, when the shortage is not more than seventy-one units, the capacity of the SCALE. Thus, when a line is three ems eight units short, the SCALE will have revolved and stopped with the POINTER indicating column No. 62 (the columns are numbered at the bottom), which means that the line is sixty-two units short; three ems eight units are the same as sixty-two units ($3 \times 18 = 54$ units, to which add the 8 units, $54 + 8 = 62$).

115 In the same way that the vertical columns indicate units, the horizontal spaces indicate justifying spaces; and, for every justifying space added to the line, the POINTER rises one space on the SCALE (see JUSTIFYING-SCALE POINTER, ¶103).

116 While a different SCALE is used for each different set face, the JUSTIFYING KEYS that the SCALE indicates (and the JUSTIFYING WEDGES at the CASTING MACHINE controlled by these KEYS) are never changed and are the same for all faces. This is explained by the fact that *the amount each justifying space is increased to justify the line is measured in thousandths of an inch and not in units of the set being composed;* that is, the KEYBOARD registers in units all characters struck (including the justifying spaces which it counts as 4 units), but, in determining the amount that each justifying space must be increased, the "calculating mechanism" *first*, reduces the number of units the line is short to thousandths of an inch; *second*, divides this amount by the number of justifying spaces in the line; *third*, expresses this number of thousandths of an inch to be added to each justifying space, not in thousandths of an inch, but in JUSTIFYING KEYS that will increase the size of the justifying spaces from four units of the set in use to the width required to justify the line.

117 *"When the line ends exactly at zero (requiring no justification), the Justifying Scale will indicate the Justifying Keys that must be struck to cause the Casting Machine to make these justifying spaces the same size as the Keyboard has counted them; that is, four units of the set in use."* (¶100.)

118 When the line ends exactly at zero as just described (when the line is 0 units short), the column numbered 0 at the bottom of the SCALE will be presented to the POINTER. By referring to Plate VI, at back of book, it will be seen that the justification in this column is the same for all positions of the POINTER; that is, when the BOARD is at zero the justification is the same whether the line contains one justifying space or twenty. This is obvious, since the object of this justification is to cause the CASTER to make the width of the justifying spaces four units of the set of the SCALE; that is, the same size as the KEYBOARD has counted them.

119 The diagonal red lines on the Scale guide the operator in preserving uniform spacing in the different lines. If the JUSTIFYING-SCALE POINTER indicates, at the end of the line, a rectangle between these limiting red lines, the justifying space produced by striking the JUSTIFYING KEYS, indicated by the figures in this rectangle, will not be smaller than six nor larger than twelve units of the set in use. The nearer the POINTER is to the upper red line, the nearer will the size of the justifying space be to six units (a three-to-em space), while the nearer the POINTER is to the lower red line, the nearer will the space be to twelve units (two three-to-em spaces). If the page is to be open, leaded matter, for example, the operator should end the lines so as to keep the POINTER near the lower red line; to preserve the close spacing that distinguishes MONOTYPE work from other machine composition, the operator should end the lines so as to keep the POINTER close to the upper red line.

120 The Scale Constant of any set is the justification given in the zero column of the SCALE of this set; that is, the column presented to the JUSTIFYING-SCALE POINTER when the BOARD is at zero (EM-RACK POINTER at zero on EM SCALE, UNIT WHEEL graduation at zero on UNIT INDICATOR). Striking the JUSTIFYING KEYS, indicated by the Scale Constant, sets the space-sizing mechanism at the CASTER so that the justifying spaces cast with the NORMAL WEDGE of the same set as the SCALE whose Constant is thus used, are four units of this set in width.

121 Constant Justification: In some forms of tabular work, where fixed-size spaces are used instead of justifying spaces, the justifying space is sometimes used with "constant justification" (striking the Scale Constant at the end of the line) to get extra thin spacing. While the smallest fixed space produced by a KEY is five units (see MATRIX CASE Diagram, Fig. 18, page 22), with constant justification the SPACE BARS produce a four-unit space which, although it requires justification to obtain its size, is the equivalent of a fixed space four units in width and will be so considered in this book.

122 Automatic Revolution of the Justifying Scale:* The JUSTIFYING SCALE automatically starts to revolve when the EM-RACK POINTER passes the four-em mark on the EM SCALE. Each character struck thereafter revolves the SCALE the proper amount, the number of vertical columns on the SCALE which pass the SCALE POINTER being the same as the number of units registered by the counting mechanism (¶98); that is, the number of units the character struck is wide. Thus at any point within seventy-one units of the end of the line the SCALE POINTER indicates the proper justification on the SCALE.†

* On older BOARDS not equipped with the automatic revolution of the JUSTIFYING SCALE it is necessary at the end of the line to press a KEY (green KEY in the lower right corner of the left KEYBANK) to revolve the SCALE.

† For special work (double justification, described later) the SCALE is rotated by hand. This applies whether or not the BOARD is equipped with the automatic revolution of the JUSTIFYING SCALE.

CHAPTER XIV

The Space-Sizing Mechanism

123 *"As the paper is perforated at the Keyboard, it is wound on a Spool from which the paper unwinds when it is placed in the Casting Machine; thus, the last perforations made at the Keyboard are the first perforations presented to the Casting Machine. But the last perforations in a line are produced by the Justifying Keys, therefore, before the Casting Machine makes the first type in a line, it sets its space-sizing mechanism, so that the spaces it makes for this line will be of the size required to justify the line exactly."* (¶77.)

124 Before considering the details of the space-sizing mechanism, turn to the description of the type-sizing mechanism (page 13), for the NORMAL WEDGE (Fig. 10, page 14) regulates the size of both type-bodies and justifying spaces. This WEDGE moves from right to left with the MATRIX CASE and, when a justifying space is required, the CASTING MACHINE positions these two parts as follows: NORMAL WEDGE in second position from the right (LOCKING PIN in second notch from left end, as shown in Fig. 10), MATRIX-CASE with blank MATRIX O–2 (Fig. 18, page 22) in casting position; in short, WEDGE and CASE are set to produce a six-unit space, for the SPACE BARS of the KEYBOARD operate the six-unit PUNCH exactly as it is operated by the six-unit space KEY. The NORMAL WEDGE is used in casting justifying spaces just as it is used in casting a six-unit space or character.

125 But, in addition to the six-unit row PUNCH, the SPACE BARS operate the JUSTIFYING-SPACE PUNCH, and it is the BAR carrying this PUNCH that causes the counting mechanism of the KEYBOARD to register the first twenty justifying spaces in a line as *four* units instead of *six*. When the SPACE BAR is struck for the twenty-first time in the same line, this special PUNCH does not operate, and the BOARD registers, and the CASTER casts, a six-unit space. (¶86.)

126 Consider now the action of the CASTING MACHINE when this special perforation (produced by the SPACE BAR and registered as 4 units) is presented to it; that is, before considering how the CASTING MACHINE adjusts its space-sizing mechanism, at the beginning of a line, let us see how it produces a justifying space after the sizing mechanism has been adjusted. For full details and illustrations of the space-sizing mechanism see our book on the CASTING MACHINE.

127 The Type Transfer Wedge lies just behind the NORMAL WEDGE at the CASTING MACHINE, and, after the NORMAL WEDGE is positioned, to determine the width of the next type to be cast, the TYPE TRANSFER WEDGE moves to the left until it comes in contact

with an adjustable stop called the MICROMETER WEDGE, the object of which is to determine accurately the stopping point of the TRANSFER WEDGE. When both the NORMAL WEDGE and the TRANSFER WEDGE are in casting position, the MOLD BLADE is pulled back; its motion is stopped by the NORMAL WEDGE, which in turn is stopped by the TYPE TRANSFER WEDGE, and this in its turn is supported by a fixed ABUTMENT that never moves. *Summary: In casting a six-unit (or any other size) character, or fixed space, the Normal Wedge is backed up by the Type Transfer Wedge which is supported by the fixed Abutment.*

128 The Space Transfer Wedge rests upon the TYPE TRANSFER WEDGE and operates in exactly the same manner to support the NORMAL WEDGE, except that the SPACE TRANSFER WEDGE is backed up not by a fixed but by an "adjustable abutment;" that is, two JUSTIFYING WEDGES that rest upon the ABUTMENT for the TYPE TRANSFER WEDGE and are, in their turn, supported by their own fixed ABUTMENT. These two JUSTIFYING WEDGES are set by the CASTING MACHINE for each line, so that the justifying spaces cast in the line will be of the proper size to justify it. *Summary: In casting a justifying space, the Normal Wedge (in its 6-unit position) is backed up by the Space Transfer Wedge, which is supported by the two Justifying Wedges, which in turn are backed up by their own fixed Abutment.*

129 Whether the Normal Wedge is backed up by the Type or the Space Transfer Wedge is determined by the special perforation produced by the Space Bars. *When casting characters and spaces of fixed size* (everything but justifying spaces*), *the Space Transfer Wedge remains at the right and may be considered not to exist,* for it has no effect whatever on the NORMAL WEDGE. Consequently *if only the six-unit perforation is presented, the Type Transfer Wedge* moves to the right (while the NORMAL WEDGE is brought to its 6-unit position), and, this done, the TYPE TRANSFER WEDGE then *moves to the left to support the Normal Wedge.* If, however, *the six-unit and the justifying space perforations are presented together,* the TYPE TRANSFER WEDGE moves to the right as described, and stays there while this justifying space is cast. In its place the *Space Transfer Wedge moves to the left into position to support the Normal Wedge, in its six-unit position;* therefore the width of *the type cast is no longer six units, but is determined by the position of the Justifying Wedges* which lie behind and support the SPACE TRANSFER WEDGE.

130 The Justifying Wedges of the CASTING MACHINE are similar to the NORMAL WEDGE (Fig. 10, page 14); like it, they have teeth to hold them after they are set in any one of their fifteen positions, but, unlike the NORMAL WEDGE, they are not "stepped," but are of uniform taper. Their thin ends are to the right (like the NORMAL WEDGE), so that the further to the left they are placed, the

* "Everything but justifying spaces" is not strictly correct, for, in casting characters, the NORMAL WEDGE may be supported by the SPACE TRANSFER WEDGE, provided these characters are struck with the SPACE-PUNCH KEY, to increase their width by casting them with justification added. This method of using the SPACE WEDGE is fully explained later, but for the sake of simplicity it is assumed in this chapter that this WEDGE is used only for justifying spaces.

larger is the size of the justifying space. These two WEDGES are controlled by the JUSTIFYING KEYS as follows:

131 The Justifying Keys are the thirty red KEYS at the top of the BOARD, arranged in two horizontal rows and numbered, from left to right, one to fifteen inclusive. (See Plate V, at back of book.) As already described, the JUSTIFYING SCALE automatically revolves at the end of the line and stops with the SCALE POINTER indicating two numbers on the SCALE, the upper one of these is the JUSTIFYING KEY in the top row, the lower one the KEY in the bottom row to be struck to justify the line. Each row of JUSTIFYING KEYS has its own PUNCH (these two JUSTIFICATION PUNCHES are larger than the other twenty-nine PUNCHES so that the larger perforations in the ribbon may show where the lines end), and these KEYS, in addition to their own PUNCHES, also operate the unit-row PUNCHES; therefore, the same mechanism at the CASTING MACHINE that moves the MATRIX CASE and the NORMAL WEDGE also moves the JUSTIFYING WEDGES. The JUSTIFYING WEDGES do not move, however, unless JUSTIFYING KEY perforations are presented to the CASTER, causing it to lift the left end of the WEDGE up into position to be engaged by the mechanism that moves the NORMAL WEDGE. Thus the KEYBOARD operator may, by striking the JUSTIFYING KEYS, set the JUSTIFYING WEDGES for any justification desired; once set, they remain set until new perforations made by the JUSTIFYING KEYS cause the CASTER to re-position these WEDGES.

132 *What becomes of the two characters cast while the Justifying Wedges are being set?* A most appropriate question that shows that the reader has grasped the relation between the MATRIX CASE, NORMAL WEDGE, and JUSTIFYING WEDGES. However, no characters are cast while the JUSTIFYING WEDGES are being positioned, because the same perforations that cause the CASTER to lift these WEDGES (to be engaged by the mechanism that moves the MATRIX CASE from left to right) also operate the PUMP LOCK, so that, while these WEDGES are being set, the CASTING MACHINE goes through its cycle of making a type, but none is produced because the PUMP is locked out and delivers no metal to the MOLD. NOTE: In addition to controlling the PUMP LOCK, these perforations govern the galley mechanism and, while the WEDGES are being set for the next line to be cast, the line just completed is removed from the type channel and placed on the galley. (¶150.)

CHAPTER XV

Calculating a Justifying Scale

133 While the MONOTYPE operator is never called upon to calculate SCALES, as this work has been done for him, the following will be of interest to those who wish to test their knowledge of the principles that underlie the MONOTYPE System. A thorough understanding of these principles is of great practical value, for the printer who understands them can make short cuts to profits, using his head to save his hands. All MONOTYPE calculations are based on the following facts:

134 The front Justifying Wedge (¶128 and ¶130) is controlled by the upper row of JUSTIFYING KEYS, and each position of this WEDGE, as it is moved from right to left, adds .0075″ to the size of the justifying space: Thus, the No. 1 KEY in the upper row (the zero position of this WEDGE) adds nothing to the size of the space; the No. 2 KEY adds .0075″; the No. 15 KEY adds .1050″ (.0075″×14=.1050″).

135 The rear Justifying Wedge is controlled by the lower row of JUSTIFYING KEYS, and each position of this WEDGE, as it is moved from right to left, adds .0005″ to the size of the justifying space: Thus, the No. 1 KEY in the lower row (the zero position of this WEDGE) adds nothing to the size of the space; the No. 2 KEY adds .0005″; the No. 15 KEY adds .0070″ (.0005″×14=.0070″).

136 The justifying space is cast with the NORMAL WEDGE in its second position to the left; that is, the six-unit position with the standard arrangement of unit-rows.* While for some special conditions NORMAL WEDGES have been made without a six-unit row, these are not desirable, since they require a special adjustment of the SPACE TRANSFER WEDGE.

137 The Space Transfer Wedge is thicker, from front to back, than the Type Transfer Wedge (¶127 and ¶128), so that, if both these WEDGES worked against the same abutment, the space cast with the SPACE WEDGE would be .0184″ thinner than the six-unit space cast with the TYPE WEDGE. Of course, these two WEDGES do not work against the same abutment, for the SPACE WEDGE is backed up by the JUSTIFYING WEDGES, but when the JUSTIFYING WEDGES are as far to the right as possible (the result of striking 1-1 JUSTIFYING KEYS), that is, in the position where they add nothing to the size of the justifying spaces, the effect is the same as if both TYPE and SPACE WEDGES worked against the same abutment.

* With the Wide Spacing Attachment (Chapter XLIX, page 221) and the standard arrangement of unit-rows, the justifying space is registered by the counting mechanism as seven units and cast with the NORMAL WEDGE in its nine-unit position; the principle, however, is the same as here described.

138 *"The Scale Constant of any set is the justification given in the zero column of the Scale of this set; that is, the column presented to the Justifying-scale Pointer when the Board is at zero. . . . . Striking the Justifying Keys, indicated by the Scale Constant, sets the space-sizing mechanism at the Caster so that the justifying spaces cast with the Normal Wedge of the same set as the Scale whose Constant is thus used, are four units of this set in width."* (¶120.)

139 Eighteen units of twelve-set equal one pica (.166″); one unit of twelve-set equals .166″÷18=.009222″; one-unit-of-one-set equals .009222″÷12=.0007685″. (¶54 and ¶55.)

140 Prove that the Constant for a twelve-set SCALE is 1-1. The unit sizes for different sets are taken from the Table of Type Sizes (Fig. 21, Plate I, facing page 27), but they may be calculated by using .0007685″, the equivalent of one-unit-of-one-set.

Six units of twelve-set (see Table of Type Sizes, Fig. 21, Plate I) . . . . . .009222″×6=	.0553″
Deduct for difference between thickness of SPACE and TYPE WEDGES (¶137)	.0184
	.0369″
No. 1 position front JUSTIFYING WEDGE adds	.0000
No. 1 position rear JUSTIFYING WEDGE adds	.0000
	.0369″
Four units of twelve-set (see Table of Type Sizes, Fig. 21, Plate I) . . . . . .009222″×4=	.0369
Error	.0000″

141 Find the Constant for an eight-and-one-half-set SCALE.

Six units of eight-and-one-half-set (see Table of Type Sizes, Fig. 21, Plate I)	.0392″
Deduct for difference between thickness of SPACE and TYPE WEDGES (¶137)	.0184
Size of space cast if NORMAL WEDGE in six-unit position is backed up by SPACE WEDGE and no justification added; that is, if the JUSTIFYING WEDGES be as far to the right as possible, if 1-1 JUSTIFYING KEYS have been struck (.0392″−.0184″=.0208″)	.0208″
Four units of eight-and-one-half-set (see Table of Type Sizes, Fig. 21, Plate I) . . . . . .00653″×4=	.02612
Therefore the amount that must be added by JUSTIFYING WEDGES is . . . . . .02612″−.0208″=	.00532″
No. 1 JUSTIFYING KEY top row adds . . . . . .0000″	
No. 12 JUSTIFYING KEY lower row adds .0005″×11=.0055″	.0055
Error	.00018″

Therefore the Constant for an eight-and-one-half-set SCALE is 1-12; verify this by reference to eight-and-one-half-set SCALE, Plate VI, at back of book.

142 What JUSTIFYING KEYS must be struck to justify a line of eight-and-one-half-set matter that contains sixteen justifying spaces and is sixty-five units short after the last character in the line has been struck?

Sixty-five units of eight-and-one-half-set . . . . .00653″×65=	.42445″
Amount to be added to each of the sixteen justifying spaces (counted by the KEYBOARD as four units of eight-and-one-half-set) to justify the line . . . . . .42445″÷16=	.02653

That is, the justifying spaces that have been counted by the KEYBOARD as four units of eight-and-one-half-set must be increased .02653″ to justify the line. But, *in order to first make these spaces four units* (the size the KEYBOARD counted them in determining the shortage of 65 units), the JUSTIFYING KEYS for the Constant (1-12) would have to be struck; therefore, to the amount that must be added to each four-unit space to justify the line (.02653″), we must add the Constant (.00532″, see preceding paragraph) before we can select the JUSTIFYING KEYS required for the line.

Amount to be added by the JUSTIFYING KEYS is .02653″ + .00532″ = .03185″
No. 5 JUSTIFYING KEY top row adds . . . .0075″ × 4 = .0300″
No. 5 JUSTIFYING KEY lower row adds . . 0005″ × 4 = .0020 .0320
Error .00015″

Therefore the JUSTIFYING KEYS to be struck to justify a line of eight-and-one-half-set matter that contains sixteen justifying spaces and is sixty-five units short are: Top row No. 5, lower row No. 5 (5-5). Verify this by reference to the eight-and-one-half-set SCALE, Plate VI, at back of book.

143 Justification 3-8 always makes the justifying space six units of the set in use,* regardless of the number of justifying spaces in the line, because striking the No. 3 JUSTIFYING KEY in the top row and the No. 8 KEY in the lower row sets the JUSTIFYING WEDGES to compensate for the difference in the thickness of the SPACE and TYPE TRANSFER WEDGES (.0184″), and causes the CASTING MACHINE to produce a six-unit space from the NORMAL WEDGE in its six-unit position, whether this WEDGE be supported by the TYPE TRANSFER WEDGE or the SPACE TRANSFER WEDGE.

No. 3 JUSTIFYING KEY top row adds . . . . . .0075″ × 2 = .0150″
No. 8 JUSTIFYING KEY lower row adds . . . . . .0005″ × 7 = .0035
.0185″
Difference between thickness of SPACE and TYPE WEDGES . . .0184
Error .0001″

144 The difference in the thickness of the Space and Type Transfer Wedges equals two units of twelve-set; that is, the Constant for a twelve-set JUSTIFYING SCALE is 1-1. As was stated in ¶137, the SPACE TRANSFER WEDGE is .0184″ thicker, from front to back, than the TYPE TRANSFER WEDGE; one unit of twelve-set equals .009222″ (¶139) and two units of twelve-set equal .018444″ (error .000044″). The example in ¶140 shows that the Constant for a twelve-set SCALE is 1-1; that is, to cast a justifying space four units thick, with a twelve-set NORMAL WEDGE, the JUSTIFYING WEDGES must be in position to add nothing (1-1 justification), for the SPACE WEDGE takes two units of twelve-set from the six-unit size of the twelve-set NORMAL WEDGE and makes the justifying space four units, the size it is registered by the KEYBOARD.†

*This is not true for sets larger than twelve-set; with these a special adjustment of the SPACE TRANSFER WEDGE is required.

†A demonstration of the WEDGES at the CASTING MACHINE, *after* studying this chapter, will be helpful to the reader.

CHAPTER XVI

Arrangement of Punches

145 The thirty-one Punches of the KEYBOARD have now been accounted for: Twenty-eight PUNCHES control the movement of the MATRIX CASE (¶24); two control the space-sizing mechanism (¶131), and one produces justifying spaces by the action of the SPACE TRANSFER WEDGE (¶128 and ¶129). It is essential that the position of these PUNCHES at the KEYBOARD be clearly understood, for no operator can consider himself an expert until he can "read the ribbon"; that is, tell from the location of the perforations the characters the ribbon will produce at the CASTER.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
5	1	▮	▮	*l*	*t*	‘	’	.	,	▮	l	i	]	[	′	|	1
6	2	*j*	*f*	*i*	!	:	;	-	j	f	ı	*l*	:	;	▮	▮	2
7	3	*c*	*r*	*s*	*e*	)	(	’	‘	r	s	t	ȷ	*v*	°	*z*	3
8	4	‡	*q*	*	*b*	*g*	*o*	?	I	z	c	e	z	s	†	*?*	4
9	5	*I*	▮	*9*	*7*	*5*	*3*	*1*	*0*	.	9	7	5	3	1	0	5
9	6	c	▮	▮	*8*	*6*	*4*	*2*	$	–	$	8	6	4	2	▮	6
9	7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	P	F	L	T	7
10	8	A	*fi*	*u*	*n*	.	S	v	y	p	u	n	Q	B	O	E	8
10	9	D	▮	*fl*	*p*	fl	fi	q	k	b	h	d	V	Y	G	R	9
11	10	H	&	*J*	*S*	*æ*	*æ*	*ff*	▮	Z	▮	ff	X	U	K	N	10
12	11	*O*	*L*	*C*	*F*	*w*	£	æ	L	P	F	¶	M	*Z*	*Q*	*G*	11
13	12	*E*	&	Q	V	C	B	T	O	E	A	w	*P*	*T*	*R*	*B*	12
14	13	*D*	*A*	*Y*	*ffl*	*ffi*	*m*	œ	Y	U	G	R	Œ	Æ	w	*V*	13
15	14	*K*	*N*	*H*	ffl	ffi	X	D	N	K	H	m	&	lb	*X*	*U*	14
18	15	Œ	Æ	¾	¼	½	*W*	*M*	—	.	.	M	W	%	Œ	Æ	▮	15
Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row

FIGURE 23

MATRIX CASE Arrangement: This diagram shows the CASE as it appears to one looking down on it as in Fig. 7, page 9; the rows numbered from 1 to 15 inclusive are the rows from front to back of the MATRIX CASE, those lettered from A to O inclusive are the rows from right to left. Thus, the black square at the intersection of rows O and 15 (18-unit space) is the front, right-hand MATRIX when the CASE is in operating position, the vertical (l) is the front, left MATRIX. NOTE: The above diagram is identical with Fig. 18, page 22.

146 Fig. 23 is the MATRIX CASE diagram. We will indicate the PUNCHES that control the movement of the MATRIX CASE by the letters and numbers that indicate the rows of the MATRIX CASE, thus: PUNCHES A to N inclusive are the PUNCHES that cause

the MATRIX CASE to move back and front (operating position), while PUNCHES 1 to 14 inclusive move it left and right. Indicate the PUNCH for the top row of JUSTIFYING KEYS by .0075 (the increment in the size of the justifying space produced by these KEYS), and, for the same reason, use .0005 for the lower row of JUSTIFYING KEYS. Let S indicate the PUNCH operated by the SPACE BARS to produce justifying spaces. Then, as the operator faces the KEYBOARD, the PUNCHES are arranged from left to right as follows:

N-M-L-K-J-I-H-G-F-S-E-D-.0075-C-B-A-1-2-3-4-5-6-7-8-9-10-11-12-13-14-.0005

Fig. 24 shows the arrangement of the PUNCHES at the KEYBOARD, and the INDEX PLATE which is placed beneath them to designate the PUNCHES as described.

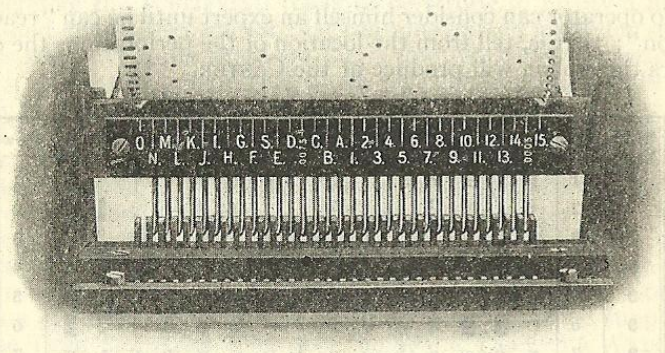


FIGURE 24

Arrangement of PUNCHES; shows the INDEX PLATE for identifying the thirty-one PUNCHES; viz., fourteen numbered from 1 to 14 inclusive to move the MATRIX CASE right and left, fourteen indicated by the letters A to N inclusive to move the CASE front and back, one (.0075) operated by the upper row of JUSTIFYING KEYS controls the front JUSTIFYING WEDGE, one (.0005) operated by the lower row of JUSTIFYING KEYS for the rear JUSTIFYING WEDGE, and one (S) operated by the SPACE BARS to govern the SPACE TRANSFER WEDGE. Thus, PUNCHES K and 1 bring the Roman lower case i to casting position, see Fig. 23, page 47.

147 Two extra Punch Bars, shown at left and right of Fig. 24, that do not carry PUNCHES are provided; that is, while there are but thirty-one PUNCHES, there are thirty-three PUNCH BARS (a33KC1 on Plate V, at back of book) and thirty-three PISTONS (¶9) for operating these BARS. In short, the KEYBOARD is built exactly as if PUNCHES were required for Row 15 and Row O, Fig. 23. The PUNCH BAR for Row 15 (at the right, facing the KEYBOARD) is essential because the PUNCH BARS for the numbered rows in Fig. 23 operate the counting mechanism, registering the width of the characters as their KEYS are struck. The PUNCH BAR for row O is necessary to preserve the absolutely uniform touch characteristic of the MONOTYPE so that the KEY for any character in that row of the MATRIX CASE will move two PISTONS, the same as a KEY for a character in the center of the MATRIX CASE.

CHAPTER XVII

The Galley Mechanism

148 The perforations made by the Justifying Keys (red Keys at top of Board) have three functions: (*a*) they cause the CASTING MACHINE to position the JUSTIFYING WEDGES before a line is cast, so that the justifying spaces in that line will be the size required to justify it; (*b*) they operate the PUMP LOCK which prevents characters being cast while the JUSTIFYING WEDGES are being positioned for a new line; and (*c*) they operate the galley mechanism. To understand this last function of these perforations produced by the JUSTIFYING KEYS, consider the following in reference to the operation of the CASTING MACHINE:

149 The CROSS BLOCK of the MOLD (Fig. 11, page 15) is coupled to the TYPE CARRIER by the hook at the left end of the CROSS BLOCK and, after the type has been cast, the CARRIER pushes the CROSS BLOCK to the right (operating position) until the CARRIER opening comes opposite the MOLD BLADE, which then moves forward and pushes the type just cast out of the MOLD into the CARRIER, where it is held by the TYPE CLAMP. Having thus received the type, the CARRIER moves to the left (closing the MOLD ready for the next type to be cast) until the type in the CARRIER is opposite the type channel, where the separate type making up a line are assembled. The type is then pushed out of the CARRIER into the channel by the forward stroke of the TYPE PUSHER.

150 While the last type of a line is thus being placed in the channel, the justifying perforations for the next line to be cast are presented to the CASTER to set the JUSTIFYING WEDGES for that line, and these perforations "trip the galley;" that is, cause the galley mechanism (this remains at rest, except when a line is to be placed on the galley) to operate as follows: *First*, the LINE HOOKS swing to the right so that the lugs on their rear ends come behind the last type cast. *Second*, the LINE HOOKS move toward the front of the machine, pulling the completed line forward until it comes in front of the galley. *Third*, the RULE, which closes the open end of the galley to keep the type previously placed on it from falling, lifts to permit the line to be pushed under it. *Fourth*, the COLUMN PUSHER now moves to the right, pushing the new line under the RULE. *Fifth*, the RULE moves down to the COLUMN PUSHER (to prevent the type falling back when the COLUMN PUSHER withdraws) and stops. *Sixth*, the COLUMN PUSHER withdraws, the RULE moves down to the bottom of its stroke, and the LINE HOOKS move back to the rear end of their stroke ready for the next line. Having completed its work, the galley mechanism remains at rest until it is "tripped" for the next line. NOTE: While the galley mechanism

completes its cycle (one revolution of the GALLEY CAM), the CASTING MACHINE makes five revolutions (casting a type of the next line for each revolution), *in addition to the two revolutions for setting the Wedges* when the PUMP is locked and no type is cast. The GALLEY CAM is rotated by a shaft driven from a worm on the CAM SHAFT; "tripping the galley" causes a latch on the CAM to engage the shaft so that the CAM rotates with it as one piece. The ratio of this gearing is such that the DRIVING PULLEY makes seven revolutions while the GALLEY-CAM SHAFT makes one. *Summary: The perforations that set the Justifying Wedges for the next line to be cast also "trip the galley" for the line just completed, causing the galley mechanism to pull the line forward and put it on the galley.*

151 Three different justifications in the same line are shown in ¶7. Since the spaces in these different sections of the same line are of different size, it is obvious that in casting lines like these the JUSTIFYING WEDGES must have been positioned three different times for each line. It is equally clear that the galley mechanism was not "tripped" and the line pulled forward and put on the galley until the three sections required for the line were completed and in the type channel.

152 *Question:* Can the JUSTIFYING WEDGES be moved without "tripping the galley"? A perforation produced by any JUSTIFYING KEY causes the CASTING MACHINE to lift the WEDGE this KEY controls and put it in the position corresponding to the KEY that produced the perforation, but, by a simple adjustment, the galley mechanism may be made "immune" to a single perforation produced by a JUSTIFYING KEY; that is, in work like ¶7 the perforations that set the WEDGES for the different sections (except the last) of these lines have no effect whatever on the galley mechanism.

153 In "double justification," as this work is called, if the KEYBOARD operator strikes together a JUSTIFYING KEY in the lower row and the KEY above it (bringing up the two JUSTIFYING PUNCHES simultaneously), these double perforations will "trip the galley" exactly as a single perforation trips it when the CASTING MACHINE is not adjusted for "double justification." For example: The first two sections of a line with three justifications are justified as usual; at the end of the last section of the line, assume that the justification indicated by the SCALE is 8-3. The operator strikes the No. 8 KEY in the top row as usual, but when he strikes the No. 3 KEY in the lower row he strikes with it the KEY directly above it (No. 3 in the upper row), in order to "trip the galley" for the complete line. Consequently, the KEYBOARD operator controls the galley mechanism of the CASTING MACHINE quite as thoroughly as he controls the movement of the MATRIX CASE. In ordinary matter he "trips the galley" by using any JUSTIFYING KEY (.0075 PUNCH or .0005; see ¶146); in "double justified" matter he "trips the galley" by using PUNCHES .0075 and .0005 together.

154 The object of the above reference to "double justification" is to make clear the action of the galley mechanism; for the method of using the KEYBOARD on matter which requires different size

justifying spaces in the same line and details of method of handling this work see "Double Justification," Chapter XXV, page 71.

155 When starting a new ribbon, strike a Justifying Key in the upper row six times and then a Justifying Key in the lower row once before beginning composition (for "double justified" matter strike a KEY in the upper row with the KEY in the lower row). This is done to "trip the galley" and bring out the last line cast (the first line set), which otherwise would remain in the type channel. Use a KEY in the lower row because the KEYS in this row also restore (¶105), and the new line must be started with the EM RACK as far to the left as possible, for, while the UNIT WHEEL rotates when a JUSTIFYING KEY is struck, the units so registered must not be counted in the line about to be set. Strike the JUSTIFYING KEYS seven times at the beginning of a take, because after the last character is cast and the line is complete, the CASTER must make seven revolutions (¶150) to place this line on the galley. Of course, one keystroke is all that is required to "trip the galley;" the object of the other six strokes is to keep the PUMP locked (cast no type) while this last line is placed on the galley. But for these perforations the CASTER would cast em-quads, which the operator would have to remove from the type channel before starting a new take. NOTE: Do not strike a JUSTIFYING KEY in the lower row seven times, for this causes the BOARD to restore after every stroke; save this wear.

156 The Casting Machine Stop Motion is part of the galley mechanism. The object of this device (for details see our book on the mechanism of the CASTING MACHINE) is to test the work of the KEYBOARD operator, and to prevent improperly justified lines being placed on the galley. *If the line be too short, or too long, to lock up properly, this fault is detected* as the COLUMN PUSHER pushes the line under the RULE, and the CASTING MACHINE stops automatically so that its operator can correct the error in justification.

157 To stop the Casting Machine when a take is finished, the KEYBOARD operator takes advantage of this stop motion. After setting the first line of a take (the last line cast) he reads the JUSTIFYING SCALE as usual, but, *after* reading the SCALE and *before* striking the JUSTIFYING KEYS indicated, he strikes the em-leader KEY. Consequently the line is cast one em too long and this stops the CASTING MACHINE, notifying the operator that the take is finished; he then removes the leader and pushes the line onto the galley. After the leader is removed the line is justified perfectly, since, in determining the justification for the line, this em-leader (struck after the SCALE was read) is not counted.

CHAPTER XVIII

Changing Pica Ems to Ems of Any Set

158 *"The Em Scale 9KB1 is a strip of celluloid divided into sixty-five ems and each em is subdivided into half-ems."* (¶99.) The EM-RACK POINTER a4KB3 (Plate V, at back of book) indicates on this SCALE ems and half-ems of the face being composed. Thus, when a twelve-set JUSTIFYING SCALE is used, the ems on the EM SCALE represent picas and the half-ems six points; with an eight-set SCALE the ems are eight points and the half-ems four points. Therefore since measures are given in picas it is, of course, necessary to change the measure required from picas to ems of the set to be composed before the KEYBOARD measure is adjusted. Thus if the required measure be twenty picas and the face to be composed be six-set, the KEYBOARD must be adjusted so that at the beginning of a line the EM-RACK POINTER indicates forty on the EM SCALE and the UNIT INDICATOR (¶96) shows zero. If an eight- instead of a six-set SCALE be used, the KEYBOARD would be set to indicate thirty ems at the beginning of the line.

159 The Table for Changing Pica Ems to Ems of Any Set (Plate VII, at back of book) is used to determine the KEYBOARD measure, for any measure in picas, without calculation. The following example shows the use of the table: A column of matter thirteen picas wide is to be composed in a seven-set face; in the column headed "7," opposite "13" in the column headed "Pica Ems," are found the figures "22–5," meaning that thirteen picas are equal to twenty-two ems and five units of seven-set. Thus:

$$13 \text{ picas} \times \frac{12}{7} = \frac{156}{7} = 22\tfrac{5}{7} \text{ ems of seven-set}$$

There are eighteen units to the em; therefore, to reduce two-sevenths of an em to units take two-sevenths of eighteen.

$$18 \times \frac{2}{7} = \frac{36}{7} = 5\tfrac{1}{7}$$

The fraction of a unit is negligible. The above example shows the manner in which the "Table for Changing Pica Ems" was calculated; of course, the KEYBOARD operator obtains the setting he requires direct from the table.

160 Allowance for squeeze in lock-up should be made in setting the KEYBOARD measure just as the compositor allows for this in adjusting his stick for hand composition. It is not possible to give fixed rules for this, as different offices have different standards. A number of offices use the following: Allow one-half point on all measures up to ten picas; from ten to twenty picas allow one point;

from twenty to thirty picas allow one and one-half points, and from thirty to forty-two picas allow two points. A table giving the equivalent of points in units of the different sets is given, with an explanation of the method of adding the squeeze allowance to the measure (Plate VIII, at back of book). NOTE: Most offices make no allowance for squeeze in setting ruled tables made up of a number of small columns that do not average more than five picas in width, because experience shows that such tables take up very little in lock-up.

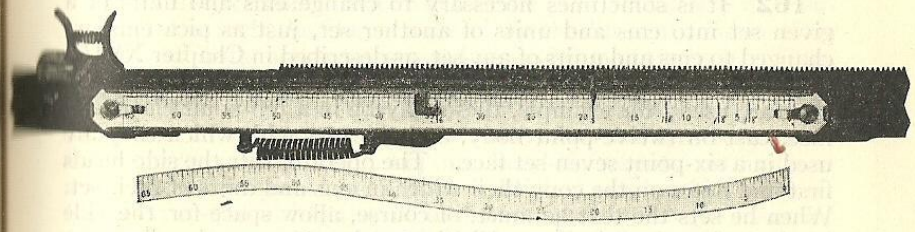


FIGURE 25

Paper em scales: Used in tabular work in preparing or preserving the cast of a table. The paper scale is held in position on the KEYBOARD EM SCALE by an EM-SCALE CLIP at each end, as shown in the figure; the lower edge of the paper scale rests on the ledge formed by the EM-SCALE HOLDER, and the upper edge of the paper scale is about an eighth of an inch below the top of the KEYBOARD EM SCALE so as not to cover completely its graduations. A separate paper em scale, not marked, is shown below the main cut.

161 Paper Em Scales (Fig. 25) are used on tabular work to preserve a record of the conversion of picas into ems for repeat orders, instead of looking up in the "Table for Changing Pica Ems to Ems of Any Set" the cast of a table each time it is set. By means of these paper em scales up-to-date offices that prepare copy before it goes to the composing machine can give the operator the cast of a table with the copy, so that he has only to put the paper scale in place and start keyboarding. Thus, these paper scales not only save time but they also insure uniformity when several operators are working on the same job. The paper em scale rests on the metal ledge at the bottom of the EM SCALE and is held at each end by metal CLIPS, as shown in Fig. 25. Care must be used in putting in a paper em scale to see that its graduations coincide with those of the KEYBOARD EM SCALE and for this reason the paper em scale is made narrower than the KEYBOARD SCALE so that the paper does not completely cover the graduations.

CHAPTER XIX

Changing Measures from one Set to Another

162 It is sometimes necessary to change ems and units of a given set into ems and units of another set, just as pica ems are changed to ems and units of any set, as described in Chapter XVIII.

163 Side heads: In some work side heads of a larger size type are used; for example, these may be in a ten-point eleven-set face, cast on twelve-point body, and the text with which they are used in a six-point seven-set face. The operator sets the side heads first and notes on the copy their width in ems and units of their set. When he sets the text he must, of course, allow space for the side heads so that the "dead wood" (the quads and spaces he allows for the side head) may be lifted out when the matter is made up, and the side head inserted without any justification of the matter or overrunning by hand. To make this allowance for the side head its measure (in ems and units of its set) must first be converted into ems and units of the same set as the text.

164 Tabular work: In the same way two sizes of type are frequently used in tabular work, a smaller size for the headings, for example. The total measure of the table, including the rules inserted after the matter is cast, is, of course, given in picas, but the cast off (the measure of the different sections) is often made in ems and units of the same set as the face used for the body of the table instead of in picas. The measure of the sections of the head, set in smaller size type, must, however, be made exactly the same as the measure for the sections of the table beneath the heads in order that the vertical rules that extend through both the heads and the body of the table may not bind when the table is made up and locked up. Therefore, before setting the heads, the measure of the different sections of the body of the table must be converted from ems and units of this set into the equivalent number of ems and units of the set of the face used for the heads. Consider, first, the conversion of units of one set into units of another set.

165 The Table of Type Sizes (Fig. 21, Plate I, facing page 27) will make clear the method of converting units of a given set into units of a required set. EXAMPLE: Given fifteen units of eleven-and-one-quarter-set, find its equivalent in units of seven-and-three-quarters-set. The table shows that fifteen units of eleven-and-one-quarter-set equal .1297″; to find the number of units of seven-and-three-quarters-set equal to, or most nearly equal to, this amount follow across the line of the table for seven-and-three-quarters-set. Twenty-one units of seven-and-three-quarters-set equal .1251″, twenty-two units equal .1310″. Since the difference between fifteen units of eleven-and-one-quarter-set and twenty-one units of

seven-and-three-quarters-set (.1297″ − .1251″ = .0046″) is greater than the difference for twenty-two units of seven-and-three-quarters-set (.1310″ − .1297″ = .0013″), we know that the nearest equivalent, disregarding fractions of a unit, in seven-and-three-quarters-set to fifteen units of eleven-and-one-quarter-set is twenty-two units.

166 The Scale for Changing Units of Any Set Into Units of Any Other Set (Plate VIII, at back of book) is a simplified Table of Type Sizes. Since this scale is used only for comparing the values of different units, not to determine their actual size in thousandths of an inch, the "key numbers" for the different combinations of sets and units are not expressed as decimals of an inch. Thus, referring to the preceding paragraph, the actual size of fifteen units of eleven-and-one-quarter-set is .1297″; in the scale the key number for this is 130; the actual size of twenty-one units of seven-and-three-quarters-set is .1251″, key number 125; twenty-two units of seven-and-three-quarters-set equal .1310″, key number 131. Therefore, twenty-two units of seven-and-three-quarters-set (key number 131) is the whole number of units most nearly equal to fifteen units of eleven-and-one-quarter-set (key number 130).

167 To change ems and units of any set into ems and units of any other set use the Table for Changing Pica Ems (Plate VII, at back of book) in connection with the Scale for Changing Units: Find on the table, in the column for the given set, the number of ems and units most nearly equal to the known measure; to get the equivalent of this measure follow this line across the table to the column for the required set. The measure there given in ems and units of the required set must then be corrected by adding, or subtracting, units to compensate for the difference between the known measure and the measure of the set selected. This use of the table and scale will be clear from the example given on Plate VIII, which see, noting carefully the caution for checking the total measure.

168 Scales for comparing two sets: When two faces of different sets are frequently used together on work requiring many conversions of measures, a special scale for these two sets may be made. Thus, if the style of the office be to set all tables in eight point 8A (8½-set) with the heads in six point (7-set), a scale like the one shown in Fig. 26, page 56, should be made, for it will very quickly save the time required to make it. With such a scale the operator can read directly from the scale the equivalent, in ems and units of one set, of any measure in ems and units of the other set. For example, the upper half of the scale shown in Fig. 26 is graduated to ems and units of seven-set, the lower half to ems and units of eight-and-one-half-set. To make any conversion within the length of the scale, find the given measure on the section of the scale for this set and, directly above or below this, read from the other section the measure in ems and units of the set for this section. Thus, a glance at the scale (Fig. 26) shows that the nearest measure to three ems six units of eight-and-one-half-set is four ems one unit of seven-set. The scale should, of course, be made long enough to convert directly the widest measures in general use.

169 To make a scale for comparing two sets, similar to the one shown in Fig. 26, use a nine-unit vertical dash for the graduations, so that the figures above, or below, the graduations are on the same width body. Six-point figures with a six-point vertical dash cast on six-point body make a very neat scale. First set up, at the KEYBOARD the line of figures, centering these over the verticals cast on the nine-unit body; strike the nine-unit space three times, then the figure one, then two nine-unit spaces, then figure six, then two spaces, then figure nine. Since the numeral twelve (which is composed of 2 characters) must center above the third vertical to the right of that beneath nine, strike, after nine, a six-unit space, then a seven-unit space, then figure one and then figure two (to make 12); after this a nine-unit space, then figure one and then figure five (to make 15), then a five-unit space, and then two nine-unit spaces. Repeat two nine-unit spaces, then figure three and so on. In making these scales it is better to punch the ribbon for the full length of the scale, instead of stopping the CASTING MACHINE and repeating the ribbon, as the MOLD might cool off too much while changing the ribbon. Since no justifying spaces are used, it is necessary only to strike any one JUSTIFICATION KEY to "trip the galley"

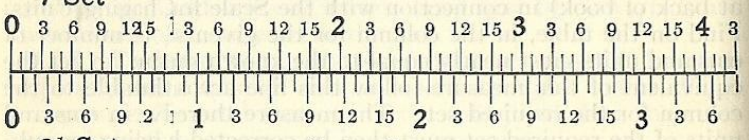


FIGURE 26
Scale for comparing two sets.

(¶150). Then restore and strike the nine-unit vertical as many times as required for the length of the scale.

170 Cast the ribbon, using the NORMAL WEDGE for one of the sets, and then rerun the ribbon with the WEDGE for the other set. Since no justifying spaces were used, the matter will come out as perfectly in one set as in another. In making these scales great care must be used to adjust the CASTING MACHINE so that the body-sizes for the verticals are exactly nine units of their sets, because any error, however slight, in one of these sets would accumulate in the length of the scale. In making a scale for seven-set and eight-and-one-half-set it is obvious that eight and one-half of the seven-set verticals should be of exactly the same width as seven of the eight-and-one-half-set verticals; or, to avoid comparing half-units, that seventeen units in the seven-set section of the scale should coincide with fourteen units on the eight-and-one-half-set section, and so on across the scale for all multiples of seventeen and fourteen. In making this test be sure that the zeros, the first divisions on each scale, coincide exactly. Make up the two sections of the scale, putting two-point leads between the verticals and the figures; take as many proofs as desired on durable paper, and with pen and ink extend every third (numbered) vertical to its number to make the scale easier to read. Also extend each eighteenth vertical, beginning with the first, which mark zero, the second one, etc., to indicate ems; mark the sets on each section and the scale is finished.

171 Double Em Scales: In ¶163 was explained the conversion of sets required when side heads of a large size type are used; for example, heads in a ten-point eleven-set face and text in a six-point seven-set face. The operator who knows how to make scales for comparing two sets (Fig. 26, page 56) can save a great deal of time by making a paper scale of the proper proportion for this eleven-set face and attaching it to the EM SCALE of the KEYBOARD by means of the CLIPS shown in Fig. 25, page 53. Of course this paper scale must be the reverse of the KEYBOARD EM SCALE, that is, *zero must be at the left of the paper scale which is graduated from left to right.* The paper scale is placed on the regular KEYBOARD SCALE, so that when the POINTER of the EM RACK is at the beginning of the line this indicates zero on the auxiliary paper em scale. The top of the paper scale should be about a quarter of an inch below the top edge of the KEYBOARD SCALE in order that the paper may not cover the graduations of the SCALE. Now, the operator must allow eleven and one-half ems "deadwood" (quads and spaces) for a side head to be inserted after the matter is cast, he strikes the quads and spaces required to bring the POINTER of the EM RACK to eleven and one-half ems on the auxiliary scale and this done, he sets the balance of the line in seven-set, paying no further attention to the paper scale until he requires it for the next side-head. These paper em scales must be printed on strips of paper long enough so that when their zero is placed at the desired point on the EM SCALE the paper is held by the CLIPS at the ends of the EM SCALE; the portion that would project beyond the CLIPS is cut off.

172 The side heads or other matter to be inserted of course must be set first and, as the operator sets this he notes on the copy the length of this insert in ems and units of its set. Obviously, fixed size spaces (6- or 9-unit) must be used between the words of the matter to be inserted, because justifying spaces are not cast the same size they are counted. If the reader has grasped the principle of these auxiliary paper scales to measure the allowance for matter to be inserted, and if he understands that the graduations on the KEYBOARD EM SCALE bear no relation to the width of the em of the set JUSTIFYING SCALE in use on the KEYBOARD, then it will be clear that *before making one of these auxiliary paper em scales we must determine the proportion between the graduations of the Em Scale, which represent the ems of the set of the Justifying Scale on the Keyboard, and the ems of the set represented by the auxiliary paper scale.*

173 An em on the Keyboard Em Scale is .5708″ wide, a half-em is .07854″, and since the EM SCALE is never changed, regardless of the set JUSTIFYING SCALE, it should be kept clearly in mind that the EM SCALE counts the ems as they are set and does not measure their width: Therefore, if a seven-set JUSTIFYING SCALE be used on the KEYBOARD and the matter to be inserted is in eleven-set, the

half-ems on the auxiliary scale must be larger than the half-ems on the EM SCALE in the proportion of eleven to seven, or, to express this in figures: to find the graduations for half-ems on the auxiliary scale for eleven-set matter to be inserted in seven-set matter multiply the size of a half-em on the EM SCALE by eleven and divide by seven. Thus:

$$\left.\begin{array}{l}\text{Half-em graduations for eleven-}\\ \text{set matter inserted in seven-set}\end{array}\right\} = \frac{.07854'' \times 11}{7} = .12342''$$

174 Rule: *To find the width to cast the verticals for half-ems for an auxiliary scale, multiply .07854″ by the set of the matter to be inserted and divide this product by the set of the matter in which the insert is to be made.*

175 Caution: Before using an auxiliary scale test it carefully with the EM SCALE of the KEYBOARD, using the method described in ¶170 for a scale for comparing two sets; see Fig. 26, page 56. Thus, if the inserted matter be twelve-set and the matter in which it is to be inserted be eight-and one-half-set, seventeen ems on the auxiliary scale should exactly equal twenty-four ems on the EM SCALE. *Remember that a carelessly made auxiliary scale will cause more lost time on one job than one of these scales could save in a month. These auxiliary scales should be used only by expert operators who thoroughly understand the Monotype System.*

176 Table of Relative Measures: Opposite this page, on Plate II, is a table for comparing directly measures varying by points from one point to eleven and one-half picas, and by multiples of ten picas from twenty picas to sixty picas in the most generally used sets (6-, 6½-, 7-, 8-, 8½-, 9-, 10-, 11-, and 12-sets). This table is a modification of a table in the MONOTYPE Manual of the Government Printing Office. The table in that Manual has served its purpose admirably, because the work of that Office is so thoroughly standardized that a compact table can be made to include all the different measures used. For commercial offices we have modified that table to include the sets most frequently used and have based the measures on picas and points. This table may not be complete enough to meet all requirements, in which case use the most suitable method of conversion described in this chapter or make a similar table sufficiently complete to cover the work in the office. The important point to note in using this table, or any method of converting ems and units of one set into ems and units of another set, is that *conversions are not absolutely accurate because fractions of a unit in the result must be rejected; therefore* if the equivalents of several sections of the same line be taken from the table, *always check the sum of these conversions with the equivalent of the total measure obtained* as described in ¶166 and ¶167; unless, as in most cases, this equivalent of the total measure can be obtained directly from the Table for Changing Pica Ems (Plate VII, at back of book). The method of using the table will be clear from the instructions at the left of the table.

Table of Relative Measures

PLATE II

Table of Relative Measures

For all Standard Sizes, 6-, 6½-, 7-, 8-, 8½-, 9-, 10-, 11-, and 12-Sets

Varying by Points from 1 Point to 11½ Picas, and by Multiples of 10 Picas to 60 Picas

In the column headed with the set for which the measure is known, find this measure; then, in the same line with this, but in the column headed with the set required, will be found the equivalent, in ems and units of the required set. For a full description of the method of using this table see directions at the left.

In the columns headed "Picas and Points" the figures at the left of the plus sign (+) indicate picas, those at the right of the plus sign indicate points; thus, 5+9 means 5 picas and 9 points. For convenience in reading the table, all picas and half-picas, as well as all even ems of all sets, are emphasized by using heavier figures.

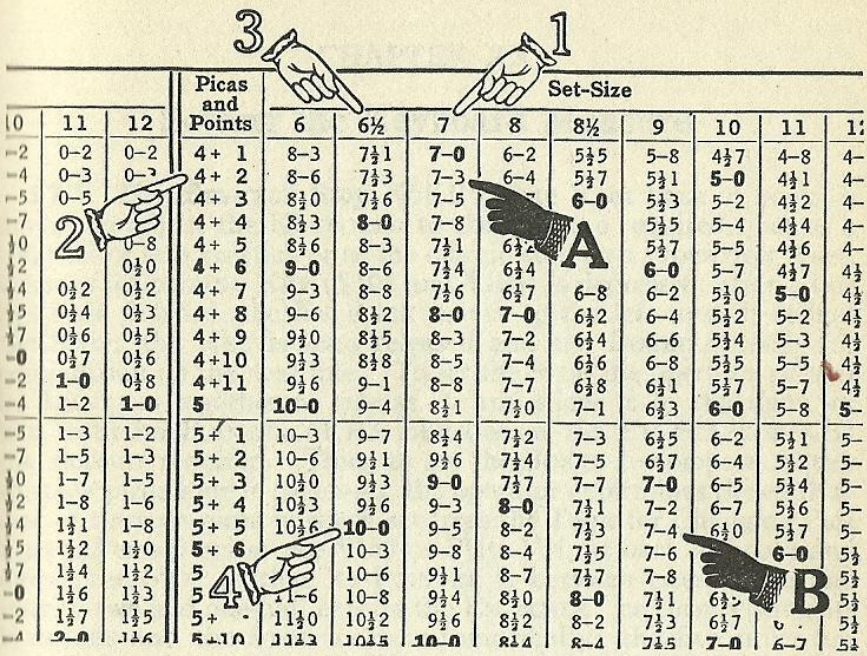
Picas and Points	Set-Size								
	6	6½	7	8	8½	9	10	11	12
+ 1	0-3	0-3	0-3	0-2	0-2	0-2	0-2	0-2	0-2
+ 2	0-6	0-6	0-5	0-4	0-4	0-4	0-4	0-3	0-3
+ 3	0½0	0-8	0-8	0-7	0-6	0-6	0-5	0-5	0-5
+ 4	0½3	0½2	0½1	0½0	0-8	0-8	0-7	0-7	0-6
+ 5	0½6	0½5	0¼4	0½2	0½2	0¼1	0½0	0-8	0-8
+ **6**	**1-0**	0½8	0½6	0¼4	0¼4	0½3	0½2	0½1	0¼0
+ 7	1-3	1-1	**1-0**	0½7	0½6	0½5	0¼4	0½2	0½2
+ 8	1-6	1-4	1-3	**1-0**	0½8	0½7	0½5	0¼4	0½3
+ 9	1½0	1-7	1-5	1-2	1-1	**1-0**	0½7	0½6	0½5
+10	1½3	1½1	1-8	1-4	1-3	1-2	**1-0**	0½7	0½6
+11	1½6	1½3	1½1	1-7	1-5	1-4	1-2	**1-0**	0½8
1	**2-0**	1½6	1¼4	1½0	1-7	1-6	1-4	1-2	**1-0**
1+ 1	2-3	**2-0**	1⅝6	1½2	1½1	1-8	1-5	1-3	1-2
1+ 2	2-6	2-3	**2-0**	1¼4	1⅓3	1½1	1-7	1-5	1-3
1+ 3	2½0	2-6	2-3	1½7	1⅓5	1⅓3	1½0	1-7	1-5
1+ 4	2⅔3	2-8	2-5	**2-0**	1½7	1⅓5	1½2	1-8	1-6
1+ 5	2½6	2⅔2	2-8	2-2	**2-0**	1½7	1¼4	1½1	1-8
1+ **6**	**3-0**	2⅔5	2⅔1	2-4	2-2	**2-0**	1⅔5	1⅔2	1½0
1+ 7	3-3	2⅔8	2¾4	2-7	2-4	2-2	1½7	1¾4	1½2
1+ 8	3-6	3-1	2⅔6	2½0	2-6	2-4	**2-0**	1⅙6	1⅔3
1+ 9	3½0	3-4	**3-0**	2⅔2	2-8	2-6	2-2	1½7	1⅓5
1+10	3⅔3	3-7	3-3	2¾4	2½2	2-8	2-4	**2-0**	1½6
1+11	3½6	3⅔1	3-5	2½7	2¾4	2⅔1	2-5	2-2	1⅔8
2	**4-0**	3⅔3	3-8	**3-0**	2⅔6	2⅔3	2-7	2-3	**2-0**
	6	6½	7	8	8½	9	10	11	12
2+ 1	4-3	3½6	3⅔1	3-2	2⅔8	2½5	2½0	2-5	2-2
2+ 2	4-6	**4-0**	3¾4	3-4	3-1	2½7	2¾2	2-7	2-3
2+ 3	4½0	4-3	3⅔6	3-7	3-3	**3-0**	2¾4	2-8	2-5
2+ 4	4⅔3	4-6	**4-0**	3½0	3-5	3-2	2⅔5	2⅔1	2-6
2+ 5	4⅔6	4-8	4-3	3½2	3-7	3-4	2⅔7	2½2	2-8
2+ **6**	**5-0**	4½2	4-5	3¼4	3⅓1	3-6	**3-0**	2¾4	2½0
2+ 7	5-3	4½5	4-8	3⅓7	3⅓3	3-8	3-2	2½6	2½2
2+ 8	5-6	4⅔8	4⅓1	**4-0**	3⅓5	3⅓1	3-4	2⅔7	2⅔3
2+ 9	5½0	5-1	4¾4	4-2	3⅔7	3⅓3	3-5	**3-0**	2⅔5
2+10	5⅔3	5-4	4½6	4-4	**4-0**	3⅓5	3-7	3-2	2½6
2+11	5⅔6	5-7	**5-0**	4-7	4-2	3⅔7	3½0	3-3	2⅔8
3	**6-0**	5⅓1	5-3	4½0	4-4	**4-0**	3½2	3-5	**3-0**
3+ 1	6-3	5⅓3	5-5	4½2	4-6	4-2	3¾4	3-7	3-2
3+ 2	6-6	5½6	5-8	4¾4	4-8	4-4	3⅔5	3-8	3-3
3+ 3	6½0	**6-0**	5⅓1	4⅔7	4½2	4-6	3⅔7	3⅓1	3-5
3+ 4	6⅔3	6-3	5¼4	**5-0**	4¾4	4-8	**4-0**	3½2	3-6
3+ 5	6⅔6	6-6	5½6	5-2	4⅔6	4⅓1	4-2	3¾4	3-8
3+ **6**	**7-0**	6-8	**6-0**	5-4	4⅔8	4⅓3	4-4	3⅔6	3½0
3+ 7	7-3	6½2	6-3	5-7	5-1	4½5	4-5	3⅔7	3½2
3+ 8	7-6	6⅔5	6-5	5½0	5-3	4⅔7	4-7	**4-0**	3⅔3
3+ 9	7½0	6⅔8	6-8	5½2	5-5	**5-0**	4½0	4-2	3⅔5
3+10	7⅔3	7-1	6⅓1	5¾4	5-7	5-2	4½2	4-3	3⅔6
3+11	7⅔6	7-4	6¾4	5⅔7	5⅓1	5-4	4¾4	4-5	3⅔8
4	**8-0**	7-7	6⅔6	**6-0**	5⅓3	5-6	4⅔5	4-7	**4-0**
Picas and Points	6	6½	7	8	8½	9	10	11	12
	Set-Size								

Picas and Points	Set-Size								
	6	6½	7	8	8½	9	10	11	12
4+ 1	8-3	7⅓1	**7-0**	6-2	5⅓5	5-8	4⅓7	4-8	4-2
4+ 2	8-6	7⅓3	7-3	6-4	5⅓7	5⅓1	**5-0**	4⅓1	4-3
4+ 3	8½0	7⅓6	7-5	6-7	**6-0**	5⅓3	5-2	4⅓2	4-5
4+ 4	8⅓3	**8-0**	7-8	6½0	6-2	5⅓5	5-4	4¾4	4-6
4+ 5	8⅓6	8-3	7⅓1	6½2	6-4	5⅓7	5-5	4⅓6	4-8
4+ **6**	**9-0**	8-6	7¼4	6¾4	6-6	**6-0**	5-7	4⅓7	4½0
4+ 7	9-3	8-8	7⅓6	6⅓7	6-8	6-2	5½0	**5-0**	4½2
4+ 8	9-6	8½2	**8-0**	**7-0**	6½2	6-4	5½2	5-2	4⅓3
4+ 9	9½0	8⅓5	8-3	7-2	6¾4	6-6	5¾4	5-3	4⅓5
4+10	9⅓3	8⅓8	8-5	7-4	6⅓6	6-8	5⅓5	5-5	4⅓6
4+11	9⅓6	9-1	8-8	7-7	6⅓8	6⅓1	5⅓7	5-7	4⅓8
5	**10-0**	9-4	8⅓1	7½0	7-1	6⅓3	**6-0**	5-8	**5-0**
5+ 1	10-3	9-7	8¾4	7½2	7-3	6⅓5	6-2	5⅓1	5-2
5+ 2	10-6	9⅓1	9⅓6	7¾4	7-5	6⅓7	6-4	5⅓2	5-3
5+ 3	10½0	9⅓3	**9-0**	7⅓7	7-7	**7-0**	6-5	5¾4	5-5
5+ 4	10⅓3	9⅓6	9-3	**8-0**	7⅓1	7-2	6-7	5⅓6	5-6
5+ 5	10⅓6	**10-0**	9-5	8-2	7⅓3	7-4	6½0	5⅓7	5-8
5+ **6**	**11-0**	10-3	9-8	8-4	7⅓5	7-6	6½2	**6-0**	5½0
5+ 7	11-3	10-6	9⅓1	8-7	7⅓7	7-8	6¼4	6-2	5½2
5+ 8	11-6	10-8	9¾4	8½0	**8-0**	7⅓1	6⅓5	6-3	5⅓3
5+ 9	11½0	10½2	9⅓6	8½2	8-2	7⅓3	6⅓7	6-5	5⅓5
5+10	11⅓3	10⅓5	**10-0**	8¾4	8-4	7⅓5	**7-0**	6-7	5⅓6
5+11	11⅓6	10⅓8	10-3	8⅓7	8-6	7⅓7	7-2	6-8	5⅓8
6	**12-0**	11-1	10-5	**9-0**	8-8	**8-0**	7-4	6⅓1	**6-0**
	6	6½	7	8	8½	9	10	11	12
6+ 1	12-3	11-4	10-8	9-2	8⅓2	8-2	7-5	6⅓2	6-2
6+ 2	12-6	11-7	10⅓1	9-4	8¾4	8-4	7-7	6¾4	6-3
6+ 3	12½0	11⅓1	10¾4	9-7	8⅓6	8-6	7⅓0	6⅓6	6-5
6+ 4	12⅓3	11⅓3	10⅓6	9½0	8⅓8	8-8	7½2	6⅓7	6-6
6+ 5	12⅓6	11⅓6	**11-0**	9½2	9-1	8⅓1	7¼4	**7-0**	6-8
6+ **6**	**13-0**	**12-0**	11-3	9¾4	9-3	8⅓3	7⅓5	7-2	6½0
6+ 7	13-3	12-3	11-5	9⅓7	9-5	8⅓5	7⅓7	7-3	6½2
6+ 8	13-6	12-6	11-8	**10-0**	9-7	8⅓7	**8-0**	7-5	6⅓3
6+ 9	13½0	12-8	11⅓1	10-2	9⅓1	**9-0**	8-2	7-7	6⅓5
6+10	13⅓3	12½2	11¾4	10-4	9⅓3	9-2	8-4	7-8	6⅓6
6+11	13⅓6	12⅓5	11⅓6	10-7	9⅓5	9-4	8-5	7⅓1	6⅓8
7	**14-0**	12⅓8	**12-0**	10½0	9⅓7	9-6	8-7	7½2	**7-0**
7+ 1	14-3	13-1	12-3	10½2	**10-0**	9-8	8½0	7¾4	7-2
7+ 2	14-6	13-4	12-5	10¾4	10-2	9⅓1	8½2	7⅓6	7-3
7+ 3	14⅓0	13-7	12-8	10⅓7	10-4	9⅓3	8¾4	7⅓7	7-5
7+ 4	14⅓3	13⅓1	12⅓1	**11-0**	10-6	9⅓5	8⅓5	**8-0**	7-6
7+ 5	14⅓6	13⅓3	12¾4	11-2	10-8	9⅓7	8⅓7	8-2	7-8
7+ **6**	**15-0**	13⅓6	12⅓6	11-4	10½2	**10-0**	**9-0**	8-3	7½0
7+ 7	15-3	**14-0**	**13-0**	11-7	10¾4	10-2	9-2	8-5	7½2
7+ 8	15-6	14-3	13-3	11½0	10⅓6	10-4	9-4	8-7	7⅓3
7+ 9	15½0	14-6	13-5	11½2	10⅓8	10-6	9-5	8-8	7⅓5
7+10	15⅓3	14-8	13-8	11¾4	11-1	10-8	9-7	8⅓1	7⅓6
7+11	15⅓6	14½2	13⅓1	11⅓7	11-3	10⅓1	9½0	8½2	7⅓8
8	**16-0**	14⅓5	13¼4	**12-0**	11-5	10⅓3	9½2	8¾4	**8-0**
Picas and Points	6	6½	7	8	8½	9	10	11	12
	Set-Size								

Picas and Points	Set-Size								
	6	6½	7	8	8½	9	10	11	12
8+ 1	16-3	14⅔8	13⅓6	12-2	11-7	10⅓5	9¾4	8⅓6	8-2
8+ 2	16-6	15-1	**14-0**	12-4	11⅔1	10⅓7	9⅔5	8⅔7	8-3
8+ 3	16½0	15-4	14-3	12-7	11⅔3	**11-0**	9⅔7	**9-0**	8-5
8+ 4	16⅓3	15-7	14-5	12⅓0	11⅓5	11-2	**10-0**	9-2	8-6
8+ 5	16⅓6	15⅓1	14-8	12⅓2	11⅓7	11-4	10-2	9-3	8-8
8+ **6**	**17-0**	15⅓3	14⅓1	12¼4	**12-0**	11-6	10-4	9-5	8⅓0
8+ 7	17-3	15⅓6	14¼4	12⅓7	12-2	11-8	10-5	9-7	8⅓2
8+ 8	17-6	**16-0**	14⅓6	**13-0**	12-4	11⅓1	10-7	9-8	8⅓3
8+ 9	17½0	16-3	**15-0**	13-2	12-6	11⅓3	10⅓0	9⅔1	8⅔5
8+10	17⅓3	16-6	15-3	13-4	12-8	11⅓5	10⅓2	9⅔2	8⅔6
8+11	17⅓6	16-8	15-5	13-7	12⅓2	11⅓7	10¼4	9¾4	8⅔8
9	**18-0**	16½2	15-8	13⅓0	12¾4	**12-0**	10⅔5	9⅔6	**9-0**
9+ 1	18-3	16⅔5	15⅓1	13⅓2	12⅓6	12-2	10⅓7	9⅓7	9-2
9+ 2	18-6	16⅔8	15⅓4	13¼4	12⅔8	12-4	**11-0**	**10-0**	9-3
9+ 3	18½0	17-1	15⅓6	13⅓7	13-1	12-6	11-2	10-2	9-5
9+ 4	18⅓3	17-4	**16-0**	**14-0**	13-3	12-8	11-4	10-3	9-6
9+ 5	18⅓6	17-7	16-3	14-2	13-5	12⅓1	11-5	10-5	9-8
9+ **6**	**19-0**	17⅓1	16-5	14-4	13-7	12⅓3	11-7	10-7	9⅓0
9+ 7	19-3	17⅓3	16-8	14-7	13⅓1	12⅓5	11⅓0	10-8	9⅓2
9+ 8	19-6	17⅓6	16⅓1	14⅓0	13⅓3	12⅓7	11⅓2	10⅓1	9⅓3
9+ 9	19½0	**18-0**	16¼4	14½2	13⅓5	**13-0**	11¼4	10⅓2	9⅓5
9+10	19⅓3	18-3	16⅓6	14¼4	13⅓7	13-2	11⅓5	10¼4	9⅓6
9+11	19⅓6	18-6	**17-0**	14⅓7	**14-0**	13-4	11⅓7	10⅓6	9⅓8
10	**20-0**	18-8	17-3	**15-0**	14-2	13-6	**12-0**	10⅓7	**10-0**
	6	6½	7	8	8½	9	10	11	12
10+ 1	20-3	18⅔2	17-5	15-2	14-4	13-8	12-2	**11-0**	10-2
10+ 2	20-6	18⅔5	17-8	15-4	14-6	13⅓1	12-4	11-2	10-3
10+ 3	20½0	18⅔8	17⅓1	15-7	14-8	13⅓3	12-5	11-3	10-5
10+ 4	20⅓3	19-1	17¼4	15⅓0	14½2	13⅓5	12-7	11-5	10-6
10+ 5	20⅓6	19-4	17⅓6	15½2	14¾4	13⅓7	12⅓0	11-7	10-8
10+ **6**	**21-0**	19-7	**18-0**	15¾4	14⅓6	**14-0**	12⅓2	11-8	10⅓0
10+ 7	21-3	19⅓1	18-3	15⅓7	14⅔8	14-2	12¾4	11⅓1	10⅓2
10+ 8	21-6	19⅓3	18-5	**16-0**	15-1	14-4	12⅔5	11⅓2	10⅓3
10+ 9	21½0	19⅓6	18-8	16-2	15-3	14-6	12⅓7	11¾4	10⅓5
10+10	21⅓3	**20-0**	18⅓1	16-4	15-5	14-8	**13-0**	11⅓6	10⅓6
10+11	21⅓6	20-3	18¼4	16-7	15-7	14⅓1	13-2	11⅓7	10⅓8
11	**22-0**	20-6	18⅓6	16⅓0	15⅓1	14⅓3	13-4	**12-0**	**11-0**
11+ 1	22-3	20-8	**19-0**	16½2	15⅓3	14⅓5	13-5	12-2	11-2
11+ 2	22-6	20⅓2	19-3	16¾4	15⅓5	14⅓7	13-7	12-3	11-3
11+ 3	22½0	20⅓5	19-5	16⅓7	15⅓7	**15-0**	13⅓0	12-5	11-5
11+ 4	22⅓3	20⅓8	19-8	**17-0**	**16-0**	15-2	13½2	12-7	11-6
11+ 5	22⅓6	21-1	19⅓1	17-2	16-2	15-4	13¾4	12-8	11-8
11+ **6**	**23-0**	21-4	19¾4	17-4	16-4	15-6	13⅓5	12⅓1	11⅓0
12	**24-0**	22-3	20⅓1	**18-0**	16⅓8	**16-0**	14-7	13-2	**12-0**
20	**40-0**	36⅔8	34-5	**30-0**	28-4	26⅔3	**24-0**	21⅓6	**20-0**
30	**60-0**	55-7	51-8	**45-0**	42-6	**40-0**	**36-0**	32½4	**30-0**
40	**80-0**	73⅓6	68⅓1	**60-0**	56-8	53-6	**48-0**	43½2	**40-0**
50	**100-0**	92-6	85¾4	**75-0**	70½2	66⅔3	**60-0**	54⅓1	**50-0**
60	**120-0**	110⅓5	102⅓6	**90-0**	84¾4	**80-0**	**72-0**	65-8	**60-0**
Picas and Points	6	6½	7	8	8½	9	10	11	12
	Set-Size								

How to use the

Table of Relative Measures



10	11	12	Picas and Points	6	6½	7	8	8½	9	10	11	12
–2	0–2	0–2	4+ 1	8–3	7½1	**7–0**	6–2	5½5	5–8	4½7	4–8	4–
–4	0–3	0–3	4+ 2	8–6	7½3	7–3	6–4	5½7	5½1	**5–0**	4½1	4–
–5	0–5		4+ 3	8½0	7½6	7–5		**6–0**	5½3	5–2	4½2	4–
–7			4+ 4	8½3	**8–0**	7–8			5½5	5–4	4½4	4–
½0		0–8	4+ 5	8½6	8–3	7½1	6½2		5½7	5–5	4½6	4–
½2		0½0	**4+ 6**	**9–0**	8–6	7½4	6½4		**6–0**	5–7	4½7	4½
½4	0½2	0½2	4+ 7	9–3	8–8	7½6	6½7	6–8	6–2	5½0	**5–0**	4½
½5	0½4	0½3	4+ 8	9–6	8½2	**8–0**	**7–0**	6½2	6–4	5½2	5–2	4½
½7	0½6	0½5	4+ 9	9½0	8½5	8–3	7–2	6½4	6–6	5½4	5–3	4½
–0	0½7	0½6	4+10	9½3	8½8	8–5	7–4	6½6	6–8	5½5	5–5	4½
–2	**1–0**	0½8	4+11	9½6	9–1	8–8	7–7	6½8	6½1	5½7	5–7	4½
–4	1–2	**1–0**	**5**	**10–0**	9–4	8½1	7½0	7–1	6½3	**6–0**	5–8	**5–**
–5	1–3	1–2	5+ 1	10–3	9–7	8½4	7½2	7–3	6½5	6–2	5½1	5–
–7	1–5	1–3	5+ 2	10–6	9½1	9½6	7½4	7–5	6½7	6–4	5½2	5–
½0	1–7	1–5	5+ 3	10½0	9½3	**9–0**	7½7	7–7	**7–0**	6–5	5½4	5–
½2	1–8	1–6	5+ 4	10½3	9½6	9–3	**8–0**	7½1	7–2	6–7	5½6	5–
½4	1½1	1–8	5+ 5	10½6	**10–0**	9–5	8–2	7½3	7–4	6½0	5½7	5–
½5	1½2	1½0	**5+ 6**	**5**	10–3	9–8	8–4	7½5	7–6		**6–0**	5½
½7	1½4	1½2	5	5	10–6	9½1	8–7	7½7	7–8			5½
–0	1½6	1½3	5	5	10–8	9½4	**8–0**	7½1	6½			5½
–2	1½7	1½5	5+	11½0	10½2	9½6	8½2	8–2	7½3	6½7		5½
–4	2–0	1½6	5+10	11½3	10½5	**10–0**	8½4	8–4	7½5	**7–0**	6–7	5½

If the columns are even picas and points, the conversions to ems and units of any given set may be obtained as follows:

Example 1. A 6-point 7-set head is to cover two 2-pica columns and a 2-point rule between them or a total measure for the 7-set head of 4 picas and 2 points. What is the equivalent in 7-set ems of 4 picas and 2 points?

1 Find at the top of the table the column headed 7-set and look down this until you come to

2 The line of the table for 4 picas and 2 points (4+ 2) and at this point of the table read

A 7 ems and 3 units (7–3) of 7-set, the equivalent of 4 picas and 2 points.

If the measure is given in ems of one set to be converted to ems and units of another proceed as follows:

Example 2. Find the equivalent in ems and units of 9-set of 10 ems of 6½-set.

3 Find the column at the top of the table headed 6½-set and look down this column until you come to

4 10–0, the number of ems of 6½-set whose equivalent is desired. Then follow across this line of the table to the column headed 9-set where you read

B 7 ems 4 units (7–4) of 9-set, the equivalent of 10 ems of 6½-set.

CHAPTER XX

Setting the Keyboard Measure

177 The Em-rack Stop X6KB (Plate V, at back of book) is moved to adjust the KEYBOARD to the measure required, just as a compositor sets his stick or as the margin stop on a typewriter is set. When a RESTORING KEY (¶104 and ¶105) is depressed, after a line has been finished, the EM RACK moves to the left until it strikes the STOP; the KEY is then released and the BOARD is ready for composition on the next line. To set the STOP the operator presses its HANDLES together to release it, and slides it to the right, or left, until its POINTER 6KB3 indicates on the EM SCALE a9KB1 the measure required. Thus, to set the BOARD to compose matter thirteen picas wide in seven-set, the operator determines the equivalent of thirteen picas in seven-set from the Table for Changing Pica Ems (22 ems 5 units; see ¶159 or Plate VII, at back of book) and moves the STOP so that its POINTER is between twenty-two and twenty-two and one-half ems on the EM SCALE; he then releases its HANDLES and the STOP locks automatically; the five units are provided for by moving the EM-RACK-STOP ADJUSTING SCREW (see next paragraph). Figs. 146 and 147, Plate X, at back of book, show the correct method of setting the EM-RACK STOP and adjusting the STOP ADJUSTING SCREW.

178 The Em-rack-stop Adjusting Screw X8KB (Plate V) is used, after the EM-RACK STOP has been set for the number of ems in the measure, to position the STOP accurately so that the BOARD indicates the correct number of units. Having set the STOP for twenty-two ems (¶177), to set it for five units, hold down any RESTORING KEY (to reverse the BOARD) and turn the ADJUSTING SCREW to the right or left, as required (Fig. 147, Plate X), until a graduation on the UNIT WHEEL coincides with the figure five on the UNIT INDICATOR (¶96); of course, *the Screw must not be turned enough to move the Em-rack Pointer from between twenty-two and twenty-two and one-half on the Em Scale.* In making this adjustment set the STOP so that the teeth of the UNIT-WHEEL PAWL mesh squarely with the teeth of the WHEEL, without rubbing on either side, as the PAWL seats in the WHEEL.

179 To set the measure for Typewriter Faces, the Table for Changing Pica Ems to Ems of Any Set (¶159) cannot be used, because in these faces all characters in the font, and all spaces, are of the same width, and, as justifying spaces are not used with these uniform body faces, the measure must be divisible, without any remainder, by the width of one character. In composing these uniform body faces the KEYBOARD is adjusted: *First,* so that the SPACE BARS produce fixed spaces instead of justifying spaces (¶86).

Second, so that all character KEYS and the SPACE BARS produce characters nine units (one-half em) wide (use TYPEWRITER STOP-BAR CASE, ¶274). After this adjustment is made, setting the EM-RACK STOP is exactly the same as setting the margin stop on a typewriter, for each half-em on the SCALE represents a character, and the STOP is set to the left as many half-ems as there are characters in the line; of course, the STOP ADJUSTING SCREW must be set so that a graduation on the UNIT WHEEL coincides with zero on the UNIT INDICATOR. Since no justifying spaces are used with these faces, no JUSTIFYING SCALE is required; end all lines with the EM-RACK POINTER at zero, using spaces if necessary, and at the end of each line strike any JUSTIFYING KEY in the lower row to restore and to "trip the galley" (¶150). The CASTING MACHINE is adjusted to cast all characters of the same width, the same as in casting type fourteen-point and larger for the cases (Chapter XL, page 157); the DISPLAY-TYPE NORMAL WEDGE (without the PACKING PIECE 60S) is positioned all the way to the right, and the body-size is obtained as is the quad size on composition.

180 The width of typewriter characters, designed to match the faces created by the makers of these machines, is made both to points and to tenths of an inch: For example, ten-point No. 70L has characters six points wide (.0830″), while the twelve-point of this 70L series has characters one-tenth of an inch wide (.1000″), as have also the eleven-point No. 17L and twelve-point No. 170L typewriter faces. Thus, the measure for ten-point No. 70L (characters 6 points wide) may be made any number of picas, or half-picas, desired, but *in setting typewriter faces whose characters are one-tenth of an inch wide the measure must be an even multiple of three picas* (for example, 21, 24, or 27 picas), because, since ten of these letters are one inch wide (10 letters = 6 picas), three is the smallest number of picas that will contain a whole number of these letters (5 letters = 3 picas).

181 To set the measure for Mail-list Faces: Like typewriter faces, these faces are made on uniform width body. They are especially useful for mail-lists, kept standing, because of the speed with which changes may be made by hand; since all characters and spaces are the same width the lines do not have to be justified. The only difference between mail-list and typewriter faces is that mail-list faces are always made to points, never to tenths of an inch, and the width of each character is one-half the point-size of the face; for example, eight-point 74L has characters four points wide (8 points = .1107″; 4 points = .0553″). Since three of these eight-point 74L characters equal one pica (4 points × 3 = 12 points = 1 pica) the measure for this face must vary by one-third of a pica (7 picas, 10⅓ picas, 11⅔ picas, etc.). For adjustments required in setting mail-list faces, see ¶179.

CHAPTER XXI

Allowance for Cuts, Initials, and Rules

182 Allowance for cuts and initials to be inserted after the type has been cast is made by the KEYBOARD operator, who throws in quads and spaces to equal the width of the cut or initial to be inserted, so that the hand compositor has only to lift out this blank material and put in its place the insert without in any way affecting the justification. The KEYBOARD operator must, of course, allow for this insertion in ems and units of the set of the SCALE in use on the KEYBOARD. To do this he measures the width of the cut with a compositor's scale and uses the table for Changing Pica Ems (Plate VII, at back of book) to convert this amount in picas into ems and units of the set required.*

183 Scales for measuring inserts are helpful in composition where much matter is inserted and where this is of different set from the matter being composed; as, for example, Greek words used in English text. Suppose the inserted matter is eleven-set and the composition is in ten-set: To make a scale for transforming ems of eleven-set into ems of ten-set, place the vertical rule MATRIX in the eighteen-unit row and cast a line of these ten-set verticals on the eighteen-unit body; print this on cardboard; then, with a pen, mark the second vertical from the left zero and, counting from this, number every fifth vertical on this cardboard scale; thus, 5, 10, 15, etc.; and then divide the space between the two left verticals into three equal parts. Set the inserted matter (11-set) first and measure it with this scale to get its width in ems and units of ten-set; thus, if the insert be between seven and eight ems of ten-set in length, place the seventh graduation from zero at its right end, then the number of units the word is longer than seven ems may be estimated by noting the amount the left end of the word projects beyond the zero of the scale. A scale like the above, with the subdivisions of the em at the left of the zero, is much easier to make and to use than a scale having all the ems subdivided. See also auxiliary scales, ¶171.

184 The Table of Allowance for Rule (Plate VIII, at back of book) must be used in connection with the table for Changing Pica Ems (Plate VII) if the insert is not set to even picas. The "Pica Table" gives the equivalent, in ems and units of any set, of any number of picas (varying by half-picas) from one-half to sixty picas, while the "Rule Table" gives the equivalent, in units and decimals of a unit, of points and half-points. EXAMPLE: Find the allowance in eight-and-one-half-set for a cut twelve picas and three

* For offices using our system of "Copyfitting" this allowance for cuts, initials, and inserts is, of course, predetermined for the KEYBOARD operator (see our book, "Copyfitting").

points wide. The "Pica Table" shows that in eight-and-one-half-set the equivalent of twelve picas is sixteen and one-half ems eight units, while the "Rule Table" gives the equivalent of three points (in 8½-set) as six units (see note below):

Three points	= 0	ems	6 units
Twelve picas	=16½	ems	8 units
Allowance (in 8½-set) for a cut twelve picas three points wide	=16½	ems	14 units
	=17	ems	5 units

Therefore, if the cut be twelve picas deep and the operator be setting matter on nine-point body, throw in seventeen ems and five units of blank material while setting the sixteen lines that come opposite the cut. NOTE: When obtaining the equivalent of any given number of points from the "Rule Table," reject the decimal if it be less than one-half (.5); if it be one-half or more, call it a whole unit.

185 Allowance for Rule is made by two methods: *First*, for a small table, less than a page in length, the operator does not reduce the KEYBOARD measure by the thickness of the rules to be added after the type is cast, but, instead, throws in characters equal in width to the total thickness of the rules to be inserted, just as he makes allowance for a cut (¶184); it is more convenient in making up tables to have the characters allowed for rules *at the ends of the lines*. *Second*, for pages of tables the operator deducts from the total measure, in ems and units of the set, the equivalent of the rules to be inserted, also expressed in units of the set, and makes this difference the KEYBOARD measure, thus saving himself from striking the KEYS to represent the rules and the CASTING MACHINE from casting these spaces and characters. For tables where some lines contain more rules than others (box heads, etc.), a combination of both these methods is used. NOTE: Since no allowance for squeeze (¶160) is made in ruled tables made up of a number of small columns that do not average more than five picas in width, the width of the extra characters inserted instead of rule must equal the width of the rule *plus* the allowance made for squeeze in the straight matter accompanying the table (page 28, Part II).

CHAPTER XXII

Extra Characters*

186 There is no limit to the number of characters that may be used in the same work: The MATRIX CASE carries 225 characters and spaces, but infrequently used characters not carried in the CASE are never omitted from the job. The MATRIX CASE is arranged to carry the MATRICES for the characters most frequently used, and for those not carried in the CASE the KEYBOARD operator strikes a KEY for a character *of the same width* as the required character. When the matter is corrected by a hand compositor at the case, the type cast in place of the required character is exchanged for it *without affecting the justification*. With the MONOTYPE the insertion of the extra characters never retards the machine, and the cost of this work is the time of a case hand using the type made by the MONOTYPE, not the wages of a machine operator *plus* the wages of a composing machine. There is no distribution whatever with the MONOTYPE, for the extra characters are melted with the rest of the type when the job is finished.†

187 Extra Keys and Special Matrix Case Arrangements: Plate IX, at back of book, shows MATRIX CASE Arrangement C (the same as Fig. 23, page 47), Roman caps, small caps, and lower case combined with Italic caps and lower case, and also a diagram of the arrangement of KEYS when setting this combination. Note that, while the MATRIX CASE contains 225 MATRICES, the KEYBOARD has 242 KEYS, exclusive of the thirty JUSTIFYING KEYS (¶131), the SCALE KEY (footnote to ¶122), the RESTORING KEY (¶104), and the SPACE BARS (¶86). These seventeen extra KEYS (242 KEYS − 225 MATRICES = 17 extra KEYS) are for the convenience of the KEYBOARD operator: *First*, characters used frequently with both Roman and Italic are carried on both the right and left KEYBANKS; for example, period, comma, hyphen, nine- and eighteen-unit quads and leaders; *Second*, to preserve a convenient grouping of the KEYS when modifications of the MATRIX CASE Arrangement are required; for example, if the eight-unit space were used more frequently than the double dagger (‡) the MATRIX for this would

* This chapter explains, not too technically, the manner in which minor changes are made in MATRIX CASE Arrangements. It is not desirable to consider complete changes (various combinations of Roman and Boldface, Chapters XXXV, page 119, and XXXVI, page 130) until the details of the KEYBOARD mechanism have been explained in the chapter on KEYBANKS, KEYBARS, and STOPBARS, page 95.

† The advantages of the MONOTYPE on work that requires extra characters can best be appreciated by considering the slug-casting composing machine. With any machine that casts the line in a bar, or slug, the operator must insert, *by hand*, in the line being set, the MATRICES for all extra characters not carried in the machine and, after the line is cast, these extra MATRICES are delivered to the "pi-box," where they must be sorted *by hand*. The expense and delays of such a method of using extra characters are obvious; of course, it is cheaper and quicker to set type by hand than it is to set MATRICES by hand, but perhaps the greatest difference between setting type and setting MATRICES by hand lies in the cost of the stick used by the man setting type and the "stick" (the composing machine itself) used by the man setting MATRICES.

be replaced in the CASE by a space MATRIX and the operator would cap (¶262) KEY No. 26, beside the other fixed size spaces (¶192) to indicate an eight-unit space. Then, if the ‡ were required, the operator would strike its KEY (No. 6) and, since this MATRIX has been replaced with a space, a space would be cast, which the hand corrector would exchange for the ‡ *without affecting the justification.* In the same way, if the matter required the fractions 1/8, 3/8, 5/8, and 7/8, the operator would cap KEYS Nos. 13, 14, 17, and 18 with these fractions and notify the CASTER operator to make the corresponding change of MATRICES in the MATRIX CASE (¶334). See "KEYBANKS," ¶253.

188 Signal characters may be used profitably on work containing a large number of special characters; for example, dictionaries, with many diacritical letters. The MATRICES for these signals produce rectangles which, being type-high, show in the first proof like turned letters. KEYS for five-, six-, seven-, eight-, and nine-unit signals are provided for at the KEYBOARD by capping (¶262); with these five signals the operator can indicate any width extra character desired; for example, for an eleven-unit character he strikes the five- and six-unit signal KEYS. After the matter is cast, and before the first proof is read, a hand compositor removes the signals and inserts in their place the special characters indicated in the copy; the prominence of the signals insures that no changes will be overlooked. A proof of the matter complete with all characters inserted is then taken for the proof-room. When the number of extra characters does not warrant the use of signals, the first proof goes directly to the proof-room, where the corrections and characters to be inserted are marked, and then to the corrector, who inserts the extra characters while making corrections.

189 Duplicate characters on different size bodies: In some tabular matter the same letters are used in the reading matter of the stub and also in the figure columns for symbols; this frequently occurs in insurance work, where letters are used with figures to indicate different forms of building construction. In such cases it greatly simplifies the tabular composition to carry in the MATRIX CASE extra MATRICES for these letters used as symbols. These extra MATRICES are carried in the proper unit-rows to make the characters cast from them justify with the figures; for example, in the nine- and eighteen-unit rows. Standard MATRICES may be used for this purpose; with these the shoulder cast on the type, by carrying the MATRIX in a wider row than that for which its character is designed, comes to the left of the character in print. In some special work these symbol letters must center on their larger bodies, and in such cases the saving in justification, by reason of having them on uniform bodies with the figures, will quickly pay for having special MATRICES made to order.

CHAPTER XXIII

Justification with Fixed Size Spaces

190 *"Monotype type is self-spacing; this explains the almost incredible ease with which the Monotype operator composes the most difficult tabular matter. The set-sizes of all characters in the same font bear a fixed relation to one another. For example,.....the width of one cap M equals three j's, three f's, two a's, two o's, two g's, two x's."* * (¶43.) *"The unit registering mechanism.....measures the width of each character as struck (in units of the set of its face) and adds this number of units to the sum of the units of the characters preceding it in the line, in order that the counting mechanism may indicate the amount required to complete the line."* (¶83.) *"The number of ems and units required to complete the line, or any section of it, are shown by the Em Scale and Unit Indicator: Thus, if the Em-rack Pointer be between three and three and one-half ems and a graduation of the Wheel coincides with the figure 8 of the Unit Indicator, we know that three ems and eight units are required to complete the line. If now we strike the eight-unit space once and the em-quad three times, the Em Rack will move to the right until its Pointer coincides exactly with the zero of the Em Scale, at which point the right tooth of the Pawl is, of course, seated in a graduated space of the Wheel. The Board is now at zero, the line is complete and no expansion of the justifying spaces is required to justify it, since there is no remainder to be spread over these spaces."* (¶100.) Justification with fixed size spaces almost explains itself from the above quotations, but, first, let us sum up the points already covered by defining justifying and fixed spaces.

191 A justifying space is a space that is cast larger than the size it is counted, in order to distribute equally over the justifying spaces in the line (or section of a line) the amount the line (or section of a line) is short of the required measure after the last character in the line (or section of a line) has been struck. Justifying spaces are produced by the SPACE BARS (¶86); the BOARD counts a justifying space as four units, but the size these spaces are cast is determined by the JUSTIFYING KEYS struck at the end of the line (or section of the line). Justifying spaces are cast with the NORMAL WEDGE in its second position (6-unit), when moving from right to left, backed up by the SPACE TRANSFER WEDGE, which is supported by the JUSTIFYING WEDGES set to make the justifying spaces the correct width to justify the line (or section of a line). After twenty justifying spaces have been struck for the same line, the JUSTIFYING-SPACE PUNCH is cut out automatically and does not perforate the paper again for this line; thus, when the SPACE BAR (either BAR) is

* Roman characters are here referred to, as will be noted by turning back to Fig. 17, page 21, which accompanies ¶43, from which this passage is quoted.

struck for the twenty-first time in the same line a six-unit fixed space instead of a justifying space is produced:* More than twenty justifying spaces cannot be used in the same line (or section of a line) because the JUSTIFYING SCALES are calculated for a maximum of twenty spaces; for the same reason the maximum number of units shortage that can be distributed over the justifying spaces in a line (or section of a line) is seventy-one. With "constant justification" (¶121) the justifying space becomes the equivalent of a fixed space, counted by the KEYBOARD and cast by the CASTING MACHINE four units wide.

192 A fixed space is a space that is cast the same width (in units of the set in use) that it is counted by the KEYBOARD. EXAMPLES: five-unit space, nut-quad (9 units), em-quad (18 units), four-unit space which is produced by the two SPACE BARS when constant justification is used (¶191). In short, fixed spaces are counted and cast exactly the same as characters; that is, with the NORMAL WEDGE in the required position, supported by the TYPE TRANSFER WEDGE, which, in turn, is supported by the fixed abutment.†

193 Justification with fixed spaces is the method of making a line (or section of a line) the length required, by determining from the reading of the EM SCALE and UNIT INDICATOR the number of

Bristol, Pa.
Trenton, N. J.
Dover, Del.
York, Pa.

FIGURE 27
Justification with fixed spaces.

ems and units required to complete the line (or section of a line) and then using the fixed spaces thus determined to justify the line (or section of a line). EXAMPLES:

194 In Fig. 27 the matter between the vertical rules (measure, 5 picas) is set with fixed spaces exclusively. The face is eight-and-one-half-set and, in this set, five picas (the measure) equals seven ems and one unit; see table for Changing Pica Ems, Plate VII, at back of book. Between the name of the town ("York,") and the state abbreviation ("Pa.") a six-unit space is used; the amount of space taken up by "York, Pa.", is as follows:

Y	14 units wide
o	9 units wide
r	7 units wide
k	10 units wide
Comma	5 units wide
Space	6 units wide
P	12 units wide
a	9 units wide
Period	5 units wide
Total	77 units, or 4 ems 5 units.

* If the Wide Spacing Attachment is used, the NORMAL WEDGE is in the nine-unit position when casting justifying spaces, but the principle is the same as described above; after twenty justifying spaces have been struck, the SPACE BARS produce fixed nine-unit spaces with the Wide Spacing Attachment.

† The four-unit space is cast with the NORMAL WEDGE supported by the SPACE TRANSFER WEDGE, as explained in ¶191.

The measure for which the BOARD is set is seven ems one unit; therefore, when the operator strikes the period after "Pa." the EM SCALE and UNIT INDICATOR will show that two and one-half ems five units are required to fill the measure:

Total measure	=7	ems 1 unit
Amount set	=4	ems 5 units
Amount required to complete line	=2	ems 14 units
	=2½	ems 5 units

Therefore, after striking the period of "Pa." the operator strikes the five-unit space to seat the right tooth of the PAWL in a graduated space of the UNIT WHEEL (¶96) and, this done, a nut-quad brings the KEYBOARD to even ems, and two em-quads complete the line. He then strikes any KEY in the lower row of JUSTIFYING KEYS to restore the BOARD ready for the next line to be set and to "trip the galley" (¶150) at the CASTING MACHINE for the line just finished.

Japan	France	Russia
Canada	Wales	Egypt
Italy	Brazil	Peru
China	India	Spain

FIGURE 28
Justification with fixed spaces.

195 Fig. 28 shows a more complicated use of fixed spaces; the matter between the vertical rules (measure 9 picas) is set with fixed spaces exclusively. In the set used (8½) nine picas equal twelve and one-half ems four units; see table for Changing Pica Ems, Plate VII, at back of book. The total measure (12½ ems 4 units) is divided as follows: First section, "Japan, Canada," etc., four and one-half ems four units; second section, four ems; third section, four ems. In matter of this character it is desirable, if possible, to dispose of the half-em and odd units in the first section to keep the other sections to even ems. Having set the KEYBOARD measure (12½ ems 4 units), the operator marks with a pencil (¶99) on the EM SCALE at eight and four ems to show where the second and third sections of the line begin. As before, take the last line of Fig. 28, "China India Spain", for illustration; by counting the unit value of the letters composing these words their length will be found to be as follows:

China	=47 units;	that is, 2½ ems 2 units
India	=42 units;	that is, 2 ems 6 units
Spain	=44 units;	that is, 2 ems 8 units

The total measure is twelve and one-half ems four units, and consequently after the operator strikes the last letter of "China" the KEYBOARD indicates ten ems two units:

Total measure for which BOARD is set	=12½	ems 4 units
Ems and units in word "China"	=	2½ ems 2 units
Amount required to complete the line	=10	ems 2 units

As the next section of the line begins at "even ems" (8 ems), the operator first disposes of the two odd units by striking the ten-unit space twice, which adds one em and two units to the line:

$$10 \times 2 = 20 = 18 + 2 = 1 \text{ em } 2 \text{ units.}$$

The BOARD now indicates even ems.

Total measure for which BOARD is set	=12½ ems 4 units
"China"	=2½ ems 2 units
Two ten-unit spaces	=1 em 2 units = 3½ ems 4 units
Reading of BOARD after second ten-unit space is struck	= 9 ems 0 units

One em-quad now brings the BOARD to eight ems, where the operator begins the second section by setting the word "India"; as stated above, this word is two ems six units long, so that a twelve-unit space (12=9+3) after the letter "a" makes exactly three ems for the word and the space after it and brings the BOARD to even ems; one em-quad now brings the EM-RACK POINTER to four ems, the point marked on the EM SCALE where the third section begins. This section begins with the word "Spain", which contains two ems eight units. After its last letter "n" has been struck, the BOARD indicates that one and one-half ems one unit are required to bring the BOARD to zero (4 ems−2 ems 8 units=1½ ems 1 unit) and complete the line; this is done by striking one ten-unit space to bring the BOARD to even ems, one em-quad to bring the EM-RACK POINTER to zero, and any JUSTIFYING KEY in the lower row to restore the BOARD and "trip the galley" when the line is cast.

196 The advantages of justifying with fixed spaces are: *First*, no JUSTIFYING SCALE is required and consequently the operator saves reading the SCALE. *Second*, only one JUSTIFYING KEY stroke (to restore and trip galley) is required for each line; as each key-stroke means a revolution of the CASTER, saving strokes means both increased KEYBOARD and CASTER output. In short, in most tabular matter it is quicker and easier to read the UNIT INDICATOR and EM SCALE than to use the JUSTIFYING SCALE. NOTE: In justifying with fixed spaces the operator, of course, takes advantage of all the spaces carried in the MATRIX CASE; for example, Arrangement C (Fig. 23, page 47) carries five-, six-, nine-, ten-, eleven-, and eighteen-unit spaces. Thus, if the UNIT INDICATOR shows that three units are required to bring the EM-RACK POINTER to an even em, or half-em, strike the six-unit KEY twice, which adds three units and one-half em to the line; the UNIT INDICATOR will then show zero and the EM-RACK POINTER will indicate an em or half-em (6×2=12=3+9).

CHAPTER XXIV

Justification with Leaders

197 Justification with leaders is exactly the same as justification with fixed spaces (¶193), excepting that with spaces any size space (5-unit, 6-unit, etc.) may be used to bring the UNIT WHEEL to the required point, whereas in justifying with leaders but two odd size leaders (8-unit or 10-unit) are used in order that the appearance of uniform spacing between the leaders may always be preserved. Increasing or decreasing the space between the first four dots (or dashes) of a line of leaders makes so little difference that it is scarcely possible to detect this on the printed page.

198 The eight-unit leader is a leader of exactly the same face as the nine-unit leader with which it is used, but cast on a body eight units wide. It is not a nine-unit leader MATRIX carried in the eight-unit row, but is designed to bring the dot central on an eight-unit body. Do not attempt to use a nine-unit leader for this purpose, as the character will overhang the type-body if run in the eight-unit row. The eight-unit leader is used to bring the UNIT WHEEL to "even ems" (make the right tooth of the UNIT-WHEEL PAWL seat in a graduated space of the WHEEL, so that another graduation coincides with the zero of the UNIT INDICATOR; see ¶96) as follows: If the INDICATOR shows eight, that is, if the WHEEL must revolve eight spaces for its PAWL to seat in a graduated space, strike the eight-unit leader KEY *once*, and, when this KEY is released, the eight tooth of the PAWL will be seated in a graduated space. Strike the eight-unit leader *twice*, if the INDICATOR shows seven; the WHEEL will revolve sixteen spaces, adding to the line one-half em (9 units) and the seven units required to bring the INDICATOR to zero (8×2=16=9+7=½ em 7 units). If six units must be added to bring the BOARD to "even ems," use the eight-unit leader *three* times (8×3=24=18+6), adding one em and the six units required. To add five units strike the eight-unit leader *four* times (8×4=32=27+5=½ ems 5 units). *If five, or more, strokes of the eight-unit Key be required to seat the right tooth of the Pawl in a graduated space of the Wheel, use the ten-unit leader instead of the eight.*

199 The ten-unit leader is a leader of the same face as the nine-unit leader, but designed to bring the dot central on a ten-unit body. Like the eight-unit leader, the ten-unit leader is used to bring the UNIT WHEEL to "even ems." If the INDICATOR shows one, strike the ten-unit leader KEY *once*, thus adding the one unit required and one-half em to the line (10=9+1=½ em 1 unit). To gain two units, strike the ten-unit leader *twice*, adding one em and two units to the line. To gain three units strike the ten-unit leader *three* times, adding one and one-half ems and the three units required

(10×3=30=27+3=1½ ems 3 units). In the same way use the ten-unit leader to gain four units, but *for five, or more, units use the eight-unit leader as described in the preceding paragraph.*

200 Rule: *To gain any number of units from one to four inclusive strike the ten-unit leader as many times as the number shown by the Unit Indicator, and, after the last stroke of the ten-unit leader Key, the right tooth of the Unit-wheel Pawl will be seated in a graduated space of the Wheel. To gain any number of units from five to eight inclusive subtract the reading of the Unit Indicator from nine, and this difference is the number of times the eight-unit leader Key must be struck to make the right tooth of the Pawl seat in a graduated space.*

201 In some very narrow measure matter, such as baseball scores in newspapers, there is not room before the figure columns to strike the ten-unit leader four times to gain four units, and in work of this character additional leaders may be used to gain units; these special leaders are five-unit leader (or period), six-, and seven-unit leaders. *Do not use leaders smaller than eight units* if it be possible to avoid them, for these thin leaders are objectionable for several reasons: *First*, a six-unit leader beside a nine-unit leader is unsatisfactory in quality work; *Second*, special leaders take up room unnecessarily in the MATRIX CASE; *Third*, they are expensive, as MATRICES for these smaller size leaders are not carried in stock and must be made to order.

CHAPTER XXV

Double Justification

202 *"All that the compositor can do with this Keyboard; he can measure, or he can divide the full measure, or he can divide the full umns (the sum of the measures of the full measure) and make a separate and distinct justification for each column. All these lines were composed and cast the full measure, just as this specimen reads. They were not set in separate columns and then combined, but at the end of each section the operator justified that section before beginning to set the next section of the same line. The justification is absolutely accurate for each column and full measure."* (¶7.)

203 Double Justification, of which the above paragraph is a specimen, is the method of independently justifying with justifying spaces (¶191) different sections of the same line, in order that each section may be justified to its measure and the sum of these sections may equal the total measure; thus, when the last character in the line has been cast, the CASTING MACHINE delivers the complete line on the galley exactly as though it were a line of ordinary straight matter containing justifying spaces of one size only. At the end of each section of the line the operator reads the JUSTIFYING SCALE and justifies that section by striking the JUSTIFYING KEYS indicated by the SCALE, in order to distribute the amount the section is short of its measure over the justifying spaces it contains. The justifying spaces in the different sections of the same line have no relation to each other and may vary as much in size as the justifying spaces in different lines of straight matter. NOTE: While it is possible in tabular matter to justify different sections of the same line independently by justification with fixed spaces (¶193), or by justification with leaders (¶197), such work is not considered as double justified matter because the lines do not contain justifying spaces of two or more sizes.

204 Of course ¶202 is a "stunt" that would not be used in commercial work in just the manner shown in that paragraph; it emphasizes, however, an exclusive MONOTYPE advantage that is of the greatest possible value in both straight matter and tabular work. The principles it illustrates are used constantly in all MONOTYPE offices on all kinds of work; for example, probably the simplest form of double justification in straight matter is to center a cut in a page and have the lines carry across the cut; while a more complex form of straight matter requiring double justification is the well-known mail order catalog with its many various size cuts placed irregularly on the page, frequently requiring several justifications in a line when

the page is composed and cast at one operation; the many forms of tabular work, too numerous to mention, which would be quite impossible without double justification are doubtless familiar to the reader.

205 Double justification is the application of the principles of justification with fixed size spaces (determining the shortage from the EM SCALE and UNIT INDICATOR) to the use of the JUSTIFYING SCALE. While it is true that the JUSTIFYING SCALE does not automatically revolve and indicate the justification (¶122) unless the EM-RACK POINTER be within four ems of zero on the EM SCALE, it is equally true that the JUSTIFYING SCALE may be revolved by hand at any time, regardless of the position of the EM RACK. Thus, to determine the JUSTIFYING KEYS to be struck to justify a section of a line, at a point where the SCALE does not automatically revolve, ascertain the shortage of this section from the reading of the EM SCALE and UNIT INDICATOR, exactly as though the section were to be justified with fixed spaces. *Knowing the number of units the section is short of its measure, revolve the Justifying Scale, by hand, until the vertical column of the Scale of this number* (the SCALE columns are numbered at the bottom, indicating the number of units shortage for which that column is calculated; see Plate VI, at back of book) *is presented to the Scale Pointer; then read the Justifying Keys to be struck, exactly as though the Scale had automatically rotated, and strike the two Keys indicated.*

206 Before beginning composition on the next section of the line, set the EM-RACK POINTER and UNIT WHEEL at the point where the next section of the line begins. To do this, grasp the rim of the UNIT WHEEL firmly with the left hand, and with the right hand press down the right end of the RESTORING-ROCKER-ARM-LINK LEVER 24KB4 (Plate V, at back of book). This raises the UNIT-WHEEL PAWL out from mesh with the WHEEL. Now rotate the WHEEL with the left hand until the POINTER is at the proper point on its SCALE and the right tooth of the UNIT-WHEEL PAWL will seat in the required space in the UNIT WHEEL when the LEVER 24KB4 is released. This done, release the LEVER 24KB4 with the right hand, and the PAWL seats, locking the WHEEL, which is then released by the left hand. The BOARD is now set at the correct point at which to begin composition for the next section of the line. CAUTION: Be sure to hold the UNIT WHEEL tightly before the LEVER 24KB4 is depressed by the right hand and until after this LEVER is released, for if the UNIT WHEEL be allowed to slip, its teeth may cut the fingers; also push the LEVER 24KB4 down as far as it will go, so that the JUSTIFYING-SCALE POINTER (¶103) will drop to the bottom of its stroke, into position to count the justifying spaces for the next section of the line.

207 The lower row of Justifying Keys is not used to restore when setting double justified matter (¶105), because, after a section of the line has been completed and justified, the nearer the EM-RACK POINTER is to the starting point of the next section of the line, the less the UNIT WHEEL must be rotated by hand to set the

BOARD at the proper point to begin the next section of the line. It would be a waste of time to have the EM RACK go back to the beginning of the first section whenever a JUSTIFYING KEY in the lower row is struck, and to avoid this the lower row of JUSTIFYING KEYS is cut out from restoring. Therefore, to use the BOARD for double justified matter turn the PISTON-BLOCK-VALVE HANDLE 29KC17 (Plate V, at back of book) to the left; this cuts out the lower row of JUSTIFYING KEYS as RESTORING KEYS; that is, they are then used for justifying exactly as the upper row is used. When the line is completed (the last justification for the line has been made), the operator depresses the RESTORING KEY (¶104) to send the EM RACK to the left into position to begin the next line.

208 Strike two Justifying Keys together, the one in the bottom row indicated by the JUSTIFYING SCALE and the KEY of the same number above it in the top row at the *end of a line of double justified matter to "trip the galley,"* for, in this class of composition, the CASTING MACHINE must be adjusted so that a single perforation produced by a JUSTIFYING PUNCH has no effect on the galley mechanism; consequently, the different sections of the line are assembled in the type channel exactly the same as a line of straight matter until the perforations made by PUNCHES .0075 and .0005 (¶146), at the end of a line, are presented to the CASTING MACHINE simultaneously and cause it to place the completed line on the galley. See "The Galley Mechanism," Chapter XVII, page 49.

209 Fig. 29 illustrates both double justification and the allowance for rules (¶185). The measure between the right and left border

Discount allowed on "Alpha" Oil shipments in bulk.....	Any line	13
Rates named to Portland, Maine.....	C. & A. Ry. via Joilet.	75

FIGURE 29
Double justification.

rules (not including these 2 rules) is twelve and one-half picas, the equivalent of which in the set used (8½) is seventeen and one-half ems three units; see Table for Changing Pica Ems, Plate VII, at back of book. From this (17½ ems 3 units) deduct the equivalent in the set used (8½) of two two-point rules (8 units of 8½-set, see Table of Allowance for Rule, Plate VIII at back of book) and set the KEYBOARD measure to seventeen ems four units (17½ ems 3 units−8 units=17 ems 4 units). The total measure for which the BOARD is set (17 ems 4 units) is divided as follows in the cast-off of the table: Matter between the left border rule and the first rule of the table ("Discount allowed on") is made nine and one-half ems four units, balance of line seven and one-half ems (17 ems 4 units−9½ ems 4 units=7½ ems). As usual, the operator throws the odd units into the first section and marks the EM SCALE at seven and one-half ems, with a china-marking pencil (¶99), to indicate the starting point for

the second column. Consider now the action of the KEYBOARD in setting the last two lines of Fig. 29. Including twelve units for the three justifying spaces, the words "Rates named to Port-" contain 166 units (9 ems 4 units), and when this has been set the BOARD will be one-half em from the end of the first section of the table.

KEYBOARD measure for complete table	= 17 ems 4 units
Amount set	= 9 ems 4 units
Amount required to complete line	= 8 ems 0 units

That is, at this point the UNIT INDICATOR shows zero and the EM-RACK POINTER is at eight on the EM SCALE. As the next section begins at seven and one-half ems, the shortage for this first section (8 ems − 7½ ems = ½ em or 9 units) must be distributed over the three justifying spaces it contains. To determine the JUSTIFYING KEYS to strike to accomplish this, the operator rotates the JUSTIFYING SCALE, by hand, until the ninth column of the SCALE (numbers at bottom of columns) is presented to the SCALE POINTER, which, since three justifying spaces have been struck, stands in its third position. In short, *the operator sets the Justifying Scale, by hand, in exactly the same position it would occupy were this the last section of the line and the Scale had revolved automatically with the Em-rack Pointer one-half em from zero on the Em Scale;* and, this done, he reads the justification for this section of the line and strikes the JUSTIFYING KEYS indicated, exactly as if he were justifying an ordinary line of straight matter. The JUSTIFYING KEYS to strike for this first section (shortage of 9 units, to be distributed over 3 justifying spaces) are 4-6; this may be verified by reference to the eight-and-one-half-set SCALE (Plate VI, at back of book).

210 Striking the No. 4 JUSTIFYING KEY (upper row) rotates the UNIT WHEEL eight spaces, while the No. 6 KEY in the lower row adds nine more spaces; total amount these JUSTIFYING KEYS rotate the UNIT WHEEL is seventeen units (8+9=17):

"Rates named to Port-"	= 9 ems 4 units
Amount added by striking 4-6 JUSTIFYING KEYS	= 17 units
Total distance moved by EM RACK from beginning of line	= 10 ems 3 units

But the total measure for which the BOARD is set is seventeen ems four units; therefore, after the No. 6 JUSTIFYING KEY has been struck, as described above, the BOARD stands at seven ems one unit:

Total measure	= 17 ems 4 units
Sum of keystrokes in first section	= 10 ems 3 units
Reading of BOARD after justifying first column	= 7 ems 1 unit

The pencil mark on the EM SCALE indicates that the second column must begin at seven and one-half ems, and, to set the BOARD at this point, the operator first grasps the rim of the UNIT WHEEL firmly with his left hand and then, with his right hand, depresses the right end of the RESTORING-ROCKER-ARM-LINK LEVER 24KB4 (Plate V, at back of book) to drop the JUSTIFYING-SCALE POINTER a14KB1 into position to count the justifying spaces in the next section and to lift the PAWL so that the UNIT WHEEL may be turned by hand. He now rotates the UNIT WHEEL right-handed for eight spaces, that is, until a graduated space on the WHEEL coincides with zero on the UNIT INDICATOR and the EM-RACK POINTER stands at seven and one-half on the EM SCALE. He then releases, first, the RESTORING LEVER 24KB4 and, then, the UNIT WHEEL; the BOARD is now set in position to begin the second section of the line. The second section ("C. & A. Ry.") of the specimen line ("Rates named to Port-") begins at seven and one-half ems and is set exactly the same as though this were a line of single justified tabular matter, except that at the end of the line the operator simultaneously strikes two JUSTIFYING KEYS. No justifying spaces are used between the right border rule and the rule to the left of it (the figure column); that is, the right column is justified with fixed spaces and the expansion of the justifying spaces justifies the center column ("C. & A. Ry."). The unit value of "C. & A. Ry.", including three justifying spaces counted as four units each, is five ems (18+4+13+4+18+4+29=90=5 ems); therefore, when the operator strikes the period after "Ry." five ems have been added to the line and the BOARD stands thus:

KEYBOARD measure for second section of table	= 7½ ems 0 units
Amount set	= 5 ems 0 units
Amount required to complete line	= 2½ ems 0 units

That is, at this point the UNIT INDICATOR shows zero and the EM-RACK POINTER is at two and one-half on the EM SCALE. The third column (the figure column) is to be two ems wide, and two em-quads bring the EM-RACK POINTER to one-half. As this is within four ems of zero on the EM SCALE, the JUSTIFYING SCALE has automatically revolved and the operator reads the justification (4-6) for a line nine units short containing three justifying spaces—this reading may be verified by reference to the eight-and-one-half-set SCALE (Plate VI, at back of book). As this is the end of the line, the operator strikes the No. 4 JUSTIFYING KEY in the upper row and then the No. 6 KEY in the lower row, *together with* the No. 6 KEY in the upper row. Striking these two KEYS simultaneously brings up both the .0075 and the .0005 PUNCHES, and the perforations produced by these "trip the galley" (¶153). The operator now depresses the RESTORING KEY (¶207) to drop the JUSTIFYING-SCALE POINTER and to send the EM RACK as far to the left as its STOP will permit; that is, into position to begin the first section of the next line.

211 The following line ("land, Maine....via Joliet. 75") is set with but one reading of the JUSTIFYING SCALE, the first column being justified with eight- and ten-unit leaders (¶197) instead of justifying spaces.

Total measure for which KEYBOARD is set	= 17 ems 4 units
Em-quad "land," six-unit space "Maine"	= 6 ems 5 units
Amount required to complete line	= 10½ ems 8 units

One eight-unit leader now brings the BOARD to "even ems" and three eighteen-unit leaders bring the EM-RACK POINTER to seven and one-half ems, the point at which the second column of the table begins. The words "via Joliet." are centered in the second column; therefore the same number of justifying spaces (2) must be used at the beginning and end of these words; a fixed space (6-unit) is used between them to preserve even spacing.

KEYBOARD measure for second section of table..	=7½ ems	0 units
Two justifying spaces "via" six-unit space "Joliet." two justifying spaces.....	=5 ems	4 units
Amount required to complete line.....	=2 ems	5 units

One em-quad and the figures "75" (each figure 9 units) complete the line, leaving a shortage of five units to be distributed over the four justifying spaces in the line. The operator reads the justification (2-13) from the SCALE (verify this by reference to the 8½-set SCALE, Plate VI, at back of book); he first strikes the No. 2 KEY in the upper row and then the No. 13 KEYS in both rows together. These two specimen lines have been thus followed through in detail, not because double justification requires so elaborate an explanation, but in order that the student of this book may be familiar with the methods of explanation used in the exercises in Part II, Tabular Composition.

CHAPTER XXVI

Justifying by Letter Spacing

212 Justifying lines by increasing the width (set-size) of characters is still another method of making lines the required measure that the MONOTYPE operator may use when necessary. In short, he may letter space a word with the KEYBOARD, just as he would do this in setting type by hand, the only difference being that the CASTING MACHINE, to save time, combines the character and the hair-space to the left of it and casts these two as one piece; that is, the hair-space, or larger size space if desired, is cast as a shoulder on the *left* of the type-body. This method of casting the hair-space as part of the character has been termed "inter-spacing," in order to distinguish it from the method of inserting a separate space between the characters, usually termed "letter spacing."

213 Six different methods of justification may thus be used by the MONOTYPE operator, and as these may be used both separately and in combination—"*all that the compositor can do with his stick, and more, he can do with this Keyboard.*" (¶7.)

First: He may justify by making all the justifying spaces in the same line the same size, just as this line of straight matter is justified.

Second: He may use different size justifying spaces in different sections of the same line, as shown in ¶7.

Third: He may justify tabular matter by using fixed spaces (¶193) of different sizes in order to make the sum of the width of the characters and spaces in the line equal the measure for which the KEYBOARD is set.

Fourth: By reducing or increasing the width of the first leaders in a line of leaders by one unit (using 8- or 10-unit leaders, see ¶198 and ¶199), and then using nine- and eighteen-unit leaders for the remainder, he may make up the amount the line, or section of a line, is short of the measure and justify it.

*Fifth:***The*operator*of*the*MONOTYPE*KEYBOARD*may*justify a line by letter spacing one or more of the most important words in the line, using fixed size spaces between the words, just as the first line of this paragraph is set; that is, with eight-unit spaces† between the words and thin spaces between the letters of the words "MONOTYPE" and "KEYBOARD". This method of justifying is used, like letter spacing in hand work, for very narrow measures where there are but two or three justifying spaces to the line and where the variation in size of the spaces between words in the different lines would be too great for good work. (Fig. 30, page 78.)

† As "an evidence of good faith"—to prove that there are no justifying spaces in the line that is letter spaced—asterisks (*) are used between the words instead of eight-unit spaces. It is evident, therefore, that this line is justified by the spacing between the letters of the words "MONOTYPE" and "KEYBOARD".

Sixth: For extra-close spacing (less than 4 units of the set in use), instead of using justifying spaces between the words, the operator may use the method of letter spacing illustrated in the first line of the preceding paragraph, except that, instead of casting the letters making up the important words with a shoulder to the left of the type, he strikes the KEYS required to cause the CASTING MACHINE *to cast the first letter of each word* (except the first word of each line) with a shoulder of the width required to justify the line. In short, he combines the justifying space before each word with the first letter of the word, casting them as one piece (Fig. 31). While this special method of justifying takes slightly longer at the KEYBOARD, it saves a revolution of the CASTING MACHINE for each space between words.

Asterisks(*)*are used*between*the words*of*this*paragraph*instead*of justifying*spaces to*prove*that*the lines*are*justified by*"inter-spacing" the*words*that make*up*the*lines. This*"inter-spacing"*is*done*by striking*the*keys; no*hand*work*of any*kind—the matter*comes*off the*Casting*Machine*exactly*as you*see*it*here and,*to*save*time, that*machine*casts the*hair-space*of the*size*required as*a*shoulder*on the*type.

FIGURE 30
Letter spacing.

214 Before considering in detail justifying by increasing the width of characters (casting them with a shoulder to the left of the type-body), let us "review" the action of the TYPE and SPACE TRANSFER WEDGES: *"Whether the Normal Wedge is backed up by the Type or the Space Transfer Wedge is determined by the special perforation produced by the Space Bars. When casting characters and spaces of fixed size (everything but justifying spaces), the Space Transfer Wedge remains at the right and may be considered not to exist, for it has no effect whatever on the Normal Wedge. Consequently, if only the six-unit perforation is presented, the Type Transfer Wedge moves to the right (while the Normal Wedge is brought to its 6-unit position), and, this done, the Type Transfer Wedge then moves to the left to support the Normal Wedge. If, however, the six-unit and the justifying space perforations are presented together, the Type Transfer Wedge moves to the right as described, and stays there while this justifying space is cast. In its place the Space Transfer Wedge moves to the left into position to support the Normal Wedge, in its six-unit position; therefore the width of the type cast is no longer six units, but is determined by the position of the Justifying Wedges which lie behind and support the Space Transfer Wedge."* (¶129.)

One of the prominent characteristics of MONOTYPE composition is its close and uniform spacing. For special work "hair-spaces" may be used between words as here shown. To save time, the "hair-space" is cast as a shoulder on the letter to the left of it.

FIGURE 31
Extra-close spacing between words.

215 From any Matrix in any part of the Matrix Case a type of any width (set-size) may be cast regardless of the size of the unit-row of the Case in which the Matrix is carried, or the set of the Normal Wedge in use: The only limits are: *First,* the size of the MATRIX (.2″ square), for it is obvious that it is not possible to cast a character wider than the MATRIX, which must cover the MOLD opening completely; *Second,* the amount that can be added by the JUSTIFYING WEDGES to the size produced by the NORMAL WEDGE for the position corresponding to the unit-row in which the MATRIX is located. The maximum amount added by the front JUSTIFYING WEDGE is .1050″ (¶134), and for the rear WEDGE this is .0070″ (¶135); that is, .1120″ for both WEDGES, from which we must deduct .0184″, the difference in thickness of the SPACE and TYPE WEDGES (¶137), to get the maximum amount that can be added to a character (.1120″ −.0184″ = .0936″).*

216 While the above statement in Boldface type (¶215) seems to verge on the impossible, for it removes the only limitations to the flexibility of the MONOTYPE† we have so far noted; nevertheless it is literally true and will be easily understood by reference to the MATRIX shown at the intersection of Row O and Row 2 in the MATRIX CASE Arrangement (Fig. 18, page 22). This is the MATRIX from which all justifying spaces are cast and also six-unit fixed spaces, for the JUSTIFYING-SPACE BARS (¶86) will position this MATRIX whether they be struck once or a hundred times in the same line. From the first to the twentieth time they are struck, in the same line, they produce justifying spaces; for the twenty-first time, and thereafter for the line, six-unit spaces. Whether the SPACE BARS produce from this MATRIX (O-2) justifying spaces (spaces cast with the NORMAL WEDGE in its 6-unit position supported by the SPACE TRANSFER WEDGE, which in turn is backed up by the JUSTIFYING WEDGES positioned to make the justifying space the width desired), or whether the SPACE BARS produce six-unit fixed size spaces (spaces cast with the NORMAL WEDGE in its 6-unit position backed up by the TYPE TRANSFER WEDGE which is supported by the fixed abutment) —whether justifying or fixed spaces be produced depends upon whether the SPACE BARS operate the JUSTIFYING-SPACE PUNCH. Thus, when the *two* perforations produced by the SPACE BARS are presented to the CASTING MACHINE it positions the MATRIX CASE and NORMAL WEDGE just as if the justifying space perforation had not been made, but, because of this perforation made by the JUSTIFYING-SPACE PUNCH, the CASTING MACHINE moves the SPACE WEDGE to the left to support the NORMAL WEDGE, so that the set-size of the character cast from this setting of the MATRIX CASE and NORMAL WEDGE is determined by the position of the JUSTIFYING WEDGES. The SPACE BARS make this SPACE PUNCH perforation in combination with the perforation for MATRIX O-2 for the first twenty justifying spaces put in the line, but, in order that the SPACE

* It is taken for granted that the operator will not try to make a type smaller than the unit-row of the KEY struck. While it is possible to decrease the size of a type cast from a given unit-row by .0184″, this would not be done in practice.

† *First,* all MATRICES on the same MATRIX COMB produce characters on the same width body; *Second,* the width of all characters in a MATRIX CASE bears a fixed ratio to the widest characters in the CASE.

PUNCH perforation may be used with any character perforations, to vary set-sizes, a special KEY is provided to operate the JUSTIFYING-SPACE PUNCH independently.*

217 Not more than twenty characters on justifying bodies can be used in any one line or section of a line. It is obvious that since the JUSTIFYING SCALE is used in determining the justification for characters on a justifying body, the same limitations will apply to these as to regular justifying spaces. EXCEPTION: In cases where all the justified characters are to be on a given size body for which the justification has been predetermined (as, for example, in big figure work), the number of these characters is not limited to twenty, but as many may be used as desired; see next chapter.

218 The Justifying-space-punch Key, located at the lower right corner of the right KEYBANK (KEY No. 238, Plate IX, at back of book), makes the perforation that causes the CASTING MACHINE to move the SPACE TRANSFER WEDGE to support the NORMAL WEDGE, so that the size of the character, cast from this setting of the NORMAL WEDGE, depends upon the setting of the JUSTIFYING WEDGES which lie behind and support the SPACE WEDGE. This KEY is always used in combination with a character KEY; that is, the character KEY is struck to position the MATRIX and NORMAL WEDGE for the character required and, at the same time, the JUSTIFYING-SPACE-PUNCH KEY is struck, to produce the extra perforation in the ribbon, just as if the SPACE PUNCH were coupled to this character KEY and worked with it in the same manner that it works with the six-unit-row PUNCH when the SPACE BAR is struck. Since, as soon as the KEY is released, the paper moves forward into position to receive the perforations for the next character struck, it is clear that the JUSTIFYING-SPACE-PUNCH KEY must be struck before the character KEY is released; otherwise there would be letter spacing indeed, for the character would be cast on its regular size body, preceded by an em-quad with justification added; no perforations in the ribbon produces an em-quad, so that this special KEY, No. 238, which operates only the JUSTIFYING-SPACE PUNCH, would, if struck without a character KEY, produce a space cast from the eighteen-unit position of the NORMAL WEDGE, supported by the SPACE TRANSFER WEDGE, which is backed up by the two JUSTIFYING WEDGES.

219 The JUSTIFYING-SPACE-PUNCH KEY, of course, operates the four-unit UNIT-RACK STOP (the STOP, see ¶91, that rises in the path of the UNIT RACK to stop its movement to the right and cause the UNIT WHEEL to register a justifying space as 4 units); therefore, in using the SPACE-PUNCH KEY the operator must be careful that the BOARD registers the width of each character struck (just as if this special PUNCH were not used with the character) *and not four units.* Strike the SPACE-PUNCH KEY first, and, while holding it down, strike

* As explained in ¶86, the KEYBOARD may be adjusted so that the SPACE BARS always produce six-unit spaces; that is, the JUSTIFYING-SPACE PUNCH may be locked out so that it is not operated by the SPACE BARS.

the KEY for the character required; then release the SPACE-PUNCH KEY and note that its UNIT-RACK STOP (4 unit) falls and that the RACK moves to the right until it strikes the STOP brought up by the character KEY; if the four-unit STOP does not fall, push it down with the forefinger of the hand that struck its KEY. For characters wider than nine units, the character KEY may be struck and held down while the SPACE-PUNCH KEY is struck; for, while the KEY for a character larger than nine units is held down, the UNIT RACK will be far enough to the right for the four-unit STOP to rise behind the lug on the RACK; thus, when the SPACE-PUNCH KEY is released, its STOP falls without effort, for the UNIT RACK is exerting no pressure upon it, as is the case when the SPACE-PUNCH KEY is struck first and held down while the character KEY is struck. In short, *in using the Space-punch Key be sure to get its perforation;* that is, see that its PUNCH is not prevented from passing through the paper by its STOP striking the lug on the UNIT RACK. *Be careful that the paper does not feed until the perforations for both the character and the Space-punch Keys have been made. See that the correct number of units is registered for the characters struck with the Space-punch Key.*

220 In justifying lines by increasing the width of characters the reading of the Justifying Scale must be corrected before the Justifying Keys indicated are struck; because the JUSTIFYING SCALES are calculated to add the amount required to justify the line to the justifying spaces which are counted by the KEYBOARD as *four* units and cast with the NORMAL WEDGE in its *six* unit position. In short, at the end of the line, the SCALE indicates the JUSTIFYING KEYS to strike to position the JUSTIFYING WEDGES to add *two units less* than the required size the justifying space is cast, because the NORMAL WEDGE adds these two units when its six-unit position is used to cast a space counted as four units. The amount added by the JUSTIFYING WEDGES may be a negative quantity (that is, they may subtract from, instead of adding to, the 6-unit size), for example, the justification for the Scale Constant (¶120) causes the CASTING MACHINE to cast the justifying space four units wide, the same size the KEYBOARD registers this space. As the NORMAL WEDGE does not add these two units to characters struck with the SPACE-PUNCH KEY, since these characters are cast with the WEDGE in the same unit position as the KEYBOARD registers the width of these characters—*as the Normal Wedge does not add these two units to characters,* we must add them to the reading of the JUSTIFYING SCALE, *before* striking the JUSTIFYING KEYS, so that the JUSTIFYING WEDGES will add these two units, as well as the additional amount required to justify the line.

221 To find the Justifying Keys to add two units to the set-size of a character to be cast on a justifying body, refer to the JUSTIFYING SCALE for the set used and subtract the Scale Constant from the justification given at the bottom of the second column to the left of the Constant; that is, subtract the Constant from the justification to add two units to one justifying space. Thus, the Constant for the SCALE (8½-set) shown on Plate VI, at back of

book, is 1-12, the justification at the bottom of the two-unit column is 3-8, subtracting 1-12 from 3-8 gives 1-11; therefore, to increase the size of a character of this set (8½), struck with the SPACE-PUNCH KEY, we add one to the JUSTIFYING KEY in the top row and eleven to the KEY in the bottom row indicated by the JUSTIFYING SCALE, as described in the following paragraph. NOTE: An increase of one in the top row of JUSTIFYING KEYS adds .0075″, while an increase of one in the bottom row adds .0005″ and consequently, adding one

SET	JUST.	SET	JUST.	SET	JUST.
5	1-1	7¾	1-9	10½	2-2
5¼	1-1	8	1-10	10¾	2-3
5½	1-2	8¼	1-10	11	2-4
5¾	1-3	8½	1-11	11¼	2-5
6	1-4	8¾	1-12	11½	2-5
6¼	1-4	9	1-13	11¾	2-6
6½	1-5	9¼	1-14	12	2-7
6¾	1-6	9½	1-14	12¼	2-8
7	1-7	9¾	1-15	12½	2-8
7¼	1-7	10	2-1		
7½	1-8	10¼	2-2		

FIGURE 32

Justification for each set from 5 to 12½, which must be added to the reading of the JUSTIFYING SCALE when justifying by increasing the width of characters by the use of the SPACE-PUNCH KEY.

in the top row is the same as adding fifteen in the bottom row (.0005″ ×15=.0075″). In the above example 2-23 is the same as 3-8 and subtracting the Constant 1-12 from 2-23 gives 1-11.

222 To the reading of the Justifying Scale add the justification for two units of the set in use when justifying a line by increasing the width of the characters, instead of by using justifying spaces. For example, if when setting eight-and-one-half-set matter and justifying by increasing the width of characters (using the SPACE-PUNCH KEY with these characters), the JUSTIFYING-SCALE POINTER indicates 8-6 when the line is completed, what JUSTIFYING KEYS should the operator strike? As explained in the preceding paragraph, the justification for two units of eight-and-one-half-set is 1-11, and consequently this amount must be added to the reading of the SCALE (8-6) to find the JUSTIFYING KEYS to strike for this line, therefore justify this line by striking the No. 10 KEY in the top row and the No. 2 KEY in the bottom row. See preceding paragraph for method of adding 8-6 and 1-11. The justification for two units of each set from 5 to 12½ inclusive is shown in the table in Fig. 32.

223 Double justification is necessary if justifying spaces be used in the same line with matter justified by increasing the width of characters. This caution probably is superfluous, for no operator would attempt to use two different size justifying spaces in the same line without double justification (¶203) and, of course, this would be quite as necessary when justified characters take the place of justifying spaces in one section of the line.

224 Rule: *To justify lines by increasing the width of characters strike the Keys for the characters to be increased in width with the Justifying-space-punch Key, being careful that the Keyboard registers for each character so struck the unit value of the character and that the paper does not feed until both the character and the space Punches have made their perforations.*

At the end of the line read the justification from the Justifying Scale as usual, and to this reading add the justification for two units of the set in use and strike the Justifying Keys for this total. Find the Justifying Keys for two units of the set in use from Fig. 32 (page 82) or by subtracting the Scale Constant for this set from the justification given on this Justifying Scale at the bottom of the two-unit column (3-8 except for SCALES larger than 12-set, ¶227). *Use double justification if justifying spaces are used in the same line with characters cast with justification. Do not attempt to use the Justifying Keys to make characters wider than the ability of the Matrix to cover the Mold. Do not use more than twenty characters on a justifying body in one line (or section of a line when double justification is used).*

225 Justifying by combining the justifying space before a word with the first letter of the word and casting them as one piece (Fig. 31, page 78) is used to obtain extra-thin spaces between words (less than 4 units of the set in use—the minimum size of the justifying space). This is exactly the same in principle as justifying by increasing the width of letters making up words (¶220), the only difference being that the JUSTIFYING-SPACE-PUNCH KEY is used in combination with the character KEY *for the first letter of each word*, except of course the first word of the line: Use the rule given in ¶224 for justifying. This method of combining the space before a word with the first letter of the word, casting them as one piece, is not a "stunt;" it is of real practical value, for while it, of course, takes longer at the KEYBOARD to use the SPACE-PUNCH KEY, this omission of the justifying spaces saves a revolution at the CASTING MACHINE for each space between words.

226 To those interested in testing their knowledge of Chapter XV, page 44, "Calculating a Justifying Scale," the following analysis of the rule in ¶224 will be helpful: The rule says: "*Find the Justifying Keys for two units of the set in use by subtracting the Scale Constant for this set from the justification given on this Justifying Scale at the bottom of the two-unit column;*" that is, find from the SCALE the JUSTIFYING KEYS which make one justifying space six units wide and subtract from this the Scale Constant; the result is the amount to add to the reading of the JUSTIFYING SCALE when justifying by increasing the width of characters.

227 Striking the JUSTIFYING KEYS indicated by the Scale Constant causes the CASTING MACHINE to cast a four-unit space with

the NORMAL WEDGE in its six-unit position, supported by the SPACE TRANSFER WEDGE and the JUSTIFYING WEDGES set for the position given by the Constant (¶120). But the SPACE TRANSFER WEDGE, which supports the NORMAL WEDGE when the JUSTIFYING WEDGES are used, when casting justifying spaces or to add to the size of characters struck with the SPACE-PUNCH KEY, is two units of twelve-set (.0184″) thicker than the TYPE TRANSFER WEDGE which ordinarily supports the NORMAL WEDGE when characters are cast,* and therefore in determining the Constant for any set, allowance must be made for this .0184″ taken off the six-unit size by the SPACE WEDGE. The relation between four units, six units, the Constant, and .0184″ may be expressed as follows:

A four-unit space will be cast from the NORMAL WEDGE in its six-unit position if this six-unit size is *decreased* in width by .0184″ and *increased* by the amount added by the JUSTIFYING WEDGES set in the positions given by the Scale Constant.

Or, to put this in the form of an equation:

4 units = 6 units − .0184″ + Constant

We can, of course, subtract four units from both sides of the equal sign without altering this relation and write the equation thus:

0 = 2 units − .0184″ + Constant

As we wish to express the value of two units, transpose this:

2 units = .0184″ − Constant

Find the JUSTIFYING KEYS to add .0184″:

No. 3 JUSTIFYING KEY top row adds . . . . . .0075″ × 2 = .0150″
No. 8 JUSTIFYING KEY lower row adds . . . . . .0005″ × 7 = .0035
.0185″

Therefore, the justification for .0184″ is 3-8, and our equation, *which is true for any set*, may be written thus:

2 units = (3-8) − Constant

and the rule given in ¶224 may be modified as follows: *Find the Justifying Keys for two units of the set in use by subtracting the Scale Constant from 3-8.*† Note that this gives the JUSTIFYING KEYS to *add* to the reading of the SCALE to increase that justification by two units, and that *this is quite a different thing from the justification to add two units to the size of the justifying space*, that is, make the justifying space six units wide. (¶143.)

* This does not apply above twelve-set; see foot-note on page 46.
† This rule does not apply to SCALES larger than twelve-set.

228 Apply this equation, 2 units = (3-8) − Constant, to the example in ¶221 for an eight-and-one-half-set SCALE for which the Constant is 1-12:

2 units = (3-8) − (1-12) = 1-11
Adding 1 to justification for top row increases it .0075″ × 1 = .0075″
Adding 11 to justification for lower row increases it
.0005″ × 11 = .0055
.0130″

The Table of Type Sizes (Fig. 21, Plate I, facing page 27) gives the value of one unit of eight-and-one-half-set as .00653″; two units of eight-and-one-half-set equals .01306″, and the error in the above is but .00006″.

CHAPTER XXVII

Increasing Character Sizes by Justification

229 The preceding chapter explains the use of the JUSTIFYING-SPACE-PUNCH KEY (¶218) with character KEYS to justify lines by increasing the width of these characters struck with the SPACE-PUNCH KEY; that is, to cause the CASTING MACHINE to cast these characters with justification added, instead of the unit size the KEYBOARD registers them, exactly as justifying spaces, counted by the KEYBOARD as four units, are cast larger than this to justify the line. Instead of using the SPACE-PUNCH KEY to distribute the amount the line is short of the measure, after its last character is struck, over the characters whose KEYS were struck with it, consider now the use of the SPACE-PUNCH KEY *to increase the size of the character struck with it a predetermined amount;* for example, to cast an eighteen-unit character from a MATRIX carried in the nine-unit row of the MATRIX CASE, that is, register the character as nine units and cast it as eighteen.

230 The Justifying-space-punch Key may be used with a character Key to increase the size of a character to any desired amount beyond the size of the unit-row of the Matrix Case in which the Matrix for this character is carried: Note that this "desired amount" must not be greater than the maximum width character the CASTING MACHINE can produce in composition; that is, the total width of the character cast with justification must not be beyond the ability of the MATRIX to cover the MOLD opening properly. Suppose that we wish to carry in the nine-unit row of an eight-and-one-half-set MATRIX CASE, figures designed for use in the eighteen-unit row of ten-set; that is, figures whose Set Factor (¶60) is 180 ($18\times10=180$). Determine the unit value of these figures in eight-and-one-half-set by dividing their Set Factor by this set ($180\div8.5=21.18$); therefore, when these figures are used with eight-and-one-half-set they must be made twenty-two units wide. Since they are to be carried in the nine-unit row, registered at the KEYBOARD as nine units, we must increase their size at the CASTING MACHINE thirteen units ($22-9=13$).

231 Allowance for characters cast with justification added must be made at the Keyboard the same as for a cut or other inserted matter so that, in the justification of the line containing these characters, they will be counted at their true width (the size they are cast) and not the size they are registered by the KEYBOARD. Assume that the twenty-two-unit figures specified in the preceding paragraph are to be used for prices at the end of the line and that these consist of a dollar-mark, also twenty-two units, four figures this width thus, **$13.73** and a nine-unit period for a decimal point; that is, we must make allowance for five twenty-

two-unit figures and one nine-unit period (of 8½-set), a total of 119 units, or six and one-half ems and two units ($22\times5=110$; $110+9=119$; $119\div18=6$ ems 11 units or 6½ ems 2 units): If five figures be used, increase this allowance by twenty-two units; if three, take off twenty-two units. Mark the EM SCALE at six and one-half ems two units from zero to indicate that the portion of the line preceding these figures must be justified at that point.

232 Double justification is necessary if justifying spaces are used in the same line with characters cast with justification added because the JUSTIFYING KEYS must be used to increase the set-size of the characters struck with the SPACE-PUNCH KEY to the size required, in this case to set the JUSTIFYING WEDGES to add thirteen units to the nine-unit position of the NORMAL WEDGE, and if justifying spaces be used, a different setting of the JUSTIFYING WEDGES is necessary for the portion of the line containing these spaces (see Double Justification, ¶203). For the sake of simplicity assume that these twenty-two-unit figures are preceded by leaders so that we can justify with the eight- or ten-unit leader (¶198 and ¶199) to bring the BOARD to six and one-half ems two units before striking the twenty-two-unit dollar-mark with the SPACE-PUNCH KEY. In setting these twenty-two-unit figures, striking nine-unit KEYS with the SPACE-PUNCH KEY, be sure that the figures register nine units and that the paper does not feed until both the figure and the space PUNCHES have perforated the paper for each figure. The SPACE-PUNCH KEY is not, of course, to be struck with the nine-unit period, as this is on its correct size body and is not to be increased in width.

233 To determine the Justifying Keys that must be struck to increase the width of characters struck with the Space-punch Key the amount required, use the Justifying Scale as follows: Take the reading of the SCALE to add to one justifying space *two more units* than the difference between the size the characters are to be cast and the size they are registered. For example: to increase the size of these figures, registered as nine units, adding thirteen units to make their size twenty-two units ($9+13=22$), strike the No. 14 JUSTIFYING KEY in the top row and No. 13 KEY in the bottom row because the JUSTIFYING SCALE for this set (8½), see Plate VI, at back of book, gives this justification (14-13) to add fifteen units ($13+2=15$) to the size of one justifying space; see figures at the bottom of the fifteen-unit column on the SCALE. We use the SCALE reading *to add two more units than the actual increase in size of characters*, in this case fifteen instead of thirteen, because the SCALES are calculated to add, not to characters, but to the justifying spaces which the KEYBOARD registers as four units but which are cast with the NORMAL WEDGE in its six-unit position. In short, the justification given by the SCALE in its bottom row (to increase the size of one justifying space) is two units less than the unit column of the SCALE in which the justification is given, because the NORMAL WEDGE, being in its six-unit position when justifying spaces are cast, adds two units to the size these spaces are counted and the JUSTIFYING KEYS add the

remainder. But, in adding justification to characters, the NORMAL WEDGE adds nothing because, when these characters are cast, it is in the same position as the characters are registered at the KEYBOARD; therefore to add a given number of units to the size of a character we must use the reading of the SCALE for two units more than the number of units required.

234 Rule: *To increase the size of characters, by casting them with justification added, determine the unit width of these characters in the set to be used and subtract from this the unit-row of the Matrix Case in which these character Matrices are carried; that is, the size they are registered by the Keyboard. In setting the line at the Keyboard allow this difference for each of these characters used. Strike the characters to be increased in width with the Justifying-space-punch Key, being careful that the Keyboard registers for each character so struck the unit value of the Matrix Case row in which the character is carried and that the paper does not feed until both the character and space Punches have made their perforations.*

The Justifying Keys to strike to increase the width of the characters the required number of units will be found in the bottom row of the Justifying Scale for the set used, two spaces to the left of the number of units to be added to the size the characters are registered by the Keyboard. Use double justification if justifying spaces are used in the same line with characters cast with justification. Do not attempt to use the Justifying Keys to make characters wider than the ability of the Matrix to cover the Mold opening.

235 If the characters cast with justification added come at the beginning of the line, double justification must be used for the line and the KEYBOARD must be set at the proper point *after* striking the JUSTIFYING KEYS to increase the size of these characters. Thus if, as in the example given, five twenty-two-unit characters and a nine-unit period be used (119 units or 6½ ems 2 units), the matter following the last figure must begin at the full measure for which the BOARD is set, *less* the width of the matter cast with justification added. For example, if the total measure is thirty-two ems eight units, the BOARD must be brought to twenty-five and one-half ems six units after the JUSTIFYING KEYS for the twenty-two-unit figures are struck (32 ems 8 units − 6½ ems 2 units = 25½ ems 6 units). (¶210.)

236 If the characters cast with justification do not come at the beginning or end of the line, do not use the JUSTIFYING-SPACE-PUNCH KEY to increase their size but, instead of casting these characters with justification added, cast their bodies in two pieces by striking a high space of the required width *before* each of these wide characters. For example, with twenty-two-unit characters carried in the nine-unit row of the MATRIX CASE strike a thirteen-unit high space before each twenty-two-unit character; these will be cast with a kern to the left of the type, which kern rests upon the high space cast immediately after the kerned character. This method saves making allowance at the KEYBOARD for the difference between the width these characters are cast and the width they are registered, for the KEYBOARD counts the space and therefore registers the

full width of the character; using the space in this manner also avoids the use of double justification. The JUSTIFYING-SPACE-PUNCH KEY, of course, may be used with characters not at the ends of the line, instead of casting the bodies of these characters in two pieces as described, by using double justification and justifying the portion of the line preceding the characters struck with the SPACE-PUNCH KEY, to make the justifying spaces in this part of the line the average width and, after striking these JUSTIFYING KEYS, setting the BOARD to compensate for the amount added by justification to the first section of the line. The remainder of the line is then set as though the characters used with the SPACE-PUNCH KEY came at the beginning of the line. For complete details of this method of using the SPACE-PUNCH KEY see next chapter on letter spacing words for emphasis.

237 Always reduce the width of characters cast with justification to even units of the set with which they are to be used. Some operators make entirely too much work of using the SPACE-PUNCH KEY because they make the width of the characters used with it their minimum width, instead of increasing this slightly to make their set-size an even number of units of the set with which they are used. In short, because it is possible to make a character any width by striking the proper JUSTIFYING KEYS, they throw away all the advantage of working to even units. For example, in using ten-set eighteen-unit characters in the nine-unit row of eight-and-one-half-set they determine from the Table of Type Sizes, Fig. 21, Plate I, facing page 27, the exact width of these characters to be cast with justification and from this size (.1383″) subtract the size of the unit-row of the MATRIX CASE in which these characters are carried (in this case .0588″); they then determine the JUSTIFYING KEYS to add this difference (.1383″ − .0588″ = .0795″). This method, of course, requires that the total width of all characters in the line cast with justification added be found by multiplying the exact size of each (.1383″) by the number used in the line and then reducing this total to units of the set used by dividing it by one unit of this set, in order to find the allowance to make at the KEYBOARD for the difference between the sizes these characters are registered and the size they are cast. If a different number of characters cast with justification added is used in different lines, and this is usually the case with big figures, a separate calculation for each number of characters cast with justification must be made. The very slight increase in width of characters by working to even units will be clear from the following: The exact width of these ten-set eighteen-unit characters is .1383″; dividing their Set Factor (180) by the set with which they are to be used (8½) gives 21.18, and we make these characters twenty-two units of eight-and-one-half-set, that is, .1437″, an increase in the width of each figure of but four-tenths of a point (.1437″ − .1383″ = .0054″; one point = .0138″). In most cases the increase in width caused by making the characters cast with justification an even number of units of the set with which they are used would be even less than this because the figures referred to above would almost go in the twenty-one-unit row.

CHAPTER XXVIII

Letter Spacing Words for Emphasis

238 In some languages, German, for example, instead of using Italic to emphasize words, these words are letter spaced thus: der Monotype. The same size spaces are, of course, used for this throughout the entire work; that is, this method of casting shoulders of a definite size must not be confused with justifying lines by increasing the width of characters (¶220). The hair-spaces used between letters of emphasized words (the size of the shoulder cast to the left of the type) may be made any size desired to suit the face in use and the style of the office—in the above example (der Monotype) two-unit spaces are used.

239 The simplest method of letter spacing words for emphasis is to insert, after the last letter of the word to be emphasized, a character, or characters, equal in width (set-size) to the sum of the hair-spaces required for the word. In correcting the matter at the case this extra character, or characters, is lifted out and the hair-spaces are inserted without affecting the justification of the line. Thus, in setting der Monotype with seven two-unit hair-spaces between the eight letters, the operator would strike a fourteen-unit character after the final letter e as the equivalent of the hair-spaces to be inserted at the case by hand.

240 To letter space words at the Keyboard (cast all characters composing the words, except the first letter of each word, with a shoulder equal to the width of the hair-spaces desired) is exactly the same as "Increasing Character Sizes by Justification" (Chapter XXVII) except *the shoulder is added to characters of different unit width, instead of to figures of the same width.* Double justification must always be used, and unless the letter-spaced word comes at the beginning of the line, the JUSTIFYING SCALE must be used to make the spaces between the words preceding the letter-spaced word the average width.* While letter spacing words at the KEYBOARD saves hand work, it has not the advantage of the method described in the preceding paragraph of making all justifying spaces in the same line of exactly the same width. With reasonable care, however, entirely satisfactory work can be done by this method, which also is another example of the flexibility of the MONOTYPE.

241 In the different forms of double justification we have hitherto considered the operator determines, before starting to set lines containing two or more different size justifying spaces, the points at which the different sections of the line end (the points

* Of course, if the operator knows before starting a line that it will contain a letter-spaced word, he uses fixed spaces of the proper size, instead of justifying spaces, between the words preceding the letter-spaced word.

where he must justify) and marks these points on the EM SCALE. In this case, however, he cannot determine the point where the section of the line preceding the letter-spaced word ends until he has set this section. Instead, therefore, of justifying this first section to make it fill a predetermined measure, the operator determines the average size justifying spaces he is using in the work and either uses fixed spaces of this size in this first section, or, if he has used justifying spaces between the words of this first section, justifies after striking the last space for this section (the one preceding the word to be letter spaced) as follows:

242 Assume that the justifying spaces are being made as nearly eight units wide as possible and that, after striking the justifying space preceding the word to be letter spaced, the KEYBOARD indicates eighteen ems six units; also that the JUSTIFYING-SCALE POINTER (¶103) shows that this first section of the line contains eight justifying spaces: These justifying spaces have been counted by the KEYBOARD as *four units* and we wish to cast them as *eight units* to preserve uniform spacing as nearly as possible; that is, we wish to strike JUSTIFYING KEYS that will add four units to each of these eight justifying spaces and *increase the length of this section of the line by thirty-two units* (8 spaces×4 units=32 units). We now have exactly the same condition as if the operator were setting ordinary double justified matter, like ¶202, and had found, by reading the EM SCALE and UNIT INDICATOR, after striking the last character in the section to be justified, that the section was thirty-two units short of the required measure. As described in ¶205, revolve the JUSTIFYING SCALE by hand until its column No. 32 is presented to the SCALE POINTER; in the rectangle indicated by the POINTER read the JUSTIFYING KEYS to be struck to make this section the desired measure; in this case to *make the justifying spaces it contains eight units wide.* After striking these JUSTIFYING KEYS, bring the BOARD to the proper point to begin composition on the letter-spaced word, that is, the characters to be cast with justification added. While there is no mark on the EM SCALE to indicate the point at which the letter-spaced word begins, we know that before we added justification to this first section of the line the BOARD was at eighteen ems six units (see the fourth line in this paragraph), and we also know that *the Justifying Keys struck will add thirty-two units* to this section of the line when it is cast; therefore, before striking the first character to be cast with justification, set the BOARD at sixteen and one-half ems one unit (18 ems 6 units−32 units=16½ ems 1 unit).

243 The word to be letter spaced is now set by using the JUSTIFYING-SPACE-PUNCH KEY (¶218) in combination with all the character KEYS struck in setting the word to be letter spaced for emphasis, *except the first*, for, since the shoulder is cast on the left of the type-body, no hair-space is required for the first letter. Assume that the width of the hair-spaces between letters of emphasized words is to be two units of the set (8½) in use and that the word to be letter spaced contains eight letters and consequently requires seven hair-spaces; that is, this portion of the line is to be swelled fourteen units: After

striking the last letter of the letter-spaced word, the operator rotates the JUSTIFYING SCALE by hand until its column No. 14 is presented to the JUSTIFYING-SCALE POINTER, which, of course, has risen one space for each character struck with the SPACE-PUNCH KEY; that is, each character to which justification is to be added to increase its width by two units. Since the justification indicated by the SCALE POINTER is to be added to characters, we must correct the reading of the JUSTIFYING SCALE according to the rule in ¶224 (which see, noting especially the cautions) to allow for the difference in the thickness of the SPACE and TYPE TRANSFER WEDGES and also for the JUSTIFYING SCALES being calculated to add justification to the justifying spaces which are counted by the KEYBOARD as four units and cast with the NORMAL WEDGE in its six-unit position. By reference to Plate VI, at back of book, we note that the justification for a line of eight-and-one-half-set matter containing seven justifying spaces to be swelled a total of fourteen units is 3-8. By Fig. 32, page 82, the correction to be added to the reading of an eight-and-one-half-set SCALE, in justifying with characters, is 1-11; therefore, *to use two-unit hair-spaces in a word of eight letters* strike the No. 5 KEY in the upper row and No. 4 KEY in the lower row (3-8+1-11=4-19=5-4).

244 *But, before striking the Justifying Keys after the last letter of the word to be letter spaced*, note the reading of the EM SCALE and the UNIT INDICATOR, in order that the UNIT WHEEL may be set, by hand, at the proper point to begin the last section of the line after the JUSTIFYING KEYS for the letter-spaced word have been struck. Thus, if the BOARD indicated thirteen ems three units, after the last character of the letter-spaced word is struck, it should be set at twelve ems seven units, to compensate for the fourteen units added to the line by these seven letter-spaced characters being each cast two units wider than the KEYBOARD has registered them (13 ems 3 units−14 units=12 ems 7 units) before striking the first justifying space following the letter-spaced word; that is, the first justifying space in the last section of the line. The last section of the line is set like the last section of any line of double justified matter except that special care must be used to divide the last word of the line, if a division is necessary, to make the spaces in this section of the line as nearly as possible the same width (8 units) as those in the section preceding the letter-spaced word, in order to preserve uniform spacing.

CHAPTER XXIX

Irregular Spacing for Artistic Effect

245 In justifying a line of type by hand the skilful compositor distributes the amount the line is short of the required measure (after he has placed the last character for the line in his stick) where it will be least offensive to the eye, for he cannot, of course, distribute this shortage uniformly and make all spaces in the same line exactly the same size as the MONOTYPE operator does. Thus, it is customary, in hand composition, to put more space between a word ending with an ascender, "through," for example, and a word beginning with a similar letter, "his", than between two short letters, "as is." Since "*All that the compositor can do with his stick, and more, he can do with this Keyboard*," we must provide a means of meeting the criticism of the lover of typographic tradition who objects to MONOTYPE composition because of its "uniform spacing." Again we make use of the JUSTIFYING-SPACE-PUNCH KEY (¶218).

246 To vary the size of the justifying spaces in the same line use the SPACE BARS (¶86) for the smallest size spaces and a fixed space (¶192), with the JUSTIFYING-SPACE-PUNCH KEY (¶218), for the wider spaces. The difference in size between these larger justifying spaces, made with the SPACE-PUNCH KEY, and the justifying spaces made with the SPACE BARS *equals the unit size of the fixed space*, struck with the SPACE-PUNCH KEY, *minus six*. Thus, to make a difference of two units in the size of the justifying spaces use the eight-unit space (with the SPACE-PUNCH KEY) for each of the larger size justifying spaces. That this will have the effect desired is shown by the space between the words "will have"* in the line above this; this is an eight-unit space cast with justification added, produced by striking the eight-unit space KEY and SPACE-PUNCH KEY simultaneously. These double perforations caused the CASTING MACHINE to cast this space with the NORMAL WEDGE in the eight-unit position, whereas the rest of the spaces in the line were cast with the WEDGE in the six-unit position. Since in both cases the NORMAL WEDGE is supported by the SPACE TRANSFER WEDGE (backed up by the JUSTIFYING WEDGES in the same position), it is obvious that the difference in the size of these justifying spaces is 8−6=2 units. In using the SPACE-PUNCH KEY with fixed space KEYS be careful that the KEYBOARD registers the size of the fixed space and that the paper does not feed until both KEYS have made their perforations.

247 *Questions: How can this line in which two different size justifying spaces are used be properly justified? Will it not be two units*

* To show more clearly the effect of using wider justifying spaces in this manner a ten-unit space (with justification added) is used between the words "will have" instead of the eight-unit space as described; this gives a wider space between the words, but the principle is the same.

short, for each larger size justifying space used, since the Justifying Scales are calculated for the justifying spaces which are counted by the Keyboard as four units and cast with the Normal Wedge in its six-unit position, whereas these larger size justifying spaces are cast with the Normal Wedge in the same position as the Keyboard counts these larger spaces? If the reader has asked himself these two questions, after reading the preceding paragraph, he has thoroughly grasped the principles of MONOTYPE justification. The answer to them is that, after the operator strikes the eight-unit space with the SPACE-PUNCH KEY, he turns the UNIT WHEEL back *(clock-wise)* two units (¶206), so that the BOARD is in exactly the same position as if the *eight-unit* space had been registered as *six units*. Of course, in work of this character, instead of setting the WHEEL for each wide space, the operator makes one correction at the end of the line, for all the wide justifying spaces he has put in it, before justifying; thus, if he has used four of these wide justifying spaces (made by striking the 8-unit space KEY in combination with the SPACE-PUNCH KEY) in the line he sets the WHEEL back eight units. CAUTION: Before turning the UNIT WHEEL back, count the number of spaces the JUSTIFYING-SCALE POINTER has registered, so that, if the POINTER drops when setting the UNIT WHEEL, it can be raised again by hand to register the correct number of spaces before reading the justification. If care be used, the LEVER 24KB4 (¶206) can be pressed down just enough to release the UNIT WHEEL without causing the POINTER to drop.

CHAPTER XXX

Keybanks, Keybars, and Stopbars

248 *When the operator presses a Key, he admits compressed air, the motive power of the Board, beneath the Pistons, which drive the Punches for the character struck through the paper, while, at the same time, the counting mechanism automatically registers the width of this character.* (¶9.)

249 From all that has been said heretofore it might well be supposed that a KEY can make the perforations for only one MATRIX CASE position and register but one unit value. There are, however, no such limitations to the KEYBOARD, for the KEYS may be coupled to the punching and the counting mechanisms so that *any Key will make the perforations for any one of the 225 Matrix Case positions and register any unit value within the capacity of the Board.* The following explanation of the way in which these changes are made is taken from our book, "The Mechanism of the MONOTYPE Style D KEYBOARD," wherein all details of the KEYBOARD are explained and illustrated.

250 The KEYS are not permanently united to the PLUNGERS they operate, for the movement of the KEY LEVERS is transferred to the PLUNGERS by the KEYBARS. In the same way the BARS that carry the PUNCHES are not attached to their UNIT-RACK STOPS (¶91), but the movement of these PUNCH BARS is transferred to the STOPS by the STOPBARS. Therefore, *to change the Punches that any Key operates*, we change the KEYBAR that connects its KEY LEVER with the PLUNGERS; *to change the unit value that a Key registers* we change the STOPBAR that couples the PUNCH BAR, operated by this KEY, with the STOP. The skeleton drawings, Figs. 35 and 38, show this relation between the KEYS, the PUNCHES for perforating the paper, and the UNIT STOPS for measuring the width of the characters; in order that Figs. 35 to 39 inclusive may be seen together, they are grouped on Plate III, tipped in facing page 100, so that all may be used while reading this chapter.

251 Refer first to Fig. 35: The Key **A** is attached to the KEY LEVER **B** which oscillates about the ROD **M**. The lower end of the KEY LEVER engages the lug on the top of the KEYBAR **C**, and the two lugs on the bottom of the KEYBAR engage two ROCK SHAFTS **D** which oscillate in bearings at their ends. Each ROCK SHAFT moves its PLUNGER **F** through a VALVE BAR **E**. The PLUNGERS **F** work against the constant pressure in the AIR CHAMBER (not shown). When the KEY is released the air drives the PLUNGERS forward and the VALVE BARS move the ROCK SHAFTS and restore the KEY to its position of rest. To change the PUNCHES operated by a KEY, change the KEYBAR so that the lugs on the new KEYBAR will engage the ROCK SHAFTS for the PUNCHES desired; the ROCK SHAFTS, VALVE

BARS and PLUNGERS are never changed. NOTE: Whether a KEY operates two PUNCHES, one, or none (the em-quad KEY), its KEY LEVER always moves two ROCK SHAFTS and two PLUNGERS; on the MONOTYPE KEYBOARD the "touch" of all KEYS is uniform (¶147).

252 Fig. 38 shows two of the PISTONS and the manner in which these are coupled to the PUNCHES and to the UNIT-RACK STOPS, which determine the amount the UNIT WHEEL rotates and consequently the number of units registered for each character struck. When the PLUNGERS **F** (Fig. 35) are moved by depressing a KEY, air enters two of the PIPES **A** (Fig. 38) which connect the PLUNGERS with their corresponding PISTONS **B**. When the PISTON is forced up by the air, it lifts the PUNCH LEVER **C**, about its fulcrum, the ROD **Z**, raising PUNCH BAR **D**, and the PUNCH **E**, carried in its upper end, is driven through the paper. A mechanism, not shown, instantly forces the PUNCH BARS down when the KEY is released and the air shut off from the PISTONS **B**. The PUNCHES that register unit values have their PUNCH BARS **D** connected with the UNIT-RACK STOPS **K** by (*a*) the LEVERS **W**, which oscillate about their center, and (*b*) the STOPBARS **V**. To change the unit value registered by a KEY it is necessary only to change the coupling of the PUNCH ROD to the UNIT-RACK STOP; that is, to change the STOPBAR **V**, so that the PUNCH ROD for this KEY will operate the STOP for the unit size required.

253 The Keybanks, of which there are two, are shown in Fig. 36 and Fig. 33, page 97. Plate V, at back of book, shows the KEYBANKS (upper portion only) in place on the KEYBOARD, and Plate IX, at back of book, shows the details of the arrangement of KEYS. Each BANK carries thirteen RODS (see **M**, Fig. 35) about which the KEY LEVERS oscillate, and there are eleven KEYS to a ROD, excepting the ROD nearest the operator, which has four character KEYS, a SPACE BAR (¶86), and a green KEY* which, on the left BANK, is inoperative on D KEYBOARDS equipped with the automatic revolution of the JUSTIFYING SCALE† (¶122), and, on the right BANK, is the RESTORING KEY (¶104). Of the thirty JUSTIFYING KEYS (¶131), the left KEYBANK carries twenty-two and the right eight; deducting these and the two green KEYS from the 274 KEYS carried on both BANKS, leaves 242 KEYS for characters and spaces; that is, seventeen more than required for the 225 MATRIX CASE positions. These extra KEYS duplicate MATRIX CASE positions produced by other KEYS and add greatly to the convenience of the operator both on regular work and in using special arrangements for intricate matter; for example, KEYS 111 and 112 (Plate IX), at the left of the SPACE BAR, on the left KEYBANK, are the en- and em-quad respectively; KEYS 239 and 240 in the same positions on the right BANK produce the same spaces, consequently the operator fingers the right BANK exactly as he would the left, without shifting his hand to strike these spaces. For the same reason the nine- and eighteen-unit leader KEYS are carried on both BANKS. In the MATRIX CASE Diagram (Plate

* KEYBOARDS equipped with Repeater Unit have another green KEY at the lower left corner of the left KEYBANK to operate the Repeater.

† This green KEY on the left BANK was formerly the KEY for revolving the JUSTIFYING SCALE.

IX) the red figures beneath the characters and spaces indicate the number of the KEYS that produce these MATRIX CASE positions; for KEYS double coupled as described, two, or more, KEY numbers are given in the square indicating the MATRIX CASE position.

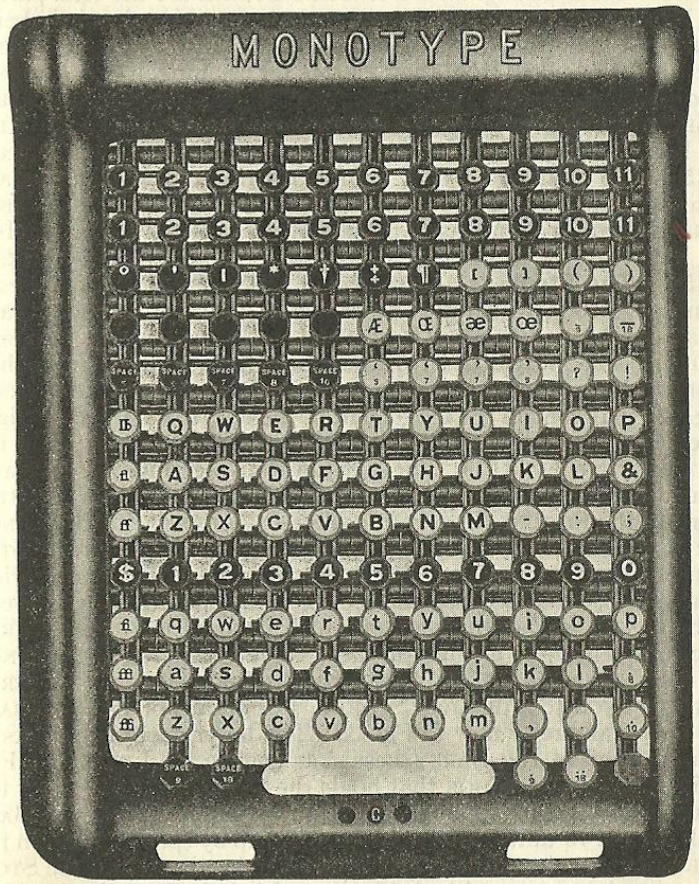


FIGURE 33
The STANDARD LEFT KEYBANK for straight matter with five alphabets.

254 To change Keybanks: Figs. 140, 141, and 142, Plate X, "Operating Adjustments," at back of book, show how either KEYBANK may be removed without disturbing the other.

255 The Keybars C (Fig. 35), one for each KEY and two for each SPACE BAR, are arranged side by side in the KEYBAR FRAMES, as shown in Fig. 37; the position of the two KEYBAR BANKS, beneath the right and left KEYBANKS, is shown in Fig. 143, Plate X. To make any change in the coupling of a KEY LEVER to the PISTONS

(that is, change a KEYBAR) the complete KEYBAR BANK must be taken out of the KEYBOARD and a new KEYBAR BANK inserted: *Never attempt to alter the arrangement of Bars in their Frame, or to change Bars from one Frame to another, for this is certain to cause confusion and to damage the Bars.* The KEYBARS are the vital part of the KEYBOARD, for upon their smooth action, that is, their being kept clean and true, depend the speed and accuracy of the BOARD. If the BARS be taken from their FRAME for cleaning, follow carefully the directions for "Care of the KEYBOARD" (see our book, "MATRIX CASE Arrangements") and do not mix or bend the BARS. The KEYBAR BANKS not in use on the KEYBOARD should be kept in their boxes.

256 To change Keybar Banks for different MATRIX CASE Arrangements, lift off the KEYBANK (¶254), slide out the KEYBAR BANK not required, and insert the new KEYBAR BANK (Figs. 143, 144, and 145, Plate X, at back of book); then replace the KEYBANK.

257 The Stopbars are carried in the STOPBAR CASE (Fig. 39, facing page 100), which may be removed from the KEYBOARD and replaced with a different CASE when a change in unit values is required: The individual STOPBARS must never be taken from their CASE, exchanged or altered in any way. Only the PUNCH BARS **D** (Fig. 38) that control the movement of the MATRIX CASE from right to left and the JUSTIFYING-SPACE PUNCH are connected with the UNIT-RACK STOPS (¶91); the skeleton drawing, Fig. 38, indicates the manner in which this connection is made. When air is admitted to any of the PISTONS **B**, operating these PUNCHES, it lifts the PUNCH BAR **D**, drives the PUNCH **E** through the paper, and raises the STOP **K** into the path of the UNIT RACK (not shown). The STOP **K** rises with the PUNCH **E** because the PUNCH BAR operates the rear end of the LEVER **W**, the front end of which is coupled to the STOPBAR **V**; consequently, to change the unit value registered by a PUNCH it is necessary to change only the STOPBAR and couple the LEVER **W** for this PUNCH to a different STOP **K**. For details of the STOPBARS and their CASE refer now to Fig. 39: The lower part of the slots in the upper end of the BARS (these slots engage the LEVERS **W**, Fig. 38) is hidden by the SHOE that holds the BARS in the CASE, for the picture shows the BARS in their bottom position (except the BARS for the 9- and 10-unit STOPS which are held up by springs). When the CASE is put in place in the KEYBOARD the lower ends of the STOPBARS come in contact with the STOPS, raising the BARS in the CASE so that, when it is pushed back into operating position, the front ends of the LEVERS **W** enter the slots in the upper ends of the BARS.

258 Count the STOPBARS in Fig. 39, from *right to left*, at their upper ends; the right BAR operates the four-unit STOP; then come the five-, six-, seven-, and eight-unit STOPBARS. The sixth BAR operates the nine-unit STOP and, as there are three nine-unit rows in the MATRIX CASE (¶261), this sixth STOPBAR is made with its upper end wide enough so that the LEVER **W** (Fig. 38) for any one of the three nine-unit row PUNCH BARS will depress this STOPBAR. Therefore, when any nine-unit KEY is depressed this STOPBAR moves down; and when the KEY is released, a SPRING raises this

STOPBAR just as the single STOPBAR is raised by the upward movement of the LEVER **W**. The ten-unit STOPBAR is similar to the nine-unit, being operated by two of the LEVERS **W**, since there are two ten-unit rows in the MATRIX CASE.

259 The STOPBAR CASE shown in Fig. 39 is for the standard MATRIX CASE arrangement, in which there is no sixteen- or seventeen-unit row. At the bottom of the CASE, in addition to the thin separators between the BARS, there are, between the two STOPBARS at the left of the CASE, two separators (each the same width as a STOPBAR) to block out the sixteen- and seventeen-unit STOPS, consequently the right PUNCH BAR, facing the KEYBOARD, will operate the eighteen-unit STOP; the STOPBAR to the right of this in Fig. 39 operates the fifteen-unit STOP, so that with the standard arrangement of unit-rows the sixteen- and seventeen-unit STOPS are not connected to the PUNCH BARS.

260 To change Stopbars; that is, to change the arrangement of unit-rows, for example, to have four nine-unit rows and one ten-unit row for tabular work, instead of the standard arrangement of three nine- and two ten-unit rows: Take out the STOPBAR CASE in the KEYBOARD and insert one carrying the required arrangement of unit-rows. See Figs. 156 and 157, Plate X, at back of book.

261 The unit-rows of the Stopbars and the Normal Wedge must be the same: It is obvious that the steps on the NORMAL WEDGE (Fig. 10, page 14) used in casting a ribbon must be the same as the STOPBARS used in perforating the ribbon, for otherwise the matter would not be properly justified, because the CASTING MACHINE would not make characters the same width as the KEYBOARD had registered them. The symbols of STOPBARS and NORMAL WEDGES, therefore, must correspond. Thus, when using the standard arrangement of unit-rows (5 6 7 8 9 9 9 10 10 11 12 13 14 15 18) use S5 STOPBARS and an S5 NORMAL WEDGE, of same set as the KEYBOARD SCALE, at the CASTING MACHINE. If the S29 STOPBARS, for tabular matter, be used, an S29 NORMAL WEDGE of the required set must also be used. (For details of the different kinds of STOPBARS see Chapters XXXV and XXXVI, MATRIX CASE Arrangements, pages 119 and 130.)

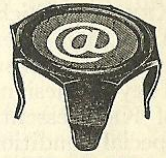


FIGURE 34
KEYBUTTON CLIP placed over the regular BUTTON on the KEY LEVER when changes in characters are made.

262 The Keybutton Clips, shown in Fig. 34, are used to change characters on the KEYBANKS; the CLIP, a metal frame carrying the character printed on paper and protected by a sheet of celluloid, is placed on top of the BUTTON for the character it replaces. Thus, if the work being set contains accents, CLIPS for these accented letters would be placed over the BUTTONS, for characters of the same width, not required in this work; of course, the corresponding change in MATRICES would be made in the MATRIX CASE (¶187). If the new character does not have the same MATRIX CASE position as the character on which the CLIP is placed, a corresponding change must be made in KEYBARS, for capping a BUTTON has no effect on

the coupling of its KEY LEVER with the PUNCHES. The character in a CLIP may be changed easily by bending back the lugs that hold the celluloid in the CLIP. A special character drawn on a piece of paper may be inserted in a CLIP instead of ordering a complete CLIP.

263 Keybutton Clip Boards are made with pegs of proper size (9/16" in diameter) to hold a KEYBUTTON CLIP; these pegs are placed in the board in the same order as the KEYS on the KEYBANK, so that CLIPS not in use may be carried on the pegs in the same relative position they occupy on the KEYBANK. Any carpenter can make these boards and they will very quickly pay for themselves where many changes in arrangements are made with KEYBUTTON CLIPS: For example, in French composition it adds considerably to the operator's speed to carry the lower case accents immediately above the lower case, moving the figures and caps up one row to make room for the accents. In changing from English to French composition (using the French KEYBARS, which provide for the accents being carried just above the lower case) a French KEYBANK may be used with the French KEYBARS, or the English KEYBANK may be capped to make the necessary changes in character positions. If these CLIPS be carried on a CLIP BOARD in the order in which they go on the KEYBANK, it takes but a moment to lift the CLIPS from their pegs and place them on the corresponding BUTTONS.

264 The advantage of standard Keybars: Chapter XXXV, page 119, on MATRIX CASE Arrangements, shows a number of standard combinations of MATRICES and designates the different KEYBARS which are to be used with these. These standard KEYBARS have been made after the most careful study by our own experts in consultation with operators of the broadest experience. They are designed to preserve the universal typewriter arrangement of KEYS essential for the fastest work, and yet satisfy the many special conditions imposed both by straight matter and by more intricate composition. *We earnestly advise both owners and operators of Monotypes to insist upon the use of standard Keybars.* Our own experience proves that our large selection of standard KEYBARS is ample to meet all requirements, and the experience of our customers for whom we have made special KEYBARS proves also that these "bastard" arrangements are a source of continued annoyance and expense; unless constant care be used, special KEYBARS are almost certain to cause confusion in use and misunderstanding in ordering additional MATRIX equipment to be used with them. We realize that some individual operators may honestly prefer slight modifications in the standard arrangement of KEYS, but we respectfully submit that it is better for them, and for their employers also, if these operators learn to use the standard equipment that abundantly satisfies the vast majority of operators and conform to standard practice rather than burden the offices in which they are working with special equipment. In short, because the MONOTYPE, unlike any other composing machine, is absolutely flexible in its KEY arrangement, is no reason why the advantages of standardization should be sacrificed.

Keybanks, Keybars, and Stopbars

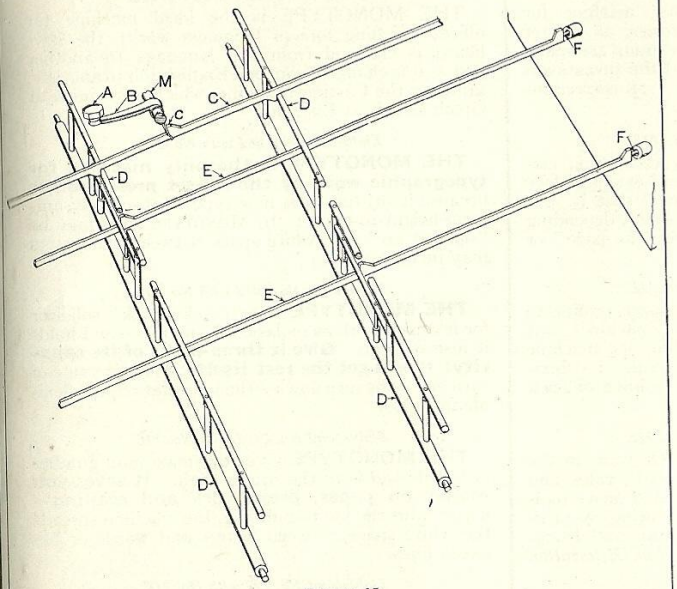


FIGURE 35

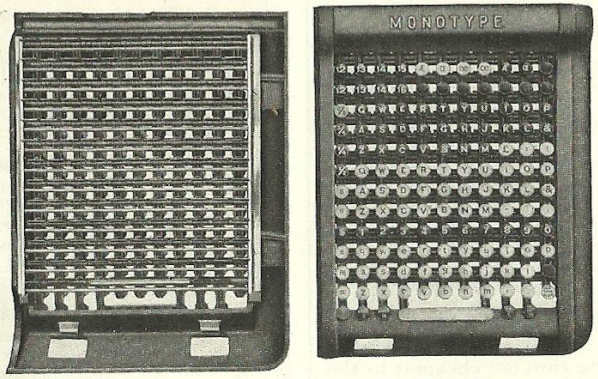
Skeleton view of the mechanism for transferring the motion of the KEY **A** to the PLUNGER **F**, so that, when the KEY is depressed, the PLUNGER is moved to admit air beneath the PISTON **B** (Fig. 38). The bottom of the KEY LEVER **B** engages a lug on the top of the KEYBAR **C**; the lugs on the bottom of the KEYBAR engage the ROCK SHAFTS **D**, which move the corresponding PLUNGERS **F**, through the VALVE BARS **E**. It is clear that, by changing KEYBARS, the same KEY LEVER may be coupled with entirely different ROCK SHAFTS and consequently bring up different PUNCHES and register different unit values.

FIGURE 38

Skeleton view of the mechanism for driving the PUNCHES **E** through the paper and raising the UNIT-RACK STOPS **K** into position to check the movement of the UNIT RACK (not shown) to the right so that the BOARD will register the proper number of units for the character struck. The air, admitted by the movement of the PLUNGERS **F** (Fig. 35) when a KEY is depressed, passes through the PIPES **A** to raise the PISTONS **B** which are connected with the PISTON LEVERS **C**; this raises the LEVERS about their fulcrum, the ROD **Z**, forcing the PUNCHES, connected with the LEVERS by the PUNCH BARS **D**, through the paper.

The PUNCH BARS for the different unit rows of the MATRIX CASE, and the PUNCH BAR carrying the JUSTIFYING-SPACE PUNCH, operate the LEVERS **W**, which, by means of the STOPBARS **V**, cause the front ends of the STOPS **K** to rise into the path of the UNIT RACK and stop its movement to the right. Thus, when one of these PUNCH BARS **D** rises it lifts the rear end of LEVER **W**, which, through the STOPBAR **V**, causes the rear end of STOP **K** to move down and the front end to rise.

It is obvious from Fig. 38 that, by changing the method of coupling the PUNCH BARS **D** to the UNIT-RACK STOPS **K**, we can change the unit values of the PUNCHES for the different unit rows of the MATRIX CASE just as, by changing the KEYBARS (Fig. 37), we can change the MATRIX CASE positions for the different KEYS.



Bottom of left KEYBANK — Top of right KEYBANK

FIGURE 36

Top and bottom views of KEYBANKS. The letters in the following description refer to Fig. 35: The KEY LEVERS **B** swing about the RODS **M**, which are carried by the frame of the KEYBANK. To remove the KEYBARS (Fig. 37) the KEYBANK is lifted off like the lid of a box: See Figs. 140, 141, and 142, Plate X, at back of book.

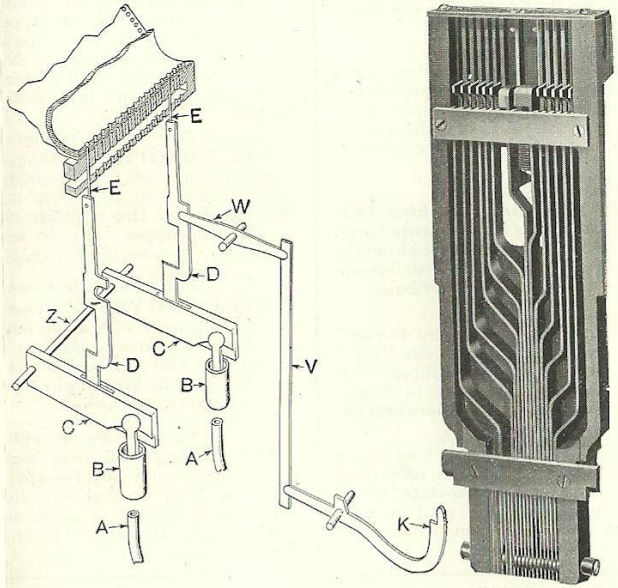
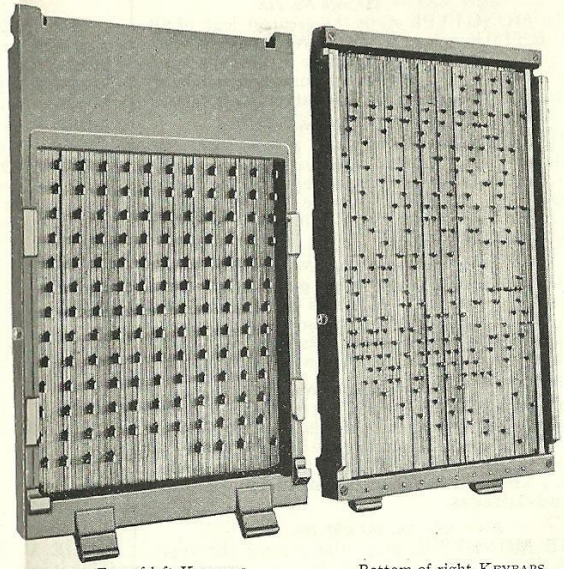


FIGURE 38

FIGURE 39



Top of left KEYBARS — Bottom of right KEYBARS

FIGURE 37

Top and bottom views of KEYBAR FRAMES complete with BARS in place. See Fig. 35 for skeleton view of BARS **C** and the letters used in the following description. Note that while the lugs on the top of the KEYBARS are arranged symmetrically, to engage the KEY LEVERS which are carried on the RODS **M** of the KEYBANK, the lugs on the lower side, which engage the ROCK SHAFTS **D**, have no relation to one another, for KEYS that are side by side may be coupled to the ROCK SHAFTS **D** in such a manner that they produce characters widely separated in the MATRIX CASE. For method of changing KEYBAR BANKS see Figs. 143, 144, and 145, Plate X, at back of book.

FIGURE 39

Back view of STOPBAR CASE. The front ends of the LEVERS **W** (Fig. 38) enter the slots in the STOPBARS (in the picture the BARS are in their bottom position and consequently the lower portion of the slots is behind the upper SHOE that holds the BARS in place in the CASE). The lower ends of the STOPBARS rest on the rear ends of the UNIT-RACK STOPS **K** (Fig. 38), which are guided by the SEPARATORS between the STOPS.

Counting the STOPBARS, in the picture, from *right to left* (immediately above the SHOE at the top of the CASE), the right STOPBAR operates the four-unit STOP; then come the five-, six-, seven-, and eight-unit STOPBARS. The sixth STOPBAR (9-unit) is different at its upper end for, instead of having a slot for the front ends of the LEVERS **W** (Fig. 38), its top is wide enough for three of these LEVERS to rest on it, thus providing for three PUNCH BARS **D** operating the nine-unit STOP with which the lower end of this STOPBAR is connected. When a nine-unit KEY that moves this STOP down is released, the STOPBAR is not raised by the LEVER **W** (the same as the single STOPS), but instead, a SPRING at the front of the CASE raises the STOPBAR. The STOPBAR to the left of this is operated by either of the LEVERS **W** connected with the PUNCH BARS for the ten-unit rows.

It is clear from the above that the PUNCH BARS may be connected with the UNIT-RACK STOPS in any way desired by changing the STOPBAR CASE. For method of changing STOPBAR CASES see Figs. 156 and 157, Plate X, at back of book.

CHAPTER XXXI

Combination of Faces

265 The manner in which the KEYBOARD is arranged for different combinations of faces by changing KEYBANKS (¶253) and KEYBARS (¶255) is described in the preceding chapter; consider now the combination of MATRICES of different faces in the MATRIX CASE. "*In the Monotype system the Matrix for each character is a separate unit; no two characters are ever united on the same Matrix.*" (¶15.) This means: *First*, that the MONOTYPE, unlike composing machines that use so-called "two-letter matrices," does not throw typographic traditions to the winds by requiring that all alphabets used in combination be of the same length and that the same letters in Roman, Italic, or Boldface be of the same width; *second*, that the MONOTYPE user does not have to "re-buy" his Roman MATRICES whenever he adds a new Boldface to his equipment; instead, he takes the Boldface not needed from the MATRIX CASE and inserts the new Boldface, either extended or condensed, in its place—"*He buys what he wants when he wants it.*"* Fig. 40, Plate III, facing this page, shows *thirty different Boldfaces combined perfectly with the same Roman Matrices.*

266 "*Experience has shown that the following allotment of units to the fifteen rows of the Matrix Case best meets all requirements: 5 6 7 8 9 9 9 10 10 11 12 13 14 15 18; that is, one row for each unit size from five to eighteen inclusive, excepting that there are three nine-unit rows, two ten-unit rows, and that the sixteen- and seventeen-unit sizes are omitted.*" (¶45.)

267 Monotype faces are designed for this standard arrangement of unit-rows and for five different arrangements of characters in the Matrix Case (C, C1, C2, C3, and C4), but it is by no means necessary to use the MATRICES so designed on just these five arrangements. Speaking within limits, MATRICES may be combined to meet the requirements of any kind of composition. "*Any Matrix may be inserted in a Matrix Case provided the Set Factor of the new Matrix equals, or is less than, the Set Factor of the Matrix replaced*" (¶59); furthermore, when the demand warrants it, we furnish MATRICES for modified characters, that is, MATRICES designed for use in special arrangements with the letters compressed, or extended, from their normal unit values, and, *furthermore*, in special cases, MATRICES may be carried in smaller unit-rows and their bodies cast in two pieces (¶236). The KEYBOARD imposes no limitations

(Continued on page 104.)

* The possibilities of MONOTYPE faces for combinations may be appreciated from the following: When this book went to press we had *forty-four* Boldfaces that combine perfectly with a ten-point, ten-set Roman face, *eight* that could be used by opening up the Roman one-quarter-set (¶35), and *nine* that combine on ten-and-one-half-set.

Some Combinations of Monotype Faces

Eight-point No. 11J with No. 21E

THE MONOTYPE stops the greatest leak of all—IDLE TIME. No machine is worth having when you can't run it. You can run the MONOTYPE more hours a year than any other composing machine. **"No matter to compose? No matter, cast type."**

Eight-point No. 25J with No. 21E

THE MONOTYPE maintains prices, for while it reduces cost it raises quality. Its product is better than hand-set foundry type, unless new type be used for every job. Thus the MONOTYPE does more than save on "estimates"—**it puts real money in the cash drawer.**

Eight-point No. 25K with No. 21E

THE MONOTYPE user can't get out of sorts—he has "type on tap"—his cases are full of type that can't go out of style because it is cheaper to make new type than to distribute and the MONOTYPE user can change the face when he "distributes."

Eight-point No. 26J with No. 21E

THE MONOTYPE wipes out the cost of leads and hand leading. After a job has been keyboarded it may be cast on the proper size body to make the number of pages required, or to fill the designated space. **This is but one of the exclusively Monotype advantages.**

Eight-point No. 68J with No. 21E

THE MONOTYPE gives the printer the type-founder's profit on body and display type (in all sizes from five-point to thirty-six-point), on borders and ornaments, on quads and spaces, **and the dollars and cents spent turning letters and waiting for sorts.**

Eight-point No. 89J with No. 21E

THE MONOTYPE enables its owner to get the work he wants, instead of taking the work the "other fellow" doesn't want, because there is no job too intricate for it, nor too large for it, and **no work can require greater facilities than one Monotype can furnish.**

Eight-point No. 89K with No. 21E

THE MONOTYPE is called "the always-busy machine" because it takes the work as it comes, plain or intricate. You don't have to buy for it "special attachments," rules or furniture, and in most cases, ***"Double-priced Matter is Plain Matter for the Monotype."***

Eight-point No. 159J with No. 21E

THE MONOTYPE **takes the limitations out of machine composition,** as it casts each type separately. Its letters are as closely fitted and its words as closely spaced as the best foundry type set by the best hand compositor.

Eight-point No. 163J with No. 21E

THE MONOTYPE saves in the most expensive department—the press-room. **Printing from Monotype type is like printing from new foundry type,** for both are absolutely accurate in height-to-paper. Saving on make-ready is a double saving, press time and man time.

Eight-point No. 28J with No. 21E

THE MONOTYPE eliminates electrotyping expense because (a) MONOTYPE type will wear as well on long runs as foundry type; (b) not necessary to electrotype to save type; (c) for duplicating, recast from the same ribbon; (d) for repeat orders use old ribbon over again.

Eight-point No. 275J with No. 21E

THE MONOTYPE has brought attractive and forceful typography within the reach of all buyers of printing—MONOTYPE composition is not only the **cheapest in the long run,** but **cheapest in the first cost.**

Eight-point No. 92J with No. 21E

THE MONOTYPE makes and sets individual type with low (or high) spaces and quads, in automatically justified lines which are delivered upon ordinary galleys. **Thus its product is the same as hand-set new foundry type.**

Eight-point No. 118J with No. 21E

THE MONOTYPE is famous for Quality; **don't think it is backward on Quantity.** Many newspapers use the MONOTYPE exclusively and our repeat order record and the results obtained in such offices prove conclusively that Quality and Quantity are united in the MONOTYPE.

Eight-point No. 118K with No. 21E

THE MONOTYPE is the only machine that will handle several rush jobs at the same time, one on the machine while the others are set from the cases of MONOTYPE type. There is no distribution; it is cheaper to make new type than distribute.

Eight-point No. 86J with No. 21E

THE MONOTYPE is the best "team worker" in the trade; its motto is, "Keep the Presses Busy." It wastes no time over "author's changes," but grinds out new matter—for other authors to change. **Alterations on press are easy with separate type.**

Eight-point No. 86K with No. 21E

THE MONOTYPE is the only Composing Machine AND Type Caster; it ***turns idle time and old type into new and up-to-date faces.*** You take books from a library to read at your leisure; in the same way we furnish matrices for casting job fonts in spare moments.

Eight-point No. 58J with No. 21E

THE MONOTYPE is the only machine for tariffs, catalogs, price lists, directories, all matter kept standing and corrected; **alterations are made as easily as with foundry type and the investment is less by eighty per cent.** MONOTYPE corrections don't stop production of new matter.

Eight-point No. 97J with No. 21E

THE MONOTYPE is the only composing machine that will produce a normal and extended face **from the same set of matrices;** that is, put many or few words in the same space, depending upon whether the work is sold "by the page" or "by the job."

Eight-point No. 117J with No. 21E

THE MONOTYPE means increased profits to the large office using a battery of machines, but to the small office that can use but one machine the MONOTYPE means new life because its flexibility promotes expansion along the lines of least resistance and greatest profit.

Eight-point No. 117K with No. 21E

THE MONOTYPE fills a long-felt want in the newspaper office. Display type, leads, rules and borders—tools at the finger-tips of hand men—tools necessary to work efficiently. No hunting, no picking, no turning; eliminating distribution and drudgery; more work with less effort—*Non-Distribution System.*

Eight-point No. 161J with No. 21E

THE MONOTYPE, although pre-eminent on intricate work, sets straight matter better, quicker, and cheaper than any other machine. Prove it? **Practically all the popular magazines are set on the Monotype.** Shall we send the list? There is not room to name them here.

Eight-point No. 161K with No. 21E

THE MONOTYPE is the best friend of that wise man—the printer with a specialty. Catalog work, price lists kept standing, intricate and tabular matter, educational work, typewritten letters, mail lists, and QUALITY—***the best paying specialty of all***—are the MONOTYPE specialties.

Eight-point No. 149J with No. 21E

THE MONOTYPE user may combine almost any boldface with any Roman; consequently, he does not have to "rebuy" his Roman matrices whenever he wishes to use a new combination of Boldface and Roman—"He buys what he wants when he wants it."

Eight-point No. 165J with No. 21E

THE MONOTYPE is the ideal machine for offices handling foreign language work: the keyboard is changed from one language to another just as it is changed from one English job to another; same for the Casting Machine, which is as quick at Greek as it is at English.

Eight-point No. 66J with No. 21E

THE MONOTYPE is the only machine for typographic work by the off-set press process because it (a) furnishes new type of absolutely uniform height-to-paper; (b) MONOTYPE faces may be "opened up" (the white space between the letters may be increased).

Eight-point No. 107J with No. 21E

THE MONOTYPE is a "crack-a-jack" solicitor for it draws work as molasses draws flies—and holds it just as tight. **Give it three-fifths of its capacity: it will get the rest itself.** With it you can turn out—not turn down—the jobs that require flexible facilities.

Eight-point No. 249J with No. 21E

THE MONOTYPE gives the maximum number of legible words to the square inch. **It saves you money on paper, press work and mailing**—if you want the job to bulk big, the machine spreads the white space between letters and words or between lines.

Eight-point No. 79J with No. 21E

THE MONOTYPE enables you to render "Service" in giving your customer what he wants—if you talk him into taking what he doesn't want you waste your time and his good-will. **The talk that gets repeat orders is the continuous conversation of the good job that speaks for itself.**

Six-point No. 128J with Eight-point No. 21E

THE MONOTYPE saves the most costly item the printer uses—TIME: time on composition, time of supervision, **time on corrections (when slugs are used),** time hunting facilities, time devising makeshifts, time of resetting because of short fonts, and time lost waiting for sorts.

Eight-point No. 275K with No. 21E

NON-DISTRIBUTION: The system by which each compositor is continuously supplied with new type, spacing material, high and low leads, slugs and rules, directly from the MONOTYPE Type & Rule Caster, which makes this material so economically that whole pages after use are melted up to make new material. ***Thus, Recasting replaces Distribution.***

FIGURE 40—The flexibility of Monotype Matrices is shown by this page, for the same Roman Matrices were used in combination with all these Boldfaces. Take the Matrices for one Boldface out of the Matrix Case and put in the Matrices for the other Boldface—"That's all."

Comparison of

Arrangement C, Roman, 8-point 38E (8½-Set)

The best kind of originality is that which comes after a sound apprenticeship; that which shall prove to be the blending of a firm conception of all useful precedent and the progressive tendencies of an able mind. For, let a man be as able and original as he may, he cannot afford to discard knowledge of what has gone before or what is now going on in his own trade and profession. If the printers of today do not wish to be

THE BEST KIND OF ORIGINALITY IS THAT WHICH COMES AFTER A SOUND APPRENTICESHIP; THAT WHICH SHALL PROVE TO BE THE BLENDING OF A FIRM CONCEPTION OF ALL USEFUL PRECEDENT AND THE PROGRESSIVE TENDENCIES OF AN ABLE MIND. FOR, LET A MAN BE AS ABLE AND ORIGINAL AS HE MAY, HE CANNOT AFFORD TO

FIGURE 41

Arrangement C, Italic, 8-point 38G (8½-Set)

The best kind of originality is that which comes after a sound apprenticeship; that which shall prove to be the blending of a firm conception of all useful precedent and the progressive tendencies of an able mind. For, let a man be as able and original as he may, he cannot afford to discard knowledge of what has gone before or what is now going on in his own trade and profession. If the printers of today do not wish to be esteemed arrogant

THE BEST KIND OF ORIGINALITY IS THAT WHICH COMES AFTER A SOUND APPRENTICESHIP; THAT WHICH SHALL PROVE TO BE THE BLENDING OF A FIRM CONCEPTION OF ALL USEFUL PRECEDENT AND THE PROGRESSIVE TENDENCIES OF AN ABLE MIND. FOR, LET A MAN BE AS ABLE AND ORIGINAL AS HE MAY, HE CANNOT AFFORD TO DIS-

FIGURE 42

Arrangement C1, Normal Boldface, 8-point 45J (8½-Set)

The best kind of originality is that which comes after a sound apprenticeship; that which shall prove to be the blending of a firm conception of all useful precedent and the progressive tendencies of an able mind. For, let a man be as able and original as he may, he cannot afford to discard knowledge of what has gone before or what is now going on in his own trade and profession. If the printers of today do not wish to be

THE BEST KIND OF ORIGINALITY IS THAT WHICH COMES AFTER A SOUND APPRENTICESHIP; THAT WHICH SHALL PROVE TO BE THE BLENDING OF A FIRM CONCEPTION OF ALL USEFUL PRECEDENT AND THE PROGRESSIVE TENDENCIES OF AN ABLE MIND. FOR, LET A MAN BE AS ABLE AND ORIGINAL AS HE MAY, HE CANNOT AFFORD TO DISCARD

FIGURE 43

Graphic comparison of the faces of the five different arrangements. In the lower case it will be seen that the C Roman, C1, and C4 are practically identical, while C Italic is slightly condensed, C3 is much more condensed, and C2 is much more extended. The caps show that C Roman, C Italic, C1, and C2 are nearly the same, while C3

Arrangements

Arrangement C2, Extended Boldface, 8-point 79J (8½-Set)

The best kind of originality is that which comes after a sound apprenticeship; that which shall prove to be the blending of a firm conception of all useful precedent and the progressive tendencies of an able mind. For, let a man be as able and original as he may, he cannot afford to discard knowledge of what has gone before or what is now going on in his own trade and profes-

THE BEST KIND OF ORIGINALITY IS THAT WHICH COMES AFTER A SOUND APPRENTICESHIP; THAT WHICH SHALL PROVE TO BE THE BLENDING OF A FIRM CONCEPTION OF ALL USEFUL PRECEDENT AND THE PROGRESSIVE TENDENCIES OF AN ABLE MIND. FOR, LET A MAN BE AS ABLE AND ORIGINAL AS HE MAY, HE CANNOT AFFORD TO DISCARD

FIGURE 44

Arrangement C3, Text Letter, 8-point 95J (9-Set)

The best kind of originality is that which comes after a sound apprenticeship; that which shall prove to be the blending of a firm conception of all useful precedent and the progressive tendencies of an able mind. For, let any man be as able and original as he may, he cannot afford to discard knowledge of what has gone before or what is now going on in his own trade and profession. If the printers of today do not wish to be esteemed arrogant when they term

THE BEST KIND OF ORIGINALITY IS THAT WHICH COMES AFTER A SOUND APPRENTICESHIP: THAT WHICH SHALL PROVE TO BE THE BLENDING OF A FIRM CONCEPTION OF ALL USEFUL PRECEDENT AND THE PROGRESSIVE TENDENCIES OF AN ABLE MIND. FOR, LET ANY MAN BE AS ABLE AND ORIG-

FIGURE 45

Arrangement C4, Condensed Boldface, 8-point 81J (8½-Set)

The best kind of originality is that which comes after a sound apprenticeship; that which shall prove to be the blending of a firm conception of all useful precedent and the progressive tendencies of an able mind. For, let a man be as able and original as he may, he cannot afford to discard knowledge of what has gone before or what is now going on in his own trade and profession. If the printers of today do not wish to be

THE BEST KIND OF ORIGINALITY IS THAT WHICH COMES AFTER A SOUND APPRENTICESHIP; THAT WHICH SHALL PROVE TO BE THE BLENDING OF A FIRM CONCEPTION OF ALL USEFUL PRECEDENT AND THE PROGRESSIVE TENDENCIES OF AN ABLE MIND. FOR, LET A MAN BE AS ABLE AND ORIGINAL AS HE MAY, HE CANNOT AFFORD TO DISCARD KNOWLEDGE OF WHAT HAS GONE BEFORE OR

FIGURE 46

is much extended and C4 much condensed. These Boldfaces may be used in combination with this or any other eight-and-one-half-set Roman face (except that the Roman would have to be opened up half a set when used with the C3 text letter which is on nine-set—we have no eight-point eight-and-one-half-set C3 face).

upon the arrangement of MATRICES in the MATRIX CASE, for the KEYBARS (¶255) provide for changing the position of MATRICES in the CASE and the STOPBARS (¶257) provide for changing the value of the unit-rows of the MATRIX CASE. The more clearly these five basic arrangements (C, C1, C2, C3, and C4) are understood, the greater the advantage that may be taken of the almost limitless flexibility of MONOTYPE MATRICES. Specimens of faces used to make these five arrangements are shown in Figs. 41 to 46, pages 102 and 103, which illustrate graphically the comparison of their condensedness or extendedness by the amount of matter contained in the six lines of each specimen of lower case and caps. Fig. 47, page 106, shows the alphabets of these faces arranged to give a comparison between caps and a comparison between lower case; also at the left a comparison between cap M's and between lower case b's.

268 Arrangement C is for Roman caps, small caps, lower case, figures, and points and Italic caps, lower case, figures, and points, and Roman faces and their corresponding Italics are designed for the unit values given by this arrangement: See Fig. 55, page 122, also Plate IX, at back of book, which give the MATRIX CASE diagram for Arrangement C. A specimen of the Roman lower case and caps and the Italic lower case and caps is shown in Figs. 41, 42, and 47, pages 102 and 106. The characters carried in the MATRIX CASE with Arrangement C are shown at the side of the diagram in Fig. 55, page 122, and beneath the diagram in Plate IX, at back of book, and the unit values of these characters may be determined by locating the character on either diagram which gives, at the side, the unit values of the different horizontal rows; that is, the rows extending from front to back when the MATRIX CASE is in operating position. The following summary gives the unit values of the letters and figures of the Roman and Italic alphabets, the superior figure at the right of the letter indicates its unit value:

A13 B13 C13 D15 E13 F12 G14 H15 I8 J9 K15 L12 M18 N15 O13 P12 Q13 R14 S10 T13 U14 V18 W18 X15 Y14 Z11

A10 B10 C9 D10 E10 F9 G10 H11 I6 J7 K11 L9 M12 N11 O10 P9 Q10 R10 S8 T9 U11 V10 W14 X11 Y10 Z8

a9 b10 c8 d10 e8 f6 g9 h10 i5 j6 k10 l5 m15 n10 o9 p10 q10 r7 s7 t7 u10 y10 w13 x9 y10 z8

A14 B13 C12 D14 E13 F12 G12 H15 I9 J11 K15 L12 M18 N15 O12 P13 Q12 R13 S11 T13 U15 V14 W18 X15 Y14 Z12

a9 b8 c7 d9 e7 f6 g8 h9 i6 j6 k9 l5 m14 n10 o8 p10 q8 r7 s7 t5 u10 v7 w12 x9 y9 z7

$9 1 9 2 9 3 9 4 9 5 9 6 9 7 9 8 9 9 9 0 9 $9 1 9 2 9 3 9 4 9 5 9 6 9 7 9 8 9 9 9 0 9

Gothic caps are designed with their letters of the same width as the Roman small caps, so that they may replace these, especially when a Boldface, instead of Italic, is used in combination with the Roman.

269 Arrangement C1: Normal Boldfaces (those not extended —for specimen of a C1 face see Figs. 43 and 47, pages 102 and 106)

are designed with their letters of the unit values given by this arrangement; these unit values are as follows:

A12 B12 C12 D14 E12 F11 G14 H15 I7 J9 K14 L11 M18 N14 O14 P12 Q14 R13 S11 T12 U13 V12 W18 X12 Y12 Z11

a9 b10 c8 d10 e9 f6 g9 h10 i5 j6 k10 l5 m15 n10 o9 p9 q9 r7 s8 t6 u10 v9 w13 x9 y9 z8

$9 1 9 2 9 3 9 4 9 5 9 6 9 7 9 8 9 9 9 0 9

The MATRIX CASE positions for C1 Boldfaces, when used in combination with Roman faces (Arrangement C), replacing the Italic, are shown in Fig. 56, page 123, which gives, beside the MATRIX CASE diagram, the characters carried in the MATRIX CASE with this C1 combination of Roman and Boldface, and beneath these a list of the characters made for use with this arrangement, either for casting as sorts to be inserted by hand at the case, or to be substituted in the MATRIX CASE on special jobs for any less frequently used characters. This list of omitted characters is based on a comparison with C Arrangement as a standard.*

270 Arrangement C2 (see Figs. 44 and 47, pages 103 and 106, for specimen) is for extended Boldfaces in which the characters have the following unit values:

A13 B13 C13 D14 E12 F12 G15 H15 I8 J10 K15 L12 M18 N14 O14 P12 Q14 R14 S11 T13 U14 V13 W18 X15 Y14 Z12

a10 b11 c9 d11 e9 f7 g10 h12 i6 j7 k11 l6 m18 n12 o10 p11 q11 r8 s8 t8 u12 v9 w14 x9 y10 z9

$9 1 9 2 9 3 9 4 9 5 9 6 9 7 9 8 9 9 9 0 9

When a C2 Boldface is used in combination with a C Roman face, replacing the Italic, the Boldface MATRICES occupy the MATRIX CASE positions shown in Fig. 57, page 123; beside this MATRIX CASE diagram will be found all the Roman and Boldface characters carried in the MATRIX CASE with this combination, also a list of other characters made for use with this arrangement, based on C Arrangement as a standard.*

271 Arrangement C3 (see Figs. 45 and 47, pages 103 and 106, for specimen) is for a text letter having extra extended caps, together with a narrow lower case; the unit values of the characters are as follows:

𝔄12 𝔅14 ℭ13 𝔇15 𝔈13 𝔉14 𝔊14 ℌ15 ℑ10 𝔍12 𝔎14 𝔏14 𝔐18 𝔑18 𝔒15 𝔓14 𝔔15 ℜ15 𝔖15 𝔗14 𝔘15 𝔙18 𝔚18 𝔛12 𝔜14 ℨ12

𝔞8 𝔟8 𝔠6 𝔡8 𝔢7 𝔣6 𝔤9 𝔥8 𝔦5 𝔧5 𝔨9 𝔩5 𝔪13 𝔫9 𝔬7 𝔭8 𝔮8 𝔯7 𝔰8 𝔱5 𝔲9 𝔳8 𝔴12 𝔵8 𝔶8 𝔷6

$9 1 9 2 9 3 9 4 9 5 9 6 9 7 9 8 9 9 9 0 9

These MATRICES, when combined with the C Roman face, replace the Italic, and the arrangement of the characters in the MATRIX CASE is shown in Fig. 58, page 124; beside this diagram are shown

* The list of characters at the side of the MATRIX CASE diagrams (pages 122 to 129 and 133 to 143 inclusive) shows the fitting of the characters, since there is no space between any of the characters except the nine- and eighteen-unit dashes, the brackets and the parentheses, and the cross-rule characters in Fig. 87, page 142.

all the characters carried in the MATRIX CASE in this combination, also other characters made for use with this arrangement, based on C Arrangement as a standard. (See foot-note, page 105.)

272 Arrangement C4 (see Figs. 46 and 47, pages 103 and 106, for specimen) is a condensed Boldface having the caps extra condensed while the lower case is about the same width as the C1 (or normal) Boldface lower case. The unit values of the characters are as follows:

A^{12} B^{12} C^{11} D^{12} E^{10} F^{10} G^{11} H^{12} I^{7} J^{8} K^{12} L^{10} M^{15} N^{13} O^{12} P^{11} Q^{12} R^{11} S^{11} T^{11} U^{12} V^{11} W^{15} X^{12} Y^{11} Z^{10}

a^{9} b^{10} c^{8} d^{10} e^{9} f^{6} g^{9} h^{10} i^{5} j^{6} k^{10} l^{5} m^{15} n^{10} o^{9} p^{10} q^{10} r^{7} s^{8} t^{6} u^{10} v^{9} w^{13} x^{9} y^{9} z^{8}

$^{9} 1^{9} 2^{9} 3^{9} 4^{9} 5^{9} 6^{9} 7^{9} 8^{9} 9^{9} 0^{9}

When the C4 Boldface is combined with the C Arrangement, the Italic caps and lower case and the small caps of the Roman C Arrangement must be omitted because the caps of the C4 Boldface

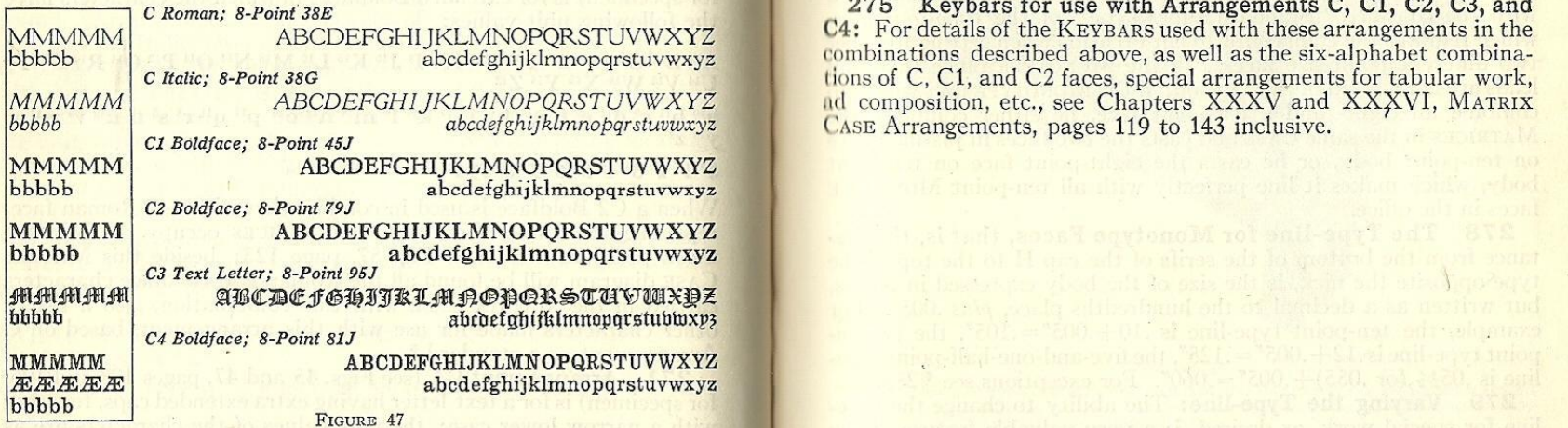


FIGURE 47

Shows the comparative length of alphabet of the five arrangements, supplementing Figs. 41 to 46, pages 102 and 103, which show these faces in composition. Note in the panel at the left that the cap M is the widest character (18 units) of the font except for the C4 Arrangement, in which the caps are so condensed that the cap M is placed in the fifteen-unit row. The lower case b, being a characteristic letter, is also given in the panel for comparison.

are so condensed that some of them occupy the MATRIX CASE positions of the Roman small caps. Thus C4 is a four-alphabet arrangement. This will be clear by referring to the C4 MATRIX CASE diagram (Fig. 59, page 124), which also shows, beside the diagram, a list of characters carried in the MATRIX CASE in this combination, and a list of other characters made for use with this arrangement, based on C Arrangement as a standard. (See foot-note, page 105.)

273 Foreign Language Faces, French, German, Spanish, Greek, etc., are, of course, designed for their own individual arrangements, for it would not be possible to make these faces conform properly to Arrangements C, C1, C2, C3, or C4. Light and heavy face German may be used in combination, as may also the similar Greek faces, or, for vocabulary work, these faces may be combined with English. Of course, these faces require their own KEYBARS (¶255) and, in some cases (Greek, for example), they also take special STOPBARS (¶257). For these foreign language faces see Chapters XXXV and XXXVI, pages 119 and 130, and the MONOTYPE Specimen Book.

274 Typewriter and Mail-list Faces have all letters, points, and figures on the same width body. In composing these faces, use at the KEYBOARD the TYPEWRITER ATTACHMENT, a special STOPBAR (¶257) that causes every KEY to register nine units (one-half em), and *do not use justifying spaces* but, instead, adjust the BOARD for the SPACE BAR to produce six-unit spaces (¶86), which, with the TYPEWRITER ATTACHMENT, will be registered as nine units; no JUSTIFYING SCALE is required. See ¶179, ¶180, and ¶181.

275 Keybars for use with Arrangements C, C1, C2, C3, and C4: For details of the KEYBARS used with these arrangements in the combinations described above, as well as the six-alphabet combinations of C, C1, and C2 faces, special arrangements for tabular work, ad composition, etc., see Chapters XXXV and XXXVI, MATRIX CASE Arrangements, pages 119 to 143 inclusive.

CHAPTER XXXII

Standard Matrix-Line

276 Monotype Faces, regardless of their point-size, line perfectly when cast on the same point-size body: For example, if the MATRICES for an eight-point face be used in the same MATRIX CASE with ten-point MATRICES, all the type cast from this MATRIX CASE on ten-point body will line absolutely: in short, in the MONOTYPE office, all type cast on the same size body lines perfectly, regardless of the point-size of the faces; thus, an eight-point face cast on a ten-point body will line with any ten-point face when both are set by hand together. For exceptions see ¶279 and ¶283.

277 STANDARD MATRIX LINE, which makes possible the infinite combination of MONOTYPE faces, must not be confused with the so-called "Standard Line Type" of the type-foundries, which requires the compositor to cut up leads when setting together two different point-size faces. In the MONOTYPE office time and leads are not wasted in this fashion: if the MONOTYPE user wishes to combine an eight- and a ten-point face, he either combines the MATRICES in the same CASE and casts the two faces in justified lines on ten-point body, or he casts the eight-point face on ten-point body, which makes it line perfectly with all ten-point MONOTYPE faces in the office.

278 The Type-line for Monotype Faces, that is, the distance from the bottom of the serifs of the cap H to the top of the type opposite the nick, is the size of the body expressed in points, but written as a decimal to the hundredths place, *plus* .005″. For example, the ten-point type-line is .10+.005″=.105″, the twelve-point type-line is .12+.005″=.125″, the five-and-one-half-point type-line is .05½ (or .055)+.005″=.060″. For exceptions see ¶283.

279 Varying the Type-line: The ability to change the type-line for special work, as desired, is a very valuable feature of the MONOTYPE; for example, an eight-point face may be cast on a seven-point body by using modified characters with shortened descenders for the MATRICES of the letters that go below the line (g, j, p, q, y, etc.). In such cases a special line standard is used and the CENTERING-PIN BUSHING (¶13) is set to the right the necessary amount, so that this eight-point face will be cast on seven-point body *below* the standard line for seven-point faces, in order that the caps and other ascenders may not overhang at the top of the body.

280 Leading Faces: In the MONOTYPE System the MATRIX and MOLD are quite independent; a face may be cast on its own size body or, to give the effect of hand leading, it may be cast on a larger size body. When a twelve-point face, for example, is cast on a fourteen-point body (leaded 2 points), the line standard for the fourteen-

point MOLD is used; that is, the face is cast on .145″ line and not on .125″, the line for a twelve-point face.

281 Lining Gage and Line Standards (Fig. 48) are used by the operator to determine the amount the CENTERING-PIN BUSHING (¶13) must be adjusted when lining up. The type to be lined up are placed on the plate at the end of the gage against the side lug as shown, with the line standard beside the type, and both type and line standard touching the under side of the knife-edge, which is here represented as transparent, to show the type and line standard below it. This knife-edge is moved by the micrometer screw, and its edge is exactly parallel to the surface of the plate on which the type rests. The eye-glass is placed in the clip-holder, which is adjustable

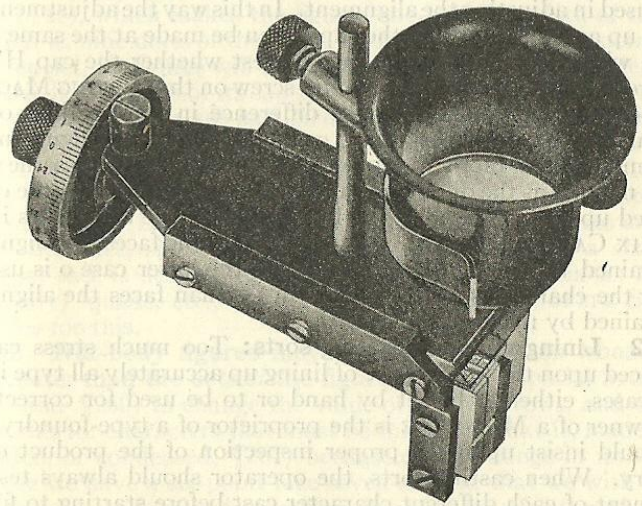


FIGURE 48

Lining gage and eye-glass with line standard and two cap H's in position for testing alignment. Note that the knife-edge is here represented as transparent to better show the position of the type and line standard below it.

up and down for focus, and may be swung around to bring it central above the type. It is mounted on and moves with the knife-edge so that, once adjusted, it need not be changed. The line standards are pieces of hardened steel whose thickness equals the line standard for the MOLD with which the standard is used; thus the line standard for a ten-point MOLD is .105″ thick. In lining up before casting the face the operator casts a few cap H's to warm up the MOLD, and places two of the last of these in the lining gage (against the lug) with the nick of the type up and the face of the type just touching the knife-edge; against the type he places the proper line standard, holding both firmly in place with the left thumb. He then advances the knife-edge by means of the micrometer screw until it coincides

with either the serifs of the cap H's or the top edge of the line standard (whichever it comes to first), obtains the reading of the micrometer screw, then advances the knife-edge to the edge of the other object, and the difference in the readings will be the number of notches the micrometer screw on the CASTING MACHINE must be turned to adjust the CENTERING-PIN BUSHING for the correct alignment. This is tested again by casting more cap H's and comparing them with the line standard as described. But before adjusting the BUSHING the operator also uses the lining gage to make sure that the BUSHING is adjusted so that the cap H is properly centered on its body; that is, that the left edge of the left vertical is the same distance from the left side of the type as the corresponding point is from the right side, using for this purpose the same two type that were used in adjusting the alignment. In this way the adjustments for lining up and for centering the cap H can be made at the same time. (Note when using the lining gage to test whether the cap H's are centered on the body the micrometer screw on the CASTING MACHINE will be moved only one-half the difference in the readings of the micrometer screw on the lining gage, while for the alignment the micrometer screw on the CASTING MACHINE is moved the same number of notches as the difference in readings on the gage.) If the cap H be lined up and centered properly, the rest of the characters in the MATRIX CASE will be right. Note that for Italic faces the alignment is obtained by the cap H as usual, but the lower case o is used to center the characters on the body; in German faces the alignment is obtained by means of the cap U.

282 Lining up when casting sorts: Too much stress cannot be placed upon the importance of lining up accurately all type in the type-cases, either to be set by hand or to be used for corrections. The owner of a MONOTYPE is the proprietor of a type-foundry, and he should insist upon the proper inspection of the product of his foundry. When casting sorts, the operator should always test the alignment of each different character cast before starting to fill the type-case with that character, and, when a font is completed, it is a good plan to take a press-proof of the caps set between cap H's and the lower case between lower case m's—HAHBHCH, mambmcm, etc.—in order that the alignment may be carefully inspected; it is especially desirable to make this test before returning a font leased for casting sorts.

283 Exceptions to Standard Line: A few abnormally tall faces, like Ionic, are cast on a special type line .005″ lower than the standard: Thus, the line for six-point Ionic No. 56J is .070″, instead of .065″. Instead of furnishing a special line standard for these faces we furnish a liner .005″ thick, which the operator places under the regular line standard for the point-size MOLD used. When these faces are used in the same MATRIX CASE with Standard Line Faces they are, of course, .005″ lower line; when casting such combinations, line up by the cap H of the Standard Line Face, using the regular line standard (of course, without the liner) for the point-size of the MOLD.

CHAPTER XXXIII

Nut-body Figures

284 "*The designer of Monotype faces divides the basic character of the font (the cap M) into eighteen equal parts, using one of these parts as his unit of measurement in determining the width of all the other characters in this font.*" (¶44.) MONOTYPE faces are designed for the standard arrangement of unit-rows: 5 6 7 8 9 9 9 10 10 11 12 13 14 15 18 (¶45), which makes the figures one-half the width of the cap M; that is, nine units of the set of the face. Thus, if a six-point face be seven-set, its figures will be three and one-half points wide; that is, one-half the width of its cap M (7 points). Nut-body figures have their width equal to *one-half their point-size;* thus, six-point nut-body figures would be three points wide. For example, our six-point No. 1A face has nut-body figures because, being designed for six-set, its cap M is six points square and the width of its figures is one-half their point-size. But for some work where nut-body figures are necessary this face, six-point No. 1A, is too condensed; a six-point seven-set face is desired for the stub of a table, and six-set figures (nut-body), quads, etc., for the balance. The MONOTYPE System provides for this.

285 Nut-body figures may be used with faces whose sets are greater than the sets of the figures by using special STOPBARS (¶257 and ¶260) to change the value of the unit-rows, and special MATRICES for characters that must be modified (that is, made more extended, or condensed, ¶267) because of the change in unit-rows. Suppose we have a six-point face seven-set and that we wish to use with this six-set (nut-body) figures; in short, *we wish to make this a six-set face,* so that its figures and nut-quad will be three points wide and its em-quad six points wide, *without compressing the face,* that is, reducing the length of its alphabets: "*Any two characters are of the same set-size (have the same width bodies) if the number of units in one, multiplied by its set, equals the number of units in the other, multiplied by its set*" (¶59); thus, a seven-unit six-set letter is exactly the same in width as a six-unit seven-set letter ($7\times6=42=6\times7$). Therefore, when we change this seven-set face to six-set, if we make the characters that formerly registered six units with a seven-set JUSTIFYING SCALE, register seven units (by changing the STOPBARS) with a six-set SCALE, we have in no wise altered these characters. Special MATRICES for the faces used for tabular work are furnished for use with these special STOPBARS.

286 The differences in sizes of the characters of a seven-set face used with the standard STOPBARS (symbol S5) and the same face used with special STOPBARS to give nut-body figures (symbol S34), are shown in Fig. 49, page 112, in which the sizes of the different

unit-rows in six- and seven-set are taken from the Table of Type Sizes (Fig. 21, Plate I, facing page 27) and compared. Where the differences in the sizes are great enough to warrant it, MATRICES for modified characters (more extended or condensed, ¶267) are furnished for use with the STOPBARS for nut-body figures.*

S5 STOPBARS give these values to the unit-rows in seven-set	S34 STOPBARS give these values to the unit-rows in six-set	DIFFERENCES between the rows for seven-set and for six-set are
5 = .0269	6 = .0277	.0008
6 = .0323	7 = .0323	.0000
7 = .0377	8 = .0369	.0008
8 = .0430	9 = .0415	.0015
9 = .0484	9 = .0415	.0069
9 = .0484	9 = .0415	.0069
9 = .0484	9 = .0415	.0069
10 = .0538	10 = .0461	.0077
10 = .0538	12 = .0553	.0015
11 = .0592	12 = .0553	.0039
12 = .0646	13 = .0599	.0047
13 = .0699	14 = .0646	.0053
14 = .0753	15 = .0692	.0061
15 = .0807	16 = .0738	.0069
18 = .0968	18 = .0830	.0138

FIGURE 49

Shows the difference in unit values when a seven-set face is run six-set with special STOPBARS, in order to obtain nut-body figures (9 units of 6-set).

287 Special Stopbars for nut-body figures: In all tabular work where nut-body figures are required it is desirable to have more than the forty-five nut-body (9-unit) characters supplied by standard STOPBARS (¶261), to provide for two sets of figures, piece-braces (Tabular Exercises 28 and 29, pages 35 and 36, Part II), reference-marks, etc.; therefore all special STOPBARS for producing nut-body figures, with faces whose set is greater than their point-size, are made with four nine-unit rows, which give sixty nut-body (9-unit) characters instead of the forty-five furnished with standard STOPBARS S5.

288 S34 Stopbars transform seven-set faces into six-set and provide for sixty nut-body (9-unit) characters, three points wide, with the six-point seven-set faces for which the necessary modified character MATRICES (¶267) are furnished for use with these STOPBARS; their unit values are as follows: 6 7 8 9 9 9 9 10 12 12 13 14 15 16 18. The changes made in the set-size of the different characters of a seven-set face, designed for use with standard STOPBARS (S5), when this face is used with S34 STOPBARS with the necessary modified character MATRICES are shown by a comparison of the specimens in Fig. 50, page 114.

289 S29 Stopbars transform eight-and-one-half-set faces into eight-set and give sixty nut-body (9-unit) characters, four points wide, when used with the faces for which the required modified character MATRICES are furnished. The unit values for S29 STOPBARS are 6 6 8 9 9 9 9 10 11 12 13 14 15 16 18. The modifications made in an eight-and-one-half-set face by using S29 STOPBARS are shown in Fig. 51, page 115, the actual changes in set-sizes may be determined from the Table of Type Sizes (Fig. 21, Plate I, facing

* The modification of characters for use with special STOPBARS is entirely satisfactory for tabular matter, but for the highest quality work, fine books and catalogs, the use of modified characters is not advocated.

page 27), just as the difference for S34 STOPBARS is shown in Fig. 49, page 112.

290 S27 Stopbars for use with six-, eight-, ten-, and twelve-set faces give sixty nut-body (9-unit) characters without changing the set of the face, for their unit values are the same as standard STOPBARS (S5) except that they provide for four nine- and one ten-unit row instead of the standard three nine- and two ten-unit rows. Summary:

STOPBARS	UNIT VALUES
S5: Standard	5 6 7 8 9 9 9 10 10 11 12 13 14 15 18
S27: Similar to standard, excepting four nine-unit rows instead of three	5 6 7 8 9 9 9 9 10 11 12 13 14 15 18
S29: Transform eight-and-one-half-set faces into eight-set	6 6 8 9 9 9 9 10 11 12 13 14 15 16 18
S34: Transform seven-set faces into six-set	6 7 8 9 9 9 9 10 12 12 13 14 15 16 18

291 Special Keybars are required with Special Stopbars: Since the changes in sets produced by special STOPBARS are accomplished by rearranging the MATRICES in the MATRIX CASE and using modified character MATRICES (¶267), it is obvious that special KEYBARS (¶255) must be used with the special STOPBARS described in the preceding paragraphs; this is also true for the S27 STOPBARS, for, although these do not alter the set of the face with which they are used, they change the MATRIX CASE arrangement from standard because they produce four nine-unit rows instead of three. For details of the MATRIX CASE Arrangements used with these STOPBARS, see Chapter XXXVI, MATRIX CASE Arrangements, pages 130 to 143 inclusive. These arrangements and the corresponding KEYBARS for Roman (C) and Italic (C) faces in combination, or Roman (C) in combination with normal Boldfaces (C1), or Roman (C) in combination with extended Boldfaces (C2), are as follows:

STOPBARS	FACES	LEFT KEYBARS	RIGHT KEYBARS	MATRIX CASE ARRANGEMENTS FIGURE	PAGE
S27: Standard, except four nine-unit rows	C and C	UC	C	69	133
	C and C1	UC	C1	70	134
	C and C2	UC	C2	71	134
S29: Transform eight-and-one-half-set faces into eight-set	C and C	WC	C	72	135
	C and C1	WC	C1	73	135
	C and C2	WC	C2	74	136
S34: Transform seven-set faces into six-set	C and C	YC	YC	75	136
	C and C1	YC	YC1	76	137
	C and C2	YC	YC2	77	137

292 Faces for use with Tabular Arrangement: As explained in ¶288 to ¶290 inclusive, MATRICES for modified characters (¶267) are required with the special STOPBARS (S27, S29, and S34) to compensate for the changes in the width of some characters when faces are transferred from standard STOPBARS (S5). In the List of MONOTYPE Faces, issued frequently, the faces for which these modified characters can be furnished are indicated by a dagger (†).

293 Matrix Symbols: To avoid confusion with standard characters the MATRICES for modified characters (¶267) are carefully symboled; for details see the explanation of the MATRIX Symboling

Six-point seven-set faces composed with Standard Stopbars S5

No.	FROM	TO	CLASS AND CENTS 1	2	3	4
19	**Martindale.....Ga.**	New York.....N. Y. Philadelphia.....Pa. Baltimore.....Md.	135	107	133	22
20	Guilds.....Ga.	Baltimore.....Md.	130			
21	Warren.....Ga.	Boston.....Mass.	152			
22	Copeland.....Ga.	Washington.....D. C.	89	32	46	38
23	Mission Ridge.....Ga.	Galveston.....Tex.	123			
24	Rossville.....Ga.	New York.....N. Y.	134			

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzfiffffffffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyz
$1234567890 **$1234567890**

Same faces composed with S34 Stopbars and modified character Matrices to give nut-body figures

No.	FROM	TO	CLASS AND CENTS 1	2	3	4
19	**Martindale.....Ga.**	New York.....N. Y. Philadelphia.....Pa. Baltimore.....Md.	135	107	133	22
20	Guilds.....Ga.	Baltimore.....Md.	130			
21	Warren.....Ga.	Boston.....Mass.	152			
22	Copeland.....Ga.	Washington.....D. C.	89	32	46	38
23	Mission Ridge.....Ga.	Galveston.....Tex.	123			
24	Rossville.....Ga.	New York.....N. Y.	134			

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzfiffffffffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyz
$1234567890 **$1234567890**

FIGURE 50

Difference produced by S34 STOPBARS in changing a seven-set face to six-set to obtain nut-body figures.

System at the front of our Specimen Book. Not only does this system provide for indicating the set and unit-row of special MATRICES, but it also prevents confusion of similar characters; for example, the Roman lower case x with the small cap x. The series number of all MONOTYPE faces used for composing matter on the galley (not sorts casting) is always followed by a letter indicating the kind of alphabet: Thus, **A** indicates modern Roman caps and lower case; **C**, the corresponding Italic; and **B**, the corresponding Roman small caps.

If, therefore, a MATRIX for the letter x of the No. 8 Series is marked **8B**, it is the small cap x of the No. 8 Series; whereas, if it were marked **8A**, it would be the Roman lower case x of the same series.

Eight-point eight-and-one-half-set faces composed with Standard Stopbars S5

No.	FROM	TO	CLASS AND CENTS 1	2	3	4
19	**Martindale..Ga.**	New York...N. Y. Philadelphia...Pa. Baltimore.....Md.	135	107	133	22
20	Guilds.....Ga.	Baltimore.....Md.	130			
21	Warren.....Ga.	Boston.....Mass.	152			
22	Copeland.....Ga.	Washington..D. C.	89	32	46	38
23	Mission Ridge.Ga.	Galveston....Tex.	123			
24	Rossville.....Ga.	New York...N. Y.	134			

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzfiffffffffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyz
$1234567890 **$1234567890**

Same faces composed with S29 Stopbars and modified character Matrices to give nut-body figures

No.	FROM	TO	CLASS AND CENTS 1	2	3	4
19	**Martindale....Ga.**	New York...N. Y. Philadelphia...Pa. Baltimore....Md.	135	107	133	22
20	Guilds.....Ga.	Baltimore....Md.	130			
21	Warren.....Ga.	Boston.....Mass.	152			
22	Copeland.....Ga.	Washington..D. C.	89	32	46	38
23	Mission Ridge..Ga.	Galveston....Tex.	123			
24	Rossville.....Ga.	New York...N. Y.	134			

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzfiffffffffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyz
$1234567890 **$1234567890**

FIGURE 51

S29 STOPBARS are used with eight-and-one-half-set faces to give nut-body figures.

CHAPTER XXXIV

The Double Matrix

294 The double Matrix produces figures as large as thirty-six point, in justified lines, without hand work of any kind; the operator strikes the KEY—"that's all." Fig. 52 shows a specimen of this work just as it comes from the CASTING MACHINE. The double MATRIX is a "double unit" in the MONOTYPE unit system of construction; the single MATRIX (Fig. 6, page 9) is .2″ square, while the double MATRIX is .2″ x .4″ and occupies the space of two single MATRICES in the MATRIX CASE. These "double units" are carried by the COMBS exactly the same as single MATRICES are carried, except that the double MATRICES are held by two COMBS, instead of one, and a BAR through their center to give additional support, as shown in Fig. 53, page 117.

$2.34 Axminster Rugs, 30x60; choice floral, Oriental and medallion; were $2.34..... **98c**

$5.67 Seamless Brussels, 10x12; in choice floral or medallion; were $5.67. **$2.34**

FIGURE 52

The work of the double MATRIX: Figures as large as thirty-six point, in justified lines, *without hand work of any kind;* strike the KEY—"that's all."

295 Double Matrices make type with a kern on the side opposite the nick; that is, *the upper portion* of a character cast with a double MATRIX extends beyond the body on which the character is cast. To provide for this overhang, when setting matter cast with double MATRICES, allowance is made in the line, or lines, *above the one in which the Keys for the big figures are struck*, exactly as allowance is made for a cut or other inserted matter; that is, quads and spaces, equivalent to the width of the big figures, are struck for as many lines above the line in which the figures are cast as may be necessary; for example, two lines in Fig. 52. The KEYS for the characters cast from double MATRICES are struck in the same line as the leaders before these big figures; that is, *these characters are cast with all the kern at the top*, never at the bottom. High quads and spaces are used always for the space in the lines above the ones in which these overhanging characters are cast, so that the kerns of the overhanging characters may rest upon and be supported by these high spaces.

296 The cone-hole of the double Matrix has exactly the same position as if the double MATRIX were a single MATRIX for casting only the lower portion of the overhanging character; that is, the portion of the MATRIX in which the kern is cast might be cut away without affecting the cone-hole. Therefore, the KEYBOARD must

make the perforations to bring the lower portion of the double MATRIX into casting position; that is, with the cone-hole beneath the CENTERING PIN. The CASTING MACHINE must be so adjusted that the COLUMN PUSHER (¶150) will push the line containing these kerned characters far enough to the right so that the RULE, as it descends, will not strike and break off these kerns.

297 The preceding paragraphs describe the provision made for the height of characters cast from double MATRICES. Consider now the methods that are used to obtain the required width for these

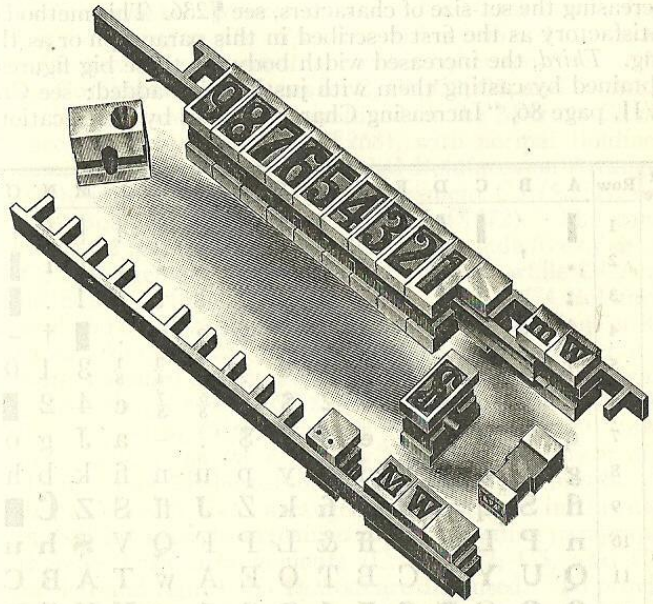


FIGURE 53

The double MATRIX: Note the manner in which it is carried by two COMBS, with teeth facing, and the BAR between the COMBS.

characters, because these double MATRIX figures are, of course, as much wider, in proportion, as they are higher than the similar figures cast from single MATRICES.

298 The set-sizes of characters cast with double Matrices may be obtained in one of three ways: *First*, the double MATRICES may be carried in the unit-row of the MATRIX CASE to give the width required; for example, Fig. 54, page 118, shows a MATRIX CASE Arrangement with the double MATRICES carried in the eighteen-unit row, of which there are two. This requires special S15 STOPBARS (¶257) and provides for Roman and Boldface caps and lower case and three fonts of figures besides the double MATRIX figures; nine-unit Roman and Boldface and fourteen-unit Boldface figures: Fig. 52, page 116, was cast from a MATRIX CASE, arranged exactly like

Fig. 54, but the third method was used, instead of the first, because the thirty-six-point figures are wider than eighteen units of the set used. *Second*, if these big figures do not come at the beginning or end of the line, their bodies may be cast in two pieces; for example, if figures whose width equals twenty-four units of eight-and-one-half-set be carried in the eighteen-unit row of that set, a six-unit high space must be struck *before* each figure (18+6=24). In this case the big figure is cast with a kern to the left of the type-body, as well as on the side opposite the nick, and these kerns are supported by spaces on two sides of the body. For further details of this method of increasing the set-size of characters, see ¶236. This method is not so satisfactory as the first described in this paragraph or as the following. *Third*, the increased width body for these big figures may be obtained by casting them with justification added; see Chapter XXVII, page 86, "Increasing Character Sizes by Justification."

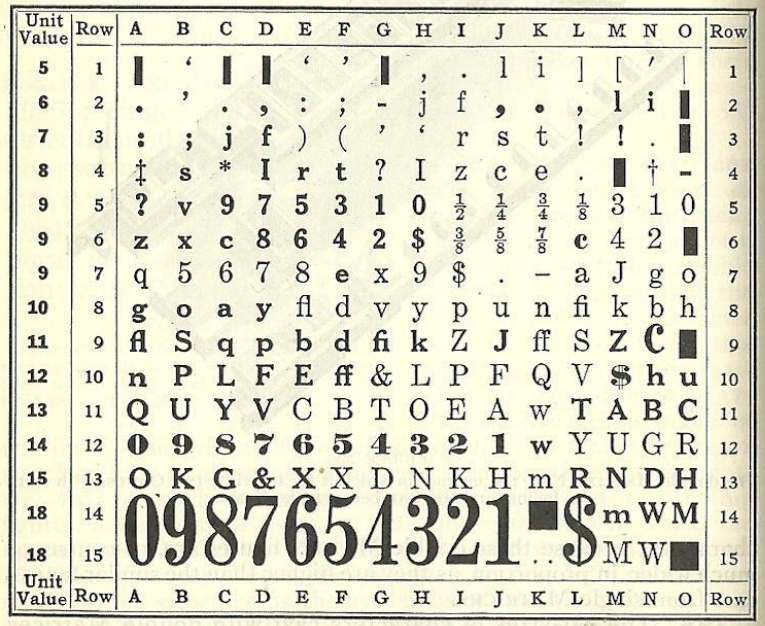


FIGURE 54

MATRIX CASE Arrangement for double MATRICES provides for Roman and Boldface caps and lower case and *four fonts of figures;* viz.—nine-unit Roman and Boldface, fourteen- and eighteen-unit Boldface. Special KEYBARS and STOPBARS are, of course, required. These STOPBARS S15 give the following arrangement of unit-rows: 5 6 7 8 9 9 9 10 11 12 13 14 15 18 18.

CHAPTER XXXV

Matrix Case Arrangements for Standard Stopbars

299 *"Monotype faces are designed for . . . . . five different arrangements of characters in the Matrix Case (C, C1, C2, C3, and C4), but it is by no means necessary to use the Matrices so designed on just these five arrangements. Speaking within limits, Matrices may be combined to meet the requirements of any kind of composition."* (¶267.)

300 Combination of Faces on C, C1, C2, C3, and C4 Arrangements: Roman faces may be combined in the MATRIX CASE with Italic faces on Arrangement C (¶268), with normal Boldfaces on Arrangement C1 (¶269), with extended Boldfaces on Arrangement C2 (¶270), with a text letter on Arrangement C3 (¶271), or with condensed Boldfaces on Arrangement C4 (¶272). The combinations on the C1 and C2 Arrangements may include five or six alphabets; C3 Arrangement includes five alphabets; while C4 Arrangement includes but four alphabets, as the caps of C4 Boldfaces are condensed and occupy some of the MATRIX CASE positions of Roman small caps. All the arrangements described in this chapter are composed with standard STOPBARS S5 (¶261), which give the standard arrangement of unit-rows (5 6 7 8 9 9 9 10 10 11 12 13 14 15 18).

301 *"Keybutton Clips, shown in Fig. 34"* (page 99) *"are used to change characters on the Keybanks"* (¶262), the object of these CLIPS being to avoid the use of needless extra KEYBANKS. Thus, with all the MATRIX CASE arrangements described in this chapter, S5 STOPBARS are used, as explained in the preceding paragraph, and with the five basic arrangements (C, C1, C2, C3, and C4) the standard left and right C KEYBANKS are also used. To provide for the difference in MATRIX CASE arrangements, however, KEYBUTTON CLIPS are used to change a few of the characters on the standard KEYBANKS. For example, in changing from Arrangement C to Arrangement C1, KEY No. 128 on the right KEYBANK is capped with the Boldface opening quote and KEY No. 159 is capped with the Boldface closing quote; these are necessary because the standard right KEYBANK C is made for Italic and, therefore, requires no quotes, since Roman quotes are used with Italic. With each MATRIX CASE arrangement (pages 122 to 143), under each of the KEYBANKS specified for use with those arrangements is given the number of KEYBUTTON CLIPS required for that KEYBANK, so that, in ordering the equipment for any of these arrangements, the required number of KEYBUTTON CLIPS may be included in the specification.

302 "Matrix Case Arrangements for the Style D Keyboard:" This book of charts, similar to Plate IX, at back of book, gives the details of KEYBANKS, KEYBARS, and cappings for the MATRIX CASE arrangements described in this chapter; the

capping details in the preceding paragraph are given only to illustrate the manner in which the same KEYBANK may be used with several KEYBARS for different MATRIX CASE arrangements, and cappings will not be given in the following description of the arrangements.

303 Five-alphabet Arrangements, of which there are four (not counting the substitution of Gothic caps for Roman small caps, ¶268), provide for the following combinations: **Arrangement C** (Fig. 55, page 122, and Plate IX, at back of book) combines Roman caps, small caps, lower case, figures, and points with Italic caps, lower case, figures, and points; **Arrangement C1** (Fig. 56, page 123) replaces the C Italic with normal Boldface caps, lower case, figures, and points; **Arrangement C2** (Fig. 57, page 123) provides for a similar combination of Roman with an extended Boldface caps, lower case, figures, and points; **Arrangement C3** (Fig. 58, page 124) combines Roman with a text letter having very extended caps, condensed lower case, figures, and points.

304 Keybanks and Keybars for Five-alphabet Arrangements: Plate IX gives both the MATRIX and the KEY positions for **Arrangement C,** which requires, at the KEYBOARD, left and right KEYBANKS C (¶253), left and right KEYBARS C (¶255), and standard STOPBARS S5 (¶261). In changing from Arrangement C to **Arrangement C1** no change whatever is required in the left KEYBANK and KEYBARS, for the position of the Roman MATRICES is identical; but since the C1 Boldface MATRICES occupy entirely different positions in the MATRIX CASE from the C Italic MATRICES, it is necessary to use different right KEYBARS, so that the KEYS in the first seven rows from the bottom on the right KEYBANK (now used for the C1 Boldface caps and lower case instead of for the Italic) will produce the required perforations to correspond with the C1 Boldface MATRICES (Fig. 56, page 123). With Arrangement C1, therefore, use the left KEYBANK and KEYBARS C, right KEYBANK C with right KEYBARS C1; that is, in changing from Arrangement C to C1 replace the right KEYBARS C with the KEYBARS C1. **Arrangement C2** uses the same left KEYBANK C, KEYBARS C, and right KEYBANK C as do Arrangements C and C1; but, since the MATRIX CASE positions for the extended Boldface characters (Fig. 57, page 123) are quite different from the positions for Italic C or Boldface C1, it is necessary to use different right KEYBARS C2. **Arrangement C3** takes the same left KEYBANK C, KEYBARS C, and right KEYBANK C as do Arrangements C, C1, and C2; but the extra extended caps of text letter faces (Fig. 58, page 124) require right KEYBARS C3.

305 Four-alphabet Arrangement C4 (Fig. 59, page 124) combines Roman caps, lower case, figures, and points with a condensed Boldface caps, lower case, figures, and points; these Boldface caps are very condensed, but the lower case is nearly normal. The Roman small caps are omitted because the condensed caps of the C4 Boldface, in many cases, occupy the positions of the Roman small caps.

306 Keybanks and Keybars for Four-alphabet Arrangement C4: This requires left and right KEYBANKS C and left KEYBARS C, same as Arrangement C1, but different right KEYBARS C4.

307 Six-alphabet Arrangements (Figs. 60 and 61, page 125), provide for Roman caps and lower case, Italic caps and lower case, and Boldface caps and lower case, with necessary points and two sets of figures. Fig. 60 shows **Arrangement 6C1** for C1 normal Boldfaces (¶269), and Fig. 61 shows **Arrangement 6C2** for C2 extended Boldfaces (¶270). Space in the MATRIX CASE for these six alphabets is obtained by omitting the diphthongs, some ligatures, and the infrequently used signs. Note *that a few of the Italic and Boldface caps are moved from their correct unit-rows to wider rows*, so that these caps are cast with a shoulder to the left of the type. Since the cap usually follows a space, this shoulder makes no difference unless entire words are to be composed in Italic or Boldface caps; in this case this shoulder would give the appearance of a hair-space between it and the cap that preceded it. When these caps, not carried in their true unit-rows, are to be set with other caps, strike characters of the correct width for these caps, instead of these wide caps, and exchange these characters for the caps on their true body when corrections are made at the case (¶186).*

308 Keybanks and Keybars for Six-alphabet Arrangements: Arrangement 6C1, for C1 (normal) Boldfaces, takes left and right KEYBANKS and KEYBARS 6C1 and standard STOPBARS S5; **Arrangement 6C2,** for C2 (extended) Boldfaces, uses the same equipment as does Arrangement 6C1 except that the right KEYBARS 6C1 are replaced by right KEYBARS 6C2.

309 French Arrangements: There are three of these (FC, FC1, and FC2) which are five-alphabet arrangements and conform to the same standards as the C, C1, and C2 English arrangements, excepting that they carry eleven French accents in each of the lower case alphabets and one or two of the cap accents. **Arrangement FC** (Fig. 62, page 126) combines Roman caps, small caps, lower case, figures, and points with Italic caps, lower case, figures, and points; **Arrangement FC1** (Fig. 63, page 126) combines Roman caps, small caps, lower case, figures, and points with normal Boldface caps, lower case, figures, and points; **Arrangement FC2** (Fig. 64, page 127) is similar to Arrangement FC1 except that the normal Boldface is replaced by an extended Boldface.

310 Keybanks and Keybars for French Arrangements: Arrangement FC takes left and right KEYBANKS† and KEYBARS FC and standard STOPBARS S5; **Arrangement FC1** uses the same equipment as Arrangement FC, except that the right KEYBARS FC are replaced by the right KEYBARS FC1; **Arrangement FC2** takes the same equipment as Arrangement FC except that it uses right KEYBARS FC2 instead of right KEYBARS FC.

311 German Arrangement GC1 (Fig. 65, page 127) combines a complete font of German lightface caps, lower case, figures, and points with German Boldface caps, lower case, figures, and points, all accents, logotypes, and signs used in the German language.

* When casting type for the case from a font which has characters moved from their true unit rows be sure to *cast these characters of their correct unit width.*

† While the English KEYBANKS C can be used by capping (¶263), it is not advisable to do this when changes are frequent as it requires a large number of cappings.

312 Keybanks and Keybars for German Arrangement: Arrangement GC1 requires left and right KEYBANKS and KEYBARS GC1 and standard STOPBARS S5.

313 Spanish Arrangements: The five-alphabet Spanish arrangements SC, SC1, and SC2 are based upon the English Arrangements C, C1, and C2. Each of these Spanish arrangements carries all the seven Spanish lower case accents in each alphabet as well as the tilda Ñ in both cap and small cap alphabets throughout. The cap W and lower case k not being regularly used in Spanish, are omitted from the MATRIX CASE. **Arrangement SC** (Fig. 66, page 128) combines Roman caps, small caps, lower case, figures, and points with Italic caps, lower case, figures, and points; **Arrangement SC1** (Fig. 67, page 128) is the same as Arrangement SC except that the Italic is replaced by a normal Boldface; **Arrangement SC2** (Fig. 68, page 129) provides for a similar combination of Roman with an extended Boldface.

314 Keybanks and Keybars for Spanish Arrangements: Arrangement SC takes left and right KEYBANKS* and KEYBARS SC and standard STOPBARS S5; **Arrangement SC1,** same equipment as Arrangement SC except that it substitutes right KEYBARS SC1; **Arrangement SC2,** same equipment as Arrangement SC except that right KEYBARS SC2 are used instead of right KEYBARS SC.

* While the English KEYBANKS C can be used by capping (¶263), it is not advisable to do this when changes are frequent, as it requires a large number of cappings.

Arrangement C

ROMAN CAPS, SMALL CAPS, and lower case; *ITALIC CAPS and lower case;* Roman and Italic figures and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	▌	▌	*l*	*t*	‘	’	.	,	▌	l	i	]	[	’	|	5
2	*j*	*f*	*i*	!	:	;	-	j	f	ı	*l*	*:*	*;*	▌	▌	6
3	*c*	*r*	*s*	*e*	)	(	’	‘	r	s	t	J	*v*	°	*z*	7
4	‡	*q*	*	*b*	*g*	*o*	?	I	z	c	e	z	s	†	*?*	8
5	*I*	▌	*9*	*7*	*5*	*3*	*1*	*0*	.	9	7	5	3	1	0	9¹
6	C	▌	▌	*8*	*6*	*4*	*2*	$	–	$	8	6	4	2	▌	9²
7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	P	F	L	T	9³
8	A	*fi*	*u*	*n*	.	S	v	y	p	u	n	Q	B	O	E	10¹
9	D	▌	*fl*	*p*	fl	fi	q	k	b	h	d	V	Y	G	R	10²
10	H	&	*J*	*S*	*œ*	*æ*	*ff*	▌	Z	▌	ff	X	U	K	N	11
11	*O*	*L*	*C*	*F*	*w*	£	æ	L	P	F	¶	M	*Z*	*Q*	*G*	12
12	*E*	&	Q	V	C	B	T	O	E	A	w	*P*	*T*	*R*	*B*	13
13	*D*	*A*	*Y*	*ffl*	*ffi*	*m*	œ	Y	U	G	R	Œ	Æ	w	*V*	14
14	*K*	*N*	*H*	ffl	ffi	X	D	N	K	H	m	&	℔	*X*	*U*	15
15	Œ	Æ	¾	¼	½	*W*	*M*	—	. .	M	W	%	Œ	Æ	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
ABCDEFGHIJKLMNOPQRST
UVWXYZ&ÆŒ
abcdefghijklmnopqrstuvw
xyzæœfiffflffiffl.,-:;‘’!?
*†‡¶%£℔⁰₂ ₁₈ ₉ ¹⁰ ¹⁸[]()
$1234567890½¼¾
$1234567890

LEFT
Keybank C—Keybars C
3 Keybutton Clips

Stopbars S5

RIGHT
Keybank C—Keybars C
1 Keybutton Clip

FIGURE 55

Arrangement C1

ROMAN CAPS, SMALL CAPS, and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface figures and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	’	‘	**l**	**i**	‘	’	.	,	▌	l	i	]	[	-	,	5
2	▌	▌	▌	!	:	;	-	j	f	ı	**j**	**f**	**t**	▌	▌	6
3	**:**	**;**	**-**	**I**	)	(	’	‘	r	s	t	J	**r**	°	**!**	7
4	‡	**?**	*	**z**	**c**	**s**	?	I	z	c	e	z	s	†	▌	8
5	**y**	**o**	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	9¹
6	C	**v**	**p**	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	▌	9²
7	**J**	**x**	**q**	**g**	**a**	**e**	x	J	g	o	a	P	F	L	T	9³
8	A	**b**	**h**	**n**	y	S	v	y	p	u	n	**fl**	B	O	E	10¹
9	D	Q	**k**	**d**	fl	fi	q	k	b	h	d	v	**u**	G	R	10²
10	H	&	▌	**Z**	**F**	**L**	**S**	**fl**	Z	**ff**	ff	x	U	K	N	11
11	**B**	**P**	**C**	**E**	**A**	**T**	æ	L	P	F	¶	M	**Y**	**V**	**X**	12
12	**&**	&	Q	V	C	B	T	O	E	A	w	**w**	**R**	**U**	**æ**	13
13	**œ**	**O**	**K**	**G**	**D**	**N**	œ	Y	U	G	R	Œ	Æ	w	**Q**	14
14	▌	**ffl**	**ffi**	ffl	ffi	X	D	N	K	H	m	▌	℔	**m**	**H**	15
15	Œ	Æ	¾	¼	½	**W**	**M**	—	. .	M	W	%	**Œ**	**Æ**	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
ABCDEFGHIJKLMNOPQRST
UVWXYZ&ÆŒ
abcdefghijklmnopqrstuvw
xyzæœfiffflffiffl.,-:;‘’!?
*†‡¶%£℔⁰₂ ₁₈ ₉ ¹⁰ ¹⁸[]()
$1234567890½¼¾
$1234567890

These Characters are made for use with this Arrangement

’|£¹⁰

LEFT
Keybank C—Keybars C
7 Keybutton Clips

Stopbars S5

RIGHT
Keybank C—Keybars C1
3 Keybutton Clips

FIGURE 56

Arrangement C2

ROMAN CAPS, SMALL CAPS, and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface figures

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	▌	▌	▌	▌	‘	’	.	,	▌	l	i	]	[	’	|	5
2	‘	’	.	!	:	;	-	j	f	ı	**,**	**l**	▌	▌	▌	6
3	**:**	**;**	**j**	**f**	)	(	’	‘	r	s	t	J	**!**	°	▌	7
4	‡	**s**	*	**I**	**r**	**t**	?	I	z	c	e	z	s	†	**-**	8
5	**?**	▌	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	9¹
6	C	▌	▌	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	▌	9²
7	▌	**z**	**x**	**v**	**c**	**e**	x	J	g	o	a	P	F	L	T	9³
8	A	**g**	**o**	**a**	.	S	v	y	p	u	n	Q	B	O	E	10¹
9	D	▌	**J**	**y**	fl	fi	q	k	b	h	d	v	Y	G	R	10²
10	H	**fl**	**S**	**q**	**p**	**b**	**d**	**fi**	Z	**k**	ff	x	U	K	N	11
11	**n**	**P**	**L**	**Z**	**F**	**E**	æ	L	P	F	¶	M	**ff**	**h**	**u**	12
12	**V**	&	Q	V	C	B	T	O	E	A	w	**T**	**A**	**B**	**C**	13
13	**æ**	**R**	**N**	**D**	**O**	**w**	œ	Y	U	G	R	**U**	**Y**	w	**Q**	14
14	**X**	**G**	**K**	ffl	ffi	X	D	N	K	H	m	**H**	℔	**œ**	**&**	15
15	Œ	Æ	**ffl**	**ffi**	**m**	**W**	**M**	—	. .	M	W	%	**Œ**	**Æ**	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
ABCDEFGHIJKLMNOPQRST
UVWXYZ
abcdefghijklmnopqrstuv
wxyzæœfiffflffiffl.,-:;‘’!?
*†‡¶%£℔⁰₂ ₁₈ ₉ ¹⁰ ¹⁸[]()
$1234567890**$1234567890**

These Characters are made for use with this Arrangement

&ÆŒ
£
½¼¾

LEFT
Keybank C—Keybars C
3 Keybutton Clips

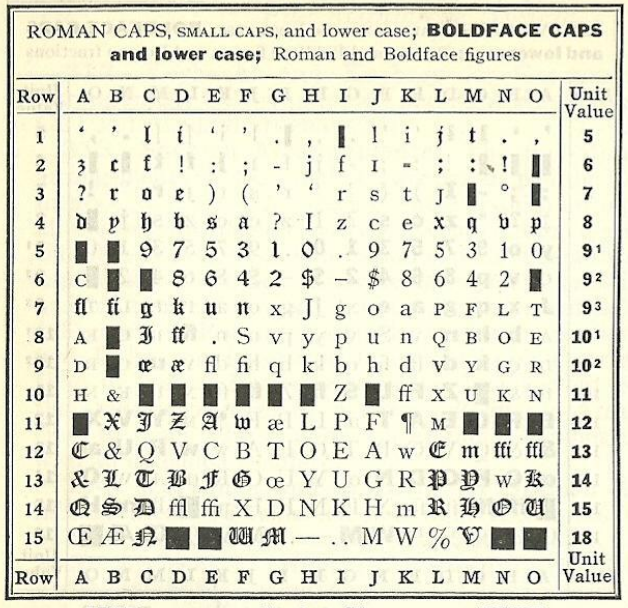
Stopbars S5

RIGHT
Keybank C—Keybars C2
9 Keybutton Clips

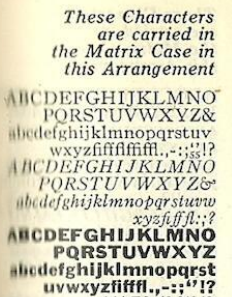
FIGURE 57

Arrangement C3

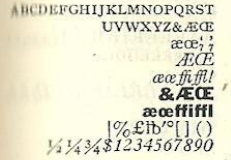
ROMAN CAPS, SMALL CAPS, and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface figures



These Characters are carried in the Matrix Case in this Arrangement



These Characters are made for use with this Arrangement



LEFT
Keybank C—Keybars C
11 Keybutton Clips

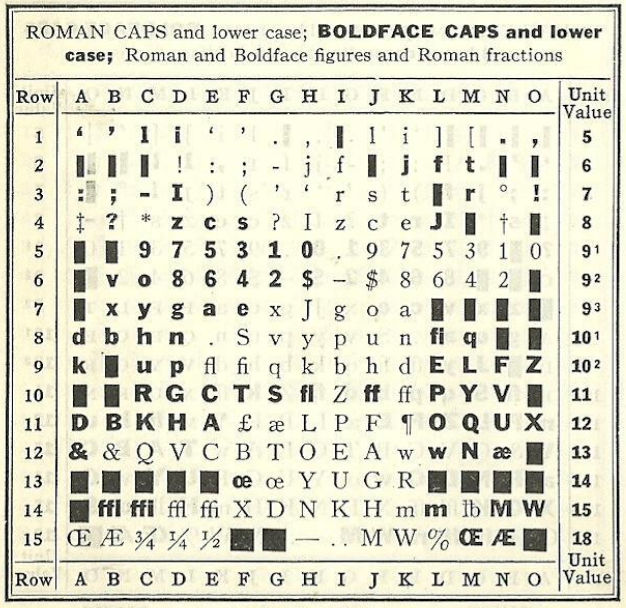
Stopbars S5

RIGHT
Keybank C—Keybars C3
13 Keybutton Clips

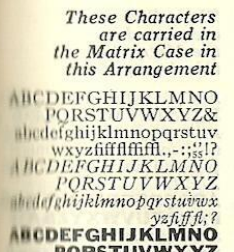
FIGURE 58

Arrangement C4

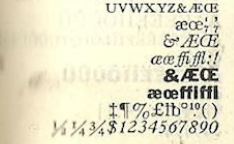
ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface figures and Roman fractions



These Characters are carried in the Matrix Case in this Arrangement



These Characters are made for use with this Arrangement



LEFT
Keybank C—Keybars C
3 Keybutton Clips

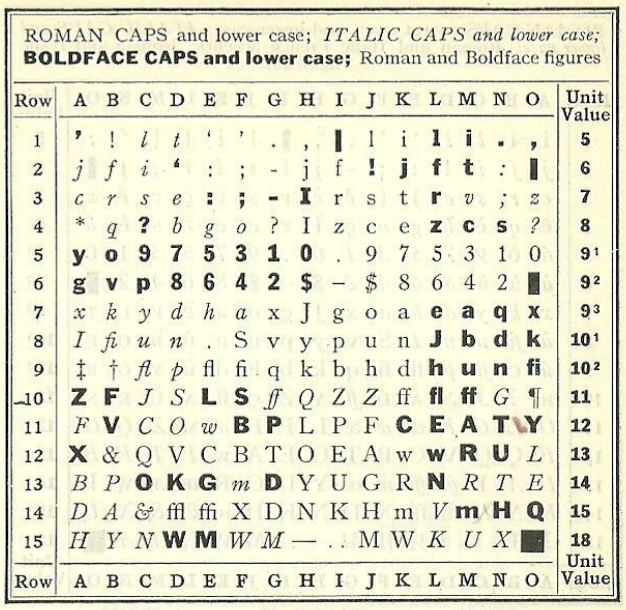
Stopbars S5

RIGHT
Keybank C—Keybars C4
11 Keybutton Clips

FIGURE 59

Arrangement 6C1

ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* **BOLDFACE CAPS and lower case;** Roman and Boldface figures



These Characters are carried in the Matrix Case in this Arrangement

These Characters are made for use with this Arrangement

LEFT
Keybank 6C1—Keybars 6C1

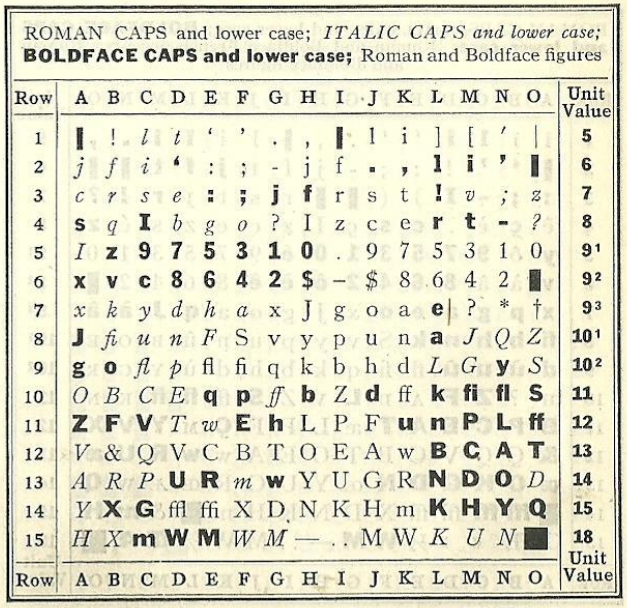
Stopbars S5

RIGHT
Keybank 6C1—Keybars 6C1
1 Keybutton Clip

FIGURE 60

Arrangement 6C2

ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* **BOLDFACE CAPS and lower case;** Roman and Boldface figures



These Characters are carried in the Matrix Case in this Arrangement

These Characters are made for use with this Arrangement

LEFT
Keybank 6C1—Keybars 6C1
1 Keybutton Clip

Stopbars S5

RIGHT
Keybank 6C1—Keybars 6C2
7 Keybutton Clips

FIGURE 61

Arrangement FC

ROMAN CAPS, SMALL CAPS, and lower case; *ITALIC CAPS and lower case;* Roman and Italic French accents; Roman and Italic figures

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	î	ï	*l*	*t*	‘	’	.	,	▌	l	i	]	[	′	:	5
2	*j*	*f*	*i*	!	:	;	-	j	f	ı	*î*	*ï*	;	J	▌	6
3	*c*	*r*	*s*	*e*	)	(	*ê*	*è*	r	s	t	*ç*	*v*	*é*	*z*	7
4	ê	*q*	è	*b*	*g*	*o*	ç	I	z	c	e	z	s	é	*ô*	8
5	*â*	*ô*	*9*	*7*	*5*	*3*	*1*	*0*	.	9	7	5	3	1	0	9¹
6	*à*	á	*â*	*8*	*6*	*4*	*2*	$	–	$	8	6	4	2	▌	9²
7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	P	F	L	T	9³
8	*ù*	*fi*	*u*	*n*	*I*	S	v	y	p	u	n	*û*	B	O	E	10¹
9	*û*	c	*fl*	*p*	fl	fi	q	k	b	h	d	ù	Y	G	R	10²
10	H	?	*J*	*S*	A	D	*ff*	v	Z	Q	ff	X	U	K	N	11
11	*O*	*L*	*C*	*F*	*w*	*æ*	æ	L	P	F	*œ*	M	*Z*	*Q*	*G*	12
12	*E*	Ç	Q	V	C	B	T	O	E	A	w	*P*	*T*	*R*	*B*	13
13	*D*	*A*	*Y*	*ffl*	*ffi*	*m*	œ	Y	U	G	R	Œ	Æ	w	*V*	14
14	*K*	*N*	*H*	ffl	ffi	X	D	N	K	H	m	*&*	&	*X*	*U*	15
15	Œ	Æ	«	»	½	*W*	*M*	—	. .	M	W	%	Œ	Æ	■	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCÇDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
ABCDEFGHIJKLMNOPQRST
UVWXYZÆŒ
aàâbcçdeéèêfghiîïjklmnoô
pqrstuùûvwxyzæœfiffffffifl
.,-:;ss!?
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&Æ
aàâbcçdeéèêfghiîïjklmnoô
qrstuùûvwxyzæœfiffffffifl
%'« » 2 18 9 18 [ ] ( )
$1234567890½*$1234567*

These Characters are made for use with this Arrangement

ÀÂÉÈÊËÎÏÔÙÛÜ
ÀÂÇÉÈÊËÎÏÔÙÛÜ&
ëü;'
ÀÂÇÉÈÊËÎÏÔÙÛÜ
ëü!?
**†‡¶£lb°¹⁰*
¼¾

LEFT
Keybank FC—Keybars FC

Stopbars S5

RIGHT
Keybank FC—Keybars FC
2 Keybutton Clips

FIGURE 62

Arrangement FC1

ROMAN CAPS, SMALL CAPS, and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface French accents; Roman and Boldface figures

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	î	ï	**l**	**l**	‘	’	.	,	▌	l	i	**ï**	**î**	.	,	5
2	▌	‘	’	!	:	;	-	j	f	ı	**j**	**f**	**t**	▌	▌	6
3	**:**	**;**	**-**	**I**	)	(	▌	▌	r	s	t	J	**r**	**!**	**?**	7
4	ê	**ç**	è	.	**c**	**s**	ç	I	z	c	e	z	s	é	**z**	8
5	**y**	ô	**9**	**7**	**5**	**3**	**1**	**0**	**é**	9	7	5	3	1	0	9¹
6	**v**	à	â	**8**	**6**	**4**	**2**	**ô**	**è**	**ê**	8	6	4	2	▌	9²
7	**x**	**p**	**g**	**a**	**e**	**o**	x	J	g	o	a	**q**	**J**	**à**	**â**	9³
8	**fi**	**b**	**h**	**n**	**k**	S	v	y	p	u	n	û	B	O	E	10¹
9	**d**	**ù**	**u**	**û**	fl	fi	q	k	b	h	d	ù	Y	G	R	10²
10	H	?	**Z**	**F**	A	D	**L**	v	Z	**S**	ff	**fl**	**ff**	K	N	11
11	**B**	**P**	**C**	**E**	**A**	**T**	æ	L	P	F	**Ç**	M	**Y**	**V**	**X**	12
12	**&**	Ç	Q	V	C	B	T	O	E	A	w	**w**	**R**	**U**	**æ**	13
13	**œ**	**O**	**K**	**G**	**D**	**N**	œ	Y	U	G	R	Œ	Æ	w	**Q**	14
14	■	**ffi**	**ffl**	ffl	ffi	X	D	N	K	H	m	■	&	**m**	**H**	15
15	Œ	Æ	«	»	½	**W**	**M**	—	. .	M	W	%	**Œ**	**Æ**	■	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCÇDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
ABDEGHIJKMNORSVWYZ
aàâbcçdeéèêfghiîïjklmnoô
pqrstuùûvwxyzæœfiffffffifl
.,-:;ss!?
ABCÇDEFGHIJKLMNO
PQRSTUVWXYZ&Æ
aàâbcçdeéèêfghiîïjklm
noôpqrstuùûvwxyzæœ
fiffffffifl.,-:;"!?
%'« » 18 5 18 ( )
1234567890½**1234567890**

These Characters are made for use with this Arrangement

ÀÂÉÈÊËÎÏÔÙÛÜ
ÀÂÇÉÈÊËÎÏLÔPQTUÙÛÜ
ëü;'
ÀÂÉÈÊËÎÏÔÙÛÜ
ëü
**†‡¶£lb°/₂?[ ]*
$$¼¾

LEFT
Keybank FC—Keybars FC
4 Keybutton Clips

Stopbars S5

RIGHT
Keybank FC—Keybars FC1
14 Keybutton Clips

FIGURE 63

Arrangement FC2

ROMAN CAPS, SMALL CAPS, and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface French accents; Roman and Boldface figures

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	î	ï	▌	▌	‘	’	.	,	▌	l	i	]	[	′	|	5
2	‘	’	.	!	:	;	-	j	f	**l**	**î**	**ï**	**ì**	,	▌	6
3	**:**	**;**	**j**	**f**	)	(	▌	▌	r	s	t	J	**!**	▌	▌	7
4	ê	**s**	è	**I**	**r**	**t**	ç	I	z	c	e	z	s	é	**-**	8
5	**?**	ô	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	9¹
6	c	à	â	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	▌	9²
7	**x**	**z**	**v**	**c**	**e**	**ç**	x	J	g	o	a	**ê**	**è**	L	**ê**	9³
8	A	**g**	**o**	**a**	**J**	S	v	y	p	u	n	û	B	O	E	10¹
9	D	**à**	**â**	**y**	fl	fi	q	k	b	h	d	ù	Y	**ô**	R	10²
10	H	?	**S**	**q**	**p**	**b**	**d**	**fi**	Z	**k**	ff	**fl**	U	K	N	11
11	**n**	**P**	**L**	**Z**	**F**	**E**	**û**	L	P	F	**ff**	M	**h**	**u**	**ù**	12
12	**V**	Ç	Q	V	C	B	T	O	E	A	w	**B**	**T**	**A**	**C**	13
13	**æ**	**R**	**N**	**D**	**O**	**w**	œ	Y	U	G	R	**U**	**Y**	w	**Q**	14
14	**X**	**G**	**K**	ffl	ffi	X	D	N	K	H	m	**H**	&	**œ**	**&**	15
15	Œ	Æ	«	»	**ffl**	**W**	**M**	—	. .	M	W	%	**m**	**ffi**	■	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCÇDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
ABCDIJKLMNORSUWXYZ
aàâbcçdeéèêfghiîïjklmnoô
pqrstuùûvwxyzœfiffffffifl
.,-:;ss!?
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
aàâbcçdeéèêfghiîïjklm
noôpqrstuùûvwxyzæœ
fiffffffifl.,-:;"!?
%'| « » 2 18 9 18 [ ] ( )
$1234567890**$1234567890**

These Characters are made for use with this Arrangement

ÀÂÉÈÊËÎÏÔÙÛÜ
ÀÂÇÉÈÊËÎÏFGIÎÏÔPQTÙÛÜVX
&ÆŒ
ëüæ;'
ÀÂÇÉÈÊËÎÏÔÙÛÜÆŒ
ëü
**†‡¶£lb°¹⁰*
½¼¾

LEFT
Keybank FC—Keybars FC
2 Keybutton Clips

Stopbars S5

RIGHT
Keybank FC—Keybars FC2
13 Keybutton Clips

FIGURE 64

Arrangement GC1

GERMAN LIGHTFACE CAPS and lower case; **GERMAN BOLDFACE CAPS and lower case;** Roman and Boldface figures and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	:	;	.	,	i	’	:	;	.	,	f	ſ	j	l	i	5
2	’	j	ſ	ſ	l	ſ	t	!	=	ſ	ʒ	c	t	e	▌	6
3	=	!	ʒ	c	r	e	]	[	“	„	)	(	?	ɾ	r	7
4	▌	ƀ	ö	ä	q	ɒ	ŋ	ß	þ	g	ƀ	ƀ	o	ɑ	b	8
5	“	„	)	(	ö	ß	ŋ	ß	.	9	7	5	3	1	0	9¹
6	ɒ	*	†	§	ü	ɾ	ƫ	ɒ	–	$	8	6	4	2	▌	9²
7	ä	q	g	u	þ	ƀ	n	ƀ	ɑ	ℒ	ü	ß	ƫ	u	n	9³
8	▌	▌	▌	†	?	ℒ	ff	ſſ	ſt	ll	ff	ck	ſſ	ll	.	10¹
9	▌	▌	▌	§	*	ℜ	ck	fl	fi	ſi	ℜ	fl	fi	ſt	ſi	10²
10	▌	▌	▌	▌	**$**	**0**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	11
11	▌	▌	▌	Ü	U	Ü	Ä	𝔜	𝔉	ℭ	U	𝔄	ℭ	ck	w	12
12	Ä	𝔗	𝔎	𝔉	ℭ	𝔍	𝔄	ℭ	ck	w	ℨ	𝔎	𝔓	𝔗	𝔍	13
13	▌	▌	▌	&	&	ℨ	𝔜	m	𝔙	𝔑	𝔊	𝔊	𝔅	𝔑	m	14
14	Ö	𝔙	𝔖	𝔑	O	𝔑	𝔊	ℊ	𝔓	𝔅	𝔇	Ö	O	𝔖	𝔇	15
15	¾	¼	½	▌	2c.	O	𝔐	𝔚	2c.	O	𝔐	—	. .	𝔚	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

𝔄𝔅ℭ𝔇𝔈𝔉𝔊ℌℑ𝔎𝔏𝔐𝔑O
PQ𝔑𝔖𝔗U𝔘𝔙𝔚𝔛𝔜ℨ2c.&
ABDEGHIJKMNORSVWYZ
aàâbcçdeéèêfghiîïjklmnoô
pqrstuùûvwxyzæœfiffffffifl
.,-:;ss!?
𝔄𝔅ℭ𝔇𝔈𝔉𝔊ℌℑ𝔎𝔏𝔐
𝔑O𝔓𝔔R𝔖𝔗U𝔘𝔙𝔚𝔛
𝔜ℨ2c.&
aàbcdefghijklmnoöpqrſs
tuüvwxyzchckfiffflſiſſtßz
.,-:;"!?"„( )*†§
$1234567890½¼¾¾
$1234567890

LEFT
Keybank GC—Keybars GC

Stopbars S5

RIGHT
Keybank GC—Keybars GC

FIGURE 65

Arrangement SC

ROMAN CAPS, SMALL CAPS, and lower case; *ITALIC CAPS and lower case;* Roman and Italic Spanish accents; Roman and Italic figures and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	▌	¡	*t*	|	*l*	[	]	.	,	l	i	í	’	‘	!	5
2	*l*	*!*	:	;	*j*	*f*	*i*	*í*	j	f	ı	-	;	:	▌	6
3	*z*	*v*	*c*	*r*	*s*	*e*	*é*	r	s	t	a	o	j	)	(	7
4	▌	*b*	*g*	*o*	*ó*	z	z	c	e	é	I	*q*	?	s	¿	8
5	*9*	*7*	*5*	*3*	*1*	*0*	*y*	*d*	.	9	7	5	3	1	0	9[1]
6	*$*	*8*	*6*	*4*	*2*	*?*	*a*	*á*	–	$	8	6	4	2	▌	9[2]
7	*I*	*x*	c	*h*	J	x	g	o	ó	a	á	P	F	L	T	9[3]
8	A	*fi*	*u*	*ü*	S	b	p	u	ú	n	ñ	Q	B	O	E	10[1]
9	D	*p*	*n*	*ñ*	*ú*	fi	v	y	h	d	q	ü	Y	G	R	10[2]
10	H	X	&	▌	*J*	*S*	¿	▌	Z	▌	▌	N	Ñ	U	K	11
11	▌	▌	*w*	*O*	*L*	*C*	¶	L	P	F	*F*	M	*Z*	*G*	*Q*	12
12	*B*	*R*	&	Q	V	C	B	T	O	E	A	w	*T*	*E*	*P*	13
13	▌	▌	▌	▌	*V*	*Y*	*m*	Y	U	G	R	*D*	*A*	▌	w	14
14	*H*	*N*	*Ñ*	X	D	N	Ñ	m	H	K	&	*X*	*U*	*K*	℔	15
15	⅛	⅜	⅝	⅞	%	*M*	⅓	—	..	M	⅔	½	¼	¾	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNÑ
OPQRSTUVXYZ&
ABCDEFGHIJKLMNÑOPQRST
UWXYZ&
aábcdeéfghiíjlmnñoópqrst
uúüvwxyzfi.,-:;‘’!?¡¿
ÁBCDEFGHIJKLMNÑ
OPQRSTUVXYZ&
aábcdeéfghiíjlmnñoópqrstu
úüvwxyzfi.:;!?¡¿
ao%¶|℔²⅛⅜⅝⅞[]()
$1234567890
½¼¾⅛⅜⅝⅞⅓⅔
$1234567890

These Characters are made for use with this Arrangement

ÁÉÍÓÚÜWÆŒ
ÁÉÍÓÚÜVÆŒ
kæœffffiffifl;;
ÁÉÍÓÚÜWÆŒ
kæœffffiffifl
’*†‡£[10]

LEFT
Keybank SC—Keybars SC
1 Keybutton Clip

Stopbars S5

RIGHT
Keybank SC—Keybars SC

FIGURE 66

Arrangement SC1

ROMAN CAPS, SMALL CAPS, and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface Spanish accents; Roman and Boldface figures and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	▌	¡	**l**	**í**	**i**	[	]	.	,	l	i	í	’	‘	!	5
2	▌	‘	**j**	**f**	**t**	**.**	**,**	’	j	f	ı	-	;	:	▌	6
3	**:**	**;**	**¡**	**!**	**I**	**-**	**r**	r	s	t	a	o	j	)	(	7
4	▌	**?**	**z**	**c**	**s**	z	z	c	e	é	I	**¿**	?	s	¿	8
5	**9**	**7**	**5**	**3**	**1**	**0**	**p**	**o**	.	9	7	5	3	1	0	9[1]
6	**$**	**8**	**6**	**4**	**2**	**g**	**e**	**a**	–	$	8	6	4	2	▌	9[2]
7	**J**	**x**	**v**	**y**	J	x	g	o	ó	a	á	**q**	**á**	**é**	**ó**	9[3]
8	A	**b**	**h**	**ü**	S	b	p	u	ú	n	ñ	**fi**	B	O	E	10[1]
9	D	**d**	**n**	**ñ**	**u**	fi	v	y	h	d	q	ü	**ú**	G	R	10[2]
10	H	X	&	▌	**Z**	**F**	**L**	**S**	Z	▌	▌	N	Ñ	U	K	11
11	▌	**B**	**P**	**C**	**E**	**A**	¶	L	P	F	**T**	M	**Y**	**V**	**X**	12
12	▌	**w**	&	Q	V	C	B	T	O	E	A	w	**R**	**U**	**&**	13
13	▌	▌	**G**	**D**	**N**	**Ñ**	**Q**	Y	U	G	R	**O**	**K**	▌	w	14
14	▌	▌	▌	X	D	N	Ñ	m	H	K	**m**	**H**	▌	▌	℔	15
15	⅛	⅜	⅝	⅞	%	**M**	⅓	—	..	M	⅔	½	¼	¾	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNÑ
OPQRSTUVXYZ&
ABDEGHIJKMNÑORSUWXYZ&
aábcdeéfghiíjlmnñoópqrst
uúüvwxyzfi.,-:;‘’!?¡¿
ABCDEFGHIJKLMNÑ
OPQRSTUVXYZ&
aábcdeéfghiíjlmnñoópqrstuúüvwxyzfi
.,-:;‘’!?¡¿
ao%¶℔²⅛⅜⅝⅞[]()
$1234567890
½¼¾⅛⅜⅝⅞⅓⅔
$1234567890

These Characters are made for use with this Arrangement

ÁÉÍÓÚÜWÆŒ
ÁÇÉFÍLÓPQTÚÜVÆŒ
kæœffffiffifl;;
ÁÉÍÓÚÜWÆŒ
kæœffffiffifl
’/*†‡£[10]

LEFT
Keybank SC—Keybars SC
1 Keybutton Clip

Stopbars S5

RIGHT
Keybank SC—Keybars SC1
1 Keybutton Clip

FIGURE 67

Arrangement SC2

ROMAN CAPS, SMALL CAPS, and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface Spanish accents; Roman and Boldface figures and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	▌	¡	▌	|	’	[	]	.	,	l	i	í	’	‘	!	5
2	▌	‘	’	**.**	**,**	**l**	**í**	**l**	j	f	ı	-	;	:	▌	6
3	▌	**¡**	**!**	**:**	**;**	**j**	**f**	r	s	t	a	o	j	)	(	7
4	▌	**I**	**r**	**s**	**t**	z	z	c	e	é	I	**-**	?	s	¿	8
5	**9**	**7**	**5**	**3**	**1**	**0**	**e**	**é**	.	9	7	5	3	1	0	9[1]
6	**$**	**8**	**6**	**4**	**2**	**¿**	**v**	**c**	–	$	8	6	4	2	▌	9[2]
7	**z**	**x**	c	**?**	J	x	g	o	ó	a	á	P	F	L	T	9[3]
8	A	**J**	**o**	**ó**	S	b	p	u	ú	n	ñ	Q	B	O	E	10[1]
9	D	**g**	**y**	**a**	**á**	fi	v	y	h	d	q	ü	Y	G	R	10[2]
10	H	X	&	**S**	**q**	**p**	**b**	**d**	Z	**k**	**fl**	N	Ñ	U	K	11
11	**P**	**L**	**h**	**u**	**ú**	**n**	**ü**	L	P	F	**ñ**	M	**E**	**F**	**Z**	12
12	**B**	**V**	&	Q	V	C	B	T	O	E	A	w	**T**	**A**	**C**	13
13	**D**	**w**	**R**	**O**	**N**	**Ñ**	**Y**	Y	U	G	R	**U**	**Q**	▌	w	14
14	**K**	**G**	**H**	X	D	N	Ñ	m	H	K	**&**	**X**	▌	▌	℔	15
15	⅛	⅜	⅝	⅞	**m**	**M**	⅓	—	..	M	⅔	½	¼	¾	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNÑ
OPQRSTUVXYZ&
ABCDEFGHIJKLMNÑOPQRST
UWXYZ&
aábcdeéfghiíjlmnñoópqrst
uúüvwxyzfi.,-:;‘’!?¡¿
ABCDEFGHIJKLMN
ÑOPQRSTUVXYZ&
aábcdeéfghiíjlmnñoóp
qrstuúüvwxyzfi.,-:;‘’!?¡¿
ao/℔²⅛⅜⅝⅞[]()
$1234567890
½¼¾⅛⅜⅝⅞⅓⅔
$1234567890

These Characters are made for use with this Arrangement

ÁÉÍÓÚÜWÆŒ
ÁÉÍÓÚÜVÆŒ
kæœffffiffifl;;
ÁÉÍÓÚÜWÆŒ
kæœffffiffifl
*†‡£%¶[10]

LEFT
Keybank SC—Keybars SC
3 Keybutton Clips

Stopbars S5

RIGHT
Keybank SC—Keybars SC2
1 Keybutton Clip

FIGURE 68

CHAPTER XXXVI

Matrix Case Arrangements for Special Stopbars

315 The MATRIX CASE arrangements described in the last chapter are for use with the standard STOPBARS S5 (¶261). The arrangements in this chapter all require special STOPBARS and some of them require MATRICES for modified characters (¶267) for use with these STOPBARS.

316 Capping Sheets: KEYBUTTON CLIPS, shown in Fig. 34, page 99, are used to change characters on the KEYBANK (¶262); the object of these CLIPS is to avoid the use of needless extra KEYBANKS. Unless special KEYBANKS be purchased, some KEYBUTTON CLIPS must be used with nearly all of the MATRIX CASE arrangements described in this chapter. The details of these KEYBUTTON CLIPS are shown on capping sheets which are similar to Plate IX, at the back of this book. When capping sheets are required they are furnished when the MATRICES are ordered, except of course the capping sheets included in "Matrix Case Arrangements for the Style D Keyboard" (¶302). With each MATRIX CASE arrangement (pages 133 to 143) under each of the KEYBANKS specified for use with these arrangements is given the number of KEYBUTTON CLIPS required for that KEYBANK, so that, in ordering any of these arrangements, the required number of BUTTON CLIPS may be included.

317 Matrix Case Arrangements for Nut-body Figures: See Chapter XXXIII, page 111. Three sets of STOPBARS are furnished for these tabular arrangements with nut-body figures: S27 (¶290) for use with six-, eight-, ten-, and twelve-set faces for tabular matter where four nine-unit rows are desired, instead of the three nine-unit rows furnished by standard STOPBARS S5; STOPBARS S29 (¶289), which transform eight-and-one-half-set faces into eight-set and supply four nine-unit rows; and STOPBARS S34 (¶288), for changing seven-set faces to six-set with four nine-unit rows. The faces which can be used with these three sets of STOPBARS are indicated in our "List of Monotype Faces" by a dagger (†) (¶292).

318 S27 Stopbars for four nine-unit rows and nut-body figures for Tabular Matter, instead of the three nine-unit rows provided by the S5 STOPBARS. These S27 STOPBARS give the following arrangement of unit-rows: 5 6 7 8 9 9 9 9 10 11 12 13 14 15 18; they differ from the standard S5 STOPBARS in that they have one additional nine-unit row and omit one ten-unit row. There are three arrangements for S27 STOPBARS (UC, UC1, UC2). **Arrangement UC** (Fig. 69, page 133) provides for Roman caps, small caps (or Gothic caps), and lower case, Italic caps and lower case, Roman and Italic nut-body figures, and the piece braces. This arrangement requires, in addition to the S27 STOPBARS, the left and right KEYBANKS C, left KEYBARS UC, and right KEYBARS C.

Arrangement UC1 (Fig. 70, page 134) is similar to Arrangement UC except that a C1 Boldface replaces the Italic and KEYBARS C1 are used on the right side. **Arrangement UC2** (Fig. 71, page 134) is similar to Arrangement UC except that a C2 Boldface replaces the Italic and KEYBARS C2 are used on the right side.

319 S29 Stopbars for transforming eight-and-one-half-set faces into eight-set with nut-body figures for Tabular Matter give the following arrangement of unit-rows: 6 6 8 9 9 9 9 10 11 12 13 14 15 16 18; they differ from the standard S5 STOPBARS in that they omit the five-unit, seven-unit, and one ten-unit row, and substitute for these one additional six-unit row, one additional nine-unit row, and add a sixteen-unit row. There are three arrangements for S29 STOPBARS (WC, WC1, WC2) which provide for the same combinations of faces as do the arrangements for S27 STOPBARS (UC, UC1, and UC2, ¶318). The equipment required for each is as follows: **Arrangement WC** (Fig. 72, page 135) for Roman and Italic requires, in addition to the S29 STOPBARS, the left and right KEYBANKS C, left KEYBARS WC, and right KEYBARS C. **Arrangement WC1** (Fig. 73, page 135) for Roman and a C1 Boldface takes the same equipment as Arrangement WC except that it substitutes right KEYBARS C1. **Arrangement WC2** (Fig. 74, page 136) for Roman and a C2 Boldface takes the same equipment as Arrangement WC except that it substitutes right KEYBARS WC2.

320 S34 Stopbars for transforming seven-set faces into six-set with nut-body figures for Tabular Matter give the following arrangement of unit-rows: 6 7 8 9 9 9 9 10 12 12 13 14 15 16 18; differing from standard S5 STOPBARS as they omit the five-unit, one ten-unit, and the eleven-unit row, and add one nine-unit, one twelve-unit, and a sixteen-unit row. The three arrangements for S34 STOPBARS (YC, YC1, YC2) provide for the same combinations of faces as do arrangements UC, UC1, and UC2 (¶318). The equipment required for each is as follows: **Arrangement YC** (Fig. 75, page 136) for Roman and Italic requires, in addition to the S34 STOPBARS, the left and right KEYBANKS C, left and right KEYBARS YC. **Arrangement YC1** (Fig. 76, page 137) for Roman with C1 Boldface takes the same equipment as Arrangement YC except that it substitutes right KEYBARS YC1. **Arrangement YC2** (Fig. 77, page 137) for Roman with a C2 Boldface takes the same equipment as Arrangement YC except that it substitutes right KEYBARS YC2.

321 S15 Stopbars for Newspaper Ad Work in English, French, Spanish, German, and for Blank Forms: These STOPBARS S15 give the following unit values: 5 6 7 8 9 9 9 10 11 12 12 13 14 15 18 18; they differ from standard S5 STOPBARS in that they omit one ten-unit row and add a second eighteen-unit row. The two eighteen-unit rows are required for the double MATRIX figures (Chapter XXXIV, page 116) which are part of each newspaper arrangement (Figs. 78 to 86, pages 138 to 142), while the arrangement for blank work (Fig. 87, page 142) requires the two eighteen-unit rows to carry the necessary eighteen-unit cross-rule MATRICES. The MATRIX CASE arrangements used with S15 STOPBARS are as follows:

322 English Newspaper Ad Arrangements (S15 Stopbars): There are four of these as follows: **Arrangement NC1** (Fig. 78, page 138) provides for Roman caps and lower case, figures, and points in combination with the same characters for a C1 Boldface and two additional sets of figures, fourteen-unit figures in single Matrices and eighteen-unit figures in double Matrices. This requires left and right Keybanks NC, left Keybars NC, and right Keybars NC1. **Arrangement NC2** (Fig. 79, page 138) shows a similar combination for a C2 Boldface in combination with the Roman and requires the same equipment except that right Keybars NC2 replace NC1. **Arrangement 6N1** (Fig. 80, page 139) is for newspaper ad work with six alphabets, that is, caps and lower case for Roman, Italic, and a C1 Boldface, and carries, in addition to the double Matrix figures, the Roman and Boldface (or Italic) figures, but unlike the four-alphabet newspaper arrangements this six-alphabet arrangement does not carry fourteen-unit figures. **Arrangement 6N2** (Fig. 81, page 139) is similar to Arrangement 6N1 except that it provides for a C2 Boldface instead of a C1 Boldface. Both the 6N1 and 6N2 Arrangements omit some of the reference marks and the f combinations. The Matrices for modified characters (¶267) for use with these combinations provide for setting complete words in caps of any of the faces used. The Keybanks and Keybars are shown beneath each Matrix Case arrangement.

323 French Newspaper Ad Arrangements (S15 Stopbars): Fig. 82, page 140, shows **Arrangement FN**, which provides for Roman and Italic caps, lower case, figures, and points, practically all of the lower case accents and the cap cedilla Ç in both Roman and Italic, also the eighteen-unit double Matrix figures. Use with this arrangement left and right Keybanks FN and left and right Keybars FN. **Arrangement FN2** (Fig. 83, page 140) shows a similar arrangement except that the Italic is replaced by a C2 Boldface and the right Keybars are replaced by Keybars FN2.

324 Spanish Newspaper Ad Arrangements (S15 Stopbars): These correspond to the French Newspaper Ad Arrangements (¶323) except that the Spanish accents replace the French. **Arrangement SN** (Fig. 84, page 141) is for Roman and Italic and uses left and right Keybanks SN and left and right Keybars SN. **Arrangement SN2** (Fig. 85, page 141) is for Roman and a C2 Boldface and therefore uses Keybars SN2 on the right side.

325 German Newspaper Ad Arrangement GN1 (S15 Stopbars): Fig. 86, page 142, provides for German Lightface and Boldface caps, lower case, figures, points, accents, and eighteen-unit double Matrix figures. GN1 Keybanks and Keybars used on both sides.

326 Cross-rule Matrix Arrangement R2 (S15 Stopbars):* Fig. 87, page 142, provides for running the T series of cross-rule

* Cross-rule Matrices are used for composing blank form work, of which two examples are shown in Fig. 91, page 146, and Fig. 102, page 168. These Matrices are made in six-set in six-, seven-, and eight-point sizes and in twelve-set in the twelve-point size. With these point sizes practically any line spacing can be obtained, while the column widths can be varied by increments of three points with the six-set Matrices and six points with the twelve-set Matrices. Referring to Fig. 87, note that "56 Additional Keybutton Clips" are furnished for the "Characters.....made for use with this Arrangement," so that when these Matrices are used in the Matrix Case their corresponding Clips may be used on the Keyboard.

Matrices (¶321) in combination with two type-faces, C1 Boldface caps, lower case, figures, and points, and C2 Gothic caps, small caps, and points, with figures for both the caps and the small caps. This arrangement requires left and right Keybanks C, left Keybars R, and right Keybars R2.

327 S500 Stopbars for both fourteen- and eighteen-point composition adjust the Keyboard counting mechanism to provide for ten instead of fifteen unit-rows in the Matrix Case, as follows: 5 7 9 9 10 11 12 14 15 18. The fourteen- and eighteen-point arrangements (Figs. 88 and 89, page 143) show that the first seven unit-rows (5 7 9 9 10 11 12) contain fifteen characters each; while the last three unit-rows (14 15 18) contain but ten characters each. There are two arrangements for S500 Stopbars for both fourteen- and eighteen-point composition, as follows: **Arrangement QC** (Fig. 88, page 143) provides for composing either fourteen- or eighteen-point Roman caps, lower case, and figures in combination with Italic caps and lower case (Italic figures may be substituted for the Roman). This arrangement requires, in addition to the S500 Stopbars, the left and right Keybanks C and the left and right Keybars QC. **Arrangement QC2** (Fig. 89, page 143) for fourteen- or eighteen-point Roman caps, lower case, and figures in combination with Boldface caps and lower case (Boldface figures may be substituted for the Roman) takes the same equipment as Arrangement QC except that it substitutes right Keybars QC2.

Arrangement UC

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
HIJKMNQRSUWYZ&ÆŒ
abcdefghijklmnopqrstuv
wxyzfiffflffiffl.,-:;!?
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
abcdefghijklmnopqrstuvwx
yzæœfiffflffiffl:;!?
†‡¶||%£℔ [ ]
( )" } |) ({ ( ) ∫
$1234567890½¼¾
$1234567890

These Characters are made for use with this Arrangement

ABCDEFGLOPTVX
æœ

ROMAN CAPS, SMALL CAPS (or **GOTHIC CAPS**), and lower case; *ITALIC CAPS and lower case;* Roman and Italic figures, and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	■	■	*l*	*t*	‘	’	.	,	■	l	i	]	[	■	■	5
2	*j*	*f*	*i*	!	:	;	-	j	f	I	/	:	;	|	■	6
3	*c*	*r*	*s*	*e*	)	(	’	‘	r	s	t	J	*v*	■	*z*	7
4	–	*q*	*?*	*b*	*g*	*o*	■	I	z	c	e	z	s	.	*?*	8
5	*I*	■	*9*	*7*	*5*	*3*	*1*	*0*	.	9	7	5	3	1	0	9[1]
6	“	■	■	*8*	*6*	*4*	*2*	*$*	–	$	8	6	4	2	■	9[2]
7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	)	)	}	|	9[3]
8	‡	*fi*	*u*	*n*	†	*	v	y	∫	¶	(	Q	(	(	{	9[4]
9	*fl*	n	*fl*	*p*	u	.	q	k	b	h	d	p	Y	■	R	10
10	H	&	*J*	*S*	*æ*	*æ*	*ff*	■	Z	■	S	fi	U	K	N	11
11	*O*	*L*	*C*	*F*	*w*	£	■	L	P	F	ff	M	*Z*	*Q*	*G*	12
12	*E*	&	Q	V	C	B	T	O	E	A	w	*P*	*T*	*R*	*B*	13
13	*D*	*A*	*Y*	*ffl*	*ffi*	*m*	■	Y	U	G	R	Œ	Æ	W	*V*	14
14	*K*	*N*	*H*	ffl	ffi	X	D	N	K	H	m	*&*	℔	*X*	*U*	15
15	Œ	Æ	¾	¼	½	*W*	*M*	—	. .	M	W	%	*Œ*	*Æ*	■	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

LEFT
Keybank C—Keybars UC
14 Keybutton Clips

Stopbars S27

RIGHT
Keybank C—Keybars C
1 Keybutton Clip

Figure 69

Arrangement UC1

ROMAN CAPS, SMALL CAPS (or **GOTHIC CAPS**), and lower case; **BOLDFACE CAPS and lower case ;** Roman and Boldface figures, and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	’	‘	l	i	‘	’	.	,	▌	l	i	]	[	.	,	5
2	▌	▌	▌	!	:	;	-	j	f	ı	j	f	t	|	▌	6
3	:	;	-	I	)	(	’	‘	r	s	t	J	r	▌	!	7
4	–	?	?	z	c	s	▌	I	z	c	e	z	s	.	▌	8
5	y	o	9	7	5	3	1	0	.	9	7	5	3	1	0	9¹
6	“	v	p	8	6	4	2	$	–	$	8	6	4	2	▌	9²
7	J	x	q	g	a	e	x	J	g	o	a	⟩	⟩	⟩	|	9³
8	‡	b	h	n	†	*	v	y	∫	¶	\	fi	⟨	⟨	⟨	9⁴
9	fl	n	k	d	u	.	q	k	b	h	d	p	u	▌	R	10
10	H	&	▌	Z	F	L	S	fl	Z	ff	S	fi	U	K	N	11
11	B	P	C	E	A	T	▌	L	P	F	ff	M	Y	V	X	12
12	&	&	Q	V	C	B	T	O	E	A	w	w	R	U	æ	13
13	œ	O	K	G	D	N	▌	Y	U	G	R	Œ	Æ	w	Q	14
14	▌	ffl	ffi	ffl	ffi	X	D	N	K	H	m	▌	lb	m	H	15
15	Œ	Æ	¾	¼	½	W	M	—	..	M	W	%	Œ	Æ	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&Æ
HIJKMNRSUWZ&ÆŒ
abcdefghijklmnopqrstuv
wxyzfiffflffiffl.,-:;’‘?!
ABCDEFGHIJKLMN
PQRSTUVWXYZ&Æ
abcdefghijklmnopqrst
uvwxyzæœfiffflffifflfi
.,-:;’‘!?
*†‡¶%lb 8 9 18 8 9 10 18 [ ] ( )
“ ‘ ’ ” ⟨ ⟩ ⟨ ⟩ ⟨ ⟩
$1234567890½¼¾
$1234567890

These Characters are made for use with this Arrangement

ABCDEFGLOPQTVXY
æœ
£’°

LEFT
Keybank C—Keybars UC
14 Keybutton Clips

Stopbars S27

RIGHT
Keybank C—Keybars C1
3 Keybutton Clips

FIGURE 70

Arrangement UC2

ROMAN CAPS, SMALL CAPS (or **GOTHIC CAPS**), and lower case; **BOLDFACE CAPS and lower case ;** Roman and Boldface figures

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	▌	▌	▌	▌	‘	’	.	,	▌	l	i	]	[	▌	▌	5
2	‘	’	.	!	:	;	-	j	f	ı	,	l	i	|	▌	6
3	:	;	j	f	)	(	’	‘	r	s	t	J	!	▌	▌	7
4	–	s	?	I	r	t	▌	I	z	c	e	z	s	.	-	8
5	?	▌	9	7	5	3	1	0	.	9	7	5	3	1	0	9¹
6	“	▌	▌	8	6	4	2	$	–	$	8	6	4	2	▌	9²
7	▌	z	x	v	c	e	x	J	g	o	a	⟩	⟩	⟩	|	9³
8	‡	g	o	a	†	*	v	y	∫	¶	\	Q	⟨	⟨	⟨	9⁴
9	fl	n	J	y	u	.	q	k	b	h	d	p	Y	▌	R	10
10	H	fl	S	q	p	b	d	fi	Z	k	S	fi	U	K	N	11
11	n	P	L	Z	F	E	▌	L	P	F	ff	M	ff	h	u	12
12	V	&	Q	V	C	B	T	O	E	A	w	T	A	B	C	13
13	æ	R	N	D	O	w	▌	Y	U	G	R	U	Y	w	Q	14
14	X	G	K	ffl	ffi	X	D	N	K	H	m	H	lb	œ	&	15
15	Œ	Æ	ffl	ffi	m	W	M	—	..	M	W	%	Œ	Æ	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&Æ
HIJKMNQRSUWYZ
abcdefghijklmnopqrstuv
wxyzfiffflffiffl.,-:;’‘?!
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&Æ
abcdefghijklmnopqrs
uvwxyzæœfiffflffifflfi
.,-:;’‘!?
*†‡¶%lb 8 9 18 8 9 10 18 [ ] ( )
“ ‘ ’ ” ⟨ ⟩ ⟨ ⟩ ⟨ ⟩
$1234567890
$1234567890

These Characters are made for use with this Arrangement

ABCDEFGLOPTVX&ÆŒ
æœ
£’°
½¼¾

LEFT
Keybank C—Keybars UC
14 Keybutton Clips

Stopbars S27

RIGHT
Keybank C—Keybars C2
9 Keybutton Clips

FIGURE 71

Arrangement WC

ROMAN CAPS, SMALL CAPS (or **GOTHIC CAPS**), and lower case; *ITALIC CAPS and lower case;* Roman and Italic figures, and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	▌	▌	*l*	*t*	‘	’	.	,	▌	l	i	]	[	▌	▌	6¹
2	*j*	*f*	*i*	!	:	;	-	j	f	ı	*l*	:	;	|	▌	6²
3	*c*	*r*	*s*	*e*	)	(	–	.	r	s	t	J	*v*	▌	*z*	8
4	‡	*q*	*	*b*	*g*	*o*	“	I	z	c	e	¶	⟩	†	*?*	9¹
5	*I*	?	*9*	*7*	*5*	*3*	*1*	*0*	.	9	7	5	3	1	0	9²
6	∫	▌	▌	*8*	*6*	*4*	*2*	$	–	$	8	6	4	2	▌	9³
7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	J	⟩	|	∫	⟨	⟨	\	9⁴
8	A	*fi*	*u*	*n*	.	g	o	a	p	u	n	Q	B	▌	E	10
9	D	q	*fl*	*p*	S	v	y	k	b	h	d	v	Y	G	R	11
10	H	&	*J*	*S*	*œ*	*æ*	*ff*	▌	fl	▌	fi	x	U	K	N	12
11	*O*	*L*	*C*	*F*	*w*	£	Z	L	P	F	ff	M	*Z*	*Q*	*G*	13
12	*E*	&	Q	V	C	B	T	O	E	A	w	*P*	*T*	*R*	*B*	14
13	*D*	*A*	*Y*	*ffl*	*ffi*	*m*	▌	Y	U	G	R	Œ	Æ	w	*V*	15
14	*K*	*N*	*H*	ffl	ffi	X	D	N	K	H	m	&	lb	*X*	*U*	16
15	Œ	Æ	¾	¼	½	*W*	*M*	—	..	M	W	%	Œ	Æ	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
ABDEGHIJKMNQRUVWXY&
ÆŒ
abcdefghijklmnopqrstuv
wxyzfiffflffiffl.,-:;’‘?!
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
abcdefghijklmnopqrstuvwx
yzæœfiffflffiffl:;’‘!?
†‡¶%£lb 8 9 18 8 9 10 18 [ ]
“ ‘ ’ ” ⟨ ⟩ ⟨ ⟩ ⟨ ⟩
$1234567890½¼¾
$1234567890

These Characters are made for use with this Arrangement

CFLOPSTZ
æœ
£’°

LEFT
Keybank C—Keybars WC
17 Keybutton Clips

Stopbars S29

RIGHT
Keybank C—Keybars C
1 Keybutton Clip

FIGURE 72

Arrangement WC1

ROMAN CAPS, SMALL CAPS (or **GOTHIC CAPS**), and lower case; **BOLDFACE CAPS and lower case ;** Roman and Boldface figures, and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	’	‘	l	i	‘	’	.	,	▌	l	i	]	[	.	,	6¹
2	▌	▌	▌	!	:	;	-	j	f	ı	j	f	t	|	▌	6²
3	:	;	-	I	)	(	–	.	r	s	t	J	r	▌	!	8
4	‡	?	*	z	c	s	“	I	z	c	e	¶	⟩	†	▌	9¹
5	y	o	9	7	5	3	1	0	.	9	7	5	3	1	0	9²
6	∫	v	p	8	6	4	2	$	–	$	8	6	4	2	▌	9³
7	J	x	q	g	a	e	x	J	⟩	⟩	|	∫	⟨	⟨	\	9⁴
8	A	b	h	n	.	g	o	a	p	u	n	fi	B	▌	E	10
9	D	q	k	d	S	v	y	k	b	h	d	v	u	G	R	11
10	H	&	▌	Z	F	L	S	fl	fl	ff	fi	x	U	K	N	12
11	B	P	C	E	A	T	Z	L	P	F	ff	M	Y	V	X	13
12	&	&	Q	V	C	B	T	O	E	A	w	w	R	U	æ	14
13	œ	O	K	G	D	N	▌	Y	U	G	R	Œ	Æ	w	Q	15
14	▌	ffl	ffi	ffl	ffi	X	D	N	K	H	m	▌	lb	m	H	16
15	Œ	Æ	¾	¼	½	W	M	—	..	M	W	%	Œ	Æ	▌	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
ABDEGHIJKMNRUVWX&ÆŒ
abcdefghijklmnopqrstuv
wxyzfiffflffiffl.,-:;’‘?!
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&ÆŒ
abcdefghijklmnopqrst
uvwxyzæœfiffflffifflfi
.,-:;’‘!?
†‡¶%lb 8 9 18 8 9 10 18 [ ] ( )
$1234567890½¼¾
$1234567890

These Characters are made for use with this Arrangement

CFLOPQSTYZ
æœ
£’°

LEFT
Keybank C—Keybars WC
19 Keybutton Clips

Stopbars S29

RIGHT
Keybank C—Keybars C1
3 Keybutton Clips

FIGURE 73

Arrangement WC2

ROMAN CAPS, SMALL CAPS (or **GOTHIC CAPS**), and lower case; **BOLDFACE CAPS and lower case ;** Roman and Boldface figures

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	▮	▮	▮	▮	‘	’	.	,	▮	l	i	]	[	▮	▮	6¹
2	‘	’	.	!	:	;	-	j	f	ı	,	**l**	**i**	|	▮	6²
3	:	;	**j**	**f**	)	(	–	.	r	s	t	j	**!**	▮	▮	8
4	‡	**s**	*	**I**	**r**	**t**	“	I	z	c	e	¶	)	†	-	9¹
5	**?**	▮	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	9²
6	∫	▮	▮	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	▮	9³
7	▮	**z**	**x**	**v**	**c**	**e**	x	J	⌡	}	|	⌠	{	⌊	⌉	9⁴
8	A	**g**	**o**	**a**	.	g	o	a	p	u	n	Q	B	▮	E	10
9	D	q	**J**	**y**	S	v	y	k	b	h	d	v	Y	G	R	11
10	H	**fl**	**S**	**q**	**p**	**b**	**d**	**fi**	fl	**k**	fi	X	U	K	N	12
11	**n**	**P**	**L**	**Z**	**F**	**E**	Z	L	P	F	ff	M	**ff**	**h**	**u**	13
12	**V**	&	Q	V	C	B	T	O	E	A	w	**T**	**A**	**B**	**C**	14
13	**æ**	**R**	**N**	**D**	**O**	**w**	▮	Y	U	G	R	**U**	**Y**	w	**Q**	15
14	**X**	**G**	**K**	ffl	ffi	X	D	N	K	H	m	**H**	ƀ	**œ**	**&**	16
15	Œ	Æ	**ffl**	**ffl**	**m**	**W**	**M**	—	..	M	W	%	**Œ**	**Æ**	▮	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&Æ
ABDEGHIJKMNQRUVWXY
abcdefghijklmnopqrstuv
wxyzfiffflffiffl.,-:;‘’!?
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&Æ
abcdefghijklmnopqrst
uvwxyzæœfiffflffiffl
.,-:;‘’!?
*†‡¶||%ƀ 8 9 18 8 9 10 18 [ ] ( )
“ ⌠ ⌡ | ⌊ ⌉ { ⌈ ⌋ }
$1234567890
$1234567890

These Characters are made for use with this Arrangement

CFLOPSTZ&ÆŒ
æœ 8 9 ?
£’°
½¼¾

LEFT
Keybank C—Keybars WC
19 Keybutton Clips

Stopbars S29

RIGHT
Keybank C—Keybars C2
9 Keybutton Clips

FIGURE 74

Arrangement YC

ROMAN CAPS, SMALL CAPS (or **GOTHIC CAPS**), and lower case; *ITALIC CAPS and lower case;* Roman and Italic figures, and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	]	[	|	.	*l*	*t*	‘	’	i	l	.	,	′	▮	▮	6
2	*!*	!	*j*	*f*	*i*	:	;	-	j	f	ı	*;*	*:*	)	(	7
3	▮	*z*	*v*	*c*	*r*	*s*	*e*	r	s	t	’	‘	.	–	J	8
4	*I*	*x*	*q*	*b*	*g*	*o*	?	I	z	c	e	z	s	*?*	¶	9¹
5	)	(	*9*	*7*	*5*	*3*	*1*	*0*	–	9	7	5	3	1	0	9²
6	}	{	\	*8*	*6*	*4*	*2*	$	.	$	8	6	4	2	▮	9³
7	⌡	⌊	⌠	|	‖	½	¼	¾	*	†	‡	“	L	C	F	9⁴
8	Y	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	.	P	V	T	10
9	A	*p*	*u*	*n*	R	S	v	y	p	u	n	Q	B	O	E	12¹
10	D	G	*fl*	*fi*	fl	fi	q	k	b	h	d	x	U	K	N	12²
11	H	&	▮	*J*	*S*	▮	▮	*ff*	Z	▮	ff	▮	▮	▮	M	13
12	&	Q	V	*O*	*L*	*C*	*F*	L	P	F	*w*	*Z*	*Q*	*G*	£	14
13	*E*	*P*	C	B	T	O	E	A	w	U	*D*	*V*	*T*	*R*	*B*	15
14	w	*ffl*	*ffi*	Y	G	R	*m*	N	K	*A*	*Y*	&	*X*	*U*	X	16
15	D	H	*K*	*N*	*H*	*W*	*M*	—	..	M	W	m	ffi	ffl	▮	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRST
UVWXYZ&
abcdefghijklmnopqrstuv
wxyzfiffflffiffl.,-:;‘’!?
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
abcdefghijklmnopqrstuvwx
yzfiffflffiffl:;!?
*†‡¶||%ƀ 8 9 18 8 9 10 18 [ ] ( )
“ ⌠ ⌡ | ⌊ ⌉ { ⌈ ⌋ }
$1234567890
$1234567890

These Characters are made for use with this Arrangement

ÆŒ
ÆŒ
æœ
ÆŒ
æœ
ƀ%°

LEFT
Keybank C—Keybars YC
17 Keybutton Clips

Stopbars S34

RIGHT
Keybank C—Keybars YC
8 Keybutton Clips

FIGURE 75

Arrangement YC1

ROMAN CAPS, SMALL CAPS (or **GOTHIC CAPS**), and lower case; **BOLDFACE CAPS and lower case ;** Roman and Boldface figures, and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	]	[	|	.	**i**	**l**	‘	’	i	l	.	,	**.**	**,**	▮	6
2	**!**	!	**j**	**f**	**t**	:	;	-	j	f	ı	**‘**	**’**	)	(	7
3	▮	**:**	**;**	**-**	**I**	**r**	▮	r	s	t	’	‘	.	–	J	8
4	T	§	▮	**z**	**c**	**s**	?	I	z	c	e	z	s	**?**	¶	9¹
5	)	(	**9**	**7**	**5**	**3**	**1**	**0**	–	9	7	5	3	1	0	9²
6	}	{	)	**8**	**6**	**4**	**2**	**$**	.	$	8	6	4	2	▮	9³
7	⌡	⌊	⌠	|	‖	½	¼	¾	*	†	‡	“	L	C	F	9⁴
8	**p**	**v**	**x**	**a**	**e**	**o**	x	J	g	o	a	**q**	P	**g**	**y**	10
9	A	**J**	**b**	**h**	**n**	S	v	y	p	u	n	Q	B	O	E	12¹
10	D	G	**d**	**u**	fl	fi	q	k	b	h	d	**k**	Y	R	V	12²
11	H	&	**ff**	**fi**	**fl**	**F**	**L**	**S**	Z	**Z**	ff	x	U	K	N	13
12	&	Q	V	**B**	**P**	**C**	**E**	L	P	F	**A**	**T**	**Y**	**V**	M	14
13	**&**	**R**	C	B	T	O	E	A	w	U	**w**	**X**	**U**	▮	▮	15
14	w	**ffl**	**ffi**	Y	G	R	**O**	N	K	**D**	**N**	**K**	**G**	**Q**	X	16
15	D	H	**W**	**M**	**H**	**m**	%	—	..	M	W	m	ffi	ffl	▮	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRST
UVWXYZ&
abcdefghijklmnopqrstuvw
xyzfiffflffiffl.,-:;‘’!?
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
abcdefghijklmnopqrst
uvwxyzfiffflffiffl.,-:;‘’!?
*†‡¶||%£ 8 9 18 6 8 9 10 18 [ ] ( )
“ ⌠ ⌡ | ⌊ ⌉ { ⌈ ⌋ }
$1234567890
$1234567890

These Characters are made for use with this Arrangement

ÆŒ
/ÆŒ
æœ
ÆŒ
æœ
ƀ%°

LEFT
Keybank C—Keybars YC
18 Keybutton Clips

Stopbars S34

RIGHT
Keybank C—Keybars YC1
10 Keybutton Clips

FIGURE 76

Arrangement YC2

ROMAN CAPS, SMALL CAPS (or **GOTHIC CAPS**), and lower case; **BOLDFACE CAPS and lower case ;** Roman and Boldface figures, and Roman fractions

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value
1	]	[	|	.	▮	▮	‘	’	i	l	.	,	′	▮	▮	6
2	‘	!	’	**l**	**i**	:	;	-	j	f	ı	**.**	**,**	)	(	7
3	▮	**!**	**:**	**;**	**j**	**f**	▮	r	s	t	’	‘	.	–	J	8
4	**I**	§	**-**	**r**	**s**	**t**	?	I	z	c	e	z	s	**?**	¶	9¹
5	)	(	**9**	**7**	**5**	**3**	**1**	**0**	–	9	7	5	3	1	0	9²
6	}	{	)	**8**	**6**	**4**	**2**	**$**	.	$	8	6	4	2	▮	9³
7	⌡	⌊	⌠	|	‖	½	¼	¾	*	†	‡	“	L	C	F	9⁴
8	Y	**z**	**x**	**v**	**c**	**e**	x	J	g	o	a	.	P	V	T	10
9	A	**g**	**o**	**a**	R	S	v	y	p	u	n	Q	B	O	E	12¹
10	D	G	**J**	**y**	fl	fi	q	k	b	h	d	x	U	K	N	12²
11	H	**fl**	**S**	**q**	**p**	**b**	**d**	**fi**	Z	**k**	ff	**Z**	**F**	**E**	M	13
12	&	Q	V	**P**	**L**	**u**	**n**	L	P	F	**h**	**ff**	**V**	**B**	**C**	14
13	**A**	**T**	C	B	T	O	E	A	w	U	**R**	**N**	**U**	**Y**	**Q**	15
14	w	**D**	**O**	Y	G	R	**w**	N	K	**G**	**K**	**H**	**&**	**X**	X	16
15	D	H	**ffl**	**ffi**	**m**	**W**	**M**	—	..	M	W	m	ffi	ffl	▮	18
Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit Value

These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRST
UVWXYZ
abcdefghijklmnopqrstuv
wxyzfiffflffiffl.,-:;‘’!?
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
abcdefghijklmnopqrst
uvwxyzfiffflffiffl.,-:;‘’!?
*†‡¶||%£ 8 9 18 6 8 9 10 18 [ ] ( )
“ ⌠ ⌡ | ⌊ ⌉ { ⌈ ⌋ }
$1234567890
$1234567890

These Characters are made for use with this Arrangement

ÆŒ
&ÆŒ
æœ
ÆŒ
æœ
%£ƀ°

LEFT
Keybank C—Keybars YC
17 Keybutton Clips

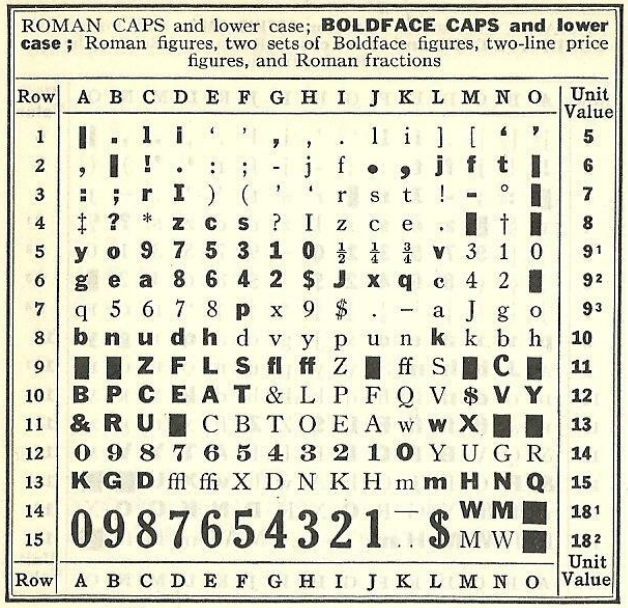
Stopbars S34

RIGHT
Keybank C—Keybars YC2
10 Keybutton Clips

FIGURE 77

Arrangement NC1

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman figures, two sets of Boldface figures, two-line price figures, and Roman fractions



These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
abcdefghijklmnopqrstuv
wxyzffffiffl.,-:;'''!?
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
abcdefghijklmnopqrst
uvwxyzffffl.,-:;''!?
*†‡°⅛⅛⅛⅛[]()
$1234567890½¼¾
$1234567890
$1234567890c.,
$1234567890c.,

These Characters are made for use with this Arrangement

ÆŒ
ABCDEFGHIJKLMNOPQRST
UVWXYZ&ÆŒ
æœffifl
ÆŒ
æœffiffiffl
¶|%£lb′/¹⁰
½¼¾

LEFT
Keybank NC—Keybars NC
9 Keybutton Clips

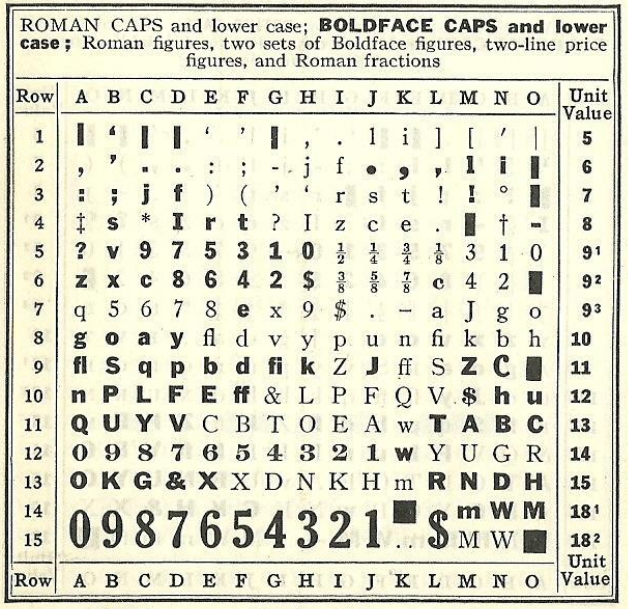
Stopbars S15

RIGHT
Keybank NC—Keybars NC1
2 Keybutton Clips

FIGURE 78

Arrangement NC2

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman figures, two sets of Boldface figures, two-line price figures, and Roman fractions



These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
abcdefghijklmnopqrstuv
wxyzffffiffl.,-:;'''!?
ABCDEFGHIJKLMNO
PQRSTUVWXYZ&
abcdefghijklmnopqrst
uvwxyzffffiffl.,-:;''!?
*†‡|'°⅛⅛⅛⅛[]()
$1234567890½¼⅜⅝⅞⅛
$1234567890
$1234567890c.,
$1234567890c.,

These Characters are made for use with this Arrangement

ÆŒ
ABCDEFGHIJKLMNOPQRST
UVWXYZ&ÆŒ
æœffiffl
ÆŒ
æœffiffl
¶|%£lb′⁰⁄₁₈¹⁰⁄₁₈
½¼¾

LEFT
Keybank NC—Keybars NC

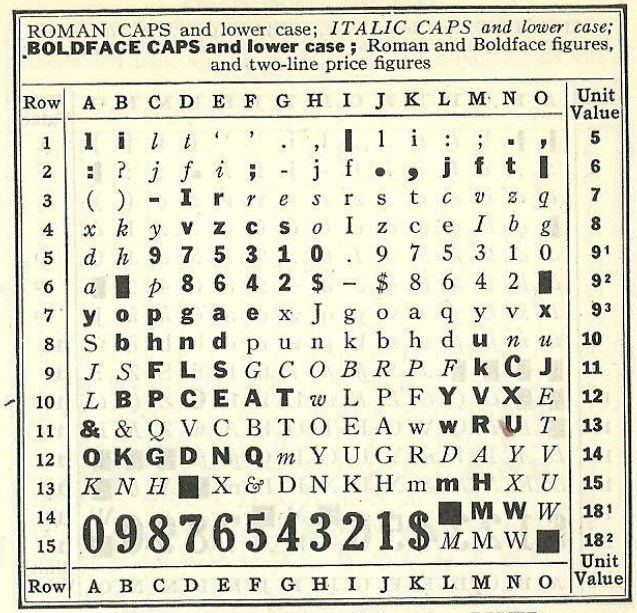
Stopbars S15

RIGHT
Keybank NC—Keybars NC2

FIGURE 79

Arrangement 6N1

ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* **BOLDFACE CAPS and lower case;** Roman and Boldface figures, and two-line price figures



These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXY&
abcdefghijklmnopqrstuv
wxyz.,-:;''!?
ABCDEFGHIJKLMNO
PRSTUVWXY&
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNO
PQRSTUVWXY&
abcdefghijklmnoprst
uvwxyz.,-:;
⁹⁄₉()
$1234567890
$1234567890
$1234567890c.,

These Characters are made for use with this Arrangement

ZÆŒ
ABCDEFGHIJKLMNOPQRST
UVWXYZ&ÆŒ
æœffiffl[fiffl:;!?
QZÆŒ
æœffiffl[fiffl:;!?
ZÆŒ
qæœfffffffffl"!?
*†‡¶|%£lb′⁰⁄₁₈¹⁰⁄₁₈[]
$1234567890½¼¾

LEFT
Keybank 6N1—Keybars 6N1
3 Keybutton Clips

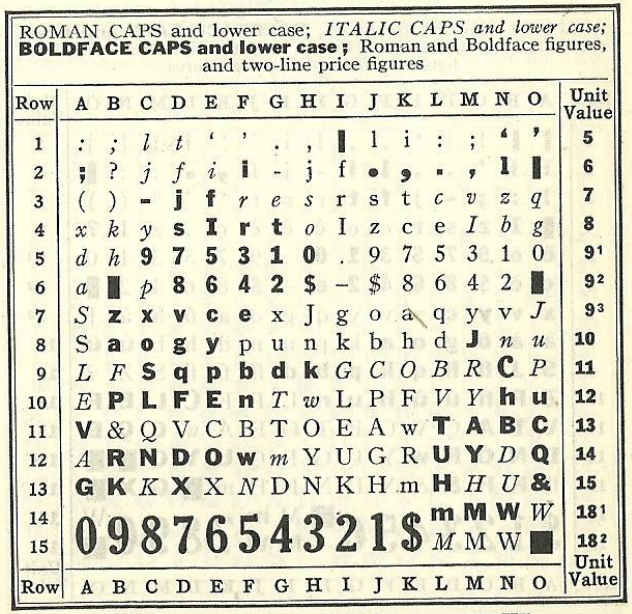
Stopbars S15

RIGHT
Keybank 6N1—Keybars 6N1
6 Keybutton Clips

FIGURE 80

Arrangement 6N2

ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* **BOLDFACE CAPS and lower case;** Roman and Boldface figures, and two-line price figures



These Characters are carried in the Matrix Case in this Arrangement

ABCDEFGHIJKLMNO
PQRSTUVWXY&
abcdefghijklmnopqrstuv
wxyz.,-:;''!?
ABCDEFGHIJKLMNO
PRSTUVWY
abcdefghijklmnopqrstuvwx
yz:;
ABCDEFGHIJKLMNO
PQRSTUVWXY&
abcdefghijklmnopqrst
uvwxyz.,-;''
⁹⁄₉()
$1234567890
$1234567890
$1234567890c.,

These Characters are made for use with this Arrangement

ZÆŒ
ABCDEFGHIJKLMNOPQRST
UVWXYZ&ÆŒ
æœffiffl[fiffl:;!?
QXZ&ÆŒ
æœffiffl[fiffl!?
ZÆŒ
æœfffffffffffl:!?
*†‡¶|%£lb′⁰⁄₁₈¹⁰⁄₁₈[]
$1234567890½¼¾

LEFT
Keybank 6N1—Keybars 6N1
1 Keybutton Clip

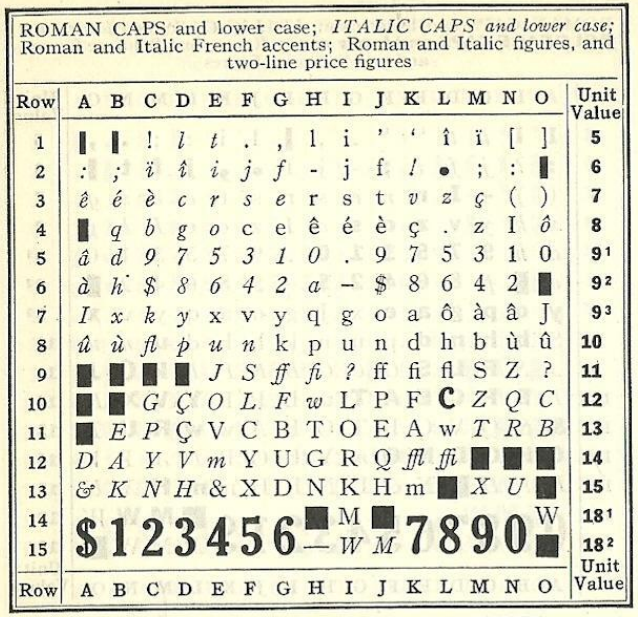
Stopbars S15

RIGHT
Keybank 6N1—Keybars 6N2
6 Keybutton Clips

FIGURE 81

Arrangement FN

ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* Roman and Italic French accents; Roman and Italic figures, and two-line price figures



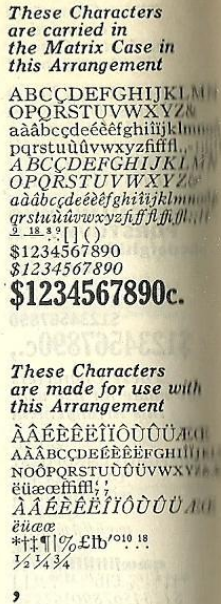
LEFT
Keybank FN—Keybars FN

Stopbars S15

RIGHT
Keybank FN—Keybars FN
3 Keybutton Clips

FIGURE 82

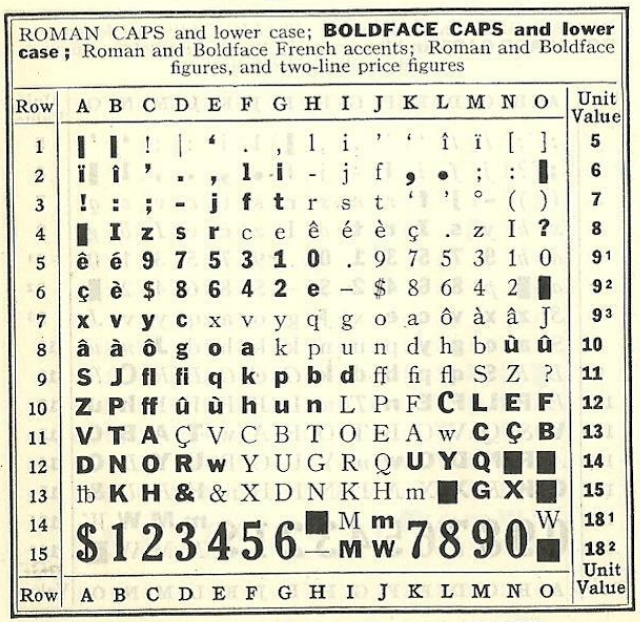
These Characters are carried in the Matrix Case in this Arrangement



These Characters are made for use with this Arrangement

Arrangement FN2

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface French accents; Roman and Boldface figures, and two-line price figures



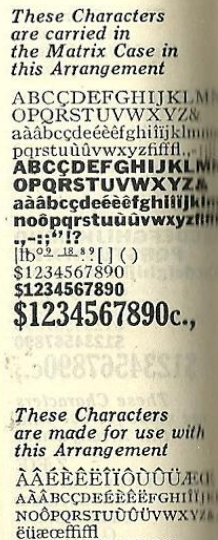
LEFT
Keybank FN—Keybars FN

Stopbars S15

RIGHT
Keybank FN—Keybars FN2

FIGURE 83

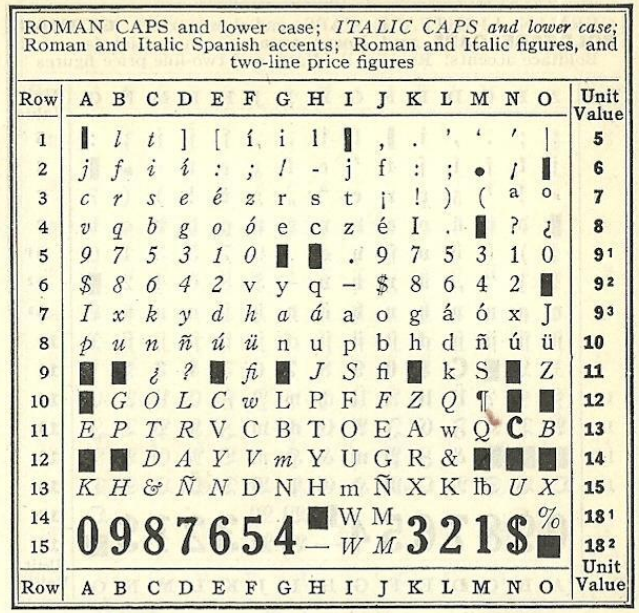
These Characters are carried in the Matrix Case in this Arrangement



These Characters are made for use with this Arrangement

Arrangement SN

ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* Roman and Italic Spanish accents; Roman and Italic figures, and two-line price figures



LEFT
Keybank SN—Keybars SN
2 Keybutton Clips

Stopbars S15

RIGHT
Keybank SN—Keybars SN
3 Keybutton Clips

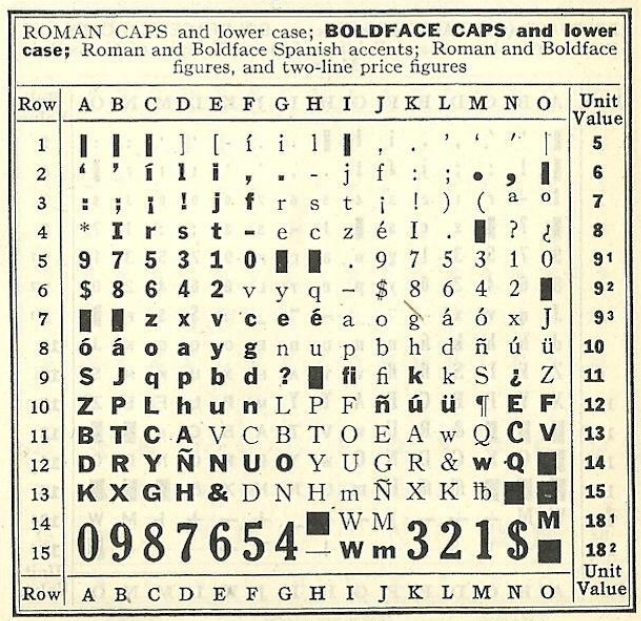
FIGURE 84

These Characters are carried in the Matrix Case in this Arrangement

These Characters are made for use with this Arrangement

Arrangement SN2

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman and Boldface Spanish accents; Roman and Boldface figures, and two-line price figures



LEFT
Keybank SN—Keybars SN
2 Keybutton Clips

Stopbars S15

RIGHT
Keybank SN—Keybars SN2
1 Keybutton Clip

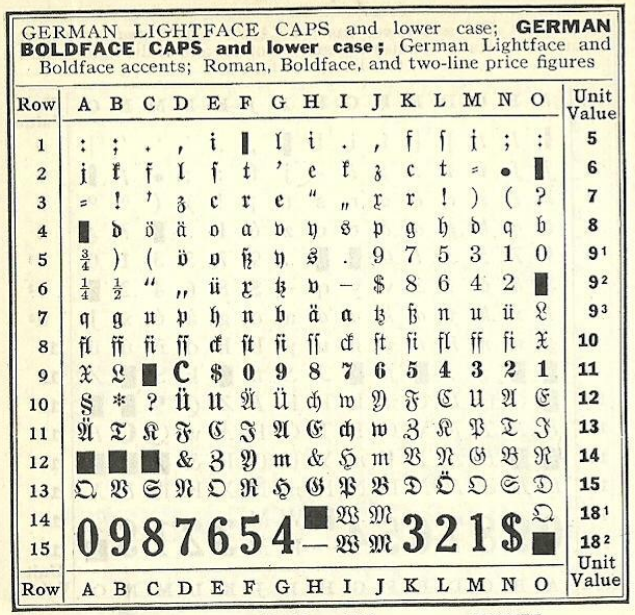
FIGURE 85

These Characters are carried in the Matrix Case in this Arrangement

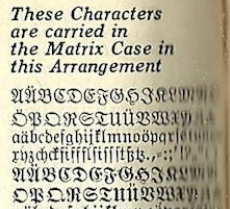
These Characters are made for use with this Arrangement

Arrangement GN1

GERMAN LIGHTFACE CAPS and lower case; **GERMAN BOLDFACE CAPS and lower case;** German Lightface and Boldface accents; Roman, Boldface, and two-line price figures



These Characters are carried in the Matrix Case in this Arrangement



These Characters are made for use with this Arrangement

LEFT
Keybank GN—Keybars GN

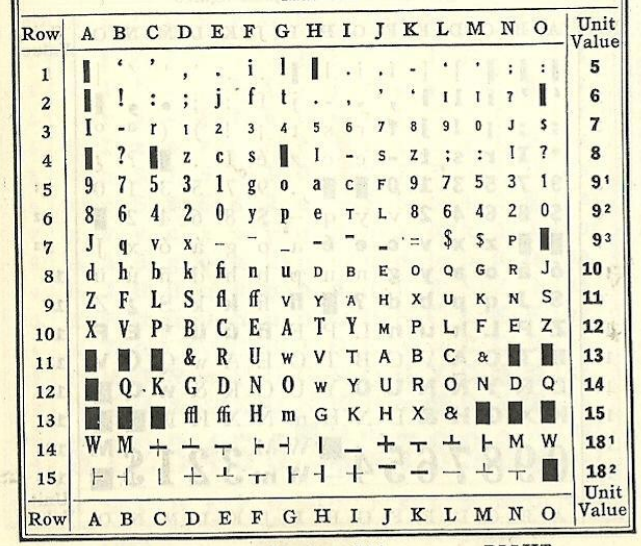
Stopbars S15

RIGHT
Keybank GN—Keybars GN1

FIGURE 86

Arrangement R2

BOLDFACE (C1) CAPS **and lower case;** **BOLDFACE** (C2) CAPS and SMALL CAPS; three sets of Boldface figures; **T** Series of Cross-Rule Matrices



These Characters are carried in the Matrix Case in this Arrangement

These Characters are made for use with this Arrangement

LEFT
Keybank C—Keybars R
26 Keybutton Clips

Stopbars S15

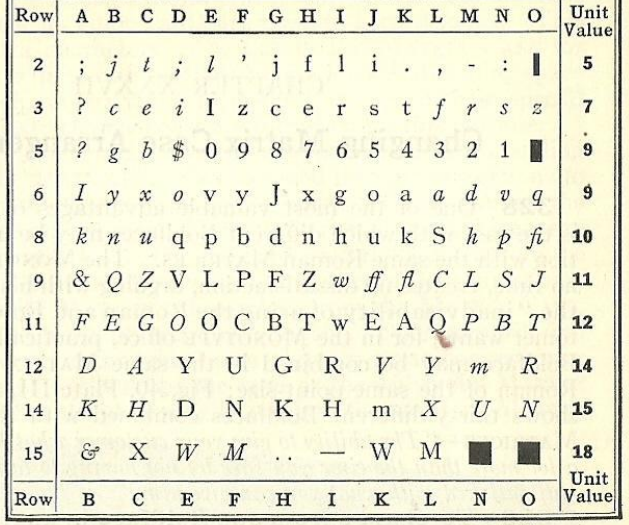
RIGHT
Keybank C—Keybars R2
60 Keybutton Clips

56 Additional Keybutton Clips

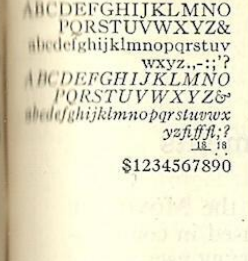
FIGURE 87

Arrangement QC

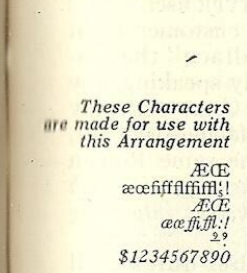
ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* Roman figures; for fourteen- and eighteen-point composition



These Characters are carried in the Matrix Case in this Arrangement



These Characters are made for use with this Arrangement



LEFT
Keybank C—Keybars QC
4 Keybutton Clips

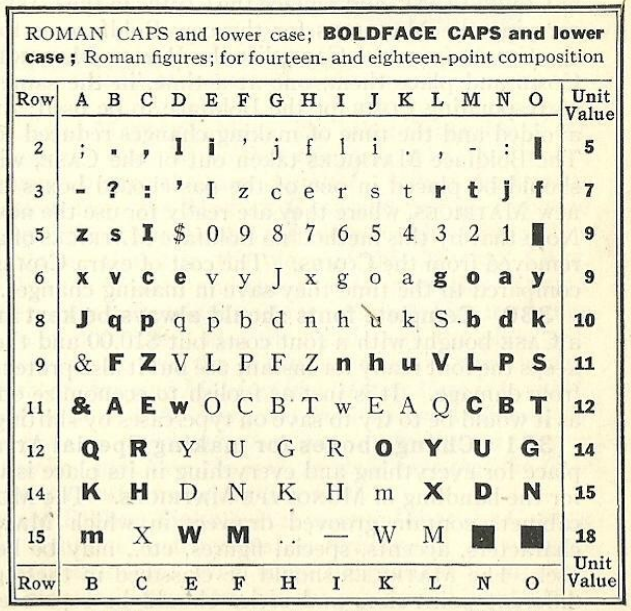
Stopbars S500

RIGHT
Keybank C—Keybars QC
1 Keybutton Clip

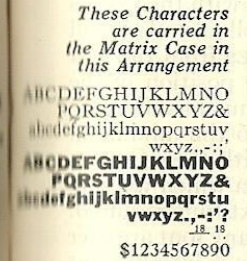
FIGURE 88

Arrangement QC2

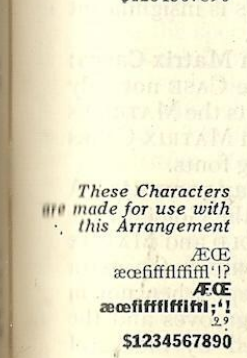
ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman figures; for fourteen- and eighteen-point composition



These Characters are carried in the Matrix Case in this Arrangement



These Characters are made for use with this Arrangement



LEFT
Keybank C—Keybars QC
4 Keybutton Clips

Stopbars S500

RIGHT
Keybank C—Keybars QC2
1 Keybutton Clip

FIGURE 89

CHAPTER XXXVII

Changing Matrix Case Arrangements

328 One of the most valuable advantages of the MONOTYPE is the ease with which different Boldfaces may be used in combination with the same Roman MATRICES. The MONOTYPE user wastes no time, creates no dissatisfaction, arguing with his customer about the "inadvisability of using the Roman and Boldface" the customer wants, for in the MONOTYPE office, practically speaking, any Boldface may be combined in the same MATRIX CASE with any Roman of the same point-size; Fig. 40, Plate III, facing page 101, shows thirty different Boldfaces combined with the same Roman MATRICES—"*The ability to give your customer what he wants is worth a lot more than the time you save by not having to talk him into being half-satisfied with what you can give him.*"

329 To change from one Boldface to another quickly all Boldface MATRICES not in MATRIX CASES should be carried on MATRIX COMBS (Fig. 6, page 9) in exactly the same positions on the fifteen COMBS the MATRICES occupy when in place in the MATRIX CASE. Then, to change from one Boldface to another, it is only necessary to open up the MATRIX CASE by removing the back, or COVER PLATE, and replace the COMBS in the CASE with the COMBS carrying the MATRICES for the new Boldface as follows: Take all the COMBS from the CASE, lift the Roman MATRICES from the first COMB and place them, one at a time, in the same position in the corresponding COMB for the Boldface to be used; thus mistakes are avoided and the time of making changes reduced to the minimum. The Boldface MATRICES taken out of the CASE, with their COMBS, should be placed in one of the pasteboard boxes in which we ship new MATRICES, where they are ready for use the next time required. Note that by this method no Boldface MATRICES of any font are ever removed from the COMBS. The cost of extra COMBS is insignificant compared to the time they save in making changes.

330 Complete fonts should always be kept in Matrix Cases: a CASE bought with a font costs but $10.00 and the CASE not only keeps the font ready for instant use but it also protects the MATRICES from damage. It is just as foolish to economize on MATRIX CASES as it would be to try to save on type-cases by shifting fonts.

331 Change boxes for making Special Arrangements: A place for everything and everything in its place is the Golden Rule for the handling of MONOTYPE MATRICES. The MOLD and MATRIX cabinets contain grooved drawers in which MATRICES for extra characters, accents, special figures, etc., may be kept when not in use. The MATRICES should be classified in these grooves and the different point-sizes and series should be separated by blocks of

wood, .2″ wide, the same as the MATRIX, marked with the different classifications just as guide cards are used in a card index. This provides for extra characters to be put in the MATRIX CASE for special work; it is quite as important to provide suitable filing space for the regular characters taken from the CASE when these special characters are used; change boxes are furnished for this purpose.

332 Fig. 90 shows a change box, a wooden box with a sliding lid to protect the MATRICES; this is divided into fifteen sections to correspond with the fifteen rows of the MATRIX CASE. When the special MATRICES, taken from the filing drawer in the cabinet, are placed in the MATRIX CASE, the standard MATRICES taken from the CASE should be placed in the corresponding rows of the change box. To quickly identify MATRICES thus taken from the MATRIX CASE, these boxes should be numbered consecutively. Operators will find similarly numbered rectangular brass plates a great convenience; the width of the plate should be the same as the width of a MATRIX CASE (3¾″), so that the plate may be slid into the rack for a MATRIX

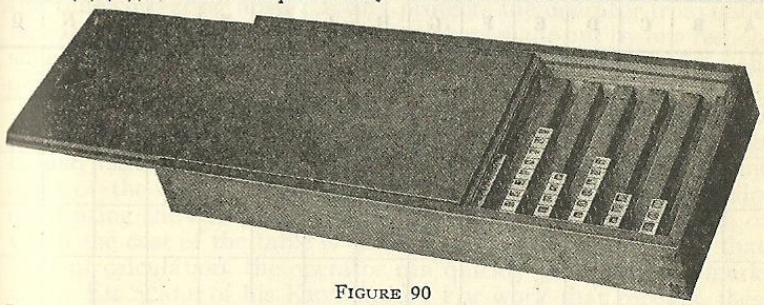


FIGURE 90

CHANGE BOX: To hold the regular MATRICES removed from a MATRIX CASE to make room for other MATRICES for a special job.

CASE in the MOLD and MATRIX cabinet; the other dimension of the plate should be less (not over 3″), so that the plate, when not in use, will go in the change box of the same number. When the regular MATRICES are taken from the MATRIX CASE and put in a change box, in making special arrangements, the plate for this change box should be put in the cabinet in the place of this MATRIX CASE. When the special job is finished and the operator puts this MATRIX CASE back in the cabinet, the plate not only reminds him to change the CASE back to standard, but also the number on the plate tells him in what change box to find the MATRICES to make this change.

333 *The object of changing Matrices in a Matrix Case is to enable the Casting Machine to cast the characters the operator strikes at the Keyboard; it is quite as important, therefore, to check up a Matrix Case after its Matrices have been changed, to make sure that the Case is correct, as it is to put metal in the Melting Pot.*

334 Keyboard Ribbon Ticket: It is essential that the CASTER operator receive complete instructions, *in writing*, for all changes from standard arrangements; even when no changes in arrangements are made, written instructions for the job should be attached

Keyboard Ribbon Ticket

Name		Keyboard No.	Date Set
Job No.	Spool and Galley No.	Folio of Copy	SINGLE / DOUBLE } Justification
Name of Job			Matrix Case Arrangement
Face and Point Size	Mold	Set	Wedge Symbol
Measure in Picas	Allow Squeeze Points	Keyboard Measure Ems Units	HIGH / LOW } Spaces
KEYBANKS Left Right	KEYBARS Left Right		STOPBARS

Note any changes in Matrix Case below; cappings on back. If ribbon is to be held for rerun, attach this Ticket to the ribbon and file it with it.

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1																5
2																6
3																7
4																8
5																9
6																9
7																9
8																10
9																10
10																11
11																12
12																13
13																14
14																15
15																16

FIGURE 91

RIBBON TICKET: One of these is made out for each SPOOL sent to the CASTER to give the operator instructions for the job. (The above is an example of cross-rule MATRIX work, see ¶326.)

to each ribbon, to give the faces, point-size, measure, allowance for squeeze (¶160), etc. A form of ribbon ticket in general use is shown in Fig. 91, page 146; this provides space for entering all possible instructions on the most intricate work. The symbol for the MATRIX CASE arrangement is entered in its proper space in the heading, and any changes from this arrangement are indicated in the blank diagram for the MATRIX CASE, at the bottom of the form, by marking in the proper squares of the diagram the characters to be inserted.

335 Since the KEYBOARD operator must be given practically all of the information required to fill out the ribbon ticket before he can start a job, it seems obvious that both time and the mistakes resulting from oral instructions can be saved if the ribbon be filled out and handed to the operator with the copy for a job; any duplicates required for additional SPOOLS may be filled in by the operator. In no manufacturing department are there so many details, so many possibilities for misunderstanding instructions, as in a composing room. It adds considerably to the output of the machines, saves the time correcting mistakes, and protects the operator from undeserved criticism to have all ribbon tickets made out by one responsible person; any special instructions, changes from the style of the office, etc., may be entered on the back of the ribbon ticket.

336 Written instructions on tabular matter: The more progressive offices also apply this principle of written instructions to tabular matter by furnishing the operator with the cast (in ems and units of the set to be used) for all tables. For this, printed slips duplicating the EM SCALE (Plate V, at back of book) are used, on which the cast of the table is marked, as described in ¶99, so that, without calculation, the operator can quickly transfer these marks to the EM SCALE of his KEYBOARD. For work that repeats, these scales should be printed on durable paper and fastened by clips to the EM SCALE, to save the time of transferring the cast, and, when the job is finished, the paper scale is filed ready for use the next time the job is set (¶161). If these paper scales are used directly on the KEYBOARD, they must be made with great care so that their graduations will match, as nearly as possible, the graduations of the EM SCALE. As explained in ¶161, the top of the paper scale should be a little below the top of the EM SCALE, so as not to cover up completely its graduations. Then, in bringing the EM-RACK POINTER (¶98) to any required position, any possibility of error in the paper scale affecting the work is eliminated, because the operator justifies accurately from the EM SCALE of the KEYBOARD. The best method is to have the cast for all tables made by the copyfitter (see our book, "Copyfitting"), as this saves machine time; if made at the KEYBOARDS, one operator should make the casts for all tables, for this operator becomes especially proficient in this work, saving time, avoiding errors, and preserving uniform style.

337 Record of Output: The ribbon ticket (Fig. 91, page 146) may, with a few additions, be used for keeping record of the output of the KEYBOARDS and the time on casting and correcting; complete forms for this will be furnished when desired.

CHAPTER XXXVIII

Keyboard Operating Adjustments

338 Plate X, at the back of the book, describes and illustrates the changes at the KEYBOARD for different measures, combinations of faces, etc. To make these clear, assume that the KEYBOARD has been used for setting tabular matter with nut-body figures (¶284) and that the next job is the straight matter of a book, which is set in ten-point 21E combined with a ten-point C1 Boldface, the 25J (10¼-set), six-alphabet arrangement (Fig. 60, page 125); the measure is twenty-two picas, with one and one-half points allowance for squeeze.

339 Changing Keybanks and Keybars: Lift off the KEYBANKS (¶253), as shown in Figs. 140 and 141, Plate X, at back of book, take out both the left and right KEYBARS, Figs. 143 and 144, and put on in their place the left and right KEYBARS 6C1 (Fig. 145, Plate X) which are required for the six-alphabet combination of Roman and Italic with a C1 Boldface. Then put on the corresponding KEYBANKS, left and right 6C1, and push them up into operating position, as shown in Fig. 142, Plate X. Look up the Arrangement 6C1, in the book of "MATRIX CASE Arrangements" (¶302) (or refer to Fig. 60, page 125, of this book), to see whether any KEYBUTTON CLIPS (¶262) are required. Since we used both KEYBANKS 6C1, only one CLIP is necessary; if the office had not been equipped with these, the KEYBANKS most nearly corresponding would have been capped for the six-alphabet arrangement.

340 Change the Stopbars, as shown in Figs. 156 and 157, Plate X, taking out the special STOPBARS for nut-body figures and inserting the standard STOPBARS S5 (¶257).

341 The Justifying Scale (10¼-set) for the faces to be composed is now put in place, see Figs. 153, 154, and 155, Plate X. CAUTIONS: In changing SCALES use especial care not to bend the lower HEAD. After the new SCALE is in place strike the SPACE BAR (¶86) ten times, bring the EM-RACK POINTER to zero, and note that the JUSTIFYING-SCALE POINTER (¶103) then indicates the constant justification (zero column) in the tenth horizontal row on the SCALE. If it does not, either the lower head of the SCALE is bent or the POINTER requires adjustment.

342 Put on a new ribbon, if necessary, as shown in Figs. 150 and 151, Plate X, so that its perforations engage the PAPER FEED WHEELS properly when the paper passes between the PUNCH-DIE CYLINDER and the PUNCH GUIDE, see Fig. 24, page 48. Release the PAPER FEED WHEELS by pulling forward the RELEASE-PLATE LINK, as shown in Fig. 149, Plate X, raising the PAWLS so that the paper may be fed forward by turning the KNOB on the PAPER-FEED-

WHEEL SHAFT; then push the PLATE back so that the FEED PAWLS will again engage their RATCHETS. Put on a new SPOOL, Fig. 148, Plate X, at back of book, and start the paper in this as shown in Fig. 152. *Make sure that the perforations made by the Punches line up (are in the same line across the ribbon) with the marginal perforations in the ribbon that engage the Paper Feed Wheels.* NOTE: When putting on a new roll of paper before a take is completed, that is, when there is a break in the ribbon, slip the end of the new ribbon under the end of the old and wind enough of the new ribbon on the SPOOL so that the paper will not slip as the SPOOL revolves to wind up the ribbon as it is perforated. Be sure to stop the CASTING MACHINE at this break, *when setting the first line on the second section of the ribbon,* by striking an em-quad after reading the JUSTIFYING SCALE and before striking the JUSTIFYING KEYS indicated (¶157); the CASTER operator is thus notified of the break in the ribbon and can start the other section properly.

343 Set the measure, adjusting the EM-RACK STOP, as shown in Figs. 146 and 147, Plate X, after first finding the equivalent of the measure, given in picas, in ems and units of the set in use, and adding to this the allowance for squeeze. Thus, by reference to the table for Changing Pica Ems (Plate VII, at back of book), twenty-two picas equal twenty-five and one-half ems five units of ten-and-one-quarter-set, to which add the allowance for squeeze, one and one-half points, which in this set is three units (2.6), see table of Allowance for Rule and Squeeze, Plate VIII, at back of book; the total measure for which the KEYBOARD is to be set is therefore twenty-five and one-half ems eight units (25½ ems 5 units+3 units=25½ ems 8 units). The BOARD is now ready to set this six-alphabet combination. *When adjusting the measure be sure that the Unit-wheel Pawl seats properly in the Unit Wheel; its teeth must not rub on the teeth of the Wheel before the Pawl is fully seated.*

CHAPTER XXXIX

Setting Straight Matter

344 The preceding chapter explains the necessary adjustments of the KEYBOARD for a measure of twenty-two picas and a six-alphabet combination of faces; that is, Roman caps, lower case, figures, and Italic caps and lower case, including the necessary points for Roman and Italic, of ten-point 21E (10¼-set) combined with Boldface caps, lower case, and points of 25J, see MATRIX CASE Arrangement 6C1 (Fig. 60, page 125), except that instead of carrying the 25J Boldface figures, in rows five and six, these are replaced by the more extended figures (10-point F57) used for paragraph numbers similar to the manner in which the paragraphs of this book are numbered. The JUSTIFYING-SPACE-PUNCH KEY (¶218) must be used with these figures to increase their width the amount required.

345 The Boldface figures for paragraph references have a Set Factor of 123; by reference to the Table of Set Factors (Fig. 20, Plate I, facing page 26), we find that these figures must be made twelve units wide when used with a ten-and-one-quarter-set face; that is, they must be cast three units wider than they are counted when carried in the nine-unit row. The JUSTIFYING KEYS to strike to add three units to these figures will be found at the bottom of column five of the ten-and-one-quarter-set SCALE with which they are used, KEY No. 6 in the upper row and KEY No. 10 in the lower row (¶215). Carry the Boldface period for use with these figures in the eleven-unit row, in place of the Roman ff (MATRIX CASE position K-10, see Fig. 92, page 151), and cap KEY 56, Plate IX, at back of book, for this with a KEYBUTTON CLIP (¶262) for the period.

346 Fill out the ribbon ticket (¶334) for this work, as shown in Fig. 92, page 151, noting in the blank MATRIX CASE diagram the positions for the special figures for the paragraph numbers and the eleven-unit period, together with their identifying symbols, for the information of the CASTER operator.

347 Adjust the Keyboard for double justification, by turning the PISTON-BLOCK-VALVE HANDLE (¶207) to the left. Double justification is required on this straight matter because characters with justification added are used at the beginning of the line (¶235). Note that the RESTORING KEY (¶104) must be used.

348 Strike a Justifying Key (¶155) in the top row six times and then a JUSTIFYING KEY in the lower row together with a key in the upper row (¶208) once, so that the CASTING MACHINE will deliver on the galley the last line cast and will cast no quads, to be left in the type channel, after this last line cast is delivered; then restore with the RESTORING KEY and strike the em-quad KEY once for the indention of the first line of the paragraph.

Keyboard Ribbon Ticket

Name: John Smith		Keyboard No.: 8	Date Set: 12-14-15
Job No.: 3182	Spool and Galley No.: 5	Folio of Copy: 52-63	~~SINGLE~~ DOUBLE } Justification
Name of Job: Brown's Manual			Matrix Case Arrangement: 6C1
Face and Point Size: 10-21E & 25J	Mold: 10	Set: 10¼	Wedge Symbol: S5
Measure in Picas: 22	Allow Squeeze: 1½ Points	Keyboard Measure: 25½ Ems 8 Units	~~HIGH~~ LOW } Spaces
KEYBANKS: 6C1 Left 6C1 Right	KEYBARS: 6C1 Left 6C1 Right		STOPBARS: S5

Note any changes in Matrix Case below; cappings on back. If ribbon is to be held for rerun, attach this Ticket to the ribbon and file it with it.

Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Unit
1																5
2																6
3																7
4																8
5			9	7	5	3	1	0								9
6				8	6	4	2									9
7																9
8																10
9																10
10																11
11																12
12																13
13																14
14																15
15																18

10F-57

10F-31 Period ⊙

FIGURE 92

Prepared ribbon ticket: Shows method of filling out for setting the text of a book as described in this chapter.

349 Strike the Boldface figure Keys with the Justifying-space-punch Key, since these figures at the beginning of the paragraph must be cast with justification added to make their width twelve units instead of the nine units they are counted by the KEYBOARD. Follow carefully the cautions in ¶234 and make sure that these figures are counted as nine units. Then, to increase the size of these figures, strike the No. 6 JUSTIFYING KEY in the top row and the No. 10 JUSTIFYING KEY in the lower row to increase the size of these figures (¶345). *Turn the Unit Wheel by hand* (¶206) clockwise to move the EM-RACK POINTER eleven units back to the left to compensate for the difference between these three figures, counted as nine units and cast as twelve units, and for the amount the EM RACK has been moved to the right in striking the No. 6 JUSTIFYING KEY in the top row (which adds 9 units) and the No. 10 KEY in the lower row (which adds 11 units) to increase the size of these figures (¶231). Thus, the measure for which the KEYBOARD is set, including one and one-half points for squeeze, is twenty-five and one-half ems eight units; as the three figures, each twelve units wide, make thirty-six units, or two ems, and one em-quad was struck at the beginning of the line for indention, set the BOARD at twenty-two and one-half ems eight units before striking the Boldface period and em-quad following these figures. Then set the balance of the line.

350 Justify to preserve even spacing: Before starting composition determine whether or not the work is to be closely spaced, depending upon its nature, the measure and size of the type, and whether it is to be cast solid or leaded. If closely spaced, terminate each line so that the justification indicated will be near the upper diagonal red line on the JUSTIFYING SCALE (¶119) to keep the justifying spaces as near three-to-em as possible.

351 Strike the em-leader Key at the end of the first line, *after reading the Scale and before striking the Justifying Keys* indicated, in order to add an em-leader to this line to stop the CASTING MACHINE when this take is completed (¶157); use a leader for stopping the CASTER, for it may be easily lifted out with the tweezers. Since this matter is double justified, owing to using the JUSTIFYING KEYS to make the Boldface paragraph figures the required size (¶349), strike the JUSTIFYING KEY indicated for the upper row and when striking the KEY for the lower row strike with it the KEY in the upper row directly above it (¶208). Then depress the RESTORING KEY and proceed with the next line.

352 The last line of a paragraph is set with fixed spaces (¶192) between the words instead of justifying spaces; before setting this line make sure from the copy that the remaining words of the paragraph will not fill the measure. Use the size space determined on for justifying spaces; thus, if justifying as near as possible to the upper diagonal red line on the SCALE (6-unit spaces) use fixed six-unit spaces between the words of this last line. After striking the period following the last word, the line is completed in one of two ways: (*a*) strike the SPACE BAR five times to put in enough justifying spaces to justify, then quad out until the EM-RACK POINTER is within four ems of zero, and justify regardless of the diagonal red lines on the SCALE; or (*b*) bring the EM-RACK POINTER to even ems (¶193), by means of fixed spaces, quad out to zero, and strike any JUSTIFYING KEYS, to trip the galley, without reference to the JUSTIFYING SCALE since there are no justifying spaces in the line. If unable to estimate readily whether the remaining words of the paragraph will fill the measure, use justifying spaces between the words and, after striking the period following the last word, quad out to bring the justification as near the size determined on as possible and justify in the usual manner. *Look at the Line Counter when ending a paragraph;* put as nearly as possible the same number of lines on each SPOOL—enough matter to fill a galley. The average galley, being from twenty-three to twenty-four inches long, will hold the following number of lines in each point-size and allow for an end lock:

Point-size body	5	6	7	8	9	10	11	12
Lines to galley	300	250	215	190	170	150	135	125

353 Quotation Marks: Four of these are provided (see MATRIX CASE diagram, Fig. 23, page 47), a five- and a seven-unit opening quote (') and a five- and a seven-unit closing quote (), or apostrophe. At the beginning of a quotation strike first the five- and then the seven-unit quote (''); at the end of the quotation strike first the seven- and then the five-unit quote (''). The seven-unit opening and closing quotes come next the quoted matter, to give some space between the quotes and the words they inclose. For this reason use these seven-unit quotes for the single quotes of a quotation within a quotation. When the closing quotes follow a period, comma, or other punctuation mark having white space above it, use two five-unit quotes instead of a seven and a five. Use the five-unit closing quote as an apostrophe for there should be no space between this character and the letter preceding it.

354 Measures beyond the capacity of the Em Scale: In the smaller sets the equivalent of forty-two picas (the maximum measure on the CASTING MACHINE without the 60-Pica Attachment) is greater than the width of the EM SCALE; for example, forty-two picas of seven-set would require seventy-two ems on the EM SCALE, which is graduated to sixty-five ems. In such cases it is necessary to use double justification (¶203) at the KEYBOARD and set the line in two sections; the CASTING MACHINE, of course, delivers these two sections on the galley as one complete line. Reduce the required measure, in picas, to ems and units of the set to be used, add the allowance for squeeze, and adjust the measure (¶343) to one-half this amount. Set the first section of the line as though it were a complete line, single justify, and restore. Then set the second section and double justify. Use care in justifying to preserve even spacing (¶350) in the two sections of the same line, and if possible, end the first section of the line in the middle of a word (it is not necessary to end with a syllable) as this saves starting the second section of the line with a space and also avoids a "river" showing in print between the two sections of the line. EXAMPLE: The measure required is forty

picas, the face to be used is seven-set. Find the KEYBOARD measure. By reference to table for Changing Pica Ems, Plate VII, at back of book, forty picas equal sixty-eight and one-half ems one unit of seven-set, to which add the allowance for squeeze (2 points = 5 units), see table of Allowance for Rule and Squeeze, Plate VIII, at back of book. Therefore the total KEYBOARD measure is sixty-eight and one-half ems six units. As this is not divisible evenly by two, we must add one unit and make the measure for half the line thirty-four ems eight units (34 ems 8 units + 34 ems 8 units = 68½ ems 7 units). To take care of this unit added to make the measure divisible by two, add one-half point to the squeeze allowance and make the measure at the CASTING MACHINE forty picas two and one-half points.

355 Justifying before reaching the four-em mark: Although the Justifying Scale will not automatically rotate unless the EM-RACK POINTER is within four ems of zero (¶122), it is an easy matter, by rotating the JUSTIFYING SCALE by hand, and, making a simple calculation, to justify a line that is more than seventy-one units short. This is useful (*a*) in centering headings where the operator must estimate the number of quads and justifying spaces to put each side the matter to be centered; (*b*) in ending long lines, when the EM-RACK POINTER has not reached seventy-one units and the next word to be set is too long to go in the line and should not be divided. Do not use this method on short lines containing few justifying spaces, because distributing a shortage of more than seventy-one units over a few spaces would make these spaces too large. In centering matter the operator estimates the number of ems in the matter to be centered (always use fixed spaces between the words of such matter) so that he can strike the same number of quads and justifying spaces both before and after setting the matter to be centered; as it is a simple matter to justify a line that is too short, be sure to put in too few quads before setting the matter rather than too many. EXAMPLE: In centering a heading the operator strikes six em-quads and six justifying spaces both before and after the matter to be centered, but the last em-quad struck does not bring the EM-RACK POINTER to within four ems of zero and, therefore, the SCALE does not automatically revolve to indicate the justification for the line; how shall he determine the JUSTIFYING KEYS to strike to justify the line? From the EM SCALE and UNIT INDICATOR determine the number of units the line is short, say 110 units; halve this and the number of justifying spaces in the line (12) and determine from the JUSTIFYING SCALE the justification for a line fifty-five units short containing six justifying spaces (9-12, see 8½-set SCALE, Plate VI, at back of book); obviously the justification for a line 110 units short containing twelve justifying spaces must be the same as for a line fifty-five units short containing six spaces.* In centering matter there must always be an even number of justifying spaces in the line (same number before and after the matter to be centered), but, in ending a line when the EM-RACK POINTER is not within four ems of zero, the operator must be careful to get an even number of spaces in the line: Thus, if there are eighteen justifying spaces before the last word is set, precede this with a fixed space, instead of a justifying space, to avoid an odd number of spaces (19); of course, this fixed space must be selected with regard to the style of spacing being used; if spacing closely, use a six-unit space, otherwise use a nine- or twelve-unit space.

* If the shortage were an odd number of units, for example, 109 units, subtract one unit before halving the shortage, making it 108 units; this error, which makes the entire line one unit short, is negligible.

356 Correcting the ribbon—*Don't!* Some operators have the mistaken idea that it pays to turn the ribbon back when they make an error, close up the wrong perforations with adhesive paper, set the UNIT WHEEL back for this cancelled character, and then strike the correct character. Thus, in their efforts to show an apparently clean proof, they waste enough time to set two or three lines. Owners of MONOTYPES should absolutely forbid this waste of man time and machine time, for, in the MONOTYPE System, corrections can be made quicker and cheaper by hand at the case than on the machine. The operator should correct a mistake by setting the balance of the line to make the hand correction as easy as possible. It is the height of absurdity to turn the ribbon back for an out, because, if the operator sets the omitted matter later in the line, the hand corrector can put this matter in its proper place almost as easily as correcting a transposition. If a letter or figure be omitted, strike it in the same line as soon as the mistake is discovered. If a wrong character be struck, let it go, unless this be of a different unit size from the character required; in this case correct the mistake by striking another wrong character so that the sum of the width of these two wrong characters equals the width of the two characters required; the corrector (¶ 358) can quickly fix this error by lifting out this "deadwood" and inserting the characters required without altering the justification. In any event, complete the line and justify it, to avoid stopping the CASTING MACHINE (¶156). *Above all, learn to be accurate—set a clean proof. Remember that no one, looking at a proof, can tell how fast it was set, but a dirty proof tells its own story.*

357 Turning back the ribbon—*Don't!* In a few cases, at the beginning of wide-measure lines, it may be desirable to turn back the ribbon and "kill" the portion of the line incorrectly set, rather than to finish the line in the way that will make easiest the work of the corrector, as explained in the preceding paragraph. *Don't get into the habit of turning back the ribbon to make corrections.* This is a waste of time both at the KEYBOARD and at the CASTING MACHINE, for, while the matter "killed" is not cast, the CASTER must make a revolution for each character "killed" in order to advance the ribbon. The MONOTYPE is far too valuable a machine to be used for corrections which can be made much cheaper by a compositor whose only "machine" is a stick and a case of MONOTYPE type. To "kill" a portion of a line pull the RELEASE-PLATE LINK forward, as shown in Fig. 149, Plate X, at back of book, and turn the ribbon back to the

beginning of the line and then push the RELEASE-PLATE LINK back into position so that the paper will feed. Now strike a JUSTIFYING KEY in the top row until the paper has been advanced to the part not previously perforated, and then strike a lower-row JUSTIFYING KEY to restore. These JUSTIFYING KEY perforations lock the PUMP so that no characters are cast (¶148), but, as explained above, turning back the paper means a waste of time at the KEYBOARD and a waste of revolutions at the CASTER. *Don't be a ribbon fixer, set a clean proof.*

358 Systematizing Hand Corrections: Speed in making corrections at the case is just as important and as profitable as speed in keyboarding, because a job cannot be printed until it is corrected. Too much emphasis, therefore, cannot be placed upon the importance of systematizing this work. *Corrections should not be "anybody's job," but should be made by one man, a skilful compositor who knows the relative unit values of Monotype characters and who uses this knowledge to save his fingers*—a man who does not try to rejustify a line when he takes out an "o" and puts in an "a" replacing one nine-unit character with another. Of course, the corrector should be supplied with copies of the different MATRIX CASE Arrangements used and with spaces for the different unit sizes of each set used.

CHAPTER XL

Casting Type for the Cases

359 The Monotype is a complete type foundry for casting type, borders, and spaces and quads (both high and low) in all sizes from five- to thirty-six-point; it also casts rules, leads and slugs, both high and low, and automatically cuts them exactly to any desired length from six picas to twenty-five inches. In the previous chapters we have looked at the machine from the viewpoint of the KEYBOARD operator, taking up the different methods of controlling the CASTING MACHINE, by the perforations in the ribbon, to cause it to cast even the most intricate matter in automatically justified lines. In this chapter we will assume that the KEYBOARD does not exist, and regard the CASTING MACHINE simply as a machine to produce the material used by hand compositors; type, quads and spaces (both high and low), rules, leads, and slugs. To this end we will consider only the TYPE&RULE CASTER.

360 The Type&Rule Caster: Fig. 93, page 158; this is just the casting mechanism of the standard MONOTYPE COMPOSING MACHINE AND TYPE CASTER (see Frontispiece). The operator inserts the MATRIX for the required character and adjusts the mechanism for the body width of this character, which the machine continues to cast until the operator changes the MATRIX. The TYPE&RULE CASTER may be converted into the standard MONOTYPE for casting type in automatically justified lines from the ribbon perforated at the KEYBOARD, by applying to it the additional units to operate the MATRIX positioning and type-sizing mechanism by means of the ribbon instead of by hand. When these units are applied and the TYPE&RULE CASTER is thus converted into the standard MONOTYPE, the scope of the machine is increased and in no way limited, for, besides casting type in automatically justified lines, *the standard Monotype does all that the Type&Rule Caster does.* In short, the TYPE&RULE CASTER is no more limited when the additional units for ribbon control are applied than is a sectional bookcase when its usefulness is increased by adding a card index unit; the bookcase unit remains the same, the type-casting feature is not affected. When the owner of the TYPE&RULE CASTER wishes to make his type in justified lines, he buys the additional units and converts it into the COMPOSING MACHINE. The TYPE&RULE CASTER is used in a number of the larger MONOTYPE plants for casting all sorts, because it is a simpler and cheaper machine than the standard MONOTYPE COMPOSING MACHINE AND TYPE CASTER. The TYPE&RULE CASTER is also used with the non-distribution system (Chapter XLI, page 170), for it furnishes hand compositors with new material for much less than the cost of breaking up forms and distributing type, rules, leads, and slugs.

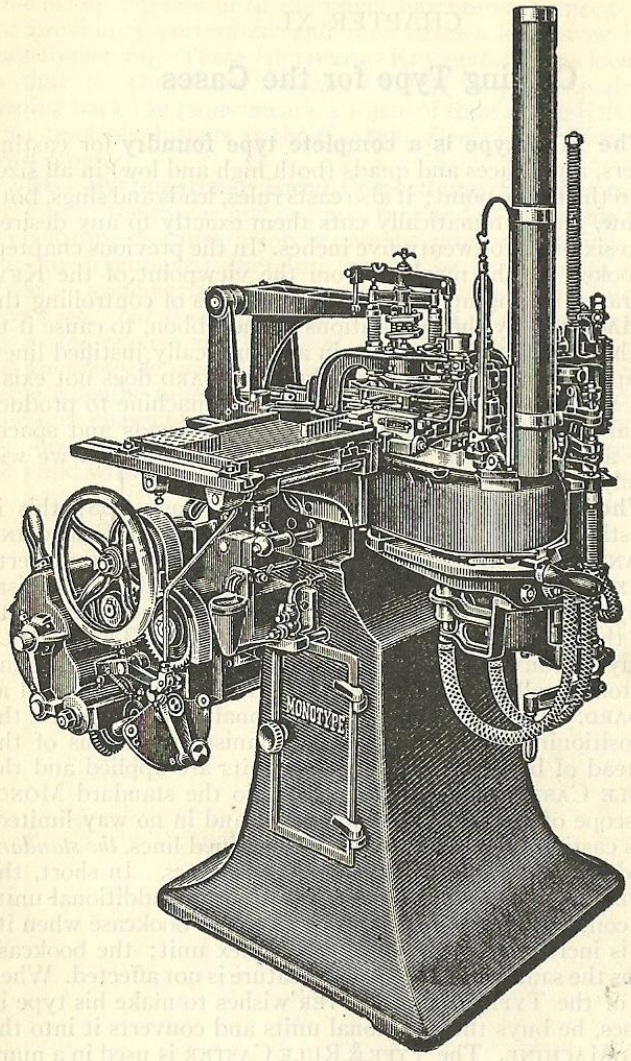


FIGURE 93

TYPE & RULE CASTER: Casts type, borders, and spaces (high and low) in all sizes from five- to thirty-six-point; also casts continuous rules, and leads and slugs, both high and low, in all sizes from two- to twelve-point, and automatically cuts them to any length from six picas to twenty-five inches. The machine is here shown casting type for the cases, the Lead and Rule Unit having been removed.

361 Holder for Composition Matrices (Fig. 94) is used for casting type for the cases from MATRICES that may also be used for casting type in justified lines; both single and double MATRICES (Fig. 53, page 117). It is also used with the MATRICES, twelve-point and smaller, for casting type to be set by hand. This HOLDER should

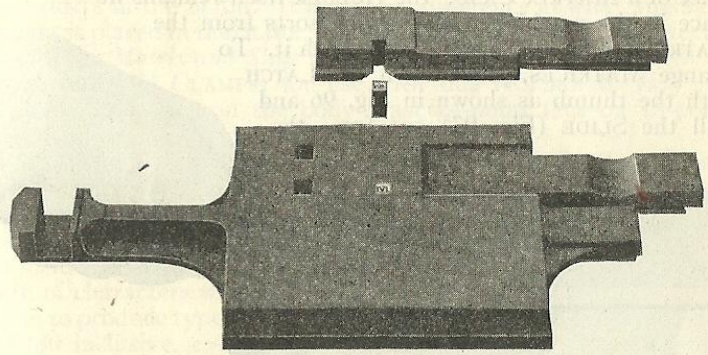


FIGURE 94

COMPOSITION MATRIX HOLDER; for casting type for the cases. The SLIDE (shown above the complete HOLDER) is withdrawn to insert a MATRIX; the HOLDER itself is not taken from the machine.

be part of the equipment of every MONOTYPE plant; it is a great convenience in casting extra characters not carried in the MATRIX CASE (¶186), for it saves opening up a MATRIX CASE and inserting these characters. The HOLDER is placed in the CASTING MACHINE the same as a MATRIX CASE, and remains in place in the machine while casting sorts from MATRICES made for use with it. To change a MATRIX, the SLIDE (also shown separately in Fig. 94) is pulled out of the HOLDER and the MATRIX for the desired character inserted in the slot in the SLIDE which is then pushed back into place in the HOLDER where it is held by its latch. The width of characters cast from MATRICES carried in this HOLDER is determined by setting the type-sizing mechanism by hand, see ¶366.

362 The Sorts Matrix (Fig. 95) is used for casting type to be set by hand from the case; it is never used for casting type in automatically justified lines. This is made for both type and borders in all sizes from fourteen- to thirty-six-point inclusive. The MATRIX for the character required is inserted in its HOLDER (Fig. 96, page 160) and the sizing mechanism adjusted by hand for the width of this character. This setting is determined from the marks on the MATRIX; for example, in Fig. 95 the figures beneath the character (18 8) indicate the setting of

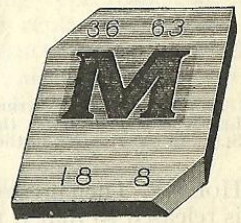


FIGURE 95

SORTS MATRIX; for casting type for the case from fourteen- to thirty-six-point.

the two WEDGES of the sizing mechanism; the figures above the character (36 63) identify the MATRIX as belonging to the thirty-six-point number sixty-three series.

363 The Sorts Matrix Holder (Fig. 96) is used with SORTS MATRICES (Fig. 95, page 159) for casting type for the case. Like the HOLDER for COMPOSITION MATRICES (¶361) it takes the place of a MATRIX CASE; the HOLDER itself remains in place in the machine while casting sorts from the MATRICES (Fig. 95) made for use with it. To change MATRICES, press down the LATCH with the thumb as shown in Fig. 96 and pull the SLIDE (Fig. 97) out from the

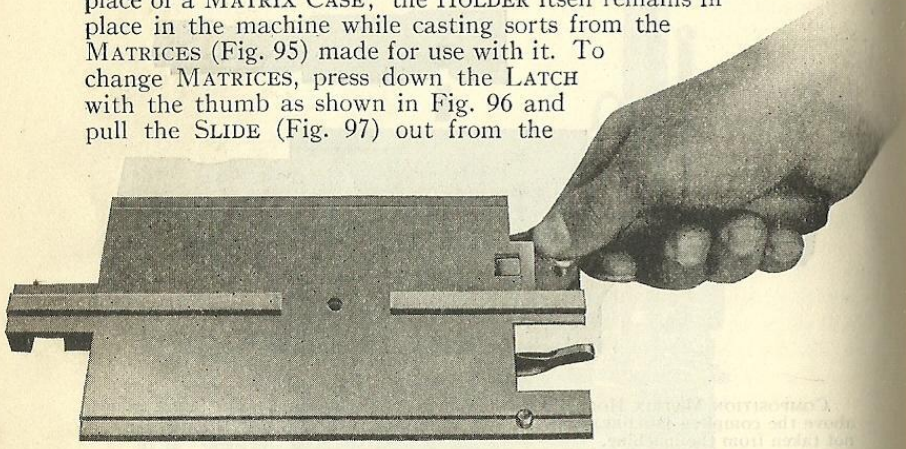


FIGURE 96

SORTS MATRIX HOLDER: Holds SORTS MATRICES (Fig. 95) one at a time for casting type for the case. To change a MATRIX, press the LATCH with the thumb as shown and pull out the SLIDE (Fig. 97); the HOLDER itself remains in the machine.

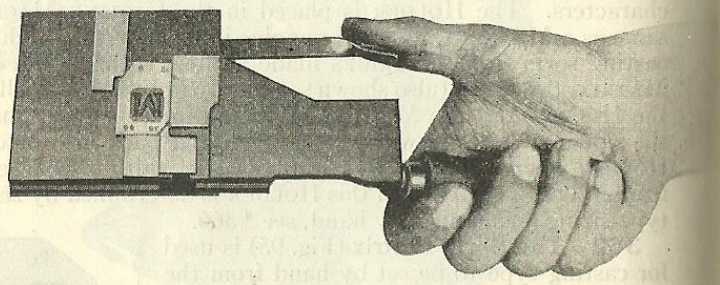


FIGURE 97

SLIDE for SORTS MATRIX HOLDER (Fig. 96): To remove the MATRIX, press the LEVER as shown; insert the next MATRIX and release the LEVER; then replace the SLIDE in the HOLDER in the machine.

HOLDER. Then press the LEVER as shown in Fig. 97, and the MATRIX is released so that it may be removed and the MATRIX for the next character inserted. Releasing the LEVER brings the new MATRIX to correct position and locks it in place. The SLIDE is then put back in its HOLDER where it is locked by its LATCH. The MATRICES used with this HOLDER have no cone-hole for the CENTERING PIN to seat

in, like the COMPOSITION MATRICES (Fig. 4, page 6); instead, the cone-hole is in the SLIDE and, therefore, the CENTERING PIN accurately positions the HOLDER and the MATRIX it carries. When the MATRIX is placed in the SLIDE and the thumb is removed from the LEVER (Fig. 97, page 160) to release it, the CLAMPS connected with this LEVER close up and accurately position the MATRIX against the ABUTMENTS in the SLIDE. It makes no difference at what angle the MATRIX is placed in the SLIDE, these CLAMPS will position it perfectly *provided the Matrix and Slide are clean.* For special SLIDE (with its ABUTMENTS and CLAMPS) for use with this HOLDER to vary the position of the face on the body (cast 24-point face on 18-point body, etc.) see ¶376.

364 The Type-sizing Mechanism for Sorts Casting: For a detailed description of this see our books on the CASTING MACHINE, the object of the following is to explain only the principles of this mechanism. See the NORMAL WEDGE, Fig. 10, page 14, and ¶27 to ¶31 inclusive, describing this WEDGE, which is used to determine the width of characters when the CASTING MACHINE is controlled by a ribbon to produce type in automatically justified lines. Re-read ¶127 to ¶130 inclusive, explaining the TYPE TRANSFER WEDGE which supports the NORMAL WEDGE when casting characters, the SPACE TRANSFER WEDGE, which takes the place of the TYPE TRANSFER WEDGE when casting justifying spaces, and the JUSTIFYING WEDGES which support the SPACE TRANSFER WEDGE and which are positioned by the CASTING MACHINE, before the first character of a line is cast, to make the justifying spaces of the proper size to justify the line. In the same way WEDGES are used in casting sorts, except that the required type size is obtained by positioning these WEDGES by hand. The special NORMAL WEDGE 47S used for sorts casting is always supported, when the type is cast, by the SPACE TRANSFER WEDGE, which, in turn, is supported by the JUSTIFYING WEDGES; the TYPE TRANSFER WEDGE is never used in casting sorts and may be considered not to exist. In casting type from COMPOSITION MATRICES (¶361) both JUSTIFYING WEDGES are used and the required width for the character to be cast is obtained by varying the position of these WEDGES as well as the position of the special NORMAL WEDGE 47S used for sorts casting. In casting type from SORTS MATRICES (¶362) the rear JUSTIFYING WEDGE is replaced with a special JUSTIFYING WEDGE 46S, the front JUSTIFYING WEDGE is placed as far to the left as possible and is never shifted; all sizes required are obtained by moving this special rear JUSTIFYING WEDGE, the special NORMAL WEDGE, and by using, for the smaller sizes, the PACKING PIECE described in the next paragraph.

365 The Wedges used for sorts casting, with the GAGES for setting them, are shown in Fig. 98, page 162. The lower WEDGE 47S in this cut takes the place of the NORMAL WEDGE, Fig. 10, page 14, and is moved, by means of its GAGE, shown beneath this WEDGE, when the NORMAL-WEDGE LOCKING PIN is lifted; after the WEDGE is positioned, this PIN is allowed to seat in the proper space of the WEDGE, which it holds in this position until the WEDGE is shifted

for the next size character. Note the graduations on the GAGE which correspond to the spaces of the rack on the WEDGE. The upper WEDGE 46S, in the illustration, replaces the rear JUSTIFYING WEDGE when casting characters from SORTS MATRICES (¶362); this WEDGE is positioned by means of its GAGE. To move the WEDGE it must be first raised, by lifting the JUSTIFYING-WEDGE-LEVER-ARM ROD by hand, just as the CASTING MACHINE, when controlled by a ribbon, lifts this WEDGE automatically. The PUMP should, of course, be locked out by hand when changing MATRICES or WEDGE positions, and it is necessary when shifting the JUSTIFYING WEDGES as this relieves the spring tension which holds down the JUSTIFYING-WEDGE-LEVER-ARM ROD. The MOLD-BLADE-ABUTMENT-SCREW PACKING PIECE 60S, shown at the lower right corner of Fig. 98, is placed between the MOLD BLADE and the ABUTMENT SCREW when casting the smaller size characters: For example, if the WEDGES be set to cast a character thirty-six points wide this size will be reduced to nineteen

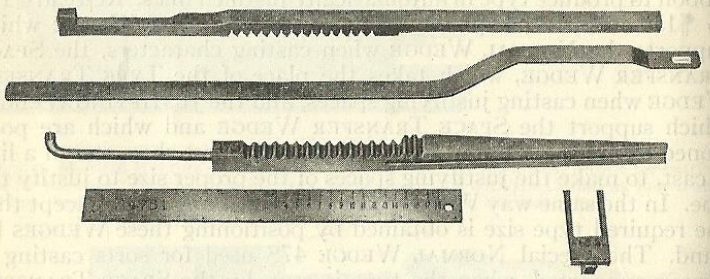


FIGURE 98

WEDGES used for sorts casting: From top to bottom in the above cut these are, JUSTIFICATION WEDGE 46S, JUSTIFICATION-WEDGE GAGE 46S1, NORMAL WEDGE 47S, NORMAL-WEDGE GAGE 47S1, MOLD-BLADE-ABUTMENT-SCREW PACKING PIECE 60S.

points when the PACKING PIECE 60S is inserted, for this takes seventeen points off the size of the character. Both WEDGE 46S and WEDGE 47S are set by bringing the required graduation on their GAGES to the left edge of the TRANSFER-WEDGE-OPERATING-ROD-GUIDE CAP 54D.

366 To set the Type-sizing Mechanism for Composition Matrices; that is, MATRICES used with the HOLDER for COMPOSITION MATRICES (Fig. 94, page 159), determine the width body required, in thousandths of an inch, from the Table of Type Sizes (Fig. 21, Plate I, facing page 27), and use the table of WEDGE Positions for Casting Sorts from COMPOSITION MATRICES (Fig. 99, page 163) thus: Follow down the column headed "Width in Inches" to the size equal to, or next greater (never less) than, the width of the character to be cast; the WEDGE positions to the right of this give the body-size required. Set the special NORMAL WEDGE 47S with its

Wedge Positions for Casting Sorts from Composition Matrices

Width in Inches	Normal Wedge 47S	Front Just. Wedge 10D	Rear Just. Wedge 11D	Width in Inches	Normal Wedge 47S	Front Just. Wedge 10D	Rear Just. Wedge 11D	Width in Inches	Normal Wedge 47S	Front Just. Wedge 10D	Rear Just. Wedge 11D	Width in Inches	Normal Wedge 47S	Front Just. Wedge 10D	Rear Just. Wedge 11D	Width in Inches	Normal Wedge 47S	Front Just. Wedge 10D	Rear Just. Wedge 11D
.0193	5	7½	1½	.0500	7	7½	4½	.0807	9	7½	7½	.1113	11	8	3	.1420	13	8	6
.0198	5	7½	2	.0505	7	7½	5	.0812	9	7½	8	.1118	11	8	3½	.1425	13	8	6½
.0203	5	7½	2½	.0510	7	7½	5½	.0817	9	8	1	.1123	11	8	4	.1430	13	8	7
.0208	5	7½	3	.0515	7	7½	6	.0822	9	8	1½	.1128	11	8	4½	.1435	13	8	7½
.0213	5	7½	3½	.0520	7	7½	6½	.0827	9	8	2	.1133	11	8	5	.1440	13	8	8
.0218	5	7½	4	.0525	7	7½	7	.0832	9	8	2½	.1138	11	8	5½	.1443	14	7½	2
.0223	5	7½	4½	.0530	7	7½	7½	.0837	9	8	3	.1143	11	8	6	.1448	14	7½	2½
.0228	5	7½	5	.0535	7	7½	8	.0842	9	8	3½	.1148	11	8	6½	.1453	14	7½	3
.0233	5	7½	5½	.0540	7	8	1	.0847	9	8	4	.1153	11	8	7	.1458	14	7½	3½
.0238	5	7½	6	.0545	7	8	1½	.0852	9	8	4½	.1158	11	8	7½	.1463	14	7½	4
.0243	5	7½	6½	.0550	7	8	2	.0857	9	8	5	.1163	11	8	8	.1468	14	7½	4½
.0248	5	7½	7	.0555	7	8	2½	.0862	9	8	5½	.1167	12	7½	2	.1473	14	7½	5
.0253	5	7½	7½	.0560	7	8	3	.0867	9	8	6	.1172	12	7½	2½	.1478	14	7½	5½
.0258	5	7½	8	.0565	7	8	3½	.0872	9	8	6½	.1177	12	7½	3	.1483	14	7½	6
.0263	5	8	1	.0570	7	8	4	.0877	9	8	7	.1182	12	7½	3½	.1488	14	7½	6½
.0268	5	8	1½	.0575	7	8	4½	.0882	9	8	7½	.1187	12	7½	4	.1493	14	7½	7
.0273	5	8	2	.0580	7	8	5	.0887	9	8	8	.1192	12	7½	4½	.1498	14	7½	7½
.0278	5	8	2½	.0585	7	8	5½	.0890	10	7½	2	.1197	12	7½	5	.1503	14	7½	8
.0283	5	8	3	.0590	7	8	6	.0895	10	7½	2½	.1202	12	7½	5½	.1508	14	8	1
.0288	5	8	3½	.0595	7	8	6½	.0900	10	7½	3	.1207	12	7½	6	.1513	14	8	1½
.0293	5	8	4	.0600	7	8	7	.0905	10	7½	3½	.1212	12	7½	6½	.1518	14	8	2
.0298	5	8	4½	.0605	7	8	7½	.0910	10	7½	4	.1217	12	7½	7	.1523	14	8	2½
.0303	5	8	5	.0610	7	8	8	.0915	10	7½	4½	.1222	12	7½	7½	.1528	14	8	3
.0308	5	8	5½	.0613	8	7½	2	.0920	10	7½	5	.1227	12	7½	8	.1533	14	8	3½
.0313	5	8	6	.0618	8	7½	2½	.0925	10	7½	5½	.1232	12	8	1	.1538	14	8	4
.0318	5	8	6½	.0623	8	7½	3	.0930	10	7½	6	.1237	12	8	1½	.1543	14	8	4½
.0323	5	8	7	.0628	8	7½	3½	.0935	10	7½	6½	.1242	12	8	2	.1548	14	8	5
.0328	5	8	7½	.0633	8	7½	4	.0940	10	7½	7	.1247	12	8	2½	.1553	14	8	5½
.0333	5	8	8	.0638	8	7½	4½	.0945	10	7½	7½	.1252	12	8	3	.1558	14	8	6
.0337	6	7½	2	.0643	8	7½	5	.0950	10	7½	8	.1257	12	8	3½	.1563	14	8	6½
.0342	6	7½	2½	.0648	8	7½	5½	.0955	10	8	1	.1262	12	8	4	.1568	14	8	7
.0347	6	7½	3	.0653	8	7½	6	.0960	10	8	1½	.1267	12	8	4½	.1573	14	8	7½
.0352	6	7½	3½	.0658	8	7½	6½	.0965	10	8	2	.1272	12	8	5	.1578	14	8	8
.0357	6	7½	4	.0663	8	7½	7	.0970	10	8	2½	.1277	12	8	5½	.1582	15	7½	2
.0362	6	7½	4½	.0668	8	7½	7½	.0975	10	8	3	.1282	12	8	6	.1587	15	7½	2½
.0367	6	7½	5	.0673	8	7½	8	.0980	10	8	3½	.1287	12	8	6½	.1592	15	7½	3
.0372	6	7½	5½	.0678	8	8	1	.0985	10	8	4	.1292	12	8	7	.1597	15	7½	3½
.0377	6	7½	6	.0683	8	8	1½	.0990	10	8	4½	.1297	12	8	7½	.1602	15	7½	4
.0382	6	7½	6½	.0688	8	8	2	.0995	10	8	5	.1302	12	8	8	.1607	15	7½	4½
.0387	6	7½	7	.0693	8	8	2½	.1000	10	8	5½	.1305	13	7½	2	.1612	15	7½	5
.0392	6	7½	7½	.0698	8	8	3	.1005	10	8	6	.1310	13	7½	2½	.1617	15	7½	5½
.0397	6	7½	8	.0703	8	8	3½	.1010	10	8	6½	.1315	13	7½	3	.1622	15	7½	6
.0402	6	8	1	.0708	8	8	4	.1015	10	8	7	.1320	13	7½	3½	.1627	15	7½	6½
.0407	6	8	1½	.0713	8	8	4½	.1020	10	8	7½	.1325	13	7½	4	.1632	15	7½	7
.0412	6	8	2	.0718	8	8	5	.1025	10	8	8	.1330	13	7½	4½	.1637	15	7½	7½
.0417	6	8	2½	.0723	8	8	5½	.1028	11	7½	2	.1335	13	7½	5	.1642	15	7½	8
.0422	6	8	3	.0728	8	8	6	.1033	11	7½	2½	.1340	13	7½	5½	.1647	15	8	1
.0427	6	8	3½	.0733	8	8	6½	.1038	11	7½	3	.1345	13	7½	6	.1652	15	8	1½
.0432	6	8	4	.0738	8	8	7	.1043	11	7½	3½	.1350	13	7½	6½	.1657	15	8	2
.0437	6	8	4½	.0743	8	8	7½	.1048	11	7½	4	.1355	13	7½	7	.1662	15	8	2½
.0442	6	8	5	.0748	8	8	8	.1053	11	7½	4½	.1360	13	7½	7½	.1667	15	8	3
.0447	6	8	5½	.0752	9	7½	2	.1058	11	7½	5	.1365	13	7½	8	.1672	15	8	3½
.0452	6	8	6	.0757	9	7½	2½	.1063	11	7½	5½	.1370	13	8	1	.1677	15	8	4
.0457	6	8	6½	.0762	9	7½	3	.1068	11	7½	6	.1375	13	8	1½	.1682	15	8	4½
.0462	6	8	7	.0767	9	7½	3½	.1073	11	7½	6½	.1380	13	8	2	.1687	15	8	5
.0467	6	8	7½	.0772	9	7½	4	.1078	11	7½	7	.1385	13	8	2½	.1692	15	8	5½
.0472	6	8	8	.0777	9	7½	4½	.1083	11	7½	7½	.1390	13	8	3	.1697	15	8	6
.0475	7	7½	2	.0782	9	7½	5	.1088	11	7½	8	.1395	13	8	3½	.1702	15	8	6½
.0480	7	7½	2½	.0787	9	7½	5½	.1093	11	8	1	.1400	13	8	4	.1707	15	8	7
.0485	7	7½	3	.0792	9	7½	6	.1098	11	8	1½	.1405	13	8	4½	.1712	15	8	7½
.0490	7	7½	3½	.0797	9	7½	6½	.1103	11	8	2	.1410	13	8	5	.1717	15	8	8
.0495	7	7½	4	.0802	9	7½	7	.1108	11	8	2½	.1415	13	8	5½	.1720	16	7½	2

The Abutment-screw Packing Piece 60S must be in position to obtain the sizes in this table.

FIGURE 99

Table of WEDGE positions for casting sorts of all sizes from five units of five-set to eighteen units of twelve-and-one-half-set. For some sizes the MOLD-BLADE ABUTMENT SCREW must be adjusted.

GAGE (Fig. 98, page 162) in the position indicated and, in the same way, set the front JUSTIFYING WEDGE 10D and the rear JUSTIFYING WEDGE 11D, using the upper GAGE shown in Fig. 98. If the table (Fig. 99, page 163) does not give the exact size required, this may then be obtained by measuring the type-body with a micrometer and adjusting the MOLD-BLADE ABUTMENT SCREW. The ABUTMENT-SCREW PACKING PIECE 60S (Fig. 98) must always be used for the WEDGE positions given in this table. EXAMPLE: Find the WEDGE positions for an asterisk (*) made for the eight-unit row of eight-and-one-half-set. From the Table of Type Sizes (Fig. 21, Plate I, facing page 27) we find that the body of this character is to be .0523″ wide; the table of WEDGE Positions (Fig. 99) does not give this size, but the next size larger is .0525″ and the WEDGE positions for this are—NORMAL WEDGE 47S in position 7, front JUSTIFYING WEDGE 10D in position 7½, and rear JUSTIFYING WEDGE 11D in position 7. This setting of the WEDGES makes the body .0002″ wider than the size required, but this difference is so slight (.015 of a point) that it is negligible; the type-body must never be made *smaller* than the size for which the character is designed.

367 To set the Type-sizing Mechanism for Sorts Matrices (Fig. 95, page 159) it is not necessary to use the Table of Type Sizes, as described in the preceding paragraph, for the marks on the MATRIX (¶362) indicate the setting of the WEDGES to make the body the required width. As described in ¶365, use with these MATRICES the special NORMAL WEDGE 47S and the special JUSTIFYING WEDGE 46S and, if necessary, the ABUTMENT-SCREW PACKING PIECE 60S (Fig. 98, page 162). When the special JUSTIFYING WEDGE 46S is used, the front JUSTIFYING WEDGE 10D must be set as far to the left as possible. The numbers under the character on the MATRIX indicate the WEDGE positions; the left number, 18 in Fig. 95, gives the setting for the special NORMAL WEDGE 47S, and if this number be starred (*), the ABUTMENT-SCREW PACKING PIECE 60S must be in position; the right number, 8 in Fig. 95, is the position for the special JUSTIFYING WEDGE 46S. Both WEDGES are positioned by means of their respective GAGES as described in ¶365.

368 Arrange the characters in a font according to set-sizes when casting sorts, in order to avoid unnecessary settings of the WEDGES. Thus, Fig. 95, page 159, shows a MATRIX of the thirty-six-point sixty-three series; before starting to cast this font place together all MATRICES requiring the same WEDGE positions, for example, all those marked (18 8), as the cap M shown in Fig. 95; then arrange these groups of MATRICES in the order of the positions for the NORMAL WEDGE 47S, placing after the MATRICES requiring position 18, those for position 17 and so on.

369 Casting Spaces and Quads: The table of WEDGE Positions for Casting Spaces and Quads, Fig. 100, page 165, gives the positions of the special NORMAL WEDGE 47S, the special JUSTIFYING WEDGE 46S, and indicates whether the ABUTMENT-SCREW PACKING PIECE 60S is to be used in casting spaces from two and one-quarter to thirty-six points wide. This table is self-explanatory; if not,

re-read ¶366, which describes the use of the similar table of WEDGE Positions for Casting Sorts from COMPOSITION MATRICES.

370 Wedge Positions for fonts twelve-point and smaller: There is not room on the Cellular MATRICES to mark the WEDGE positions like the MATRICES for fourteen-point and larger, Fig. 95, page 159, and, therefore, with fonts for sorts casting, twelve-point

Wedge Positions for Casting Spaces and Quads

Width in Points	Width in Inches	Normal Wedge 47S	Special Just. Wedge 46S	Width in Inches	Width in Points	Width in Points	Width in Inches	Normal Wedge 47S	Special Just. Wedge 46S	Width in Inches	Width in Points	Width in Points	Width in Inches	Normal Wedge 47S	Special Just. Wedge 46S	Width in Inches	Width in Points
2¼	.0311	2	2	.2663	19¼	* 8	.1107	7	8	.3458	25	*13¾	.1902	13	6	.4254	30¾
2½	.0346	2	4	.2698	19½	* 8¼	.1141	8	2	.3493	25¼	*14	.1937	13	8	.4288	31
2¾	.0380	2	6	.2732	19¾	* 8½	.1176	8	4	.3528	25½	*14¼	.1971	14	2	.4323	31¼
3	.0415	2	8	.2767	20	* 8¾	.1210	8	6	.3562	25¾	*14½	.2006	14	4	.4358	31½
3¼	.0450	3	2	.2801	20¼	* 9	.1245	8	8	.3597	26	*14¾	.2040	14	6	.4392	31¾
3½	.0484	3	4	.2836	20½	* 9¼	.1280	9	2	.3631	26¼	*15	.2075	14	8	.4427	32
3¾	.0519	3	6	.2870	20¾	* 9½	.1314	9	4	.3666	26½	*15¼	.2110	15	2	.4461	32¼
4	.0553	3	8	.2905	21	* 9¾	.1349	9	6	.3700	26¾	*15½	.2144	15	4	.4496	32½
4¼	.0588	4	2	.2940	21¼	*10	.1383	9	8	.3735	27	*15¾	.2179	15	6	.4530	32¾
4½	.0623	4	4	.2974	21½	*10¼	.1418	10	2	.3770	27¼	*16	.2213	15	8	.4565	33
4¾	.0657	4	6	.3009	21¾	*10½	.1453	10	4	.3804	27½	*16¼	.2248	16	2	.4600	33¼
5	.0692	4	8	.3043	22	*10¾	.1487	10	6	.3839	27¾	*16½	.2283	16	4	.4634	33½
5¼	.0726	5	2	.3078	22¼	*11	.1522	10	8	.3873	28	*16¾	.2317	16	6	.4669	33¾
5½	.0761	5	4	.3113	22½	*11¼	.1556	11	2	.3908	28¼	*17	.2352	16	8	.4703	34
5¾	.0795	5	6	.3147	22¾	*11½	.1591	11	4	.3943	28½	*17¼	.2386	17	2	.4738	34¼
6	.0830	5	8	.3182	23	*11¾	.1625	11	6	.3977	28¾	*17½	.2421	17	4	.4773	34½
6¼	.0865	6	2	.3216	23¼	*12	.1660	11	8	.4012	29	*17¾	.2455	17	6	.4807	34¾
6½	.0899	6	4	.3251	23½	*12¼	.1695	12	2	.4046	29¼	*18	.2490	17	8	.4842	35
6¾	.0934	6	6	.3285	23¾	*12½	.1729	12	4	.4081	29½	*18¼	.2525	18	2	.4876	35¼
7	.0968	6	8	.3320	24	*12¾	.1764	12	6	.4115	29¾	*18½	.2559	18	4	.4911	35½
7¼	.1003	7	2	.3355	24¼	*13	.1798	12	8	.4150	30	*18¾	.2594	18	6	.4945	35¾
7½	.1038	7	4	.3389	24½	*13¼	.1833	13	2	.4185	30¼	*19	.2628	18	8	.4980	36
7¾	.1072	7	6	.3424	24¾	*13½	.1868	13	4	.4219	30½						

* The Abutment-screw Packing Piece 60S must be in position to obtain this size. The front Justification Wedge 10D must be as far to the left as possible when using this Table.

FIGURE 100

Table of WEDGE positions for casting space material in all widths from two and one-quarter to thirty-six points inclusive. Space material thinner than two and one-quarter points can be obtained by readjusting the MOLD-BLADE ABUTMENT SCREW.

and smaller, a table of WEDGE Positions is furnished for each font (Fig. 101, page 166). Before using one of these fonts be sure that the characters are arranged according to their set-sizes, as shown in Fig. 101 and explained in ¶368 for MATRICES for fonts fourteen-point and larger.

371 Always take a proof of a font when casting sorts, setting the caps between cap H's and the lower case between lower case m's, as explained in ¶282.

372 Regulating speed in casting type: The speed of the CASTING MACHINE is determined by the time it takes a type to solidify in the MOLD after the metal has been forced in by the PUMP. To reduce this time to the minimum, all parts of the MOLD except the two moving parts, the CROSS BLOCK and the MOLD BLADE (¶12 and ¶14), are thoroughly cooled by ample water circulation, and, in addition, the portion of the CASTING MACHINE to which the MOLD is attached is independently water cooled. The

Character	Normal Wedge *47S	Justification Wedge †10D	Justification Wedge †11D	Width in Inches
i l . , '	5	8	2	.0273
f j : ; ! -	5	8	7	.0323
r s t	6	7½	6	.0377
I c e z ?	6	8	4	.0432
J a g o x $ Figures	7	7½	3	.0485
S b d h k n p q u v y fi fl	7	8	1	.0540
Z ff	7	8	6½	.0595
F L P æ	8	7½	5½	.0648
A B C E O Q T V & w	8	8	3½	.0703
G R U Y œ	9	7½	2½	.0757
D H K N X m ffi ffl	9	7½	7½	.0807
M W Æ Œ	10	8	2½	.0970

*The Abutment-screw Packing Piece 60S (Normal-wedge Packing Piece 47S3 on older equipments) must be in position to obtain the sizes in this table.

† Use Justification-wedge Gage 46S1 for setting these regular Justification Wedges 10D and 11D.

FIGURE 101

Table of WEDGE positions and set-sizes as furnished with fonts of cellular sorts MATRICES (12-point and smaller). These tables vary according to the arrangement and set-size of the fonts; the table here reproduced is for six-point No. 8A.

time of cooling for a type depends, of course, upon the hardness of the metal used; the harder the metal, the higher the temperature required for the metal to flow freely and cast sharply. With ordinary metal any matter can be cast from COMPOSITION MATRICES (12-point and smaller) at the normal speed of the CASTING MACHINE, 140 revolutions per minute. With harder metal it is sometimes necessary in twelve-point matter, where a number of the largest characters are used together (em-quads or em-leaders), to give the MOLD more time to cool; this may be done by reducing the speed of the CASTING MACHINE, or, better still, by keyboarding the matter to

avoid this sequence of the largest size characters. Thus, instead of striking the em-quad, or em-leader continuously, alternate these widest characters with smaller characters by striking first the em-quad, then the nut-quad, and so on. It is faster at the KEYBOARD to strike two different KEYS alternately with the right and left hands than to strike the same KEY repeatedly with one hand. In casting sorts of these twelve-point em-body characters from hard metal the speed of the machine may be reduced or the MOLD may be cooled, by locking out the PUMP, with the PUMP LOCK, and not casting every fifth revolution.

373 The Speed Regulating Attachment: The TYPE & RULE CASTER and all COMPOSING MACHINES with the Display Type Attachment, for casting type fourteen-point and larger, are equipped with the Speed Regulating Attachment shown on the TYPE & RULE CASTER in Fig. 93, page 158. By shifting three LEVERS this gives eighteen speeds through gearing and the nineteenth speed direct with all gears cut out. The LEVER for operating the TUMBLER GEAR is shown in Fig. 93 at the extreme left; this is moved from the front (HAND WHEEL side of machine) to the back (PULLEY side) and may be locked by its LATCH in any one of its four positions. When the LEVER is as near the back of the machine as possible (position 4), all gears are cut out and the machine runs direct from the tight PULLEY on belt speed; the CAM SHAFTS which determine all motions of the CASTING MACHINE making one revolution for each revolution of the PULLEY. The BACK GEAR, which gives two speeds, is moved, front or back, by a knob not shown in Fig. 93, but located on the left of the machine in the middle of the cover for these change gears. The SECTOR LEVER shown directly under the HAND WHEEL at the front of the machine may be set and locked in three positions. The positions of these three LEVERS are indicated on the Speed Regulating Attachment thus:

TUMBLER GEAR: Positions 1 2 3 4
SECTOR LEVER: Positions A B C
BACK GEAR: Positions D E

With the PULLEY making 140 revolutions per minute the nineteen speeds given by positions 1 2 3 4 A B C D E are as follows:

POSITIONS	R. P. M.	POSITIONS	R. P. M.
1 A D	9	1 A E	36
2 A D	11	2 A E	43
3 A D	12	3 A E	49
1 B D	14	1 B E	57
2 B D	17	2 B E	68
3 B D	20	3 B E	80
1 C D	23	1 C E	91
2 C D	27	2 C E	110
3 C D	32	3 C E	128

POSITION 4: THE PULLEY SPEED, 140 R. P. M.

374 Changing speed in casting type from Sorts Matrices (Fig. 95, page 159): As explained in ¶367, the figures below the character in a SORTS MATRIX indicate the WEDGE positions to make the width of the body for this character the size required; the same

marks that indicate the width of the character are also used to tell the operator the speed at which the character should be cast. Fig. 102 shows the speed table on the Speed Regulating Attachment; the left column gives the different MATRIX markings for set-sizes, the vertical columns, headed with the point-sizes, the settings of the TUMBLER GEAR, SECTOR LEVER, and BACK GEAR, as explained in the preceding paragraph. In casting a font of thirty-six-point, for example, when the operator changes the WEDGES to alter the body

MATRIX MARKING	36P	30P	24P	18P	14P	12P
18-8	1AD	2AD	1BD	1CD	3CD	1AE
14-8	2AD	3AD	2BD	2CD	1AE	2AE
11-8	3AD	1BD	3BD	2CD	1AE	2AE
8-8	1BD	2BD	1CD	3CD	2AE	3AE
5-8	2BD	3BD	2CD	1AE	3AE	1BE
2-8	3BD	1CD	3CD	2AE	1BE	2BE
*17-8	1CD	2CD	1AE	3AE	2BE	3BE
*15-8	2CD	3CD	2AE	1BE	3BE	1CE
*13-8	3CD	1AE	3AE	2BE	1CE	1CE
*12-6	1AE	2AE	1BE	3BE	1CE	2CE
*10-6	2AE	3AE	2BE	1CE	2CE	3CE
*9-4	3AE	1BE	2BE	1CE	3CE	4
*8-4	1BE	2BE	3BE	2CE	4	
*6-8	2BE	3BE	1CE	4		
*5-8	3BE	1CE	3CE			
*5-4	1CE	2CE	4			
*4-4	2CE	3CE				
*3-8	3CE	4				
*3-4	4					

TUMBLER
1-2-3-(4 BELT SPEED 140 R. P. M.)
SECTOR LEVER A-B-C
BACK GEAR D-E

FIGURE 102

SPEED INDEX PLATE: Gives the positions for the TUMBLER, SECTOR LEVER, and BACK GEAR for the various point-sizes and MATRIX markings. (The above is an example of cross-rule MATRIX work, see ¶326.)

width, he also sets the LEVERS of the Speed Regulating Attachment to the positions indicated on the speed table (column "36P") to cast the characters of this width at the maximum speed.

375 Varying Alignment: When faces are cast on a body larger than that for which they are designed, to give the effect of hand leading, they are always cast on the same line as faces made for this larger body, so that they will line perfectly with all other MONOTYPE faces on the same size body (¶280). It is often desirable to

cast faces on a smaller point-size body to save space; for example, the eight-point 8A may be cast on seven-point body, provided special MATRICES be used with shortened descenders for all characters that come below the line (g, j, y, etc.). To alter the position of characters on their body (cast them high or low line) the relation of the CENTERING PIN, which positions the character on the body, to the MOLD in which the body is cast, may be altered by adjusting the CENTERING-PIN BUSHING (¶281). This adjustment provides for raising or lowering the character on its body three and one-half points. In the same way, in casting type for the case, a character may be cast central on a wider body by adjusting the CENTERING PIN; for example, an eight-point degree mark (°) designed for seven units of eight-and-one-half-set may be cast central on a nine-unit body of ten-set and raised on the body to have the same position as a ten-point degree mark. CAUTION: In casting characters on larger size bodies, or changing their position on the body, never move the MATRIX from its normal position so far that it will not completely cover the MOLD opening; if this be done, metal will be forced out through this opening between the MOLD and the MATRIX.

376 Special Slide and Abutments for Sorts Matrix Holder (Fig. 96, page 160): In casting type from SORTS MATRICES (14-point and larger) it is often desirable to make a greater change in alignment than is possible by adjusting the CENTERING-PIN BUSHING, as explained in the preceding paragraph; for example, to cast the caps and figures of a thirty-point face on twenty-four-point body. To do this requires a special SLIDE similar to the standard SLIDE, shown in Fig. 97, page 160, except that the ABUTMENT against which the end of the MATRIX is positioned is removable and two special ABUTMENTS in addition to the standard ABUTMENT are supplied to change the position of the MATRIX in the HOLDER. When one of these special ABUTMENTS is used, the two CLAMPS which hold the MATRIX must also be changed to correspond. Thus, with each special SLIDE are furnished three ABUTMENTS and three sets of CLAMPS. This special SLIDE fits in the same standard HOLDER (Fig. 96, page 160) as does the standard SLIDE. The variations which may be obtained by the use of this special SLIDE and its ABUTMENTS and CLAMPS are as follows:

ABUTMENT	CLAMPS	OBJECT
72S16	72S20 72S21	for casting any face on its own size body
		for casting 14-point face on 12-point body*
		for casting 20-point face on 18-point body*
72S17	72S22 72S23	for casting 24-point face on 18-point body
		for casting 24-point face on 20-point body*
72S18	72S24 72S25	for casting 30-point face on 24-point body
		for casting 36-point face on 30-point body
		for casting 18-point face on 14-point body*

*The CENTERING PIN must be readjusted two points from its standard setting to obtain this alignment.

CHAPTER XLI

Non-Distribution

377 Non-distribution: The system by which compositors are continuously supplied with new type, spacing material, high and low leads, slugs, and rules directly from the MONOTYPE, which makes this material so economically that whole pages after use are melted up to make new material. Thus *recasting replaces distribution.*

378 The three fundamental advantages of the composing machine that both casts and sets matter are: *First,* the operator is never out of sorts: when he wants a character he strikes a key. *Second,* the operator wastes no time on the non-productive work of distribution. *Third,* greater speed on composition can be obtained by striking keys than by picking type from cases. However, it is a significant fact that, in spite of the universal use of composing machines, more type is to-day set by hand than at any time in the history of the printing industry. With the development of advertising as an art has come a better realization of the value of typography as a means to arouse interest and to compel action. Much of the advertising matter set to-day contains so many different faces and sizes of type that it is actually quicker to set this matter by hand at the case, *provided the hand compositor has the first two advantages of the Composing Machine operator—unlimited material and freedom from distribution.* In the same way in every printing office there are many little jobs which it is more profitable to set by hand rather than break in on the work of a composing machine operator.

379 The Non-distribution System gives the hand compositor two of the three advantages enjoyed by the machine operator, because this system supplies the hand compositor with unlimited material and insures that he wastes no time on distribution. After a page is printed or plated, it is melted up exactly the same as the work of the machine operator. It is a significant fact that the real development of the printing industry, the modern newspaper and magazine, the catalog containing many hundred pages, dates from the invention of composing machines that eliminated the wasteful processes of distribution. Even more significant is the fact that *the compositor is the only workman who wastes time taking apart a finished job in order to get material to use on his next job.* When a carpenter makes a table, the wood and nails he uses are sold as the finished table, but when a compositor sets a table, he must then, when foundry type is used, take the table apart and distribute the type, rules, leads, and slugs in order to get material for his next job.

380 Saving of Non-distribution: *Great as are the savings in the purchase of a compositor's "tools" which our Type & Rule Caster*

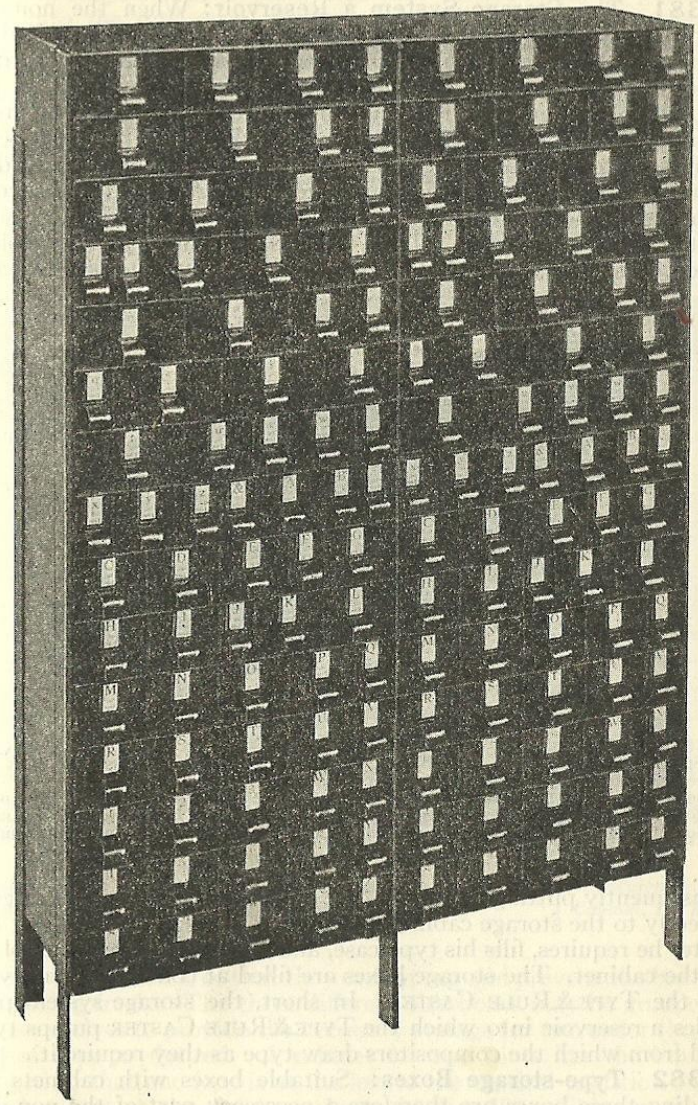


FIGURE 103

TYPE-STORAGE CABINET has a capacity of 450 pounds of type and gives storage for two or three fonts (Figs. 105, 106, 107, page 173). These single cabinet units may be combined as shown in Fig. 108, page 174, and Fig. 109, page 175. Dimensions of cabinet: Height, 37¼ inches; width, 23 inches; depth, 6⅝ inches.

makes possible, these savings are insignificant compared to the savings effected by the elimination of distribution.

381 The Storage System a Reservoir: When the non-distribution system is used, that is, when the type in a job is melted up instead of being distributed, the type is made in large quantities in order that the TYPE&RULE CASTER may be operated at the maximum efficiency and that time is not needlessly wasted by interrupting the machine to cast a few sorts of this or that. The type as cast is placed in storage boxes, a box for each character, instead of in type-cases. These storage boxes hold enough type to fill several type-cases, and the boxes are placed so that they are easily accessible to the hand compositors. Thus, when a type-case must be replenished, instead of sending it to the CASTING MACHINE to be filled, and

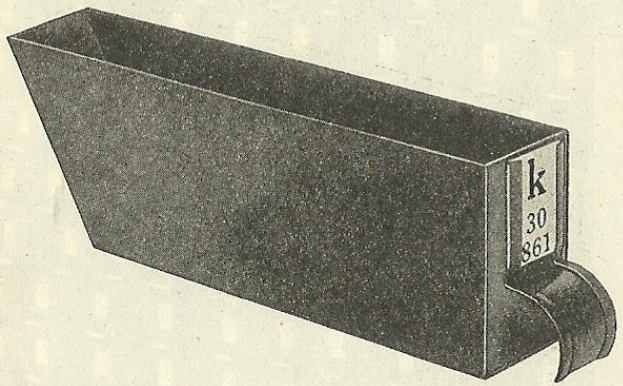


FIGURE 104

Smallest TYPE-STORAGE BOX (No. 1). Note the convenient, scoop-shaped back and large-sized label-holder, combined with the handle.
Box No. 1, length 6 inches, width 1 3/16 inches, depth 2 inches, holds 1 pound 10 ounces.
Box No. 2, length 6 inches, width 2 3/8 inches, depth 2 inches, holds 3 pounds 8 ounces.
Box No. 3, length 6 inches, width 3 9/16 inches, depth 2 inches, holds 5 pounds 6 ounces.

consequently putting that type-case out of use, the compositor goes directly to the storage cabinet, takes from it the box containing the letter he requires, fills his type-case, and returns the box to its place in the cabinet. The storage boxes are filled at convenient intervals by the TYPE&RULE CASTER. In short, the storage system provides a reservoir into which the TYPE&RULE CASTER pumps type and from which the compositors draw type as they require it.

382 Type-storage Boxes: Suitable boxes with cabinets for holding these boxes are therefore a necessary part of the non-distribution system, and the proper design of these boxes is a very essential part of this system of composing-room efficiency. The boxes must be easy to handle and properly proportioned so that they will hold enough type for the requirements of the office, but not more type than is necessary, because this means a needless investment in

metal. Fig. 104, page 172, shows the MONOTYPE storage box; note the scoop-shaped back of the box so that the type may be poured easily into the type-cases, the convenient handle, and the label-holder which makes it easy to identify the boxes. These boxes, while all of the same height (2″) and depth (6″) so that they fit the shelves, are made in three widths: box No. 1, 1 3/16″ wide, holds 1 lb. 10 oz.; No. 2, 2 3/8″ wide, holds 3 lbs. 8 oz.; and No. 3, 3 9/16″ wide, holds 5 lbs. 6 oz.

383 Type-storage Cabinet: Fig. 103, page 171, shows one of the MONOTYPE steel type-storage cabinets, designed to hold the boxes shown in Fig. 104, page 172. A central, vertical partition gives

FIGURE 105

Three-Font Storage

rangement of Boxes 1 and give storage for three different fonts of type, enough to completely nine type-cases.

Equipment
1 Cabinet, 231 Boxes

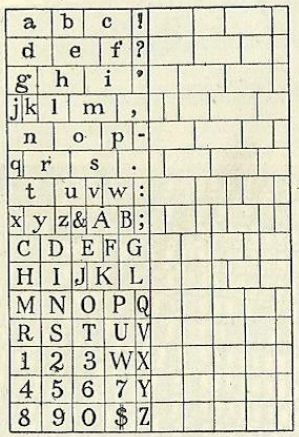


FIGURE 106

Two-Font Storage

Arrangement of Boxes 1, 2, 3 to give storage for two different fonts of type, enough to fill completely nine type-cases.

Equipment
1 Cabinet, 144 Boxes

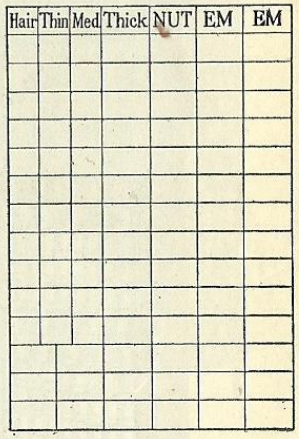


FIGURE 107

Space Material Storage

Arrangement of Boxes 2 and 3 to give storage for spaces and quads in all sizes from six- to thirty-six-point.

Equipment
1 Cabinet, 102 Boxes

rigidity to the shelves, so that they cannot sag and prevent the boxes from sliding freely. The three different size boxes may be grouped on these shelves to provide the necessary storage for two or for three fonts of type as desired. A cabinet for two fonts has the boxes arranged so that one font is at the left of the vertical partition and the other font at the right, as shown in Fig. 106. This provides storage for 225 lbs. for each font. These two-font storage cabinets have sufficient capacity for the largest newspaper composing-room. For most printing offices one of these cabinets provides ample space for the storage of type for *three fonts*. For three-font storage the boxes are arranged from left to right across the shelves, five shelves

being given to each font as shown in Fig. 105, page 173. For the storage of space material the boxes are arranged as shown in Fig. 107, page 173.

384 These Storage Cabinets are made on the Unit System so that they can be combined to utilize space that otherwise would be wasted; for example, three of the cabinets placed side by side just fill the space at the back of a standard type-frame, as shown in Fig. 108. For wall storage two cabinets are used, one placed on top of the other, the legs of the upper cabinet fitting into sockets provided for this purpose in the top of the lower cabinet, as shown in Fig. 109, page 175.

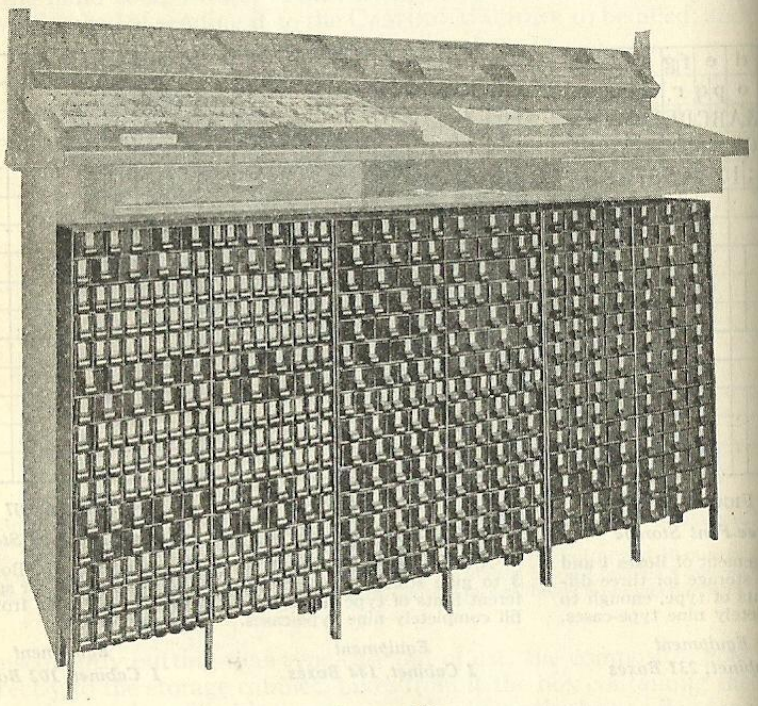


FIGURE 108

Storage behind a type-frame: Three single cabinet units (Fig. 103, page 171), side by side to utilize space otherwise wasted. Gives storage for from six to nine fonts—1350 pounds of type.

385 Labels for Type Boxes: It is important that the cardboard labels carried in the label-holders at the front of the type boxes should be easy to read. Many offices, realizing the effect that neatness in the arrangement of equipment has upon the character of the product, print these labels. Satisfactory labels may be made by using type and a rubber stamp pad; logotypes for the different series and point-sizes are made by soldering together the figures composing these numbers.

386 Leads, rules, and slugs cut to required lengths are kept "on tap" for the use of all compositors, exactly the same as type is kept in the storage cabinets. Of course it is not necessary to carry a large stock of this material for measures not in general use, because for special jobs the leads, rules, and slugs may be made "to order" before they are required. Furthermore, while cutting a brass rule is a serious offense, for it means the destruction of assets, the MONOTYPE system is based upon the principle that a printer's most valuable asset is the time of his employees, and frequently a compositor saves time by cutting rules and leads instead of piecing together short sections of so-called "labor-saving material."

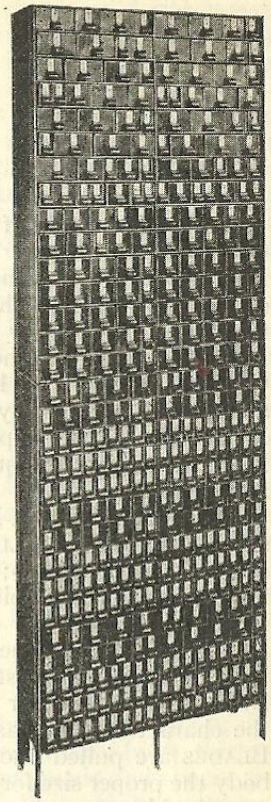


FIGURE 109

Storage against a wall. Two single cabinet units (Fig. 103, page 171), one on top of the other, giving storage for four or six fonts —900 pounds of type. The legs of the upper cabinet fit in sockets in the lower cabinet.

387 To obtain the maximum efficiency from the non-distribution system a suitable equipment for the storage of type, rules, leads, and slugs is essential, for the convenience of the reservoir from which the compositors draw their material affects the efficiency of every compositor in the office. The boxes and cabinets here illustrated embody the best of the most successful storage systems and they save both space and time. They give the maximum amount of storage in the minimum space; they are so proportioned that they prevent the waste of time and metal that comes from making more type than is necessary. Convenient and easy to handle, they are well made and will last a life-time. They are so cheap that there can be no question of the advantages of using this carefully developed system of type storage, instead of home-made makeshifts or storage systems made by dealers in composing-room furniture who have no practical knowledge of the non-distribution system.

388 The vital point of an efficient non-distribution system is this: *Don't Distribute.* Dump complete pages: don't waste time breaking up pages in order to save a little of this or a little of that. A distribution account is the biggest leak in a composing-room. Plug that leak by dumping everything in the hell box and then converting the contents of the hell box into new material.

CHAPTER XLII

Type Molds

389 Two kinds of type-casting Molds are furnished: *First*, COMPOSITION MOLDS, for use on the COMPOSING MACHINE (see Frontispiece) for casting, in automatically justified lines, type and quads and spaces which may be low for matter that is printed direct from type, or high for matter that is electrotyped; *Second*, SORTS MOLDS, used on both the COMPOSING MACHINE and the TYPE & RULE CASTER (Fig. 93, page 158), for casting type and high and low quads and spaces to be set by hand from the case. NOTE: To use SORTS MOLDS for making type fourteen-point and larger the COMPOSING MACHINE must be equipped with the Speed Regulating Attachment (¶373).

390 Composition Molds (Fig. 11, page 15), have the point-size built into the MOLD and can be used only for casting type of the same size as the MOLD; of course, they can be used for casting type for the cases of this point-size as well as for casting type in justified lines with high or low quads and spaces. These MOLDS have two BLADES, one above the other; the TOP BLADE is about one-eighth inch thick. When casting type and high quads and spaces, both BLADES move together as one piece of steel. While the MATRIX for the character to be cast is being positioned over the MOLD, both BLADES are pulled back together, to make the width of the type-body the proper size for this character; the MATRIX is then clamped over the MOLD opening and the PUMP forces the metal into the MOLD (¶13 and ¶14). Thus, the top of a high quad or space is cast against a blank MATRIX; this makes such a quad shorter than a type by .03″, the "depth-of-drive" of the MATRIX; that is, the distance from the face of the character in the MATRIX to the bottom of the MATRIX which rests on the top of the MOLD when a type is cast is .03″. To cast a low quad or space, the TOP BLADE of the MOLD is automatically unlatched so that it is not pulled back with the BOTTOM BLADE, to make the type the width required; therefore the top of a low quad or space is cast against the bottom of the TOP BLADE, instead of against a blank MATRIX.

391 High or low spaces may be cast from the same ribbon: Another proof of the flexibility of the MONOTYPE—there is no limitation of any kind to the use of high or low spaces and quads; a low space may be cast of any width, with the NORMAL WEDGE (Fig. 10, page 14) in any one of its fifteen positions, and the MATRIX CASE in any one of its 225 positions. High quads and low quads may be used in the same line; as explained in ¶295, high quads and spaces are used to support the overhang of characters cast from DOUBLE MATRICES, but if the matter is to be printed from type, or stereo-

typed, all other quads and spaces would be cast low. *A ribbon may be cast with low quads and spaces and then, on a repeat order, be re-cast with high quads and spaces, if plates are to be made, by turning a lever at the Casting Machine.*

392 The TOP BLADE of a COMPOSITION MOLD is controlled by the MATRIX presented to the MOLD when a type or space is cast. If this MATRIX has a cone-hole, like the MATRICES shown in Fig. 4, page 6, the TOP and BOTTOM MOLD BLADES operate as one piece and, if the the MATRIX be a blank with no character driven in it, a high quad or space, depending upon the position of the NORMAL WEDGE, will be cast. If there is no cone-hole in the MATRIX, the CENTERING PIN cannot make its complete down stroke; stopping the down stroke of the CENTERING PIN trips the LATCH (Fig. 11, page 15) for the TOP BLADE, so that this BLADE remains forward and is not pulled back with the BOTTOM BLADE. Therefore, for low quads and spaces use blank MATRICES without cone-holes. *With eleven- and twelve-point Molds do not attempt to cast high quads and spaces from Matrices without cone-holes, by adjusting the Casting Machine as described in the preceding paragraph; use instead blank Matrices with cone-holes.*

393 Composition Molds for high quads and spaces only: Some offices electrotype everything and do not require low quads and spaces; in such cases it is better to use COMPOSITION MOLDS with one blade only, for these single-blade MOLDS cost less than the double-blade MOLDS, and, of course, a MOLD with one BLADE requires less care than a MOLD with two.

394 Sorts Molds, used only for casting type to be set by hand from the case, are adjustable for point-size; that is, several BLADES for different point-sizes may be used with the same MOLD; for example, the Style U MOLD is used for casting twenty-four-, thirty-, and thirty-six-point. With these MOLDS low quads and spaces are produced by moving a lever on the MOLD. It is absolutely necessary, however, when casting low quads and spaces to have a MATRIX in position, for the TOP BLADE is so thin that it could not withstand the pressure of the metal forced into the MOLD by the PUMP if it were not held down by the pressure of the CENTERING PIN acting through a MATRIX.

395 Care of Molds: The MOLD is the heart of the MONOTYPE, all the accuracy necessary in the production of type—no article in daily use requires greater accuracy—is concentrated in the MOLD and no mechanism producing duplicate parts with a limit of accuracy of two-ten-thousandths of an inch (.0002″) can be made foolproof. The smoothness with which a MOLD runs, the accuracy of the type it produces, the cost of maintaining this accuracy, and the life of the MOLD depend entirely upon the treatment of the MOLD by the operator. While no technical description of the MOLD or its adjustments is necessary here, the following cautions from our book, "The Monotype Mold," so vitally affect the results obtained from the MONOTYPE System that they are repeated here for the benefit of those who buy MONOTYPE MOLDS quite as much as those who operate them.

396 Don't run Molds dirty: The first half (¶397) of running MOLDS properly is keeping them clean; watch the MOLD to see that it does not "lead-up," gather metal on any of its moving parts, for any metal on these parts acts as a lap and quickly wears away the accuracy of the MOLD. This leading, provided the MOLD is properly adjusted, is a sure indication that the metal does not contain enough tin or antimony, or both (see next chapter on METAL). When a MOLD is taken off the machine, blow all water out of the water passages with the air blast and blow oil through them. Slide out the CROSS BLOCK and its GATE PUSHER, carefully clean off any metal adhering to any of the parts, wipe all parts perfectly clean, oil thoroughly, and put GATE PUSHER and CROSS BLOCK back in the MOLD.

397 Don't run Molds without proper oil: This is the second half (¶396) of running MOLDS properly; use MONOTYPE oil: ordinary oil will not give satisfactory results at the high temperature and speed at which the MOLD operates. Be sure that the MOLD OILER is adjusted so that the MOLD gets all the oil it will take, one drop every two or three minutes, but not so much that it drips into the METAL POT. Oil the CROSS-BLOCK COUPLING occasionally to keep it from wearing loose. Keep the MATRIX SEATS and MATRICES free from oil.

398 Don't run metal too hot: This should not be hotter than 725° except for extra hard metal, which must be run with especial care. Keep the temperature as low as possible without frosted faces; a higher temperature than necessary is liable to make the MOLD "hang up," is hard on MATRICES, and may cause bleeding feet.

399 Don't neglect water regulation: MOLDS are built to use as little water as possible; use just enough to avoid blistered bodies and bleeding feet. The water from the MOLD should be quite hot, enough to feel uncomfortable. Remember that it is perfectly possible to affect the size and parallelism of the type by regulating the water.

400 Don't start casting until ready: When putting on a MOLD be sure that the MOLD and its seat on the machine are clean. Tighten the SCREWS that hold it in casting position, carefully in proper order, so as not to spring the MOLD. Oil carefully, turn on the water, turn the machine over by hand once, to make sure everything is working properly—then start the machine, not before.

401 Don't fail to test the type after changing Molds: Cast quads for half a minute, to warm the MOLD, and measure six of the last cast, side by side at top and bottom, both point-ways and set-ways. Make these measurements after the ribbon is started, so as not to waste the machine's time. Never pass type large at the top, point-ways or set-ways, for it is certain to work up on press; type may be large at the bottom, provided this error is not greater than .0002″ per type.

402 Don't take a Mold apart until you have to: Keep the MOLD clean, oil it properly, and *let it alone—don't tinker.* So long as a MOLD casts type within the limits in the preceding paragraph and the MOLD BLADE does not hang up, keep screw-drivers away from the MOLD. If it hangs up (produces short lines) or if the type is not parallel (this is shown by the lines being tighter at the top or bottom as they pass through the gate onto the galley), examine the temperature of the metal and the water circulation and make sure that the MOLD is clean and properly oiled. If the trouble is not in these points, take the MOLD apart and clean it according to directions.

403 Don't lap the Mold: Never, under any circumstances, try to alter the shape of any part of a MOLD; remember that these parts are not absolutely square when cold; they are lapped by experienced workmen to be the right shape when the MOLD is hot.

404 Don't neglect the Bridge setting: After this has been adjusted with the CARRYING-FRAME ADJUSTING GAGE the BRIDGE setting is correct for all MOLDS and MATRICES. Test this setting after changing a MOLD to be sure that no adjustments have worked loose and that the MATRICES seat lightly on the MOLD instead of hammering it. Failure to follow this caution means the expense of new MATRICES and restoring MOLDS to height-to-paper.

405 Don't fail to watch the height-to-paper (¶39 and ¶42): This is most important for it means saving in make-ready in the press-room. When the MATRIX SEATS of a COMPOSITION MOLD (¶390) wear so that the high quad is .886″ high, the MOLD must be restored to height. A SORTS MOLD (¶394) should be restored to height if it makes high quads shorter than .866″. Always measure the high quad instead of a character, as this eliminates any variation due to wear of MATRICES. The cost of restoring a MOLD to height is insignificant compared with the annoyance and expense of mixing type of different heights-to-paper.

406 Don't try to repair Molds: No operator, however skilful, can repair a broken MOLD or lap one that has worn, for this most accurate of all machine work requires, not only specially trained mechanics, but also special tools and testing machines. When returning a MOLD for repairs always inclose samples of the type it produces and a memorandum giving details of the defects.

407 Don't overlook the Cross Block adjustment: A MOLD just from the factory requires special attention until the CROSS BLOCK has found its true bearing against the TYPE BLOCKS, for no bearing, much less one of which so much is required as this, can be adjusted when new to duplicate exactly running conditions. Test the CROSS BLOCK adjustment after the MOLD has run an hour and readjust it if necessary. Repeat this examination after the MOLD has run half a day and also a full day.

408 Don't ignore these cautions: The owner of a MONOTYPE is the proprietor of a type foundry and there is no more reason why he should accept type from his type foundry of any lower quality than he would accept from any other type foundry. There is no excuse, except carelessness, for type cast not parallel, or with burrs, or with bleeding feet, or low-to-paper, because reasonable care of MOLDS will prevent all these troubles. About all the accuracy required in the MONOTYPE System concentrates in the care of MOLDS; the man who cannot give the "heart of the MONOTYPE" the care it deserves can never hold a place among the operators who have made the MONOTYPE a symbol of typographic quality.

CHAPTER XLIII

Lead and Rule Molds

409 Lead and Rule Molds include all MOLDS for casting in continuous strips *of any length* rules and high and low leads and slugs in any point size from two to twelve inclusive, also tie-up slugs (¶414) and electrotype guards in twelve-point only. The same MOLD will cast rules and high and low leads or slugs of a given point-size, but, like our body-type MOLDS, these MOLDS are not adjustable for point-size; our experience proves that it is not possible to get from an adjustable MOLD the accuracy essential for rules and body-type.

410 Continuous strips are the product of these Molds. Fig. 110 shows *a two-point rule six hundred feet long cast in one piece in less than two hours*. This rule was coiled up like a rope so that its picture could be taken. The product of these strip MOLDS is delivered toward the right of the machine, as shown in Fig. 111, page 181. Thus, in these MOLDS the MOLD BLADE operates from left to right instead of from back to front, as in MOLDS for type casting. MOLDS for casting strips work on this principle: A piece of the rule or lead is cast and then pushed to the right in the MOLD, but not out of the MOLD like a type, by the movement of the MOLD BLADE to the right. Then the MOLD BLADE withdraws to the left, the position occupied when the first cast was made. The PUMP now makes a stroke forcing the metal into the MOLD as before, and this hot metal fuses to the piece previously cast and pushed to the right but not ejected from the MOLD. Therefore, these MOLDS work on the unique principle of casting and welding; they make a perfect joint, forming a continuous piece of any length desired in which the joints are as strong as any other part of the strip. In fact, when the MOLDS are used with metal at the proper temperature and a strip is broken to test it, it will be found that the strip does not break at the joints. Having made the second cast as described above, the MOLD BLADE pushes to the right the piece just cast, and which is welded onto the strip previously cast, and then the BLADE

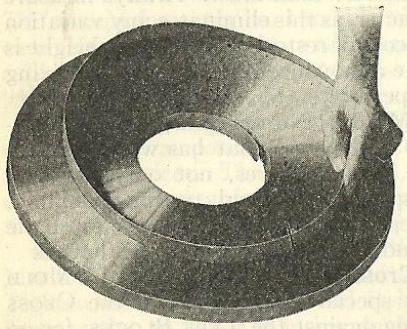


FIGURE 110

Six hundred feet of two-point rule cast in less than two hours. This rule was coiled up as it came off the machine so that its picture could be taken.

moves again to the left into position for the next cast. It will be clear from the above that the opening in which this cast is made is enclosed front and back by the BLOCKS of the MOLD, on the left by the end of the MOLD BLADE, and on the right by the end of the piece of rule or lead previously cast.

411 The strip is automatically cut to any length desired from six picas to twenty-five inches as it is delivered from the MOLD. For details of the Automatic Cutter see Chapter XLIX, page 221.

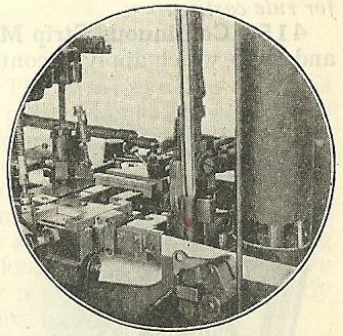


FIGURE 111

The continuous strip which is the product of the LEAD AND RULE MOLDS is delivered toward the right of the CASTING MACHINE.

412 Rule of any face may be cast for the body-size of the MOLD by changing MATRICES. A different MATRIX is required for each different face of rule and for each different point-size. Note that because of the position of the rule face on its body the rule MATRICES for different point-size MOLDS are not interchangeable; thus, a MATRIX for a hair-line face on a two-point body cannot be used to cast a hair-line face on a six-point body. For details of the many rule MATRICES we furnish see our Specimen Book.

413 Mold Blades: The same MOLD BLADE serves both for high leads and for rules, and to cast low leads a low blade is substituted for the high and a MOLD-BLADE CAP is used instead of a MATRIX. For casting high leads and slugs a high-lead MATRIX is used with the high BLADE instead of a rule MATRIX. Note that all MATRICES clamp on the top of the MOLD and do not move up and down as each cast is made as do the MATRICES for casting type.

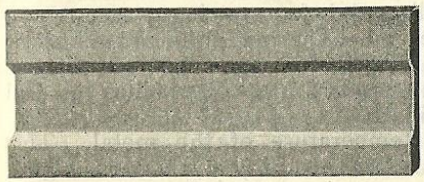


FIGURE 112

TIE-UP SLUG: The product of the TIE-UP SLUG MOLD (12-point), full size, showing the shape of the slot in the side for the string.

414 The Tie-up Slug Molds: Tie-up slugs (Fig. 112) are one of the most valuable time and labor savers ever introduced in a composing-room. They save the work of untying pages before they are locked up and then tying them up again when taken from the chase. When they are used, the page is tied up and it stays tied up until the page goes in the hell box or is untied to be corrected for a subsequent edition—because the slot in the side of the slug provides space for the string (Fig. 113, page 182) when the pages are in the chase. These slugs have the further advantage of requiring much less metal per foot

than solid slugs. The MOLD for these slugs is made in twelve-point only and is exactly similar in principle to the other MOLDS for casting continuous strips described in this chapter, except that the MOLD BLADE is recessed the same as the slug. High and low slugs and electrotype guards may be cast with this MOLD—*it cannot be used for rule casting.*

415 Continuous Strip Mold Cautions: Re-read ¶395, ¶403, and ¶406, which apply to continuous strip MOLDS as well as to type MOLDS. *Also pay special attention to the following additional cautions for continuous strip molds:*

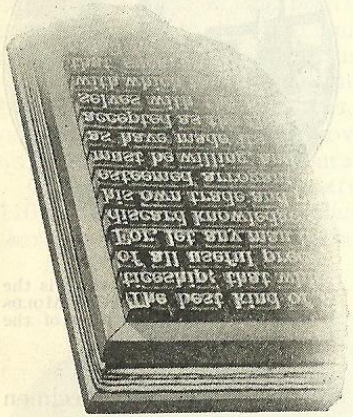


FIGURE 113

Page tied up with tie-up slugs: Because of the slot for the string, the pages are not untied for lockup; the string stays in place until the page goes to the hell box or is to be corrected for another edition.

416 Don't take the Mold apart when changing Mold Blades—this is not only unnecessary but also is highly undesirable, for the less a MOLD is taken apart the less chance there is of injuring the parts; furthermore, to take a MOLD apart unnecessarily wastes time.

417 Don't forget to save a piece of the product just cast when changing from one style product to another (for example, from leads to rule or from one face of rule to another) in order to start the MOLD when next used. About four inches of the product of the MOLD should be saved and wrapped with the part (MATRIX or BLADE) removed from the MOLD to make this change.

418 Don't fail after changing products to insert a piece of the product to be cast (rule, high or low lead) in the MOLD, at the point where the product is delivered, before starting to cast.

419 Don't use improper oil. The best lubricant for these MOLDS is Lubricating Castor Oil. If this cannot be obtained, use mutton tallow. Never use our standard MONOTYPE oil as this will not work with continuous strip MOLDS.

420 Don't neglect the temperature of the metal. This should be about 800° for standard MONOTYPE metal. A higher temperature is required when casting these strips than when casting type from the same metal.

421 Don't neglect water regulation: The maximum should go through the MOLD with a very little through the MAIN STAND of the CASTER.

CHAPTER XLIV

Metal

422 The importance of metal: The owner of a MONOTYPE is the proprietor of a type foundry; no printer would knowingly buy type from a foundry that used any old metal, melted and mixed in any old way, and the MONOTYPE user will find the selection and care of the metal used in his type foundry well worthy of his attention. There is no greater economy in operating MONOTYPES than the use of good metal; with properly selected metal, electrotyping is entirely unnecessary on even the longest runs, and MONOTYPE type, kept standing and corrected for many editions, is frequently subjected to quite as severe wear as any foundry type.

423 The possibilities of standing matter are well worthy of a separate chapter, so great is the profit if this feature of the MONOTYPE System be studied and fitted into the needs of each office. Too many printers think that standing matter is a luxury to be enjoyed only by those who print railway tariffs or rate tables for insurance companies. As a matter of fact, a large percentage of all the orders that pass through a job office are reprints, with more or less alterations, that offer to the MONOTYPE owner, not only extra profits, but also insure the retention of old customers. To those who doubt this we ask these questions: How many times have you been asked to "duplicate this job"? How many times has your competitor been asked to figure on one of your jobs? If you had the matter standing, could he take the job from you? If he knew you had this matter standing, would he try?

424 The cost of standing matter is greatly overestimated by most printers—this statement refers, of course, to their own calculations whether to "take a chance and keep the type for next year," and not to the legitimate charges they make their own customers for this service. Four square inches of type weigh a pound; exclusive of storage, ten per cent. a year is ample for interest, taxes, and insurance on standing metal on which there is no depreciation whatever. Metal loses about five per cent. in melting from "type to type;" that is, in melting into pigs for the CASTING MACHINE and in turning these pigs into new type. Therefore, the net loss in keeping four square inches of type, one pound, standing one year is five per cent., if the matter be used within a year and one melting saved. With metal at ten cents per pound this means that the cost of standing matter to the printer is an eighth of a cent a square inch the first year. Of course, to this must be added storage, but space worthless for any other purpose may be used for this. It pays handsomely to carry "repeat-order insurance" by keeping the jobs that reprint standing in MONOTYPE type.

425 The cost of cheap metal: Poor metal inevitably reduces the output of the CASTING MACHINE, it clogs the PUMP, and it leads the MOLD; cheap metal is deficient in tin and antimony, and these are the ingredients that keep the MOLD from leading. The lead that sticks to the MOLD wears it out of true, causes burs on the type, and necessitates expensive repairs to the MOLD. Consider now the "economy" of cheap metal: A CASTING MACHINE producing 4000 ems, or twelve pounds of type, an hour does not consume this metal; not more than five per cent. of it disappears during each cycle of casting. If we try to save two cents a pound on a metal, we do not save twenty-four cents per hour, we "save" only five per cent. of this, or one and two-tenths cents an hour. Disregard MOLD repairs and consider this point only: If a CASTING MACHINE is worth two dollars an hour, a loss of less than one per cent. in output will wipe out a "saving" of two cents a pound in buying metal. The difference between good metal and poor metal will often make a difference of more than twenty per cent. in output.

426 Cheap metal would be dear if it cost nothing; it reduces output, wears out MOLDS and PUMPS, it has no life to stand repeated meltings, and it soon produces type that will not resist wear; it is a constant expense for temper metal to patch it up, and a source of delays and annoyances until it is thrown out. In buying metal remember that tin costs about nine times, and antimony more than three times, as much as lead; skimping these two makes quite a difference in the price of the mixture and a much greater difference in results. If tempted to buy a cheap metal, look at the prices quoted in the market reports and remember that no metal man gives you more tin and antimony than you pay for.

427 The selection of metal: The all-important question is the selection of the house from which you buy your metal, for metal must be bought on honor; without an expensive chemical analysis the printer cannot tell what the metal he buys contains. Select a reliable metal house and stick to it; to shop around, buying metal here and there, only results in your having a mixture of metals for which no dealer is responsible.

428 For casting type in justified lines don't use linotype metal: While it is true that newspaper offices equipped with MONOTYPES and line-casting machines use linotype metal on both machines, so that complete pages may be dumped without sorting out the different kinds of metal, this saving is more apparent than real because it is made at the cost of MONOTYPE efficiency. Linotype metal is very soft, being made to work at a temperature about 200° lower than MONOTYPE metal; such a soft metal does not contain enough antimony to wear well or enough tin to flow sufficiently freely for casting 140 perfect characters a minute. In offices using the non-distribution system (Chapter XLI, page 170) there is no objection to using a good grade of linotype metal in casting type for the cases, because the speed of the TYPE & RULE CASTER can be regulated exactly to the size of the character being cast, and for the grade of metal used.

429 Metal formulæ: MONOTYPE metal is both a chemical and a mechanical mixture of lead, tin, and antimony. The lead is used to give body to the mixture and also because of its cheapness and low melting-point. The tin makes the metal tough; it also serves to unite the other two metals and causes the mixture to flow quickly and cast sharply, most important points in casting at the high speed of the MONOTYPE. Antimony is used to make the mixture hard, to resist wear, and to expand on cooling and completely fill the MOLD. New metals must be used to make a satisfactory mixture. MONOTYPE metal made from old materials, from which the life has been worked out, is in the same class as renovated butter and just as satisfying. A suitable metal for ordinary composition should be made from clean new materials in about the following proportions:

Lead	72 per cent.
Antimony	19 per cent.
Tin	9 per cent.

For unusually long runs the antimony and tin must be increased.

Lead	58 per cent.
Antimony	26 per cent.
Tin	16 per cent.

430 Care of metal: The life of good metal depends upon the care it receives—poor metal has no life to consider. Having bought suitable metal, see that it is treated properly. Never melt type in the MELTING POT of the CASTING MACHINE, but always melt this type in a suitable furnace and clean this metal thoroughly and run it into small-sized pigs. With these it is an easy matter to keep the metal in the MELTING POT of the CASTING MACHINE at the proper level and at uniform temperature: a shelf is provided on the side of the MELTING POT where the next pig to be inserted should be placed to heat as soon as the one previously heated has been fed into the POT.

431 The Melting Furnace (Fig. 114, page 186) is not a luxury, it is an absolute necessity in an office making its own type. Do not make the mistake of buying a cheap furnace of small capacity; the secret of success with metal lies in melting in sufficiently large quantities to mix the metal thoroughly and keep it uniform. Small furnaces waste gas and are not economical to operate. Even an office operating but one machine should have a furnace of 600 pounds capacity, and large plants will find a furnace of double this size an economy. Be sure that the burner conforms to the shape of the pot and that the temperature may be regulated easily, so that the metal will not get hotter and hotter, burning out the valuable tin and antimony and leaving only the lead. See that the burners provide for ample regulation of the mixture of gas and air, for, unless the gas burns with a blue flame, the bottom of the pot will quickly cover with soot, an excellent non-conductor of heat. The casing of the furnace should be properly insulated so that the heat will be applied to the pot and not to the room and the operator; a suitable means of drawing off the fumes and dust from the metal is essential, and this vent pipe should be connected with a flue. Unless the furnace be placed on a brick or concrete floor, a sheet of zinc or tin

must be placed under it, and, to conform to the underwriters' regulations, the bottom of the furnace must be completely enclosed and the furnace carried on legs to give at least a four-inch air space between the bottom and the floor.

432 Use of the Melting Furnace: Melt as large quantities as the furnace will permit; this saves both gas and time and keeps the metal uniform. Use great care not to burn the metal; it should be heated to 750° but should be permitted to remain at that temperature only a short time, and, as the metal is drawn from the pot, the gas supply must be reduced. Use the CASTING MACHINE thermometer; paper may be used to test the temperature, but this is not as accurate as the thermometer. Never let the metal become hot enough to set fire to paper; it should scorch it brown (not dark brown) and no more. As soon as the metal heats enough to become soft at the bottom of the pot, it should be churned up and down with the skimmer; this mixes the hotter portion, next the gas-flame at the bottom of the pot, with the colder metal at the top, thus keeping the mixture at a uniform temperature. Unless this is done at frequent intervals, the thermometer will not register correctly the average temperature of the metal; it also saves time and gas, as the metal will melt faster and be ready to pour sooner if churned as described. When the type melts, it occupies less space in the pot and more type must be shoveled in to fill the pot, and then churned into the molten metal; repeat this until the pot is full of the molten metal.

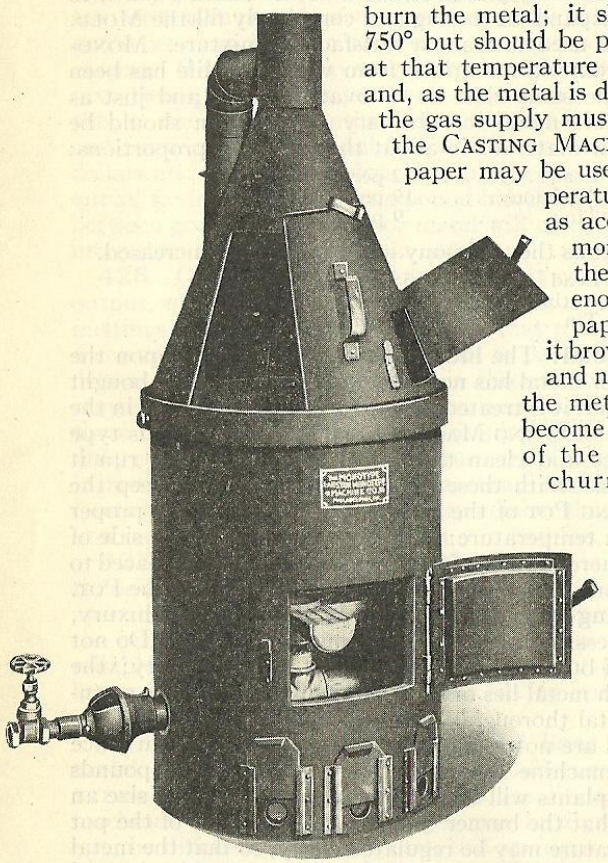


FIGURE 114

MELTING FURNACE: Note enclosed base; air and gas regulation; flue connections for gas and metal fumes; easy access for cleaning the under side of the pot.

433 Monotype Metal Cleaner: *Buy good metal and keep it clean* if you want maximum production from the CASTING MACHINE. A suitable means for cleaning the metal, therefore, is quite as important as the furnace in which the metal is melted. While there are various fluxes on the market, the ingredients of which are not disclosed, these are of very little real value for thoroughly cleaning the metal, because they are sprinkled on the surface of the molten metal. *Never use rosin alone as a flux*, for it makes the metal brittle and, unless the rosin be thoroughly worked out of the metal, the PUMP will stick and not work freely. A suitable metal cleaner should be placed in the molten metal, at the bottom of the pot, so that it may separate the dirt and dross and force them to the top, where they may be skimmed off.

434 The importance of mixing: Thoroughly mixing the molten metal is the secret of obtaining uniform results, because type metal is a mechanical as well as a chemical mixture of lead, tin, and antimony. Because of the difference in the specific gravity of these metals it is essential that the mixture be thoroughly stirred all the time it is in the molten state, for unless this be done, the lighter tin and antimony will rise to the top. Not only will an imperfect mixture result, but also a large percentage of these valuable metals will be lost with the skimmings. Putting the metal cleaner at the bottom of the pot has just the required result, because the moisture in the cleaner causes the metal to boil, stirring it thoroughly while the melted cleaner passes up through the metal, freeing the dirt and dross which rise to the top, where they can be easily skimmed off.

435 We furnish MONOTYPE Metal Cleaner properly prepared, all ready for use, in cans of convenient size. To those who wish to mix this for themselves we publish the formula and the following suggestions for mixing:

4 parts, by measure, of beef tallow
4 parts, by measure, of sal ammoniac
1 part, by measure, of powdered rosin

Render the beef tallow (suet) in a kettle over a fire; stir constantly until all the fat is extracted, and the residue, called "crackling," turns a light brown. Strain the hot fat through a cotton cloth and measure it, to determine the amount of sal ammoniac and powdered rosin to mix with this liquid fat. Then, while the fat is still liquid, add an equal measure of sal ammoniac and one-fourth as much rosin, by measure, stirring them thoroughly into the tallow. Continue to stir until the mixture hardens; this can be hastened by setting the kettle in cold water while stirring.

436 The Cleaning Rod (Fig. 115, page 188) is used to thoroughly distribute the metal cleaner through the molten metal. This is a metal rod, three and one-half feet long, with a cup on the lower end; in this cup are drilled fifty holes, three-sixteenths of an inch in diameter. To use the cleaning rod fill the cup with the metal cleaner (it holds about 2½ ounces) and plunge the cup into the metal down to the bottom of the pot. NOTE: The cup full of cleaner is sufficient

to thoroughly clean 1000 pounds of metal. Do not use more cleaner than necessary; if 500 pounds of metal be melted at a time, fill the cup half full of cleaner.

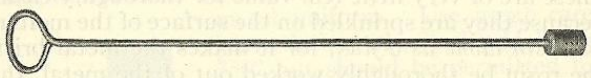


FIGURE 115

CLEANING ROD: For mixing metal cleaner through the molten metal in the melting furnace; the perforated cup holds sufficient cleaner for 1000 pounds of metal.

437 Then stir the metal from the bottom of the pot, with the cleaning rod containing the cleaner, and thoroughly agitate the metal. As the metal cleaner melts, it passes through the holes in the cup, causing the metal to boil. Do not use the metal cleaner until the metal has reached a temperature of 750°. While using the cleaner light the dross on the top of the metal by throwing in a piece of burning paper and continue to stir the metal until all the metal cleaner has been used, that is, until the metal no longer boils and the dross ceases to burn.

438 Skimming: Be sure the metal is at the proper temperature, 750°. Test the temperature by using the CASTING MACHINE thermometer; but if paper is used for testing the temperature, the metal should scorch the paper a light brown, but should not burn or char the paper when it is thrust into the metal. With the large skimmer (Fig. 116), work the dross against the side of the pot, rubbing it between the skimmer and the side until it is reduced to a fine powder. This powder is a light slate color, but, as it lies on top of the metal, particles of the powder will glow a dull red. When this state is reached, the dross is ready for skimming. Work it carefully to the side of the pot with the blade of the skimmer held perpendicularly, then tilt the skimmer blade slightly and gradually work the dross above the level of the metal between the skimmer and the side, when the dross may be lifted out. Scrape the sides and the

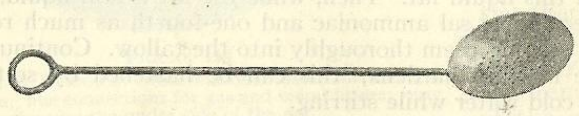


FIGURE 116

SKIMMER: For reducing the dross to a powder by working it against the side of the melting furnace and for removing this dross without taking metal with it.

bottom of the pot with the skimmer to be sure all dross is removed. After the dross has been skimmed as described, the surface of the metal will be bright and clean. *Don't neglect the skimming: there is*

no use cleaning the metal unless you take the dirt out after you have separated it from the metal. Careless skimming means the loss of tin and antimony, the richest and most valuable parts of the metal.

439 Pouring: After skimming, immediately lower the gas to reduce the temperature and start to pour. To save time and to avoid oxidation, the metal should be poured into pigs as quickly as possible; water-cooled molds (Fig. 117) enable the operator to cast the metal into pigs as fast as he can ladle it from the furnace. Use the MONOTYPE water-cooled molds, as these make pigs of the right size. Do not use molds made for linotype pigs, as these are too large for use on the MONOTYPE. When pouring, always ladle from the bottom of the pot, using the ladle shown in Fig. 118, page 190.

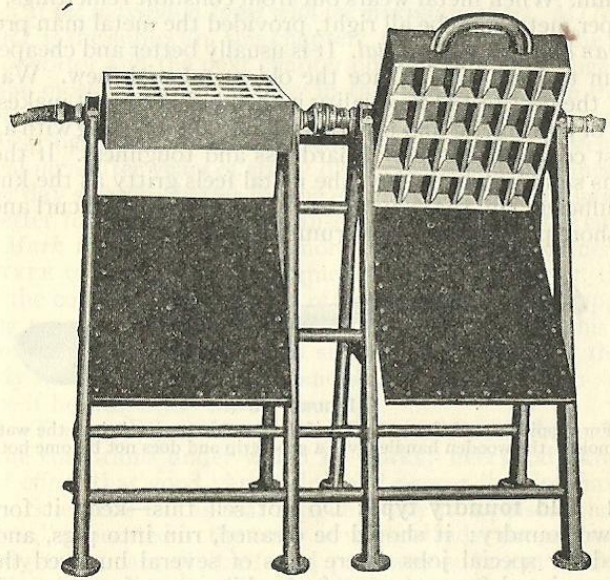


FIGURE 117

WATER-COOLED MOLDS: Save time and reduce danger of burning metal, for they cool the metal as fast as it can be ladled from the furnace.

It may be necessary to skim once or twice while pouring, depending on the quantity of metal melted at one time; save these latter skimmings and put them into the next melting.

440 Care of the metal at the Casting Machine: The metal should be handled carefully at the CASTING MACHINE to keep it from deteriorating. Do not skim the metal too often; twice a day is ample. The oxide that collects on top of the metal protects it from further oxidation. Before skimming, stir the metal thoroughly and work the skimmer around the sides and bottom of the MELTING POT to bring up any dirt that may have collected. Then rub the material on top of the metal against the side of the MELTING POT

with the blade of the skimmer; this works out the dross in the form of a black powder, which take out with the skimmer; do not remove anything but this; to skim off the oxide and leave the metal bright only wastes metal. Before skimming as just described, increase the heat on the MELTING POT to bring the temperature to 750°; skimming at a lower temperature means wasting antimony. Follow carefully these directions for care of metal—they mean (*a*) product of uniformly good quality; (*b*) insurance against trouble in casting; and (*c*) long life for PUMPS, PISTONS, and MOLDS.

441 "Doctoring" metal—*Don't!* A MONOTYPE owner or an operator cannot be expected to be a metallurgist. Buy good metal from a reliable dealer, and if you have any metal troubles, put them up to him. When metal wears out from constant remeltings, the use of temper metal may be all right, provided the metal man prescribes it *after an analysis of the metal.* It is usually better and cheaper in the long run to have him replace the old metal with new. Watch the metal; the best test of its quality is the kind of type it makes. Save a piece of good metal and use it as a standard. Cutting with a knife is the best comparative test of hardness and toughness. If the metal contains sufficient antimony, the metal feels gritty as the knife cuts it; if sufficient tin, the shaving made by the knife will curl and break off in short pieces instead of crumbling.

FIGURE 118

LADLE: For dipping metal from melting furnace and pouring it into the water-cooled molds; the wooden handle gives a good grip and does not become hot.

442 Old foundry type: Do not sell this—keep it for use in your own foundry; it should be cleaned, run into pigs, and either reserved for special jobs where runs of several hundred thousand must be printed from type or for making type fourteen-point and larger. Mixing this harder metal, in the form of display type, with the regular metal in this manner cannot injure the regular metal because the percentage of the harder metal will be small and the addition of a reasonable amount of the hard metal compensates for the losses in the regular metal of tin and antimony through use. Note that old foundry type does not contain enough tin to cast type in justified lines at the rate of 140 type per minute, but will make just as good type as the foundry made from it if cast at the slower speed at which the foundry originally cast this metal. The speed of casting may be increased considerably by adding one per cent. of tin and five per cent. of lead.

CHAPTER XLV

Operating the Keyboard

443 "*The Monotype Keyboard is the simplest, fastest, most flexible composing machine, the easiest to learn and the easiest to operate.*" The fundamental idea in the design of the MONOTYPE has been to furnish the compositor with a machine to transform copy into composition at *the maximum speed with the minimum effort. MINIMUM EFFORT* is the subject of this chapter; the following on the position of the operator and the next chapter on the method of fingering are quite the most important matter in this book. We urge that both owners and operators of MONOTYPES study these two chapters carefully, bearing in mind that adherence to these rules, developed by practical men after years of study of all composing machines, means a better day's work—better for the employer, because of more product; better for the operator, because of less fatigue at the end of the day. *Mark this:* There is no more reason for a beginner at the MONOTYPE to "use his own judgment" about how to sit, the position of the copy, and the method of fingering than for an apprentice learning to set type to change the lay of the case to suit his whims. *After* an operator has learned to sit properly and to hit the KEYS correctly he may depart, with some show of reason, from standard practice if he wants to—*but he won't.*

444 The quality and quantity of a man's work depend largely upon the conditions under which he works; everybody knows the marked effect that good ventilation and proper lighting have upon output. Scientists tell us that fatigue is due to a poison, the "toxin of fatigue," generated in the body at work. Under proper conditions the body takes care of itself and produces sufficient antitoxin to neutralize this toxin of fatigue, but if the latter be generated in too great quantities, a steady self-poisoning results. It is the knowledge of this fact that has made motion study, which may be considered, perhaps, the most important part of so-called scientific management, of such great value; it means the conservation of energy of workmen by observing and timing, in most minute detail, the motions required to perform a given piece of work and then analyzing and studying the data thus obtained so that, by changing the methods of working and the tools used, all useless motions are eliminated. The results that have been obtained by motion study speak for themselves; for example, Mr. Gilbreth, the foremost authority on this work, by modifying methods and tools, has reduced the number of motions required to lay a brick on filling tiers from eighteen motions to one and three-quarter motions per brick. Great as is the increase in output produced by Mr. Gilbreth's system, this is less impressive than the conservation of the workman's resources, for

the elimination of needless fatigue enables him to get more out of life both in his working and in his leisure hours.

445 In the same way the design of the MONOTYPE KEYBOARD, with the universal typewriter arrangement of KEYS, is based upon years of motion study. Not only does this reduce the finger motions to the minimum, but, what is even more important in saving fatigue, it makes still greater reductions in mental effort. The operator who fingers the KEYS properly *always hits the same Key with the same finger*, which means elimination of the brain strain of selection. "To make up your mind" requires effort even in the simplest matters Offer a man two apples exactly alike: before taking one his brain must make a decision as to which to take. The operator who has no definite and logical method of fingering forces his brain to perform the operation of deciding which finger to use thousands of times each day. The operator who learns at the start the correct method of fingering "makes up his mind" once for all, and sticks to it; then fingering quickly becomes a matter of habit: a lower case "t" in the copy means to his brain a definite movement of the left forefinger; when the eye sees that character the brain almost automatically, certainly without any effort of selection, causes the left forefinger to make the required motion. In the same way complete words become signals for a series of motions; thus, without decisions, without analysis, the word "and" causes the brain of the skilled operator to make the three finger-strokes necessary to compose this word. *Do not underestimate the brain strain of making decisions, and remember that the more fatigued the brain and body, the harder it is "to make up your mind;"* every man has come home at the end of a hard day's work so tired that deciding whether to stay home or go out for the evening has been a real problem.

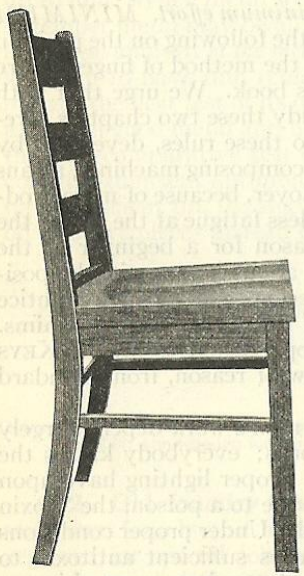


FIGURE 119

KEYBOARD CHAIR: Note the solid construction and the straight back to give support to the operator.

446 The chair: As the operator spends more than twenty-five per cent. of the hours in a year sitting in the same chair, the selection of this chair is of the utmost importance in its effect on both production and fatigue. Keeping the body in a fixed position consumes quite as much energy as working; few men can stand at "attention" for more than an hour, and to sit on a stool, with hands in lap, without any support for the back for any length of time is indeed a task. The folly of expending any energy on supporting the body when a suitable chair will do this work is obvious. Fig. 119, page 192, shows the correct chair for the MONOTYPE operator, solid and rigid as possible and *without adjustment of any kind*. No adjustable chair can be as rigid as the chair shown, and any adjustment in the chair is entirely unnecessary because the KEYBOARD itself is adjustable for height. The operator should sit as far back in the chair as possible, supporting his back against the back of the chair, with the feet resting easily on the floor, as shown in Fig. 120, page 194. Thus, the chair-back saves all the effort and work of supporting and balancing the trunk; since the chair supports the body, the position of the feet is quite immaterial; a man with no legs would be perfectly comfortable in this chair. The height of the seat of the chair is of no consequence (since the KEYBOARD is adjustable for height) unless the operator's legs are so short that, when the heels are resting on the floor directly under the knees, there is no clearance between the front edge of the chair and the thighs; there should be about half an inch clearance. The back of the chair should be almost straight, sloping back from perpendicular one and one-half inches to the foot. The front legs of the chair shown in Fig. 119 were shortened three-quarters of an inch to make the angle of the back correct. A chair in which the sides of the back come forward, like a kitchen chair, is not satisfactory for a stout person, and for any one it is annoying to have the arms, in operating position, touch any part of the chair. Sit well back; *do not sit forward and slouch back*, for this position is an unnecessary strain and also cramps the chest and prevents easy, natural breathing.

447 The height of the Keyboard is adjusted by turning the HAND WHEEL on the COLUMN SCREW at the top of the STANDARD. The BOARD should be as low as possible, to allow comfortable clearance for the thighs beneath its front. The lower the BOARD, the less the possibility of "reaching up" for the KEYS in the bottom rows; the forearms should slope down slightly to the hands when the fingers rest on the second row of KEYS from the bottom, as shown in Fig. 120, page 194. If the hands be higher than the elbows, the circulation of the blood is impeded and fatigue results much more quickly; when the hands hang easily at the sides, the fingers do not become tired and numb, as they soon do if held higher than the elbows.

448 The position of the Keyboard: The BOARD should be as close to the operator as possible because, in this position, the arms hang easily at the sides, as shown in Fig. 120, page 194, which is a much less fatiguing position than when the elbows are held forward, in front of the shoulders. The nearer the BOARD to the operator, the less the eye-strain in reading the JUSTIFYING SCALE and, a most important matter in tabular work, the EM SCALE and the UNIT INDICATOR.

449 The Copy Holder is adjustable in every direction, up and down, forward and back, right and left, and to vary the angle of the copy from perpendicular. This last adjustment is quite important, and varies with the height of the operator's eyes above the seat of the chair; a line from the eyes should not be perpendicular with the

copy, but should make a slight angle, just as in holding a book comfortably for reading. Always work from the copy below the guide bar beneath the roller; never work above the roller, where the copy has no support. Furthermore, if the copy be read above the roller it may be necessary to move the copy up to see the words to com-

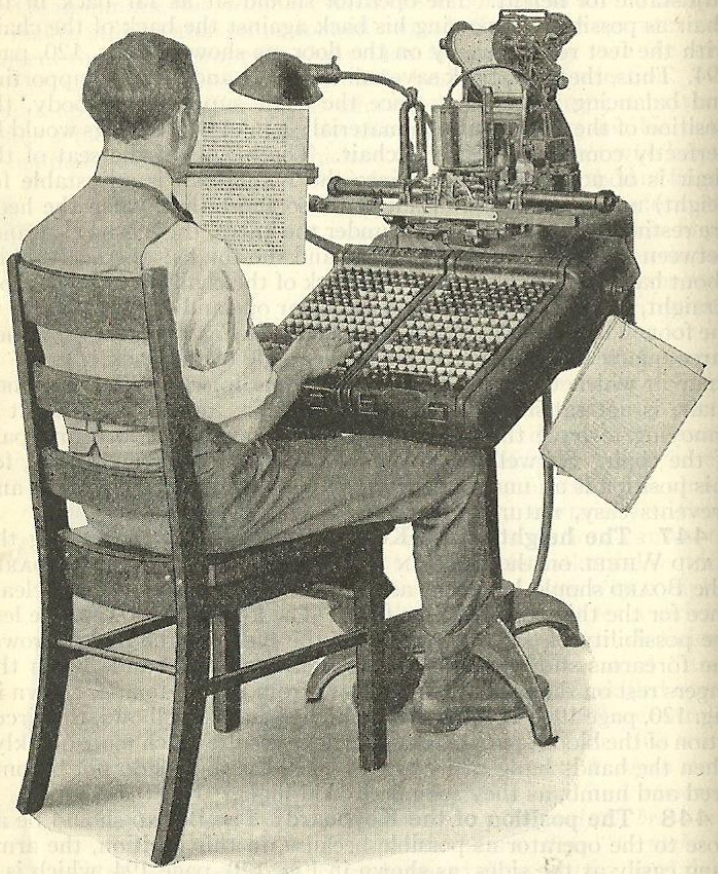


FIGURE 120

KEYBOARD AND OPERATOR: Shows the correct position at the KEYBOARD and the relation between the light, the copy, the KEYS, and the operator's eyes. Note how firmly and comfortably the operator's body is supported by the chair (see Fig. 119, page 192).

plete the line. For tabular and other intricate matter, or with bad copy, the guide is necessary, but for general work *learn not to depend upon the copy guide.* With ordinary manuscript or typewritten copy the guide is quite unnecessary, and the operator who starts right, and does not get the habit of depending upon the guide, saves many

needless motions by not having to adjust the copy at the end of each line; three or four inches of copy can be read comfortably below the guide. To adjust the copy, turn the front and back rollers by pressing on their outside surfaces with the thumb and forefinger of the left hand, at the same time striking, with the right hand, the required JUSTIFYING KEYS to end the line. Making simultaneously the motions for copy adjusting and justifying means a marked increase in product, especially on narrow measure work. Thus, if the copy is to be adjusted, as soon as the last character in the line has been struck, move the right hand to the top of the BOARD and strike the JUSTIFYING KEYS with it while the left hand moves to the COPY HOLDER and advances the copy.

450 Use both hands in justifying, unless it be necessary to use the left hand to move the copy, as explained in the preceding paragraph. If no adjustment of the copy is necessary, move both hands to the top of the BOARD, after striking the last character in the line; then, while reading the justification from the SCALE, strike with the right hand the JUSTIFYING KEY at the right and use the left hand for the KEY at the left. Thus, if the justification is 3-8, strike 3 in the upper row with the left hand and 8 in the lower row with the right hand. If the justification is 8-3, strike 8 in the upper row with the right hand and 3 in the lower row with the left; never cross the hands and be sure to *strike the Justifying Key in the lower row last.* As soon as the right or left hand has finished striking a JUSTIFYING KEY the hand should return immediately to the guide KEYS; that is, to position to start composition. If both JUSTIFYING KEYS are on the right bank (KEYS 12 to 15 inclusive), it is better to strike both KEYS with the right hand and thus avoid reaching over with the left hand. *Most operators could increase their product at least ten per cent. by a little study to eliminate useless motions between hitting the last character Key for the finished line and first Key for the next line.*

451 The position of copy: One of the most important points in operating, for upon this depends the amount of eye-strain. Unless the operator has learned the touch system, his eyes are on the horizontal rows of the KEYS most of the time in operating. The most severe strain that can be put on the eyes is to look at an object at an angle; that is, focus one eye up and the other down. Therefore, make certain that the lines of the copy, when the head is lifted and turned to look at it, are in the same plane as the horizontal rows of the KEYS. To test this, rest one end of a book, or light piece of board, against the bridge of the nose and sight down this, when sitting directly in front of the left KEYBANK in operating position (¶446), and hold the board so that its lower edge lines with a horizontal row of KEYS. Then, holding the board in this position relative to the head, turn the head and the board and make sure that the lines of the copy are parallel with the lower edge of the board, just as the KEYS were. When working, the head is both turned and lifted to read the copy, but if the lower lines of the copy are at the correct angle, of course the lines above, at the reading point, will also be at

the same angle. Have the copy near enough to the eyes so that it can be read easily and without strain when leaning back in the chair (¶446). Do not have the copy too low; Fig. 120, page 194, shows the correct position; to work from low copy keeps the head down and cramps the chin. An operator who has acquired the touch system and does not have to look at the KEYS should have the reading point of the copy in line with the EM SCALE; for a beginner the copy should be about two inches lower.

452 Light: The KEYBOARD should be placed near a window, so that the light, over the operator's left shoulder, falls directly on the copy. The BOARD may be turned from left to right, to suit the light, without altering its height. The best arrangement of artificial light, where incandescent lights are used, is our Electric Light Unit (Chapter XLIX), consisting of JUSTIFYING-SCALE LIGHT and COPY LIGHT. The COPY LIGHT is carried on an adjustable bracket which attaches to the left side of the KEYBOARD (Fig. 120, page 194) to bring the light over the COPY HOLDER so that it falls directly on the copy. Usually the general light of the room is quite enough for the KEYS, EM SCALE, and UNIT INDICATOR, which ought not to be so strongly illuminated that the light is reflected from them into the operator's eyes; but if this light is not strong enough, the lamp bracket may be turned just enough to light these without putting them in the full glare of the light. Hanging lights are not satisfactory because, when close enough to the KEYBOARD to light the copy, the light is almost certain to strike the operator's eyes when he looks up at the paper ribbon. Glancing frequently at a bright light is a severe and entirely needless strain on the eyes; the BOARD should be placed so that, when the operator looks up at the paper ribbon, his eyes are not dazzled by lights behind the KEYBOARD.

453 Operating position: Fig. 120, page 194, shows the correct position for setting matter containing but little Italic or Boldface; that is, for setting Roman on the left KEYBANK. For occasional matter on the right side of the KEYBOARD the BOARD may be turned to bring that side nearer the operator; it is much easier to turn the KEYBOARD on its STANDARD than to shift the chair; if the matter requires the frequent use of both sides of the BOARD, the operator should sit more to the right, nearer the center of the BOARD, than shown in Fig. 120. Leaning back comfortably in the chair the operator's trunk is supported by the chair, and all strain of balancing the body is eliminated. He can breathe freely and naturally because his chest is not cramped. A slight lift of the head to the left moves his eyes from the KEYS into position to read the copy without any strain of refocusing. The arms hang easily at the sides and, when the fingers rest on the second row of KEYS from the bottom, the forearms slope slightly downward and forward. An operator who has thus adjusted his KEYBOARD and COPY HOLDER to suit his physical requirements and his eyesight, who knows how to sit easily, without cramping or strain, letting the chair do its share of the work, can work as rapidly and as comfortably an hour before quitting time as an hour after starting time. "*Constancy of operating*" is the secret

of the success of the MONOTYPE CASTING MACHINE; it is equally the secret of the success of the competent KEYBOARD operator. Temporary bursts of great speed that cannot be sustained are wearing on the operator and on his employer too, who not unnaturally attributes slow-downs to laziness. Be comfortable, don't fritter away your energy in non-productive effort, learn to finger the BOARD correctly—"*always hit the same Key with the same finger*"—get into the swing of operating, strike a good gait that you can keep up. The brain strain when working rapidly is much less than when working slowly; if you doubt this, try to keep track of the cards when playing with people who "take all day" to decide what card to play.

CHAPTER XLVI

Fingering

454 The Monotype is the only composing machine with the universal typewriter keyboard; it is therefore the only machine with a logical arrangement of characters, the only machine in which the key positions are determined by the requirements of the operator and not by the mechanical limitations of the machine. Early typewriters differed quite as much in key arrangement as in design; today, however much other features may vary, all have the universal typewriter keyboard. Why? Because it is the survival of the fittest. *Would you buy a typewriter without the universal keyboard?*

455 The universal typewriter keyboard is universally used because the test of time has proved that it is the best arrangement for transforming words into keystrokes with the least mental and physical effort. It fully meets the requirements of normal people; that is, those who have two hands, each with four fingers and a thumb, *and* the common sense to reduce their work to the minimum by using these eight fingers and two thumbs intelligently, in a systematic manner, instead of jumping around like a squirrel in a cage and scrambling for the keys in any old way with any old finger.

456 The fundamental idea of the universal keyboard is to reduce to the minimum the motions, for motions require effort, of the two hands and of their eight fingers; to this end the work is divided between the eight fingers according to their ability. Omitting, for the present, consideration of the ligatures (fi, ffi, etc.), and the em- and en-quads and leaders, the characters for each alphabet are arranged in ten vertical rows, each containing three characters (Fig. 121, page 199). With the exception of the forefingers, which, because of their strength and flexibility, operate six KEYS each, the fingers are used for three KEYS only, and move one row up, or down, from the center horizontal row, the position of rest, and never to the right or left. Thus, every finger is "self-supporting," even the left little finger must "work its passage;" indeed, it is made responsible for one of the most frequently used characters, "a;" it is not overworked, however, because its other two letters, "q" and "z," are so infrequently used that it rarely moves from "a," its position of rest. When an "a" is required, the operator pushes down the little finger of his left hand, without any effort, or motion, to find this character. With the exception of the forefingers, the movement of the other fingers is the same as just described; that is, one row up or down from the center position of rest. The forefingers operate six KEYS each, moving one row up and one row down; the left forefinger also moves one row to the right and the right forefinger one row to the left from their respective positions of rest. This extra space between

the right and left forefingers, in their positions of rest, gives ample room for the thumbs to operate the SPACE BARS. In operating on the same alphabet the maximum distance that any fingers, except the forefingers, move from their position of rest is seven-eighths of an inch, while the maximum movement of the forefingers is but one and one-eighth inches.

457 The Monotype has not a "hair-trigger" touch: While no typewriter made has as easy a touch as the pneumatic action of the MONOTYPE, the KEYS offer enough resistance so that the fingers

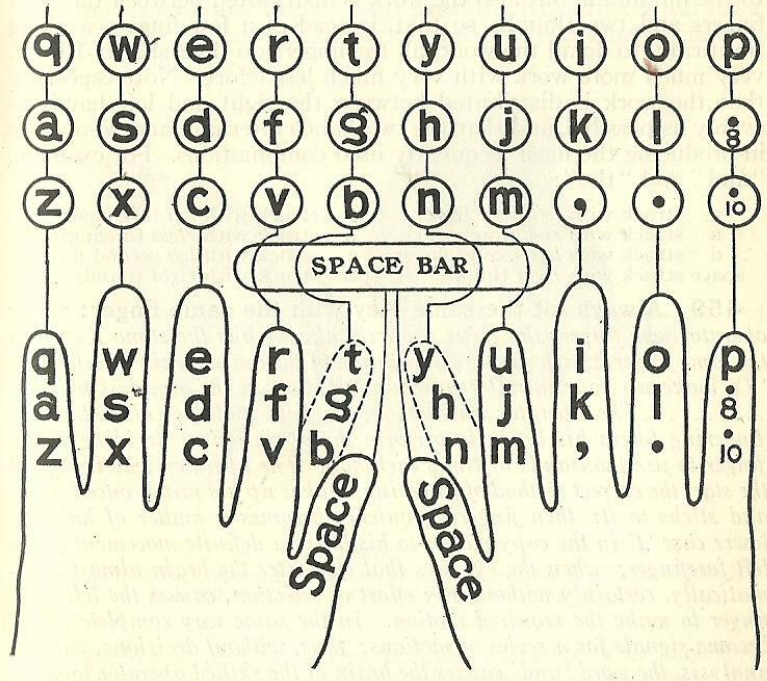


FIGURE 121
The arrangement of the KEYS of the alphabet and the finger which is responsible for each.

may rest lightly upon them, which not only gives support to the hands, but also enables the operator to keep his fingers in correct operating position on the KEYS. The value of this support to the fingers cannot be overestimated; to appreciate it, compare the key action of the MONOTYPE with that of the linotype, where the slightest touch on a key causes a matrix to drop, which means that the operator is continuously making two opposed efforts, to hit the keys and not to hit the keys, with his hands held in front of him without

any support whatever. Referring to Fig. 121, page 199, the fingers rest, in operating position, upon the following characters:

LEFT HAND FINGERS				RIGHT HAND FINGERS				
LITTLE	THIRD	SECOND	FORE	FORE	SECOND	THIRD	LITTLE	
a	s	d	f	j	k	l	leader	

458 Distribution of work between the right and left hands: A study of Fig. 121, page 199, will convince the most skeptical that either the hands were made to fit the universal keyboard or else this key arrangement was made to fit the hands, for the relation between the two is perfect. Not only is the movement of all fingers reduced to the minimum, but also the work is distributed between the eight fingers and two thumbs, so that, instead of a few fingers working frantically to do all the work, all the fingers do their share: Result, very much more work with very much less effort. Note especially that the work is distributed between the right and left hands as evenly as possible, and that the two hands alternate and co-operate in producing the most frequently used combinations. For example, "and" and "the":

a	struck with *left* little finger	t	struck with *left* forefinger
n	struck with *right* forefinger	h	struck with *right* forefinger
d	struck with *left* second finger	e	struck with *left* second finger
space	struck with *right* thumb	space	struck with *right* thumb

459 Always hit the same Key with the same finger: "*The operator who fingers the Keys properly always hits the same Key with the same finger, which means elimination of the brain strain of selection. 'To make up your mind' requires effort even in the simplest matters. .....The operator who has no definite and logical method of fingering forces his brain to perform the operation of deciding which finger to use thousands of times each day. The operator who learns at the start the correct method of fingering 'makes up his mind' once for all, and sticks to it; then fingering quickly becomes a matter of habit: a lower case 't' in the copy means to his brain a definite movement of the left forefinger; when the eye sees that character the brain almost automatically, certainly without any effort of selection, causes the left forefinger to make the required motion. In the same way complete words become signals for a series of motions; thus, without decisions, without analysis, the word 'and' causes the brain of the skilled operator to make the three finger-strokes necessary to compose this word.*" (¶445.)

460 Keep the eyes on the Keys while acquiring the correct method of fingering; by watching the KEYS and selecting with the eyes the next KEY to be struck, the brain is saved the strain of trying to locate quickly, by memory, the position of the different KEYS. After the fingers have been trained, by practice, to move automatically to the required KEY, the operator need not keep his eyes on the KEYS constantly and may save the eye-strain of continually looking from copy to KEYS. When you look at the copy, take a good look and get enough in your mind to keep your fingers busy for a reasonable time; don't bob your head constantly from copy to KEYS. *Don't try to learn the touch system;* the most indulgent employer will not pay for correcting the work of a "near-touch" operator. Learn to finger the KEYS correctly—*always hit the same Key with the same finger*, and you will not have to learn the touch system—it will come without effort, the reward of fingering correctly.

461 Learn both the arrangement of Keys and the fingers that control the different Keys; that is, memorize the diagram, Fig. 121, page 199, before attempting to hit KEYS. The position of these thirty characters, and the hands in operating position, should be so clearly impressed on the mind that you can actually see them when you shut your eyes. First, learn the KEYS in the guide row (a, s, d, f, etc.) so that you can look at your fingers and instantly name the KEY for any finger. Next learn the KEYS by *vertical* rows, that is, the KEYS operated by each finger above and below its KEY

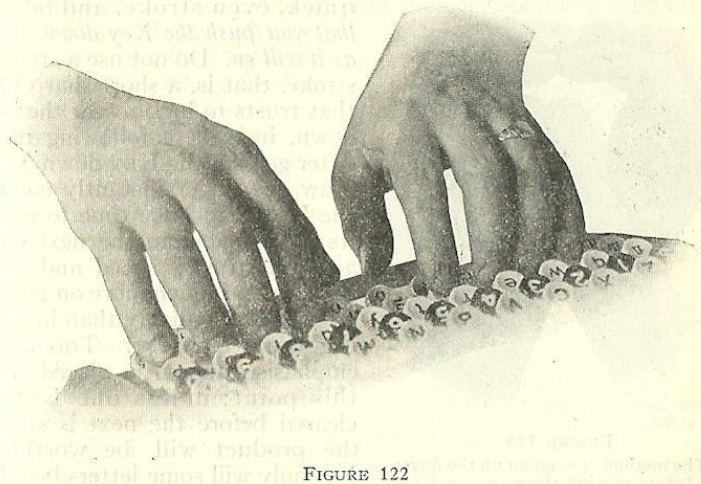


FIGURE 122

The hands in correct operating position, each finger resting naturally on the KEY assigned to it and the two thumbs on the SPACE BAR.

in the guide row, and, of course, the three extra KEYS for each forefinger. Then test the thoroughness with which you have associated fingers and KEYS by filling in blank diagrams in alphabetical order, from "a" to "z" and then from "z" to "a." In short, practise associating the characters of the alphabet with the fingers that produce them; that is, "e" is really the sign-board that tells the second finger of the left hand to move one row up from its position of rest, and "t" is an order for the left forefinger to move diagonally to the KEY one row above and to the right of this finger's position of rest.

462 The finger position: It is almost impossible to hit the KEYS correctly unless the operator is properly seated and the KEYBOARD and copy are correctly adjusted to suit his physical requirements. Before proceeding further, re-read the preceding chapter on "Operating the KEYBOARD," paying especial attention to ¶446 to

¶453 inclusive. Let the tips of the fingers rest lightly upon the KEYS in the second row above the SPACE BAR, as explained in ¶457, and as shown in Fig. 122, page 201. The KEYS should be pushed straight down; do not make the common mistake of striking the KEYS from the side, due to not keeping the backs of the hands in a horizontal plane. To get the correct position place the finger-tips together, as shown in Fig. 123, and then, without moving the fingers, turn the hands over and place the finger-tips on the KEYS; *after* this is done, spread the fingers slightly so that they will rest on their respective KEYS (¶457); then drop the thumbs so that they will rest on the SPACE BAR.

463 The stroke: Strike the KEYS with the tips of the fingers like an expert typist or skilful pianist; do not use the flat of the finger, like some linotype operators, who "comb the keys." Use a quick, even stroke, and be *sure that you push the Key down as far as it will go.* Do not use a staccato stroke, that is, a short sharp blow that trusts to luck to get the KEY down, instead of following it up. After getting the KEY down, withdraw the finger instantly so that the KEY may have time to regain its position before the next character is struck; speed and accuracy depend much more on getting off the KEYS quickly than in striking them quickly. Too much emphasis cannot be placed upon this point; unless one KEY be cleared before the next is struck, the product will be worthless. Not only will some letters be missing, as is the case when a slovenly typist "piles up" the keys, but also the justification will be inaccurate, and this means CASTER stoppages. *The operator who cannot absolutely release one Key before striking the next is a luxury no employer can afford; such an operator wastes the time of both the Casting Machine and its operator, and his product will probably cost more to correct than to reset.*

FIGURE 123

The method of evening up the finger-tips before placing them on the KEYS, as shown in Fig. 122, page 201.

464 Strike from the fingers, not the wrists: Cultivate the power of the fingers and do not depend upon the muscles of the wrists; to work from the wrists means that the whole hand must be moved—*the less movement of the hands the less fatigue at the end of the day.* Keep the fingers as close to the KEYS as possible, the two little fingers resting on their respective guide KEYS; when setting Roman lower case, left little finger on "a," right little finger on the eight-unit leader. Remember that movement means effort, effort means fatigue; the object of the correct method of fingering is to save fatigue. Be careful to make no unnecessary movements.

465 Use both thumbs for spacing: While it is true that some good operators use only the right thumb for spacing, it is equally true that they could work more easily if they used both thumbs, as nature intended. The operator who spaces with one thumb invariably holds this spacing hand nearer the KEYBOARD; consequently the operator who spaces with both thumbs not only saves fatigue, but also secures a more uniform position of the hands and a much more uniform touch. If you end a word with the left hand, space with the right thumb, and *vice versa.*

466 "Quadding out:"* When several quads or leaders are required in succession, the KEY should be struck with a quick stroke from the wrist, using the second finger supported by the thumb and forefinger, as shown in Fig. 124. In this work the expert operator uses both quad (or leader) KEYS, striking the KEY on the left KEY-BANK with the left second finger and the corresponding KEY on the other BANK with the right second finger. As it is essential that one KEY be released before the next is struck (¶463), this double stroke with the two hands requires considerable practice; do not try it on copy until you can run the EM-RACK POINTER, with no paper on the BOARD, from sixty-five ems to zero without losing a unit.

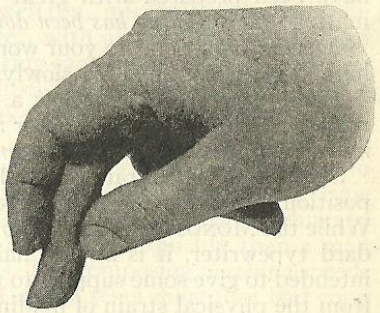


FIGURE 124

The second finger supported by the thumb and forefinger for quadding and leadering outlines.

467 Finger exercises: For those who are in earnest, who are determined to take advantage of the wonderful possibilities of the universal keyboard to give the maximum product with the minimum effort, we have prepared a book of finger exercises, "Operating the Monotype Keyboard," with which it is a very simple matter to acquire the correct method of fingering and to learn always to hit the same KEY with the same finger. Beginning with words composed of letters in the guide KEY row only (second above the SPACE BAR), then words to be set with the KEYS in the row above this, then words for these two rows, then words containing all the letters of the alphabet, then frequently used words, sentences with all the letters, words with the most common initial and terminal combinations, words with double letters, words for the left hand only and words for the right, and words containing the ligatures; these exercises, if practised carefully, are certain to insure the correct method of fingering. You can make no better investment, to earn money and to save effort, than

* Most offices now have their KEYBOARDS equipped with the Repeater Unit (Chapter XLIX), which enables the operator to quad out or leader out at the rate of 25,000 ems per hour simply by pressing a special KEY together with the quad or leader KEY and holding both down while the KEYBOARD does the work. Not alone the quad and leader, but any character on the BOARD may be repeated in the same manner.

to acquire an easy, accurate finger motion. To those who are in earnest in this we urge special consideration of the following points:

First: Make up your mind whether you wish to use the system that embodies the experience of the fastest and most skilful operators, or whether you wish to invent a system, or lack of system, for yourself.

Second: Before you attempt to hit the KEYS learn their location and to associate the KEYS with the respective fingers that control them, so that you can write down the twenty-six letters from memory; not in the order in which they occur on the KEYBOARD, but in alphabetic order, from "a" to "z" and then from "z" to "a." You can test your knowledge of fingers and KEYS anywhere; repeat the alphabet to yourself and, as you say each letter, move the finger that operates the KEY for this letter.

Third: Give strict attention to every detail of the exercises; they have been prepared with great care and contain no unimportant matter—*the skipping has been done for you.*

Fourth: Don't add to your work by starting wrong; unlearning is harder than learning—go slowly.

Fifth: The exercises follow a regular sequence so that they are useless unless taken up in order and mastered; *do not attempt to set matter until the exercises have been completed.*

Sixth: Don't be afraid to touch the KEYS, and learn to keep your position by letting the little fingers rest lightly on the guide KEYS. While the MONOTYPE KEYBOARD has a lighter touch than any standard typewriter, it is not a "hair-trigger" machine; its KEYS are intended to give some support to the hands, thus saving the operator from the physical strain of holding his hands out in the air, and the mental strain of trying to avoid touching KEYS inadvertently.

Seventh: Be accurate; above all, *learn to set a clean proof.* Speed is greatly to be desired, but remember that while you can start slow and become a "swift," accuracy must be acquired now or never. Also *it pays not to overlook the fact that no one can tell by looking at a proof the speed of the operator who set it, but a dirty proof tells its own story.*

CHAPTER XLVII

Preparing Copy

468 "Pay no attention to oral instructions," or words to that effect, are printed on all job tickets used in an up-to-date composing room, but (and how is this for consistency?) the printing office manager, who will not permit a piece of paper to be cut without written instructions, gives his machine operators no instructions except the copy; that is, written instructions that are in most cases full of errors and inconsistencies. Written instructions for everybody except the man who needs them most, and, "Set that" for him. In many cases "that" is badly written, misspelled, improperly punctuated, grammatically incorrect, with a different style in each paragraph. If some buyers of printing saw, in cold type, what they have written, they would sue for libel the printer who did it. The inaccuracies in the copy must be taken out before the job is printed. Who is the man to do it?

469 The proprietor of the office buys a composing machine to enable a man to work at five or six times his speed setting type by hand. But is there anything about any composing machine to enable its operator to decipher bad copy more quickly than a man setting the same matter at the case? The composing machine speeds up a man's fingers, not his brain. Careful tests show that bad copy will often reduce an operator's output more than one-third; that is, to save the fancied expense of preparing copy, the proprietor will be content with but two-thirds of the return he should receive from his money invested in a machine and the wages he pays its operator. Remember that this loss occurs not only on bad copy, but also on the good copy that follows; the operator who must slow up for bad copy inevitably loses the free and easy finger motion necessary for speed.

470 What is the cost of editing copy? Is it not a fact that the errors must be taken out of the copy some time? Is it not cheaper to read and correct the copy, in the proof-room, as carefully as a first proof is read from unedited copy? After that, proofreading consists of comparing proof with edited copy. Certainly it is quicker and cheaper to correct a mistake in the copy with a pencil than to correct a mistake in type. But the cost of correcting the type is insignificant compared to the loss of product caused by unedited copy. An operator producing 5,000 ems an hour hits three KEYS every second, sets thirty words a minute, a word every two seconds. Surely no further argument as to the advantage of furnishing the operator properly written instructions (clean copy) is necessary.

471 The modern idea of copy preparation includes a great deal more than furnishing the operator with perfectly written and punctuated copy and the written directions for setting this copy. The

development of the mail order catalog and other large edition publications, where space is worth many dollars per square inch, has created a demand for an accurate method of measuring copy and cuts to the end that the work may be properly planned and the pages accurately laid out before the copy is given to the machine operator. Our system of copyfitting admirably supplies this demand. The remainder of this chapter is for advanced students of the MONOTYPE System and the beginner is advised to ignore this for the present.

472 Copyfitting *is the system of making copy and cuts fit the allotted space by accurately measuring the typewritten copy and cuts and then planning the work. Thus, copyfitting saves the cost of overrunning and alterations* because it enables the printer, before starting composition, to (*a*) determine the MONOTYPE face and the leading required to make the copy and cuts fit; or (*b*), if the face and leading cannot be changed, to cut the copy to make it fit. The complete system is described in detail in our book, "Copyfitting."

473 Counting characters, not words, explains the accuracy of Copyfitting: Briefly, this system is based upon the common-sense idea of counting characters and spaces in typewritten copy instead of the very inaccurate method of counting words. Obviously it is impossible to plan work with any degree of accuracy from a word count which takes no cognizance of the essential point of the style of the author; whether he uses long or short words or long or short paragraphs. Imagine trying to forecast the space required for copy by counting the words of a language where the words "fair" and "beautiful" are synonymous; a language in which Henry James writes sentences a page long and Laura Jean Libby makes a paragraph of the word "Sir!"

474 In Copyfitting the characters are measured, not counted: By the use of ingenious transparent gages we determine the number of characters and spaces in a page of typewritten copy in a fraction of the time required for a word count. Knowing the average number of characters and spaces in a line and the number of lines to a page, a glance at a table gives the number of "set-ems" in this page of copy.

475 The Set-ems System of Measuring Matter: This is the only common-sense method of measuring composition because it is the only system that does not ignore the obvious fact that some type-faces are fat and some are lean. To use the type rule to measure composition, that is, an em equal to the square of the type-body, is more ridiculous than trying to determine the yards of carpet required to cover a floor while ignoring entirely the width of the carpet to be used; actually type-faces of the same point-size vary in width more than carpet. Now we know (¶50) that "*the set of a face indicates whether the face is extended or condensed, and the set of a face is expressed by the width in points, and fractions of a point, of the eighteen-unit characters of the face.*" Therefore, the MONOTYPE user, instead of measuring an eight-point, seven-and-one-quarter-set face with an em eight points square, multiplies the measure, expressed in ems of seven-and-one-quarter-set, by the number of lines and obtains an accurate result that penalizes neither himself nor his operators.

476 Knowing the number of set-ems in copy we can tell the number of lines the copy will make in any face: Since the result in set-ems is obtained by multiplying the measure in ems of the set by the number of lines the matter makes, as explained in the preceding paragraph, it is obvious that, if we know the number of set-ems in a manuscript, and the measure in ems of the face in which it is to be set, to find the number of lines this matter will make in the face to be used we have only to divide the set-ems by the measure.

477 The ratio between Typewriting and Monotype Composition: The MONOTYPE KEYBOARD is a counting and adding machine (¶83) that measures characters of twelve different widths; similarly a typewriter counts and adds characters which are all the same width. Experience shows that 53 typewriter characters and spaces will make 25 set-ems of matter set in MONOTYPE Roman type. Now when we know, by using the gage described in ¶474, the average number of characters and spaces to the line of a page of typewriting and the number of lines to the page, a simple multiplication gives the number of typewriter characters and spaces on that page. Then, multiplying this result by the ratio $\frac{25}{53}$ gives the number of set-ems that page of typewriting will make in any MONOTYPE Roman face. But the user of the MONOTYPE is too efficient to waste any time making multiplications "by hand"; instead, when he knows the average number of letters and spaces to the line in typewritten matter and the number of lines, he reads directly from a table (¶474) the number of set-ems that the typewritten copy will make.

478 Measuring Cuts and Space in Square-points: This system of copyfitting also provides a unit for measuring areas, the square-point—something that has been urgently needed, because a large part of the printer's work is filling areas of a known size with cuts and matter; just as copyfitting provides an accurate method of measuring copy, it also provides an accurate method of measuring area of cuts, regardless of irregularity of outline, as well as the space the cuts and copy are to fill. For the first time in the history of printing the printer has the necessary "tools" to measure his "raw material," cuts and copy, and to plan his work accurately to avoid overrunning or resetting to make copy and cuts conform to space limitations.

479 Set-ems Charts: This cross-ruled paper provides for laying out the area of cuts in set-ems of the face in which the matter accompanying the cuts is to be composed; thus the operator, without wasting time on measuring or figuring, can accurately allow in setting the matter the necessary space for the cut. With these charts the operator can follow with ease the outline of any cut.

480 In short, our book on "Copyfitting" explains the method of using a few simple "tools," the gages and tables described above, to the end that the printer need no longer be a "cut and try" workman but an artisan who accurately plans his work before he starts it, just as the architect plans to save time and waste in building. *Copyfitting is another example of composing-room efficiency that can be obtained only through the use of the Monotype System.*

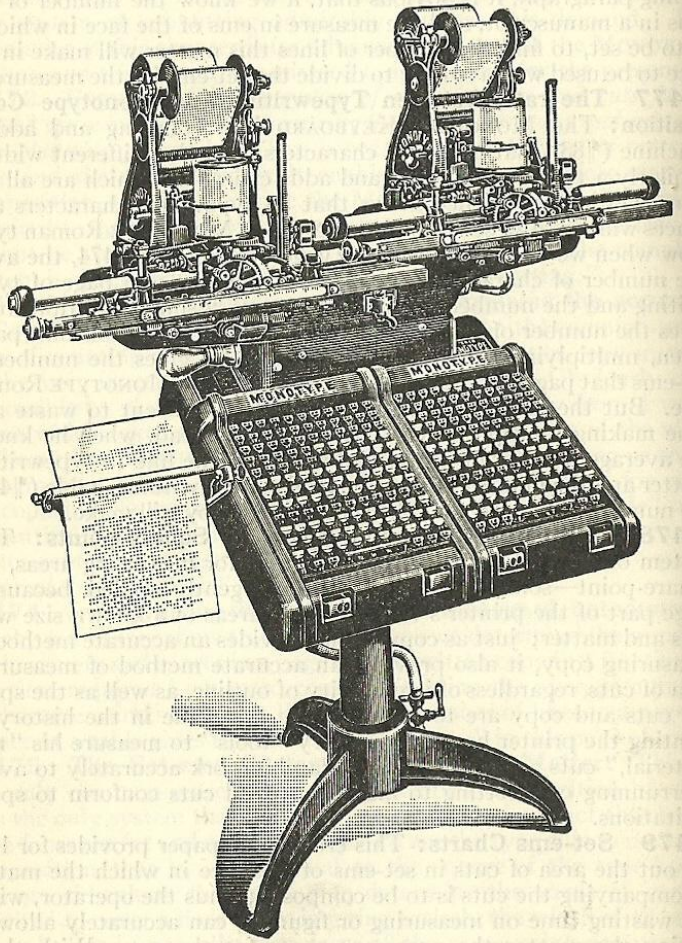


FIGURE 125

The Style DD KEYBOARD is two KEYBOARDS in one, for it has two separate and independent counting and perforating mechanisms operated singly, or together, by the one KEY mechanism.

CHAPTER XLVIII

The Double Keyboard

481 The Style DD (Double) Keyboard is two Keyboards in one (Fig. 125, page 208): From the KEYS down it is exactly the same as the single KEYBOARD (see Frontispiece); from the KEYS up it is two KEYBOARDS, for *it has two separate and independent counting and paper-perforating mechanisms.* For setting matter containing two sizes of type it is exactly the same as two KEYBOARDS placed side by side, so that, if such a thing were possible, the operator could instantly move from one BOARD to the other with his copy. It is also used for duplicating, that is, setting the same matter in two totally different faces, measures, and sizes of type; for example, the same keystrokes that compose a magazine story in eight-point, fifteen picas measure, produce the same matter for a book in ten-point, twenty-two picas measure; see Fig. 126.

A new process of composition is made possible by the "Style DD" Keyboard; it will simultaneously compose two different sizes of type in any different measures and faces—*the same key-strokes that produced this paragraph made the paragraph beside it.*

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FIGURE 126

Duplicating with the Style DD KEYBOARD; setting the same matter in two different measures and sizes of type.

482 *"When the Plungers* **F** *(Fig. 35, Plate III, facing page 100) are moved by depressing a Key, air enters two of the Pipes* **A** *(Fig. 38) which connect the Plungers with their corresponding Pistons* **B**. *When the Piston is forced up by the air, it lifts the Punch Lever* **C**, *about its fulcrum, the Rod* **Z**, *raising Punch Bar* **D**, *and the Punch* **E**, *carried in its upper end, is driven through the paper"* (¶252).

483 In the DOUBLE KEYBOARD the PIPES **A** leading from the PLUNGERS **F** to the PISTONS **B** are forked; one branch of each PIPE leads to the PISTON for the left side of the KEYBOARD and the other branch leads to the right side. Thus, *when a Key is depressed the Plungers operated by it are moved and air is admitted beneath the Pistons corresponding to these Plungers on both the right and left side of the Board,* and, but for a locking device, the corresponding PUNCHES would be forced through the paper on both PAPER TOWERS and the unit value of the character registered by both counting mechanisms. This locking device enables the operator to determine which side of

the BOARD will operate. The PUNCH LOCK for the single BOARD is shown on Plate V, at back of book: "*A mechanism, not shown* (PAPER-TOWER TENSION ARM), *instantly forces the Punch Bars down when the Key is released and the air shut off from the Pistons*" (¶252). The PUNCH LOCK keeps this TENSION ARM from lifting when air is admitted beneath the PISTONS, and consequently prevents the PUNCHES from being forced up through the paper and the counting mechanism from registering the character. Therefore, beyond the PLUNGERS, the DOUBLE BOARD is exactly the same as two single BOARDS, *plus a "switch" for controlling the Punch Locks for the right and left Towers*, for it has two sets of PIPES, two sets of PISTONS, two sets of all the mechanisms operated by these PISTONS; that is, two paper punching and counting mechanisms.

484 The Switch (Fig. 127) at the front of the KEYBOARD, just above the KEYS, controls the PUNCH LOCKS for both PAPER TOWERS. When this small lever is turned to the *right* (toward the side of the BOARD to be cut out), the *right* side of the DOUBLE KEYBOARD, both counting and punching mechanism, is locked and the KEYS have no effect upon it whatever; the DOUBLE BOARD is then exactly the same as a single BOARD with only the left PAPER TOWER. When the SWITCH is turned to the *left*, the KEYS operate the *right* punching and counting mechanism only; thus, in setting ten-point matter with eight-point inserts, turn the SWITCH to the right while setting the ten-point, and the characters struck are recorded on the left ribbon and counted by the left counting mechanism as units of this ten-point face; of course, the measure on the left side of the BOARD is adjusted for this ten-point face and the JUSTIFYING SCALE on this side of the BOARD is of the same set as this face. In the same way the JUSTIFYING SCALE for the set of the eight-point face is used on the right side of the BOARD, which is adjusted, in ems of this set, for the same measure in picas as the left side of the BOARD. To set an eight-point insert—"*Turn the Switch, that's all,*" and the characters struck are now recorded on the right ribbon instead of the left. Thus, *the same Keys are used with either Paper Tower, depending upon the position of the Switch.*

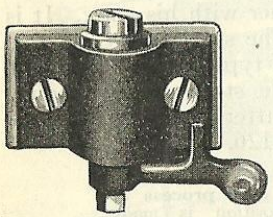


FIGURE 127

Details of the SWITCH, one-half actual size; see Fig. 125, page 208, which shows the DOUBLE KEYBOARD complete. The SWITCH controls the two PUNCH LOCKS; when it is turned to the right, the KEYS operate the PUNCHES of the left PAPER TOWER only; when turned to the left, the left TOWER is locked out; in the central position the KEYBOARD duplicates as shown in Fig. 126, page 209.

This chapter was composed on the DOUBLE KEYBOARD: The same KEYS that produce the nine-point matter above now produce this seven-point, exactly as if the operator had moved with his copy to another KEYBOARD as quickly as he could turn the SWITCH. The seven-point insert finished, to go on with the nine-point matter—"*Turn the Switch, that's all.*"

485 For duplicating, turn the Switch to its central position: This double product (Fig. 126, page 209), two letters for the same keystroke, is entirely independent of point-sizes, measures, or spacing. An article may be set for a magazine in eight-point, closely spaced, and, at the same time, in leaded eleven-point, widely spaced, for publication in book form; a *de Luxe* and popular edition of the same work, in different faces and measures, may be produced for one composition cost. But since, with the SWITCH in central position, neither PUNCH LOCK operates, how can justification be obtained with the DOUBLE KEYBOARD? What prevents the perforations made by the JUSTIFYING KEYS (¶131) appearing in both ribbons?

486 The Restoring Keys also operate the Punch Locks of the Double Keyboard. "*The Restoring Key (the right green Key at the bottom of the Board) is used to 'restore' the counting mechanism to position to register the next line after a finished line has been justified.*" (¶104.) "*The lower row of Justifying Keys may also be called Restoring Keys, for any Key in that row does the work of the Restoring Key. . . . . By arranging these Keys in the bottom row to restore, as well as justify, he* (the operator) *is saved the trouble of depressing the Restoring Key, which, consequently, is used for special tabular work only.*" (¶105.) "*Therefore, to use the Board for double justified matter turn the Piston-block-valve Handle 29KC17 (Plate V, at back of book) to the left; this cuts out the lower row of Justifying Keys as Restoring Keys; that is, they are then used for justifying exactly as the upper row is used.*" (¶207.) In the DOUBLE KEYBOARD there is no special RESTORING KEY—the lower row of JUSTIFYING KEYS are always used for this purpose. But the green KEYS (one in the lower right corner of the left BANK, the other in the lower left corner of the right BANK) of the DOUBLE KEYBOARD are LOCKING KEYS and operate the PUNCH LOCKS, just as they are operated by the SWITCH, Fig. 127, page 210. Thus, when the SWITCH is in central position for duplicating (¶485) and the left green LOCKING KEY is depressed, the PUNCHES of the right PAPER TOWER are locked, and, so long as this KEY is held down, the right PAPER TOWER is locked out exactly as if the SWITCH were turned to the right to cut out the right PAPER TOWER. Therefore, *to end a line on the left Paper Tower*, after the last character of the line has been struck, *the operator depresses the left green Locking Key and holds this Key down while he strikes the Justifying Keys indicated by the Justifying Scale;* these perforations are registered in the left ribbon, but, since the PUNCHES are locked on the right side of the BOARD, no perforations are added to the right ribbon nor is there any movement of the right counting mechanism. Depressing the KEY in the lower row of JUSTIFYING KEYS restores the left side of the BOARD, sending the EM RACK to the left for the next line to be set. To avoid possibility of confusion, each TOWER of the KEYBOARD is equipped with a signal light in addition to a small bell; thus the signal to justify, when the EM-RACK POINTER is within four ems of zero, is given by the lighting of an electric light and the ringing of the bell.

487 The Locking Keys are used to cut out characters not required in both ribbons when using the DOUBLE KEYBOARD for duplicating: For example, in Fig. 126, page 209, the first line of six-point "A new process of" ends with the word "of;" to justify this

line the operator depresses the right LOCKING KEY and holds it down while he strikes the JUSTIFYING KEYS indicated. The right side of the BOARD is now restored and the operator is ready to set the word "composition" which begins the second line of six-point. But in the eight-point the word "composition" is preceded by a justifying space which, of course, must not appear in the six-point on the right ribbon; therefore, while striking this space the operator holds down the left LOCKING KEY to lock the right TOWER. Similarly, the first line of eight-point in Fig. 126, page 209, ends with a hyphen; obviously, this hyphen must not be recorded on the right ribbon because the word divided, to end the line on the left ribbon, must not be divided on the right ribbon unless, by chance, the hyphen ends that line also. Therefore, the operator holds down the left LOCKING KEY while striking this hyphen, which is registered as usual on the left ribbon, but which does not appear on the right, since that side of the BOARD is locked by the left LOCKING KEY while the hyphen is struck. After striking the hyphen and while the left LOCKING KEY is still held down, the operator reads from the left SCALE the required justification for this line, and, with the LOCKING KEY still down, strikes the JUSTIFYING KEYS indicated; since no justifying space follows the syllables "compo" in the six-point line, he does not hold down the right LOCKING KEY and strike a justifying space, as described above, before beginning the second line of eight-point. Thus, by using the LOCKING KEYS or the SWITCH, it is quite possible to vary the matter being set simultaneously on both PAPER TOWERS.

488 Duplicating double justified matter: Fig. 126, page 209, illustrates the use of the DOUBLE KEYBOARD for duplicating, in different faces, measures and sizes of type, single justified matter; that is, matter in which all the justifying spaces in the same line (of course, of the same size type) are of the same width. Paragraph 202 is an example of double justified matter: "*Double justification . . . . . is the method of independently justifying with justifying spaces different sections of the same line, in order that each section may be justified to its measure and the sum of these sections may equal the total measure; . . . . . At the end of each section of the line the operator reads the Justifying Scale and justifies that section by striking the Justifying Keys indicated by the Scale. . . . . The justifying spaces in the different sections of the same line have no relation to each other and may vary as much in size as the justifying spaces in different lines of straight matter.*" (¶203.) "*To determine the Justifying Keys to be struck to justify a section of a line, at a point where the Scale does not automatically revolve, ascertain the shortage of this section from the reading of the Em Scale and Unit Indicator, exactly as though the section were to be justified with fixed spaces. Knowing the number of units the section is short of its measure, revolve the Justifying Scale, by hand, until the vertical column of the Scale of this number . . . . . is presented to the Scale Pointer; then read the Justifying Keys to be struck, exactly as though the Scale had automatically rotated, and strike the two Keys indicated.*" (¶205.) "*Before beginning composition on the next section of the line, set the Em-rack Pointer and Unit Wheel at the point where the next section of the line begins. To do this, grasp the rim of the Unit Wheel firmly with the left hand, and with the right hand press down the right end of the Restoring-rocker-arm-link Lever 24KB4 (Plate V, at back of book). . . . . Now rotate the Wheel with the left hand until the Pointer is at the proper point on its Scale and the right tooth of the Unit-wheel Pawl will seat in the required space in the Unit Wheel when the Lever 24KB4 is released. This done, release the Lever 24KB4 with the right hand, and the Pawl seats, locking the Wheel, which is then released by the left hand. The Board is now set . . . . . to begin composition for the next section of the line.*" (¶206.) "*The lower row of Justifying Keys is not used to restore when setting double justified matter . . . . . Therefore, to use the Board for double justified matter turn the Piston-block-valve Handle 29KC17 (Plate V) to the left; this cuts out the lower row of Justifying Keys as Restoring Keys; that is, they are then used for justifying exactly as the upper row is used. When the line is completed (the last justification for the line has been made), the operator depresses the Restoring Key to send the Em Rack to the left into position to begin the next line.*" (¶207.)

489 The green Keys at the bottom of the Board are not used as Restoring Keys when duplicating double justified matter on the DOUBLE KEYBOARD because it is more convenient to use them for locking the PUNCHES (¶486). Therefore, *in duplicating double justified matter the Piston-block-valve Handles 29KC17 are not turned to the left*, as described in the preceding paragraph on setting such matter on the single KEYBOARD, and consequently, whenever a KEY in the lower row of JUSTIFYING KEYS is depressed, the DOUBLE BOARD will restore, *unless* the UNIT WHEEL be held with the left hand to prevent restoring.* But in setting double justified matter on the single KEYBOARD, except for the last justification of the line, the UNIT WHEEL must be set by hand at the proper point to begin the next section of the line, as described in the previous paragraph. Therefore, so far as this point is concerned, in duplicating double justified matter the only difference between using the single and DOUBLE BOARD is that with the latter the operator must hold the UNIT WHEEL, to prevent its rotating clockwise (in the direction for restoring) *before* striking the lower JUSTIFYING KEYS. Of course, before striking the JUSTIFYING KEY, he must turn the SWITCH to lock the other PAPER TOWER, since, in duplicating, the perforations for justifying must be made in but one ribbon at a time. For justifying at the end of a line it is not necessary to hold the UNIT WHEEL, since the BOARD must be restored for the next line; nor need the SWITCH be turned, because the green LOCKING KEY is used to lock the other PAPER TOWER while the JUSTIFYING KEYS indicated are struck.

490 The following examples illustrate special uses of the DOUBLE KEYBOARD. It is quite impossible to cover all of these, for almost

* None of the uses of the DOUBLE KEYBOARD described in this chapter require that the PISTON-BLOCK-VALVE HANDLES be turned to the left, to keep the lower row of JUSTIFYING KEYS from restoring, but if the left side of the BOARD is used (SWITCH to right) and this VALVE HANDLE is to the left, then the green KEYS are the same as the corresponding KEYS on a single BOARD. If the right side be used with its VALVE HANDLE to the left, the green KEYS will have their functions reversed and the *left* green KEY will then be the Restoring Key for the *right* counting mechanism.

every operator has worked out methods of his own; the object of these examples is to illustrate the general uses for this most flexible machine, so that operators may apply the principles illustrated to solving their own problems and "*Turn the Switch, that's all.*"

491 Double justification, without duplicating: For setting double justified matter, "*Independently justifying with justifying spaces different sections of the same line, in order that each section may be justified to its measure and the sum of these sections may equal the total measure*" (¶203); for example, for setting matter like Fig. 128, the DOUBLE KEYBOARD is so superior to the single that no office specializing on this work (railway tariffs, etc.) can afford to use a BOARD with but one counting mechanism.* For work like this one ribbon is used, on the left PAPER TOWER; the SWITCH is placed in central position, so that both sides of the BOARD operate, and *since no ribbon is carried on the right Tower*, we have practically a BOARD with *one perforating and two counting mechanisms*. Fig. 128 is set in six-point 56J (7¼-set), twenty-two picas measure; the left column

COMMODITY	See Description On
Air brakes (to Waycross, Ga., only)	Iron and Steel Articles (car building material). See Southern Iron List.
Baseboards (mixed with other material)	Iron and Steel and Wooden Building material.
Carpenters' Moulding (mixed with other building material)	Building material.
Fixtures, car door (to Waycross, Ga., only)	Iron and Steel articles (car building material).
Hampers, fruit and vegetable, wooden splint	Box material, taking two-thirds of sixth class in Georgia classification.
Preserves, in wood or tin	Canned goods, taking one-half of fourth class in official classification.

FIGURE 128
Double justification on the Style DD KEYBOARD, using one perforating mechanism and both counting mechanisms.

is eight picas and the right fourteen. In ems of seven and one-quarter-set, the measure for the left column is thirteen ems four units, or, deducting for the two-point rule between columns, make the left column twelve and one-half ems eight units and set the left side of the BOARD to this; the right side of the BOARD is adjusted to twenty-three ems three units (equivalent of 14 picas in 7¼-set). Seven-and-one-quarter-set JUSTIFYING SCALES are carried on both sides of the BOARD. Set the first line of the first column, "Air brakes (to Waycross." and, after striking the last character, read the justification indicated on the left SCALE, and justify exactly as though this were a complete line of single justified straight matter. Since the SWITCH is in central position, the right EM RACK of course moved to the right while this section of the line was set, but when the JUSTIFYING KEY in the

*"Built on the unit system, the MONOTYPE user buys what he wants when he wants it, adding additional units as his work requires it." Thus, the single KEYBOARD may be converted into the DOUBLE KEYBOARD by adding the second units for perforating and counting.

lower row is struck, both EM RACKS move to the left and the *right side* of the BOARD is positioned to set the second section of the first line, "Iron and Steel Articles (car building material)." When the operator gets the signal to justify on the *right* side of the BOARD, he reads the right JUSTIFYING SCALE and strikes the JUSTIFYING KEYS indicated; since this is the end of the line, he double justifies, striking with the lower KEY the KEY directly above it. Both EM RACKS move to the left, when the lower JUSTIFYING KEY is struck, and the BOARD is ready for setting the first section of the next line on the *left* side. To appreciate the savings effected by the DOUBLE BOARD note the method of handling this work on the single KEYBOARD (¶488): *For double justified matter the Double Board saves: First, reading the Em Scale and Unit Indicator; second, revolving the Justifying Scale by hand; third, setting the Unit Wheel by hand after justifying.*

492 Double justification with three or more justifications to the line: The preceding paragraph explains the use of both counting mechanisms when setting matter in two sections; that is, with two different sizes of justifying spaces in the same line. If the JUSTIFYING KEYS be used three or more times in the same line, for columns of different widths, use a combination of this method with the method for the single KEYBOARD in which the JUSTIFYING SCALE is revolved by hand as described in ¶488.

493 For matter with two sizes of type, inserts, footnotes, side heads, the heads for catalogs, etc., the DOUBLE KEYBOARD saves a handling of copy, as explained in ¶484, but more than that, it expedites the work and avoids the annoyance of the inserts being overlooked until the matter is made up. This feature of the KEYBOARD is especially valuable where the change to the smaller size type occurs at the beginning of a line, regardless of paragraphs; for example, dictionaries, catalogs, and other matter where the first or catch lines of each paragraph must be prominent and all possible space must be saved. In work of this kind, when the operator reaches the point to change to the smaller size type, he turns the SWITCH and sets the next line, or lines, in smaller type on the other PAPER TOWER, just as here shown. This saves marking copy, or reading copy to find where the change in the size of type occurs, as must be done if the two sizes are set separately.

When two sizes of type are used in the same line the DOUBLE BOARD is invaluable: ¶171 explains the use of double EM SCALES which enable the operator to make allowance, directly at the KEYBOARD, for matter to be inserted in a line by hand after the type is cast. Thus, to allow, in setting this seven-point matter, the necessary quads for the words in twelve-point, "When two sizes of type are used," the operator attaches to the left EM SCALE (the 7-point being set on the left side of the BOARD) a paper scale on which the ems are in the same proportion to the ems on the EM SCALE as the sets of the two faces; in this case the ems on the paper scale would be larger in the proportion of 12 to 8, since the twelve-point face is twelve-set and the seven-point face is eight-set. The zero of this paper scale is, of course, at the left, coinciding with the point on the EM SCALE where the seven-point lines begin. Set the twelve-point with the SWITCH in central position so that this matter is duplicated (as a guide in making up) on the left ribbon and, after striking the last letter of the twelve-point, determine from the right EM SCALE the length of this matter in ems of twelve-set; then turn the SWITCH to the right, to lock the right PAPER TOWER, and quad out until the POINTER on the left EM RACK indicates this number of ems on the paper em scale. When this point is reached, turn the SWITCH to the left, to lock out that PAPER TOWER, and finish the line of twelve-point, adding justifying spaces

and quads, and justify it. Then turn the SWITCH to the right and go on with the seven-point matter on the left PAPER TOWER. In making up, lift out the "deadwood" in the seven-point line and insert the twelve-point. Fixed size spaces must, of course, be used between the words of the twelve-point insert, for otherwise the length of the insert would vary with the JUSTIFYING KEYS struck.

494 For intricate work with two different Matrix Case Arrangements the DOUBLE KEYBOARD may be used with great advantage by using BUTTON CLIPS (Fig. 34, page 99) for the KEYS that produce different characters on the two PAPER TOWERS. Both characters can be placed in the CLIP, the character for the right PAPER TOWER above the one for the left TOWER. This is especially advantageous in foreign language vocabulary work; set the first line with all accents and diacritical letters in Boldface on the right TOWER and the rest of the paragraph on the other TOWER in Roman with the same, or other, accents and diacriticals.

495 Rush Jobs in different point-sizes and measures: The operator turns the SWITCH to lock the PAPER TOWER on which he is working and sets the rush job on the other PAPER TOWER, thus:

> **The rush job is set in its own face and measure without disturbing the regular job, sidetracked to let the special go by, and then, the rush job finished, to go on with the regular job**
> ***"Turn the switch, that's all."***

496 Short takes on rush work: With any composing machine but the DOUBLE KEYBOARD it is not practical to make the takes shorter than a paragraph, but with the DOUBLE BOARD, takes may be made one line long if desirable. At the end of any line the operator may turn the SWITCH and go on the other TOWER, while the matter already completed may be taken to the CASTING MACHINE without stopping the KEYBOARD work for longer than it takes to *"Turn the Switch, that's all."*

497 Wide measure work: The maximum measure for the CASTING MACHINE without the SIXTY PICA ATTACHMENT is forty-two picas, but with the DOUBLE KEYBOARD matter eighty-four picas wide may be handled (double the capacity of the CASTER), or one hundred and twenty picas wide if the ribbons are cast on a sixty-pica CASTER.* Fig. 129 shows a line eighty-four picas wide produced on a forty-two pica CASTER; the left half of the line is set on the left PAPER TOWER with the right TOWER locked out (SWITCH to the right). Justify this half of the line as usual, then turn the SWITCH to the left to lock the left PAPER TOWER, and unlock the right TOWER on which the balance of the line is set. Thus, the left section of the line is on the ribbon produced on the left TOWER, and the right section on the ribbon of the right TOWER. After these two ribbons have been cast, the type for the right side is put on the galley and up against the type for the left side. Of course, with type there is no joint to show, as is the case with two-piece slugs.

A line to be set eighty-four picas (twice the measure of the Casting Machine), may be handled without difficulty on the DD Board, one-half the line being set on the left Paper Tower, the other half on the right Paper Tower.

* The MONOTYPE is built on the unit system and, just as the "Pianola," may be applied to the TYPE & RULE CASTER, converting it into the standard MONOTYPE COMPOSING MACHINE AND TYPE CASTER (¶360), the SIXTY PICA ATTACHMENT may be applied to any CASTING MACHINE.

FIGURE 129
Wide measure work on the DOUBLE KEYBOARD.

498 Wide measure work with one ribbon illustrates another use of the BOARD with one perforating and two counting mechanisms (¶491). For measures beyond the capacity of the EM SCALE of the KEYBOARD it is not necessary to use two ribbons, unless the measure be too wide for the CASTING MACHINE. For example: a single ribbon may be used in setting eight-point No. 8A (8½-set) sixty picas wide, provided the CASTING MACHINE be equipped with the SIXTY PICA ATTACHMENT, and adjusted for double justification (¶208). Sixty picas (8½-set) equal eighty-four and one-half KEYBOARD ems and three units (see Table for Changing Pica Ems, Plate VII, at back of book), that is, nineteen and one-half ems beyond the capacity of the KEYBOARD EM SCALE. To set this matter on one ribbon, turn the SWITCH to central position and carry an eight-and-one-half-set SCALE on both sides of the BOARD with a ribbon on the left TOWER only. Set the measure on the left side of the BOARD for nineteen and one-half ems three units, and on the right side of the BOARD for sixty-five ems. With the SWITCH in the central position, the PUNCHES on both sides of the BOARD operate and all perforations are registered in the single ribbon on the left side of the BOARD. At the end of the first section of the line justify as usual on the left side of the BOARD. When a JUSTIFYING KEY in the lower row is depressed to register this justification, the EM RACKS on both the left and the right side are restored. Then finish the line on the right side of the BOARD, of course, with SWITCH in central position, and *double justify*, using the right JUSTIFYING SCALE.

499 Testing words: In very narrow measure work, for example, setting box heads, centering ditto marks, lining up names at the right of leaders in setting tabular matter, it is frequently necessary to know the length of a word or phrase before setting it. While operators become very expert in estimating such matter, it is often a great convenience and time-saver to know exactly the number of ems and units in such matter before setting it. "Turn the SWITCH, that's all," and set the matter on the right side of the BOARD, using this as an adding machine; turn the SWITCH again, and, after making proper allowances, record this tested matter on the ribbon. Thus, to know before perforating the ribbon saves "killing" many lines.

500 Leadering out to a word of unknown length at the end of the line may be done on the DOUBLE BOARD without counting or calculation of any kind. Take, for example, a very common form of leader work in railway tariffs:

Wheeling.....W. Va. 110 98 115 30 167 142 177

In setting this, put paper on the *left* TOWER only; set the measure on the *left* TOWER the full width of the table, but on the *right* TOWER set the measure the width of the stub without the figure columns; that

is, "Wheeling ...W. Va." in the foregoing example. Lock out the *left* TOWER and set "W. Va." This will be recorded by the *right* counting mechanism but not by the *left*, nor will it be recorded on the ribbon since this is on the *left* TOWER only and that TOWER is locked out. The amount the *right* counting mechanism now registers is to be filled by the word "Wheeling" and the leaders; that is, the measure on the *right* TOWER is now equal to the measure of the full stub, minus the space occupied by "W. Va." Now turn the SWITCH to its central position, so that the KEYS struck will be recorded on *both* TOWERS, and set the word "Wheeling", and leader out to zero on the *right* counting mechanism; of course, the amount recorded on the *left* counting mechanism and on the paper will be the complete stub except "W. Va." Then setting "W. Va." will bring the *left* counting mechanism to the point where the figure columns begin. While the figure columns are being set the right EM RACK is as far to the right as possible, but this is immaterial, because when we restore, after setting the last figure, both the right and left EM RACKS move to the left to the proper position to begin the next line. Program work—for example

Merchant of Venice.....Shakespeare

is set in the same way except that, there being no figure columns, the full line here corresponds to the stub of the tariff described above and consequently *both* TOWERS would be set for the full measure, but paper would be put on the *left* TOWER only. With the *left* TOWER locked out set "Shakespeare," then turn the SWITCH to central position, set words "Merchant of Venice" and leader out to zero on the *right* counting mechanism. This leaves just the required space on the *left* counting mechanism for "Shakespeare," which when set completes the line and exactly fills the measure. Remember to pull forward the KNURLED HEAD 16KA5 (Plate V, at back of book) on *both* TOWERS so that the SPACE BARS will produce six-unit spaces instead of justifying spaces (¶86), because the justification of the line is done with leaders (Chapter XXIV, page 69).

501 Saving Keyboard changes: In offices that specialize on two sizes of type, for example, newspapers setting nonpareil and agate in the same measure, it is a great convenience to keep the left side of the BOARD adjusted for the most frequently used face and the right side for the other; this saves many changes of measure and JUSTIFYING SCALES: to change from one face to the other, "*Turn the Switch, that's all.*"

502 Using figures regardless of the set of the face: Fig. 130, page 219, shows that the DOUBLE KEYBOARD removes the last limitation in setting tabular matter. Set the stub on the left TOWER, turn the SWITCH, and set the figures on the right, the measure on the left side of the BOARD being adjusted for the set of the face used for the stub and the measure on the right side for the figures. Thus, nine-unit, six-set figures (3 points wide) may be used with a seven-and-one-half-set, six-point face; or, if the figures are to be especially prominent, seven-point figures (cast on 6-point body) can be used

with the six-point face. After the two ribbons have been cast, the type for the stub is combined on the galley with the type for the figures.

503 "Making room" for fractions: Some tables require, in addition to the figures, all fractions for halves, quarters, eighths, sixteenths, thirty-seconds, and sixty-fourths (63 MATRICES), and, of course, it is not possible to make room for these in the MATRIX CASE, for there are not enough nine- and eighteen-unit positions. Set the stub separately on the left PAPER TOWER, as described in the preceding paragraph, and the figures and fractions on the right TOWER. Use in the right TOWER the TYPEWRITER ATTACHMENT (¶274), which causes all characters to be registered as nine units, and arrange the fractions in order on the right KEYBANK (the stub is set on the left BANK); of course, the fraction MATRICES must be put in the MATRIX CASE in the corresponding positions for the characters they replace on the right BANK, and the machine adjusted

Puna	Nev.	8.16	8.16	7.44	6.20
Flanigan	Nev.	8.22	8.19	7.50	6.14
Kepler	Nev.	8.41	8.38	7.69	6.33
Sand Pass	Nev.	8.46	8.43	7.74	7.50
Fresco	Nev.	8.54	8.51	7.82	7.58
Reynard	Nev.	9.03	8.31	6.95	5.94
Bronte	Nev.	9.22	9.19	8.50	6.12
Scotts	Cal.	10.15	10.12	9.43	7.05
Red Rock	Cal.	11.56	11.41	10.74	9.02
Constantia	Cal.	12.42	12.00	10.44	10.03
N. C. O. Trans	Cal.	14.89	13.54	12.78	11.94

FIGURE 130

"Nut-body" (6-point No. 56, 6-set) figures with an extended face (6-point No. 156J, 7½-set); the stub is set on the left TOWER, the figures on the right.

to cast all nine-unit sizes the same as in casting typewriter type. Before each eighteen-unit fraction strike a nine-unit high space, to support the kern of the fraction, whose body is thus cast in two pieces.

504 Duplicate ribbons: One of the most profitable advantages of the MONOTYPE is the fact that the ribbon may be re-run at the CASTING MACHINE for stubs, headings, or other matter that repeats in a job. In many cases the ribbon is picked up so often that it actually wears out. The DOUBLE BOARD makes double ribbons, "carbon copies," for nothing. Set the SWITCH in central position and compose the matter on the left PAPER TOWER, forgetting about the right TOWER. When the job is finished on the left PAPER TOWER we have a duplicate ribbon on the right TOWER, without any effort whatever, because the justification is the same on both ribbons. In this work it is not necessary to hold down the left SCALE KEY when justifying. For rush work, to be printed two-up, the "carbon copy" may be used on a second CASTER and the job finished in half the time it would take without the DOUBLE BOARD. The "carbon copy" is valuable for matter that is to be repeated at the CASTING

MACHINE: The operator puts on the first ribbon, and, when this is finished, puts on the second ribbon. While the second ribbon is running he rewinds the first, so that it is ready to put on the CASTER when the second ribbon is finished.

505 Box heads: For offices handling tariff and other tabular matter the DOUBLE BOARD has special advantages, for the operator can set the heads, in a smaller size of type, at the same time he sets the body of the table. This saves one handling of the copy and avoids the mistakes that may occur when the two sections of a table are set at different times and possibly by different operators.

506 Parallel Tables, in which the stub is repeated in both sections of the table, can be picked up on the DOUBLE KEYBOARD. While setting the stub, put the SWITCH in central position so that this matter is recorded on both ribbons. After the last character of the stub has been set, lock the right TOWER, and finish the left section and restore; then lock the left TOWER and finish the right section. When the ribbons are cast, combine the type of the two sections. For work of this character this saves considerable time over rerunning the stub from the same ribbon and combining these with the two figure sections set separately.

507 "Estimating:" If a man could have all the money that has been wasted resetting jobs because they were first set in type too large, or too small, to fill the space properly and satisfy the customer, he could live on his income. In most job work the customer does not know whether he wants his job in eight- or ten-point until he sees it in both. With the DOUBLE BOARD a sample page can be set in both sizes for one composition cost. The customer says, "Use the biggest type you can"—*Question:* If you use twelve-point, will the matter go in the space specified? Ought you to use ten-point? Set the job in both sizes on the DOUBLE KEYBOARD, and, after it is keyboarded, determine from the line counters the number of lines in each size of type and *cast from the ribbon that best suits the job.** *The DD Keyboard will not give back the money you have lost resetting to make the type fit the space, but it will insure you against similar future losses.*

508 No Complications—No Slow Spots. The DOUBLE KEYBOARD is as simple as the single KEYBOARD, and that is the simplest composing machine ever made—"*as easy to learn, as easy to operate, as a typewriter.*" Each character has its own KEY; there is no "shift key," or similar device, to confuse the operator in using two alphabets together—"*Just hit the keys.*" The touch and the action for all KEYS are identical—*there are no "slow spots" on this composing machine.* Changes from one size to another require only one movement of one lever: "*Turn the Switch, that's all.*"

* In the office that uses "Copyfitting" (¶472) the answer to this is determined by the copyfitter from the manuscript before any composition is done.

CHAPTER XLIX

The Unit System of Building Machinery

509 Built on the Unit System, like "elastic" bookcases and filing cabinets, the MONOTYPE is a unique machine; there is nothing like it in the printing industry. Indeed, if the MONOTYPE CO. had created nothing else for printers but this unit system, it would have abundantly justified its existence, for the money-saving, money-earning power of this unit system of machine construction cannot be overestimated.

510 Monotype Users combine Monotype Units to make their composing-room equipment suit exactly their particular needs; consider just three of the advantages of this system of machine construction: *First,* you cannot buy the wrong "model" because you combine these MONOTYPE units to make your MONOTYPE exactly fit your business; *instead of scheming to make your work fit a "ready-made" machine, you use practically "made-to-order" equipment. Second,* you buy exactly what you need, no more, no less; which means that *you reduce to the minimum the losses of idle time and insure the greatest continuous return from your investment. Third,* as your business grows, as your work increases, as its character changes, you add just the units you require to take care of your needs; *the Monotype helps you grow and grows with you.*

511 Depreciation: "Printing machinery does not wear out; it is quickly made obsolete—*unprofitable*—by the perfection of more efficient machinery." Unquestionably the *greatest advantage of our unit system of machine construction is that it insures the owners of Monotypes from the losses of depreciation.* To appreciate just what this means we must emphasize the basic difference between two expenses incident to the owning and operating of machinery—Maintenance and Depreciation, or Obsolescence, to use the more expressive term now generally employed in railway and manufacturing accounting.

512 Maintenance: Machinery in the charge of competent managers does not depreciate, in the sense that its efficiency lessens. Such managers keep their machinery in the best possible condition. Breaks are repaired, worn parts replaced, so that actually the machine does as much work and as good work after years of use as the day it was installed. The cost of the necessary repairs to keep machinery in its original condition of efficiency is an operating expense that should be charged against the hour cost of running the machine, just the same as the wages of the operator of the machine.

513 Obsolescence: But, if the printer is in business to make money, and not from force of habit, he must add to his cost of operating a machine the cost of owning the machine, whether he

operates it or not. American inventive genius cannot be made to stand still, and so, while the machine purchased a few years ago is actually as efficient as the day it was bought, it has become relatively inefficient in competition with later models and improved machines. That is, time, not use, has made the machine "obsolete." The American Cost Commission, the authority on printing costs, says that ten per cent. of the original cost of a machine must be charged each year against the cost of operating a machine, so that the owner of the machine may accumulate a fund equal to the original cost of the machine, and thereby be able to buy an improved machine by the time the old machine has become obsolete and unprofitable.

514 The real loss of Obsolescence, however, is not the cost of replacing an old machine with an improved machine, great as this expense often is. Far more serious is the cost of reaching the point where you are willing to make the change. Your losses while you are "making up your mind" to replace the unprofitable machine, the profits you do not get while your competitor is running a machine that gives him a much greater return than you get from each dollar paid in wages, the money you miss making—that is the biggest loss from obsolete machinery. *Monotype users carry ample protection from such losses.*

515 All Monotype Improvements are New Units: No manufacturer of printing machinery has been more progressive than the MONOTYPE CO. in making improvements to raise the quality of product and reduce its cost, yet none of these improvements makes any MONOTYPE machines obsolete. On the contrary, every MONOTYPE improvement helps every MONOTYPE user, because every improvement made is in the form of a new unit that can be applied to any MONOTYPE. Instead, then, of having to depreciate the value of his equipment because of the appearance of new "models," the MONOTYPE user welcomes our new units because they give him a greater return from the equipment he owns; he takes off the old unit and puts on the new, that's all. Thus, *instead of charging off a large amount each year for depreciation, the Monotype owner adds our improved units at small cost, and by thus keeping his equipment as efficient as brand-new machines, eliminates depreciation.*

516 Nor does the MONOTYPE user lose any profit through operating an obsolete machine in a business as highly competitive as the printing industry. MONOTYPE users, through years of experience, have learned that every new unit we perfect means a reduction in the cost of their MONOTYPE product; therefore they waste no time "making up their mind;" they promptly equip their machines with the new units and, by thus supplementing their experience with ours, they retain all the advantages of their progressiveness. This is why the MONOTYPE has been called most aptly "*The Machine with only One Model—That always the Latest.*"

517 The Standard Monotype: The object of this chapter is to explain briefly the various units that may be added to the Standard MONOTYPE to increase its scope; that is, the range of

work it will handle. Note, however, that the application of any additional unit never reduces the efficiency of the machine on any other work; the new unit simply increases the machine's "radius of action." The Standard MONOTYPE (see Frontispiece) is both a composing machine and a type caster, which, without the application of any additional units, does the following: *Casts and composes in automatically justified lines all kinds of matter, straight or tabular, in any measure up to forty-two picas, and any sizes of face from five- to twelve-point inclusive; twelve-point faces may be cast on thirteen- or fourteen-point bodies to save hand leading.*

518 Wide Measure Unit: The Sixty Pica Attachment enables the CASTING MACHINE to deliver, on ordinary galleys, lines of any length up to sixty picas, instead of lines of maximum length of forty-two picas, see ¶517. For offices that handle much wide measure work this Sixty Pica Attachment will pay for itself in short order, for it eliminates the bother and extra work of setting wide measure jobs in two sections and then combining them.

519 To increase the line delivery from forty-two to sixty picas, a longer RULE and COLUMN PUSHER (¶150) must be applied to the CASTING MACHINE, and also a means to provide for the increased travel of the LINE SUPPORT, that is, the sliding piece in the COLUMN PUSHER. Thus, as the type for a line is assembled in the type channel, the LINE SUPPORT is pushed forward toward the front of the machine; then, after the completed line has been placed on the galley, the LINE SUPPORT must be automatically pushed back into position to support the first type delivered for the next line.

520 Display Type Unit: This attachment is used with the SORTS MATRICES (Fig. 95, page 159) which are put in casting position by hand, instead of being brought to casting position by the movement of the MATRIX CASE, and this unit provides for casting type for the cases, borders, high and low quads and spaces, in sizes from fourteen- to thirty-six point inclusive. This unit is always furnished with the TYPE & RULE CASTER (¶360), and may be applied to any Standard MONOTYPE (¶517). Thus, plants operating one MONOTYPE composing machine always have this machine equipped with the Display Type Unit, so that the machine may be used both for composition and for type casting in connection with the non-distribution system (Chapter XLI, page 170). Plants operating several composing machines have one or more machines equipped for casting display type. Since a composing machine equipped with the Display Type Unit is exactly as efficient on type casting as the TYPE & RULE CASTER, most owners of large book and job offices prefer that combination of MONOTYPE units to the TYPE & RULE CASTER, because, in rush periods, every machine can be put on composition.

521 The Display Type Attachment may be divided into three parts: *first*, the mechanism for handling type as large as thirty-six point; *second*, the MOLDS for casting these larger sizes of type (¶394); and *third*, the Speed Regulating Attachment (¶373), which provides for varying the speed of casting to suit the amount of metal in the type to be cast. To handle these larger sizes of type the

CASTING MACHINE is equipped with these units. (*a*) An attachment to increase the stroke of the MOLD BLADE so that the MOLD will be capable of casting and ejecting a type thirty-six points wide. (*b*) The mechanism to increase the PUMP capacity so that it will supply the necessary volume of metal for the large size type. (*c*) A spring battery to give greater pressure to the CENTERING PIN so that the MATRIX cannot be forced from the MOLD by the greater pressure of metal. (*d*) A HOLDER (Fig. 96, page 160) for these SORTS MATRICES. (*e*) Special TYPE CHANNEL BLOCKS to receive the large type as it is ejected from the TYPE CARRIER. (*f*) WEDGES adjustable by hand to vary the set-size of the letters (¶365).

522 The MOLDS for use with the Display Type Attachment are adjustable for different point-sizes; thus the Style T MOLD is equipped with BLADES for casting type, high and low quads and spaces from SORTS MATRICES in twelve-, fourteen-, and eighteen-point, while the Style U MOLD is similarly adjustable for twenty-four-, thirty-, and thirty-six-point. Note that MATRICES for composition cannot be used with these MOLDS, and, therefore, the only twelve-point MATRICES that can be used with the Style T MOLD are those for faces so extended that they cannot be made in the standard COMPOSITION MATRICES, which are not used for characters wider than twelve and one-half points. For details of the Style T and U MOLDS see ¶394.

523 The Speed Regulating Unit gives eighteen different speeds by means of shifting gears and the nineteenth speed running direct with all gears cut out. As explained in ¶373 and ¶374, the speed is quickly adjusted to correspond to the point-size and width of the character to be cast, so that all characters are cast at the maximum speed.

524 Lead and Rule Unit: These MOLDS for casting rules and leads, both high and low, tie-up slugs, and electrotype guards in continuous strips of any length are described in detail in Chapter XLIII, page 180; they may be used with either the TYPE & RULE CASTER (¶360) or the Standard MONOTYPE (¶517), provided this is equipped with the Display Type Unit (¶520); that is, the Speed Regulating Attachment is necessary because these strips cannot be cast at full speed, 140 revolutions per minute. In addition, the units for operating these STRIP MOLDS must be used as follows: *First*, the TYPE CARRIER is replaced by a special CONNECTING ROD, which, by means of a tongs mechanism, reduces the stroke of the MOLD BLADE, which in these MOLDS occupies the position of the CROSS BLOCK in the MOLDS for type casting, to about one-fourth the stroke of the TYPE CARRIER. *Second*, more powerful gas-burners, since these STRIP MOLDS use metal much faster than TYPE MOLDS. *Third*, bracket and rods for operating the clamping mechanism on the STRIP MOLD to lock the TYPE BLOCKS against the MOLD BLADE when the cast is made, in order to insure the essential accuracy in point-size. *Fourth*, adjustable ABUTMENT for the MOLD BLADE to permit of varying the length of stroke of the MOLD BLADE, that is, the length of the sections composing the strip being cast. NOTE: For rules and high leads these sections are one-half inch long, for low leads they are three-quarters of an inch.

525 Automatic Cutter Unit: This is used for automatically cutting the product of the LEAD AND RULE MOLDS to any desired lengths from six picas to twenty-five inches inclusive. The Cutter Unit can be applied to either the Standard MONOTYPE (¶517) or the TYPE & RULE CASTER, as shown in Fig. 131. As the strip is fed

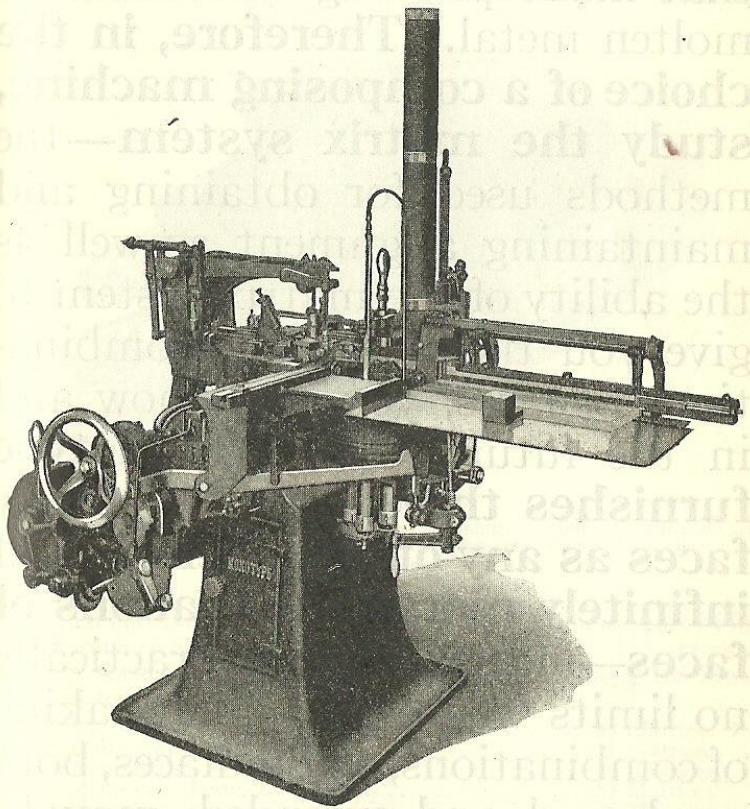


FIGURE 131
TYPE & RULE CASTER equipped with Lead and Rule Unit and Automatic Cutter Unit.

from the MOLD it passes to the Cutter, where it is cut accurately, to the length for which the Cutter is adjusted, because the cutting knives move with the strip to the exact position for cutting, but the cut is not made until the strip has stopped moving, that is, until the next cast is being made. The Cutter is operated by a CAM attached to the GEAR on the front of the right CAM SHAFT. The very short rules and leads fall into a box placed just below the shear, while material longer than nine picas is automatically stacked on the shelf

It's all in the matrix; the part that makes the type face is the vital part of composing machines that make printing surfaces from molten metal. **Therefore, in the choice of a composing machine, study the matrix system**—the methods used for obtaining and maintaining alignment as well as the ability of the matrix system to give you the faces, and combinations of faces, you want now and in the future. **¶The Monotype furnishes three times as many faces as any other machine and infinitely more combinations of faces**—indeed, there are practically no limits whatever to the making of combinations, as Boldfaces, both condensed and extended, may be combined with the same Roman face as easily as the hand compositor sets type from different cases.

FIGURE 132

Eighteen-point composition showing a combination of Roman and Boldface composed and cast at one operation on the Standard MONOTYPE equipped with the Eighteen-point Composition Unit.

in front of the Cutter. The strips can be cut to any length greater than twenty-five inches by tripping the shear by hand when the length desired has been cast.

526 Fourteen- and Eighteen-point Composition Unit: When this attachment is applied to the Standard MONOTYPE (¶517), it is possible to cast type in automatically justified lines for faces as large as eighteen-point and containing characters as wide as eighteen points, as shown in Fig. 132, page 226; without this unit the largest

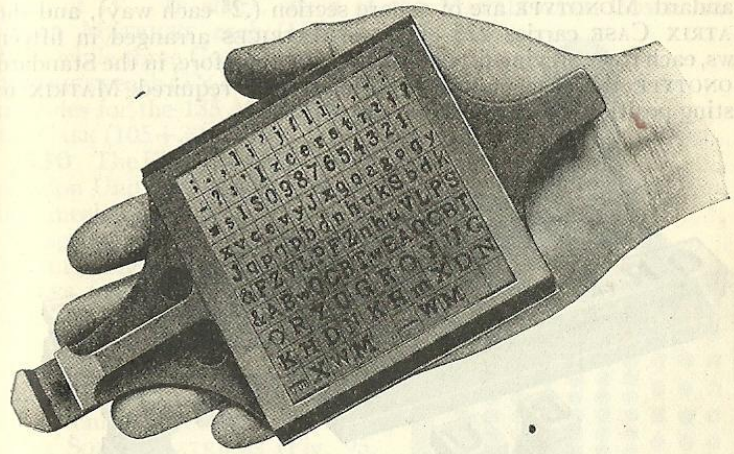


FIGURE 133

Eighteen-point MATRIX CASE for composition, containing a combination of Roman and Boldface, 135 MATRICES; used with the Eighteen-point Composition Unit.

faces that may be composed are twelve-point, with a maximum width for characters of twelve and one-half points. Fig. 133 shows a MATRIX CASE for eighteen-point composition containing 135 MATRICES as follows:

Roman caps, lower case, and &	53 Matrices
Roman figures and $	11 Matrices
Roman points . , - : ; '	6 Matrices
Boldface caps, lower case, and &	53 Matrices
Boldface points . , - : ' ?	6 Matrices
Eighteen-unit dash and leader	2 Matrices
Five-, nine-, and eighteen-unit low spaces and eighteen-unit high space	4 Matrices
	135 Matrices

(Italic may be substituted for Boldface—See Fourteen- and Eighteen-point Arrangements, Figs. 88 and 89, page 143.)

The details of this arrangement (QC2) of Roman and Boldface are shown in Fig. 89, page 143, which shows also the characters made for use with this arrangement, but not carried in the MATRIX CASE; these additional characters are cast as sorts and inserted in place of characters of the same width, without affecting the justification,

when the matter is corrected at the case. Fig. 88, page 143, gives the details of the corresponding arrangement (QC) for Roman and Italic.

527 All MATRICES used with this unit are .3″ point-ways; *thirty of the Matrices carried in the Matrix Case are of square section* (.3″ set-ways and .3″ point-ways), while the remaining *105 Matrices in the Case, for the narrower characters in a font, are of rectangular section*, being .2″ set-ways by .3″ point-ways. Note the foregoing carefully, because in this difference in MATRICES is the reason for the Eighteen-point Composition Unit. The MATRICES used with the Standard MONOTYPE are of square section (.2″ each way), and the MATRIX CASE carries 225 of these MATRICES arranged in fifteen rows, each row carrying fifteen MATRICES; therefore, in the Standard MONOTYPE the case moves, in bringing the required MATRIX to casting position, by uniform steps of .2″.

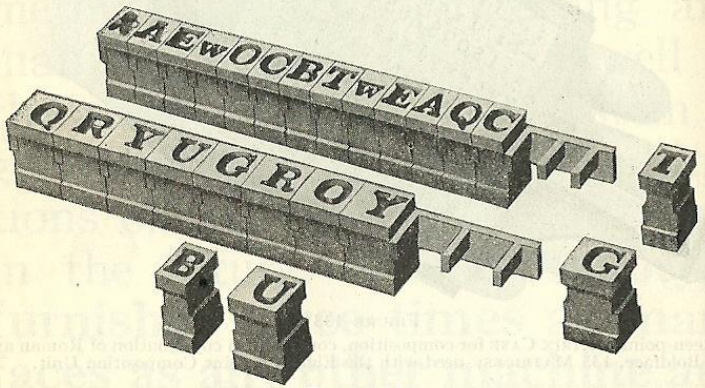


FIGURE 134

The MATRIX COMBS for eighteen-point composition. Note the two sizes of MATRICES and the COMBS with teeth correspondingly spaced. The rear COMB in the illustration (7 like this in the CASE) carries fifteen MATRICES .2″ x .3″; the front COMB (3 like this in the CASE) carries ten MATRICES .3″ x .3″.

528 When the Eighteen-point Composition Unit is used, the steps by which the MATRIX CASE moves are not the same for all characters. In moving right or left (operating position) the CASE moves .3″ (not .2″, as with the standard MATRICES) for each row of MATRICES presented to the MOLD, because all MATRICES in the CASE are .3″ point-ways. There are two different movements of the CASE from front to back (operating position); for all the MATRICES, except the thirty in the three rows at the right (operating position), the movement from row to row is .2″, the same as for all composition MATRICES, but for the three right-hand rows (operating position), that is, the rows containing the widest characters in the fonts, the movement of the CASE from row to row is .3″.

529 The preceding paragraph, which sums up the principles of the Eighteen-point Composition Unit, will be easily understood by reference to Figs. 134 and 135: Fig. 134 shows the twenty-five MATRICES carried in the third and fourth rows from the right of

the CASE (operating position); note that all MATRICES are the same size point-ways (.3″), but the MATRICES in the front row of the picture, ten in the row, are of square section (.3″), while the MATRICES in the back row of the picture and the six similar rows in the CASE are of rectangular section, .3″ point-ways by .2″ set-ways. Fig. 135, which shows the back of the CASE, makes clear that in moving right and left (operating position) the CASE always moves by steps of .3″; while in moving front or back (operating position) for seven rows the CASE moves by steps of .2″ and for three rows by steps of .3″. In short, seven of the MATRIX-CASE COMBS carry fifteen MATRICES each (15×7=105), while three COMBS carry ten MATRICES each (3×10=30) which provides for the 135 MATRICES in the CASE (105+30=135).

530 The Eighteen-point Composition Unit includes the following mechanisms in addition to the special MATRICES and their MATRIX CASE, the WEDGES and SCALES for these more extended faces, and the fourteen- and eighteen-point composition MOLDS for use with these MATRICES. NOTE: The Style T MOLD for casting type from fourteen- and eighteen-point SORTS MATRICES (Fig. 95, page 159) cannot be used with these larger size COMPOSITION MATRICES.

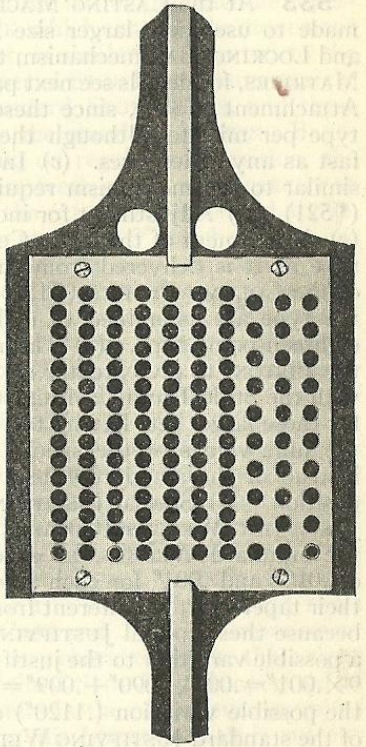


FIGURE 135

Back of MATRIX CASE for eighteen-point composition: Shows spacing of cone holes for CENTERING PIN to position MATRICES.

531 At the KEYBOARD the following units are required for fourteen- and eighteen-point composition: (*a*) Special right and left KEYBARS (¶255) to provide for the special arrangement of MATRICES in the CASE; (*b*) special STOPBARS (¶257) to make the necessary change in unit values, which for the ten rows of the CASE are as follows: 5 7 9 9 10 11 12 14 15 18. In addition, the KEYBOARD must be adjusted by moving the UNIT-RACK ABUTMENT a27KB1 (Plate VI, at back of book) to the right so that the justifying space which is carried in the five-unit row will be registered as three units; that is, two units less than the row in which it is carried, just as with the Standard MONOTYPE the MATRIX for this space is counted as four units, although it is carried in the six-unit row of the MATRIX CASE.

532 The following points in reference to the action of the KEYBOARD when arranged as above for fourteen- and eighteen-point composition should be noted: (*a*) Constant Justification (¶121) gives a space three units wide; (*b*) With eighteen-point composition the widest justifying space obtainable is .1405″, a little more than ten units. (*c*) If wide spacing is desired in eighteen-point composition, more than ten units, strike two justifying spaces between words, unless there be more than eleven words to the line, in which case use a five- or a nine-unit fixed space and a justifying space between words.

533 At the CASTING MACHINE the following changes must be made to use these larger size MATRICES: (*a*) Special STOP RACK and LOCKING BAR mechanism to position correctly these larger size MATRICES, for details see next paragraph. (*b*) The Speed Regulating Attachment (¶373), since these larger sizes cannot be cast at 140 type per minute, although these sizes can be keyboarded just as fast as any other sizes. (*c*) Increased stroke of the MOLD BLADE, similar to the mechanism required with the Style T and U MOLDS (¶521). (*d*) Adjustment for increased stroke of the TYPE CARRIER. (*e*) Adjustment of the TYPE CHANNEL BLOCKS to receive the larger type as it is delivered from the TYPE CARRIER. (*f*) Adjustment of the COLUMN PUSHER (¶150) so that the type channel, in which the type are assembled to make a line, may be wide enough for eighteen-point type. (*g*) The mechanism to increase the speed of the PISTON, to give greater PUMP capacity, just as in casting type with the Style T and U MOLDS (¶521). (*h*) NORMAL WEDGES (¶27) for these larger sets having ten casting positions to correspond with the unit values of the special STOPBARS used at the KEYBOARD, instead of the standard fifteen casting positions of body-size composition. (*i*) Special JUSTIFYING WEDGES, instead of the standard JUSTIFYING WEDGES 10D and 11D (¶130) of different taper than the standard WEDGES, in order that they may give increments of .010″ and .001″ for each position they move from right to left; their taper must be different from the standard JUSTIFYING WEDGES because these special JUSTIFYING WEDGES in their *ten* positions give a possible variation to the justifying space of .099″ (9×.010″=.090″, 9×.001″=.009″, .090″+.009″=.099″), which is but .013″ less than the possible variation (.1120″) obtainable from the *fifteen* positions of the standard JUSTIFYING WEDGES (¶134 and ¶135). (*j*) A special adjustment of the SPACE TRANSFER WEDGE (¶128) to provide for casting the justifying space from the five-unit position of the NORMAL WEDGE instead of the standard six-unit position.

534 The special STOP RACK and LOCKING BAR mechanism is so ingenious that it deserves two paragraphs to itself. It is fundamental in our unit system of construction that the application of a unit to increase the scope of the Standard MONOTYPE must not impose any limitations whatever upon the machine, and make it less efficient in any class of work because of the application of the additional unit. Since machines equipped with the Eighteen-point Composition Unit are also used for regular composition, it is obvious

that the change to fourteen- or eighteen-point composition must be made quickly and easily, without taking off or putting on special mechanisms. Nothing could be simpler than changing a CASTING MACHINE equipped with the Eighteen-point Composition Unit so that it will move the MATRIX CASE for these larger size MATRICES—*Turn a Valve, that's all.*

535 Without being too technical, the special STOP RACK and LOCKING BAR mechanism of a CASTING MACHINE equipped with the Eighteen-point Composition Unit may be described thus: The B STOP RACK which controls the movement of the MATRIX CASE from right to left is elongated toward the left of the machine (operating position), while the C STOP RACK, which controls the movement of the MATRIX CASE, back and front, is similarly elongated to the rear of the machine. Both of these special STOP RACKS have exactly the same teeth, .2″ pitch, as the standard STOP RACKS, and these teeth are capable of engagement by the standard LOCKING BARS; in fact, when the machine is running on regular composition, the standard LOCKING BARS engage these teeth of .2″ pitch exactly as if these LOCKING BARS did not have the extensions described above. In these extensions are cut similar teeth of .3″ pitch, which are engaged by special LOCKING BARS used only for composition with the larger size MATRICES. These special LOCKING BARS are operated by AIR CYLINDERS, instead of springs, like the standard LOCKING BARS. When using the larger size MATRICES, when the VALVE is turned to adjust the CASTING MACHINE for fourteen- or eighteen-point composition, air is admitted to these CYLINDERS and, at the same time, the standard LOCKING BARS are locked out and made inoperative, except the C LOCKING BAR, as hereafter explained. The perforations in the paper ribbon now move the special STOP RACKS approximately to the position required for the character to be cast, and then the RACKS are accurately positioned and locked in place by the special LOCKING BARS operated by the AIR CYLINDERS. As was explained in ¶528, the MATRIX CASE in its movement back and front moves .3″ for the three right-hand rows (operating position) of the MATRIX CASE and .2″ for the other seven rows. Thus, to position the CASE for any character in the three right rows, the auxiliary LOCKING BAR for the C STOP RACK is operated as described above, but for any characters in the other seven rows, to position the CASE by .2″ increments, this LOCKING BAR is cut out and is inoperative and the STOP RACK is positioned by the standard LOCKING BAR. The great simplicity and freedom from complication of this Eighteen-point Composition Unit explains its popularity: To change to fourteen- or eighteen-point composition, or back to regular composition—*Turn the Valve, that's all.*

536 The Wide-spacing Unit: To decrease the number of words per thousand ems, either for artistic or for commercial reasons, the MONOTYPE will not only cast the face on any larger size body desired, thereby eliminating hand leading, but, more than that, the MONOTYPE has a unique advantage, unknown to any other process of composition—*first*, of being able to stretch the face and make it

more extended, as explained in Chapter VI, page 16; and, *second*, of increasing automatically the size of spaces between words.

537 *A condensed or an extended face may be cast from the same font of Monotype Matrices:* Of course, the MATRICES made of bronze are not actually stretched and the design of the letters altered, but with the MONOTYPE it is a simple matter to vary the width of the bodies on which these letters are cast. Thus, Fig. 12, page 16, and Fig. 13, page 17, show the possibilities of "opening-up" MONOTYPE faces; that is, diluting them with white space between the letters and the words. While "opening-up" a face and wide spacing it of course sacrifices the very close-fitting and thin-spacing characteristic of MONOTYPE composition, the result is not displeasing, even when faces are "opened-up" to increase their paper-covering quality more than ten per cent., because the amount that is added to the body of each letter is proportioned to the width of the letter; for example, the width of the cap "M" is increased three times as much as the width of the lower case "f." Furthermore, each letter, being cast separately, is sharp, clear-cut, and distinct.

538 *"The milkman sells two kinds of product—cream and milk—but he does not keep two kinds of cows. If your business requires that you sell two kinds of composition, you do not need two kinds of composing machines."* To understand the commercial value of the ability of the MONOTYPE to thus "open-up" faces by putting white space between the letters and by wider spacing between words, we must appreciate clearly that there are two totally different kinds of composition.

539 *Monotype composition, the equivalent of brand-new type set by hand* (Fig. 136, page 233): The letters cast separately are so closely fitted that they flow together and make word-pictures with no perceptible white space between the letters composing a word. The spaces between words, always proportional to the size type used, give the close spacing essential in quality composition if objectionable "rivers" are to be avoided.

540 *Line-cast composition:* All casting and composing machines, except the MONOTYPE, assemble the molds for the letters in a line and make one casting for a line. These letter molds must have side walls, and obviously there must be space between the letters thus cast in bunches. Nor can words cast on line-casting machines be as closely spaced as MONOTYPE matter, because the spaces in line-cast composition are made by metal wedges (space bands) placed between the letter molds for the different words of the line; furthermore, since the same wedges are used with different size faces the spacing cannot be proportioned to the size type being composed.

541 The MONOTYPE produces, at will, either of these two kinds of composition: Fig. 136, page 233, shows MONOTYPE quality, *the cream of composition*, the maximum number of words to the square inch, close-fitted type, thin-spaced—the equivalent of the best foundry type, *brand-new*, set by the most skilful hand compositor.

542 Fig. 137, page 233, cast on the same MONOTYPE, from the same MATRICES as used for Fig. 136, shows the same face "opened-up" one-half set and wide-spaced, that is, diluted with white space between the letters and words to give the paper-covering quality of line-cast composition. But even thus diluted there is still the quality of MONOTYPE faces, for the letters, cast separately, are clean-cut and sharp, and they have not been distorted to suit the limitations of a machine.

To understand the commercial value of the ability of the MONOTYPE to thus "open-up" faces, by putting white space between letters, we must appreciate clearly that there are two totally different kinds of composition: *Monotype composition, the equivalent of brand-new type set by hand.* The letters, cast separately, are so closely fitted that they flow together and make word pictures, with no perceptible white space between the letters composing a word. The spaces, always proportional to the size type used, give the close spacing between words demanded by typographic tradition—and essential, if objectionable "rivers" are to be avoided. *Line cast composition.* All casting and composing machines except the MONOTYPE assemble the molds for the letters in a line and make one casting for a line. These letter molds must have side walls and obviously there must be space between letters thus cast in bunches. Nor can words cast on these machines be as closely spaced as MONOTYPE set words, because these spaces are made by wedges placed between the letter molds for the different words in the line. The MONOTYPE produces, at will, either of these two kinds of composition. The left hand of these specimen pages shows MONOTYPE quality, *the cream of composition;* the maximum number of words to the square inch, close fitted type, thin spaced—the equivalent of the best foundry type, *brand-new*, set by the most skilful hand compositor.

FIGURE 136

MONOTYPE quality, the cream of composition; the maximum number of words to the square inch, close-fitted type, thin-spaced, the equivalent of brand-new foundry type set by hand. *Thirty-one lines.*

To understand the commercial value of the ability of the MONOTYPE to thus "open-up" faces, by putting white space between letters, we must appreciate clearly that there are two totally different kinds of composition: *Monotype composition, the equivalent of brand-new type set by hand.* The letters, cast separately, are so closely fitted that they flow together and make word pictures, with no perceptible white space between the letters composing a word. The spaces, always proportional to the size type used, give the close spacing between words demanded by typographic tradition—and essential, if objectionable "rivers" are to be avoided. *Line cast composition.* All casting and composing machines except the MONOTYPE assemble the molds for the letters in a line and make one casting for a line. These letter molds must have side walls and obviously there must be space between letters thus cast in bunches. Nor can words cast on these machines be as closely spaced as MONOTYPE set words, because these spaces are made by wedges placed between the letter molds for the different words in the line. The MONOTYPE produces, at will, either of these two kinds of composition. The left hand of these specimen pages shows MONOTYPE quality, *the cream of composition;* the maximum number of words to the square inch, close fitted type, thin spaced—the equivalent of the best foundry type, *brand-new*, set by the most skilful hand compositor.

FIGURE 137

The same face diluted with white space between letters and words to give the fatness and paper-covering quality of line-cast composition *plus* every MONOTYPE advantage except close-fitting and thin-spacing. *Thirty-seven lines—a gain of almost twenty per cent., one line in five.*

543 The ability to produce two standards of quality is a unique advantage of the MONOTYPE—a very real advantage to those in competitive business. To decrease the number of words per thousand ems, that is, to increase the number of ems per thousand keystrokes, it is only necessary to use a larger set JUSTIFYING SCALE (¶111) at the KEYBOARD, the NORMAL WEDGE (¶27) of the corresponding set at the CASTING MACHINE and the Wide-spacing Unit at the KEYBOARD.

544 The Wide-spacing Unit consists of two parts: *First*, special STOPBARS (¶257) which cause the JUSTIFYING-SPACE BAR

(¶86) to operate the S, or JUSTIFYING-SPACE, PUNCH with the nine-unit PUNCH, instead of with the six-unit PUNCH, which is used for standard or close-spaced composition. *Second*, special left KEYBARS (¶255) to couple the left JUSTIFYING-SPACE BAR to the nine-unit instead of the six-unit PUNCH. If a KEYBOARD is to be used exclusively for wide-spaced work, it is desirable to use a similar right KEYBAR for wide spacing because, when the special wide-spacing STOPBARS are used, the SPACE BAR on the right KEYBANK cannot be operated unless the special KEYBARS to connect it to the nine-unit PUNCH are also used.

545 The result of thus changing the coupling of the SPACE BAR and the punching and the counting mechanism is that justifying spaces, which are always counted by the KEYBOARD as two units less than the WEDGE position from which they are cast, are now seven instead of four units; that is, the justification for the line is added to a minimum space seven units wide, instead of the four-unit space used with standard, close-spaced MONOTYPE composition.

546 The Wide-spacing Unit has a distinct value even on work of the highest quality, for example, eleven- or twelve-point double-leaded matter. In high quality composition the space around a word should be uniform, like the white mat around a picture; therefore, leaded matter should be more widely spaced than solid matter; in setting leaded matter the artistic hand compositor uses between words a nut space instead of the three-to-em used for solid matter. In short, the Wide-spacing Unit enables the office to control the spacing in any job, instead of depending upon the judgment and care of the operator.

547 The Automatic Repeater Unit, which may be applied to any Style D or Style DD KEYBOARD, is a little air engine controlled by a green KEY at the lower left corner of the left KEYBANK. The Repeater operates the KEYBOARD mechanically, instead of by hand, at the rate of ten keystrokes a second, that is, on quads and leaders *more than 25,000 ems per hour*. The great value of this Unit lies in its simplicity; to use it, hold down the REPEATER KEY and then depress the KEY for the character to be repeated—a quad, a leader, a dash, any character or space on the BOARD; the character for the KEY thus held down repeats as long as both Keys are depressed. Thus, to use the Repeater Unit there is nothing to adjust, nothing to change; it is the operator's best friend—right there when he wants it. For example, to quad out the last line of a paragraph depress the REPEATER KEY with the second finger of the left hand and then hold down the quad KEY with the forefinger of the same hand.

548 *On any kind of composition* the Repeater will pay for itself in a few months. Every operator knows that it is much more tiring to "quad out," to strike one KEY continuously with the same finger, than it is to set matter, that is, to distribute the work of striking the KEYS among the eight fingers; but, the wise employer who equips his KEYBOARDS with the Repeater Unit insures his operators against wasting energy by "quadding-out" by hand; instead, the operator "lets the engine do it," and thereby produces the most

matter when doing the least work—"He works while he rests." The Repeater Unit conserves the operator's energy for useful work; in fact, it is the operator's pacemaker, for it is an inspiration to any one to see the KEYBOARD working perfectly at a speed of more than 25,000 ems per hour.

549 *To properly appreciate* the Repeater Unit, think of catalog work, where the blank space for cuts is frequently half of the composition, and remember that with the Repeater Unit this blank space may be set at 25,000 ems an hour. Think of tabular matter where em-quads, leaders, and dashes frequently repeat across the whole measure. Think of legal printing, question and answer work. Think of newspaper straight matter, with its short paragraphs and dash lines between paragraphs. Think of newspaper ad composition, with its quads for overhanging figures, leaders, and open space for cuts. Think of any kind of printing you please, and you will realize that the Repeater Unit increases the output of a KEYBOARD from five to fifty per cent.

550 The mechanism of the Repeater Unit is so simple and ingenious that it is worthy of note, although it is not our intention in this book to describe mechanisms in detail. Since the function of the Repeater is to operate automatically the PLUNGERS that admit air to the PISTONS that force the PUNCHES through the paper, turn to Fig. 35, Plate III, facing page 100, where the standard KEY mechanism is shown in skeleton form. Note that when a KEY is depressed the bottom of the KEY LEVER engages a lug on the top of the KEYBAR for this KEY, and thereby moves the KEYBAR, which, in turn, operates its two ROCK SHAFTS by means of the lugs on the under side of the KEYBAR. It is these ROCK SHAFTS that, through their respective VALVE BARS, operate the two PLUNGERS for this KEY. Thus, so long as the KEY is held down, the PLUNGERS for that KEY are pushed back, so that the air forces up the PISTONS controlled by these PLUNGERS.

551 In a KEYBOARD equipped with the Repeater Unit the VALVE BARS, shown in Fig. 35, are replaced with compound VALVE BARS, that is, VALVE BARS made in two pieces and having the rear end of the BAR (the part of the BAR that comes in contact with the PLUNGER) a separate piece from, but flexibly connected with, the main part of the BAR. Thus, this rear end of the BAR is capable of telescoping upon the BAR itself; but when the Repeater is not in use, these compound VALVE BARS are extended to their full length and act exactly the same as the standard VALVE BARS shown in Fig. 35. On the rear end of each compound VALVE BAR is a lug which may be engaged by a ROCKER BELL CRANK, which is part of the Repeater Unit. This BELL CRANK is operated by the air engine of the Repeater Unit and, when the BELL CRANK is pushed forward, toward the operator, it engages the rear ends of the compound VALVE BARS for any KEY then depressed and pushes this portion of the VALVE BAR forward, toward the operator, so that the effect on the PLUNGERS is the same as if the operator had raised his finger from the KEY.

552 The foregoing will be clear from the following description of the sequence of KEYBOARD actions when the Repeater is used: *First*, the operator depresses, and holds down, the REPEATER KEY. *Second*, then, while holding down the REPEATER KEY, the operator depresses the KEY for the character to be repeated—a quad or a leader, for example: depressing the KEY for this character pushes in its PLUNGERS just as if there were no Repeater Unit on the KEYBOARD. *Third*, depressing the REPEATER KEY releases a LATCH from the path of the BELL CRANK of the repeater mechanism so that the air pressure on the PISTON of the air engine may push the BELL CRANK forward. *Fourth*, the forward movement of the BELL CRANK telescopes the rear end of the compound VALVE BARS so that the PLUNGERS previously pushed in by these VALVE BARS now move forward and cut off the air from the PISTONS for these PLUNGERS, just as if the operator had raised his finger from the quad or leader KEY. *Fifth*, the paper feeds ready to receive the perforations for the next character, and the action of the paper feed admits air to the opposite side of the PISTON of the air engine, so that the BELL CRANK moves back to its position of rest when the Repeater is not used. *Sixth*, the BELL CRANK thus being removed from the path of the VALVE BARS, the compound VALVE BARS for the quad or leader KEY being held down, now expand to their full length, operating the two PISTONS for the KEY held down; the paper is again perforated for this character, and again the BELL CRANK moves forward, as already described, so that the PLUNGERS again cut off the air from the PISTONS controlled by this KEY, and the paper feeds again for the next perforation.

553 Thus, as long as the BELL CRANK reciprocates; that is, as long as the REPEATER KEY is held down and the air engine operates, the PLUNGERS move back and forward, admitting and cutting off the air from their PISTONS exactly the same as if their KEY was being hand operated, but, of course, at a very much greater speed. The air engine is just the same, in principle, as a steam eingine: air pressure being admitted first to one side of the operating PISTON connected with the BELL CRANK and then to the other side of this PISTON, causing the PISTON to reciprocate and oscillate the BELL CRANK as described. The action of the paper feed mechanism controls the admission of air to this air engine, just as the slide valve of a steam engine controls the admission of steam to the two ends of the cylinder. Thus, the air engine operates the paper-punching mechanism, including the paper feed, which, in turn, operates the air engine by admitting air first to one side of its PISTON and then to the other, exactly the same in principle as the piston of a steam engine, through the connecting rod, rotates the main shaft which carries the eccentric which, in turn, operates the slide valve that controls the admission of steam to the two sides of the piston.

554 It should be noted that the above explanation of the air engine is a "skeleton picture" in words, just as Fig. 35, Plate III, facing page 100, is a "skeleton picture" in lines; actually, the

air engine has two PISTONS, but it is the principle of this engine and not the details of its mechanism that interests us now.

555 For the Style DD KEYBOARD (Fig. 125, page 208) the operation of the Repeater Unit is, of course, exactly the same as for the single KEYBOARD, because the DD KEYBOARD has but one KEY mechanism, which is identical with the KEY mechanism on the single KEYBOARD.

556 The Ninety-em Unit is the same in principle as a wide carriage for a typewriter: it provides for increasing the travel of the EM RACK 4KB1 (Plate V, at back of book) from sixty-five to ninety ems. This means that broadside tables may be composed in one line without double justification (¶354), because even with a six-set face the Ninety-em Unit provides for setting in one operation matter forty-five picas wide. In offices handling any amount of wide measure

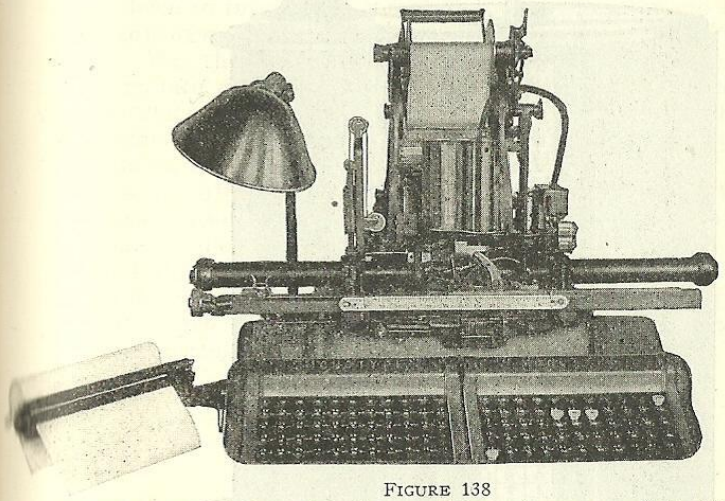


FIGURE 138
Electric Light Unit: Shows COPY LIGHT and SCALE LIGHT as applied to Style D KEYBOARD.

composition this unit very quickly pays for itself, because its use means the following savings: (*a*) One justification for every line; (*b*) one restoring of the EM RACK for every line; (*c*) one revolution of the CASTING MACHINE for every line.

557 To apply this unit to a Style D KEYBOARD, the UNIT WHEEL STANDARD complete is replaced with a STANDARD that carries the NINETY-EM SCALE, the longer EM RACK and SLIDE for use with this SCALE, and also the longer DRIVING CYLINDERS and UNIT-WHEEL DRIVING RACK. Note that the Ninety-em Unit cannot be applied to the Style DD KEYBOARD (Fig. 125, page 208) since there is not room on this BOARD for the longer DRIVING CYLINDERS and EM-RACK SLIDE.

558 The Electric Light Unit (Fig. 138) completely solves the question of proper illumination for the KEYBOARD, because it pro-

vides not only a scientifically designed COPY LIGHT that properly places the light on the copy, where the operator requires it, and keeps the light out of the operator's eyes, as shown in Fig. 120, page 194, but also it provides a special light for the JUSTIFYING SCALE (for details see Fig. 139). This light for the JUSTIFYING SCALE is carried in a frame which also carries a magnifying LENS, and through this LENS the operator reads the figures on the JUSTIFYING SCALE with-

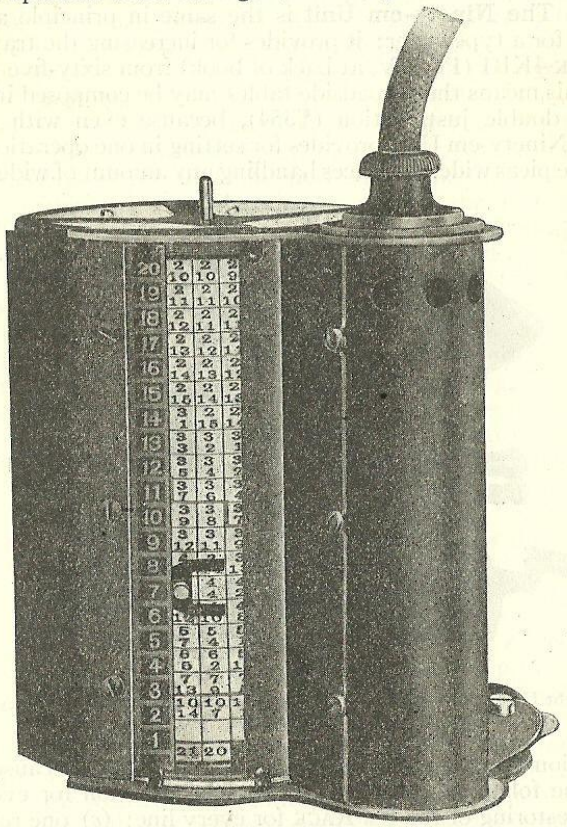


FIGURE 139

LENS and SCALE LIGHT: The LENS magnifies the figures, making them easy for the operator to read without bending forward. The electric light in the cylinder at the right lights automatically at the end of the line, illuminating the SCALE and notifying the operator to terminate the line.

out moving forward in his seat, quite as easily as reading the figures on a wall calendar.

559 The Justifying Scale Light serves also another purpose; experiments prove that a signal to the eye is less tiring than a signal to the ear, and so this SCALE LIGHT is arranged to take the place of the bell signal to terminate the line: *When a line may be justified, that is, when sufficient characters have been struck, this Scale Lamp lights automatically and remains lighted until the Keyboard is restored* (¶105) *to set the next line.* As some operators, from force of habit, prefer the bell signal, this may be used also, in addition to the light signal, if the operator desires.

560 Eye-strain is one of the chief sources of fatigue, and fatigue means loss of product; perfect illumination, for bad lighting is the cause of most eye-strain, is of the utmost importance to the progressive employer who is interested in obtaining maximum efficiency by providing for the comfort of his employees. All science rests upon the law of the conservation of energy; in the same way the highest industrial efficiency rests upon the conservation of energy because, by protecting the producer from useless work, the employer gets more work and better work. The fundamental idea in the design of the MONOTYPE and in the perfection of all new units for it has been to furnish the compositor with a machine to transform copy into composition at the maximum speed with the minimum effort. We, therefore, are constantly making scientific studies, in most minute detail, of the various operations performed by the MONOTYPE operator. Then we analyze and study these data so that, by modifying the methods of working and, if necessary, perfecting new units, all useless motions are eliminated. Great as is the increase in output thus produced, this is to us less impressive than the conservation of the operator's energy, because the elimination of needless fatigue enables him to get more out of life, both in his working and in his leisure hours. *We hold that for a man to be a good citizen in the broadest sense he must not be too tired at the end of his day's work to be able to enjoy and profit by the marvelous opportunities for self-development that this age offers on every hand.*

GLOSSARY

PART I

NOTE.—All references in the following are to Part I of this book, unless otherwise specified.

Air Bar. ¶11. A grooved bar on the CASTING MACHINE which alternately clamps and releases the paper ribbon as it is fed through the machine. When it clamps the paper, air is admitted to the groove and passes through the perforations in the paper to the PIPES thus uncovered; these PIPES lead to the AIR PINS (which see) controlling the movement of the MATRIX CASE and NORMAL WEDGE. Before the paper is unclamped the air is automatically shut off from the BAR.

Air Chamber. ¶251. The reservoir in the VALVE BANK of the KEYBOARD, from which air is admitted to the various PIPES leading to the PISTONS (which see) that operate the punching and counting mechanisms when the VALVE-BANK PLUNGERS (which see) are opened by the striking of a KEY.

Air-chamber Pet Cock. A valve underneath the back of the KEYBOARD, used for draining off any water that may collect in the AIR CHAMBER if all moisture in the air is not removed by the Condensing Tank (which see). This PET COCK should be opened for a few seconds in the morning, before starting work, and at night so that the air may blow out any moisture that may have collected.

Air Compressor. See COMPRESSOR.

Air Pins. ¶12. Twenty-eight AIR PINS on the CASTING MACHINE are lifted, not more than two at a time, by air admitted through the perforations in the paper ribbon. These PINS regulate the movements of the CASTING MACHINE, causing it to move the MATRIX CASE to bring the MATRIX for the character to be cast over the MOLD into casting position, and also to position the NORMAL WEDGE to give the correct size body when the MOLD BLADE is drawn back to cast the type. Three additional AIR PINS control the space-sizing mechanism (Chapter XIV, page 41).

Alignment. ¶281. The relative position of a character on its body; see LINING GAGE.

Allowance for Rule. ¶185, page 28 of Part II, and Plate VIII (at back of book). Making the type line short in tabular matter, either by reducing the measure or by putting in "deadwood" (which see) so that, when the table is made up and strip rule (which see) inserted, its total width will be the measure required.

Allowance for Squeeze. ¶160, page 28 of Part II, and Plate VIII (at back of book). Increasing the length of line over the required measure so that, when the type is locked up, the full pressure will come on the type lines and not on rules or leads between the lines.

Arrangement. See KEYBOARD LAYOUT.

Arrangement. See MATRIX CASE ARRANGEMENT.

Arrangement of Punches. See PUNCHES.

Automatic Cutter Unit. ¶525 and Fig. 131 (page 225). Part of the Lead and Rule Unit (which see) for automatically cutting the product of the LEAD AND RULE MOLD (which see) exactly to any desired length from six picas to twenty-five inches or longer if tripped by hand. The shorter lengths are caught in a box; those longer than nine picas are automatically stacked.

Automatic Repeater Unit. ¶547 to ¶555 inclusive. An attachment which may be applied to either the D or DD KEYBOARD for operating the KEYBOARD mechanically, by means of a little air engine instead of by hand, to repeat any character or space the operator desires, at the rate of ten keystrokes a second. To use the Repeater the operator holds down the REPEATER KEY (the green KEY in the lower left corner of the left KEYBANK) and then depresses the KEY for the character or space to be repeated—a quad, a leader, or any character or space on the BOARD—the KEY thus held down repeats as long as both KEYS are depressed. The wonderful simplicity of the Repeater Unit and the ease with which the operator controls it conserves his energy—"He works while

he rests" and on quads and leaders produces more than 25,000 ems per hour with no more effort than holding down two KEYS.

Automatic Revolution of the Justifying Scale. ¶122 and Footnote page 28. The mechanism which causes the JUSTIFYING SCALE to start to revolve automatically when the EM-RACK POINTER (which see) passes the four-em mark on the EM SCALE (which see), so that when the last KEY for a line has been struck the JUSTIFYING-SCALE POINTER will indicate on the JUSTIFYING SCALE the correct justification for the line. NOTE: On older KEYBOARDS not equipped with the Automatic Revolution the SCALE does not revolve at the end of the line until the operator presses the SCALE KEY. This SCALE KEY is the green KEY in the lower right corner of the left KEYBANK and is inoperative on D BOARDS equipped with the Automatic Revolution.

Bases for Cuts. See CUT MOUNTING.

Bell. Plate V (at back of book). The sound of the BELL notifies the operator when the line is within four ems of being complete. On the DD KEYBOARD (which see) and on all D KEYBOARDS equipped with the Electric Light Unit (which see) SIGNAL LIGHTS are used instead of BELLS or in conjunction with BELLS.

Blank Matrix. A MATRIX (which see) without a character driven in the lower end (opposite the cone-hole), used for casting quads and spaces. If the blank has no cone-hole, it produces a low quad or space (¶392).

Button. See KEY.

Button Clip. See KEYBUTTON CLIP.

Cap. ¶301. To put KEYBUTTON CLIPS (which see) on the KEYS when changing MATRIX CASE arrangements; thus the KEYS for characters omitted from the CASE are capped with CLIPS containing the characters that replace them.

Capping Sheets. ¶316. To avoid the use of needless extra KEYBANKS the standard KEYBANKS may frequently be changed to suit the new arrangement by using a few KEYBUTTON CLIPS (which see) to cap the KEYS for the characters changed. The details of these KEYBUTTON CLIPS are shown on capping sheets which are similar to Plate IX at the back of this book. These capping sheets are furnished with the font when required.

Case. See MATRIX CASE.

Casting Machine. ¶1 and Frontispiece. The COMPOSING MACHINE casts and composes type in automatically justified lines in any size from five- to twelve-point inclusive (18-point inclusive if the Fourteen- and Eighteen-point Composition Unit is applied), and in any width up to forty-two picas (60 picas if the Wide Measure Unit is applied). By the ribbon perforated at the KEYBOARD it is controlled in all its operations by the KEYBOARD operator. When equipped with the Display Type Unit, it is the standard MONOTYPE COMPOSING MACHINE AND TYPE CASTER, and may then be used also for making type to be set by hand, all sizes, including thirty-six-point, the same as the TYPE & RULE CASTER (which see). When equipped with the Lead and Rule Unit (which see), it will also cast continuous strips of rules and high and low leads and slugs, any size from two- to twelve-point, and automatically cut them to any length from six picas to twenty-five inches.

Casting Machine Stop Motion. See STOP MOTION.

Cellular Matrix. See MATRIX.

Centering Pin. ¶13 and Fig. 4 (page 6). A rod carried in an adjustable BUSHING in the BRIDGE of the CASTING MACHINE. The lower end of the CENTERING PIN is tapered to fit exactly the cone-hole of the MATRIX, which it enters at each revolution of the machine, to locate the MATRIX accurately, so that the character cast from it will be properly positioned on its body, and to clamp the MATRIX on the MOLD while the type is cast. After the character is cast the CENTERING PIN raises out of the cone-hole of the MATRIX for the character just cast, and the MATRIX CASE moves to bring the MATRIX for the next character over the MOLD into casting position.

Centering-pin Bushing. ¶13. An adjustable holder for the CENTERING PIN (which see) that can be moved right or left, front or back, and then locked in the required position. The STAND that carries this BUSHING is adjusted, in changing from one MATRIX CASE to another, to position correctly on their bodies the characters of the font to be cast, both point-ways (for alignment) and set-ways (for idebearing). (See also LINING GAGE.)

Centering-pin Micrometer. ¶281. Two SCREWS on the CASTING MACHINE for adjusting the BUSHING carrying the CENTERING PIN when lining up. One SCREW adjusts

the CENTERING PIN for alignment, the other for sidebearing. The heads of these SCREWS are graduated to correspond with the graduations on the head of the screw on the lining gage (which see). Thus the CENTERING PIN is quickly adjusted by turning the MICROMETER SCREWS as many notches as the graduations on the lining gage indicate that the character needs to be moved on its body to bring it to correct position.

Change Box. ¶331 and Fig. 90 (page 145). A wooden box for temporarily storing MATRICES taken from a MATRIX CASE to make room for special characters. The box has fifteen slots corresponding to the fifteen rows of the MATRIX CASE, and is provided with a sliding lid to protect the MATRICES.

Changing Pica Ems to Ems of Any Set. Chapter XVIII (page 52) and Plate VII (at back of book). Converting the measure given in picas into ems and units of the set of the face to be composed.

Cleaning Rod. ¶436 and Fig. 115 (page 188). A metal rod about three feet long with a handle on the upper end and on the lower end a perforated cup in which is placed the metal cleaner (which see); the rod is then used to stir the molten metal in the melting furnace (which see), thus carrying the metal cleaner to the bottom of the pot and mixing it thoroughly through the metal to bring the dross to the top.

Clip. See KEYBUTTON CLIP.

Column Pusher. ¶150. A mechanism on the CASTING MACHINE that pushes the completed line, after it has been pulled forward from the type channel (which see) by the LINE HOOKS (which see), onto the galley. To permit this, the RULE (which see) lifts so that the COLUMN PUSHER may pass under it.

Comb. ¶16 and Fig. 6 (page 9). A toothed bar in which are carried fifteen COMPOSITION MATRICES; fifteen of these COMBS are carried in a MATRIX CASE. The MATRICES are grooved to fit between the teeth of the COMB and also to receive half the thickness of the front of the COMB in which they are carried, and, on the opposite side, half the thickness of the back of the COMB for the next row of MATRICES. NOTE: For Fourteen- and Eighteen-point Composition (which see) there are but ten COMBS in the MATRIX CASE: seven of these have teeth spaced .2″ and three have teeth spaced .3″; the principle, however, is the same as the standard COMBS.

Composition Matrix. See MATRIX.

Composition Matrix Holder. ¶361 and Fig. 94 (page 159). A HOLDER which takes one COMPOSITION MATRIX at a time for casting sorts. It is used with either regular COMPOSITION MATRICES or the MATRICES leased for sorts casting, for sizes twelve-point and smaller.

Composition Mold. See TYPE MOLD.

Compressor. An air pump for furnishing compressed air, at from twelve to fifteen pounds pressure, to drive the KEYBOARD and to control the CASTING MACHINE. The compressor is equipped with an automatic governor so that, when no air is being used, the compressor runs light without compressing air.

Condensing Tank. A tank used to cool the air, after it leaves the compressor, to condense the moisture in the air, which moisture is collected in a trap and thus prevented from being carried by the air into the KEYBOARD and CASTER. The air from the compressor passes through a coil in the condensing tank before it goes to the storage tank. This coil is cooled by the circulation of water around it; the water for the tank comes from the main water supply. The tank should be hung so that its bottom is about ten feet above the floor on which the CASTING MACHINE is placed, so that the water from it may be used for cooling the MOLDS and also in the water jacket of the compressor.

Cone-hole. See MATRIX.

Constant Justification. ¶121. The name given to the combination of JUSTIFYING KEYS (which see), struck at the end of a line, that will exactly fill the measure if the justifying spaces are cast the same width as the KEYBOARD counts them; that is, four units. Or, this may be defined as the JUSTIFYING KEYS indicated when the JUSTIFYING SCALE (which see) revolves, when its KEY is depressed at end of line, so that its zero column is presented to the SCALE POINTER. Obviously, for a line that exactly fills the measure (no shortage to be distributed over the justifying spaces) the JUSTIFYING KEYS to strike at end of the line will be the same whether the line contains one, or twenty, justifying spaces; therefore, the justification given in the zero column of the JUSTIFYING SCALE (Scale Constant column) is the same for all positions of the POINTER. To find the Scale Constant for any set look at the Scale Constant column (zero column) of the JUSTIFYING SCALE for that set.

Continuous Strip Rule. See STRIP RULE.

Convertible Caster. See TYPE & RULE CASTER.

Copyfitting. ¶472 and book "Copyfitting." The system of making copy and cuts fit the allotted space by accurately measuring the typewritten copy and cuts and then planning the work.

Copy Holder. ¶449. A frame carried at the side of the KEYBOARD having two rollers between which the copy is held and advanced, as required, by turning the rollers.

Copy Hook. A hook on the side of the KEYBOARD on which to place copy.

Copy Light. ¶452, ¶558, and Fig. 138 (page 237). An adjustable bracket on the KEYBOARD carrying an electric light and shade so arranged that the light can be thrown on the copy and kept out of the operator's eyes. Part of the Electric Light Unit (which see).

Corrector. ¶358. A compositor who knows the relative unit values of MONOTYPE characters and who uses this knowledge when correcting MONOTYPE composition, by hand at the case, to save time and labor.

Counting Mechanism. Chapter XI (page 30). The portion of the KEYBOARD that measures the unit width of characters and spaces as struck and adds this to the sum of the width of the characters and spaces previously struck in the same line. This mechanism also counts the justifying spaces (which see).

Cross Block. ¶14 and Fig. 11 (page 15). A reciprocating BLOCK in the MOLD, attached to the right end of the TYPE CARRIER by a COUPLING, and moving right and left with it. The CROSS BLOCK forms one side of the MOLD opening in which the type is cast; in the CROSS BLOCK is also cast the jet which is sheared from the foot of the type and returned to the MELTING POT by the movement of the GATE PUSHER of the CROSS BLOCK as the BLOCK moves to the right, so that the CARRIER can receive the type which is pushed into it by the forward movement of the MOLD BLADE.

Cross Girt. ¶11. The part of the CASTING MACHINE on which the AIR BAR (which see) clamps the paper and from which the AIR PIPES lead to the AIR PINS (which see).

Cut Mounting. Footnote (*e*) (page 3). Where the MONOTYPE system of copyfitting (which see) is used, the allowance for a cut is made at the KEYBOARD by the operator putting in quads where the cut is to be. After the matter is made up, the cut is cemented in place, using the quads as a base, thus avoiding all overrunning or justifying of cuts by hand. Cuts may also be mounted on thirty-six-point quads or on slugs made up by hand.

Cutter. See AUTOMATIC CUTTER.

D Keyboard. Frontispiece. The KEYBOARD with one counting and one perforating mechanism.

DD Keyboard. Fig. 125 (page 208) and Chapter XLVIII (page 209). The KEYBOARD with two counting and two perforating mechanisms, and a SWITCH so that either the right or left counting and perforating mechanisms may be used independently to save rehandling of copy, etc., or simultaneously for duplicating (which see).

Dead Line. ¶356 and ¶357. A line "killed" by the KEYBOARD operator because it contains an error that cannot be easily fixed by the corrector. If the error be in the first quarter of the line, the operator may "kill" this portion of the line by turning back the ribbon and cancelling the characters struck with a JUSTIFYING KEY to lock the PUMP and prevent these characters from being cast. If the error be in the last three-quarters of the line, it saves time for the operator to strike an eighteen-unit character (a cap diphthong or fraction) to fill out the line and then justify as usual. Thus, the CASTER is not stopped and the "dead line" is removed by the corrector.

Deadwood. Ex. 22 (page 29 of Part II). Characters set by the KEYBOARD operator, of the proper width, to be replaced by rules, initial letters, side heads, etc.

Display Matrix. See SORTS MATRIX.

Display Type. ¶362. The larger point-sizes of type (above 12-point), cast as sorts to be set by hand from the case, instead of being cast in automatically justified lines.

Display Type Normal Wedge. See NORMAL WEDGE.

Display Type Unit. ¶520 to ¶522 inclusive. An attachment for the CASTING MACHINE required for casting type from SORTS MATRICES (which see) and for casting

leads, rules, and slugs. It is furnished as part of the TYPE & RULE CASTER and can also be applied to the composing machine. It provides for, (*a*) Increased stroke of the MOLD BLADE; (*b*) Increased PUMP capacity; (*c*) Increased pressure on CENTERING PIN; (*d*) HOLDER for SORTS MATRICES; (*e*) TYPE CHANNEL BLOCKS for large type; (*f*) WEDGES adjustable by hand. It includes also the MOLDS for casting type from SORTS MATRICES and the SPEED REGULATING UNIT (which see).

Distribution. A waste of the compositor's time; made obsolete in up-to-date composing-rooms by the non-distribution system (which see).

Double Em Scale. ¶171 to ¶175 inclusive. An auxiliary paper scale attached to the regular celluloid EM SCALE. Used for inserts of one set in text of a different set. The graduations on the paper scale are numbered from left to right and the width of the spaces on the paper scale bear the same relation to those on the celluloid EM SCALE as the set of the inserts bears to the set of the text. The zero of the paper scale is directly under the EM-RACK POINTER (which see) when this is as far to the left as possible, in position to begin a line.

Double Justification. Chapter XXV (page 71) and ¶488 to ¶492 inclusive. The method of independently justifying with justifying spaces different sections of the same line, in order that each section may be justified to its measure and the sum of these measures may equal the total measure. (See JUSTIFICATION.)

Double Keyboard. See DD KEYBOARD.

Double Matrix. Chapter XXXIV (page 116), ¶321, and Fig. 53 (page 117). A MATRIX .2″ × .4″ (double the size of the ordinary MATRIX) carried in the MATRIX CASE with the regular MATRICES (.2″ × .2″), for producing figures, or other characters, up to thirty-six points in size in regular composition. (See also FOURTEEN- AND EIGHTEEN-POINT COMPOSITION UNIT.)

Driving Rack. ¶88. A rack on the KEYBOARD that rotates the UNIT WHEEL (which see) by means of a PINION on its SHAFT. Air pressure acting on the right end of the RACK (PISTON in DRIVING CYLINDER) rotates the UNIT WHEEL left handed to count units when a line is being set. When a RESTORING KEY (which see) is depressed, the air pressure is transferred to the left end of the RACK and the UNIT WHEEL revolves right handed (clockwise) to position the BOARD for the next line to be set.

Dross. ¶438. Oxide of lead and dirt that must be removed from metal in the MELTING POT of the CASTING MACHINE and also from the type melted in the melting furnace to be cast into pigs. (See METAL CLEANER.)

Duplicating. ¶481, ¶485, ¶488, and Fig. 126 (page 209). An exclusive feature of the MONOTYPE made possible by the DD KEYBOARD; producing the same matter in different faces, point-sizes, and measures at the same KEYBOARD from the same keystrokes.

Eighteen-point Composition Unit. See FOURTEEN- AND EIGHTEEN-POINT COMPOSITION UNIT.

Eight-unit Leader. ¶198 and ¶200. A leader of exactly the same face as the nine-unit leader, but cast central on a body eight units wide. (It is *not* a 9-unit leader MATRIX carried in the 8-unit row.) It is used to bring the UNIT WHEEL to even ems when the UNIT INDICATOR shows any number from five to eight inclusive. (See also LEADERS and TEN-UNIT LEADER.)

Electric Light Unit. ¶452, ¶558, ¶559, and Fig. 138 (page 237). This consists of, (*a*) A scientifically designed COPY LIGHT (which see) that properly places the light on the copy and keeps it out of the operator's eyes; (*b*) A special light for the JUSTIFYING SCALE, carried in a frame with a magnifying LENS through which the operator easily reads the enlarged figures on the SCALE without leaning forward in his seat. This JUSTIFYING-SCALE LIGHT also serves as a signal to end the line, for it lights up when sufficient characters have been put in the line so that the line may be justified and it stays lighted until the KEYBOARD is restored. This light may also be turned on at any point in the line by hand by pushing to the right the front end of the BELL TRIP LEVER 3KB1 (Plate V, at back of book), the same as if tripped by the PIN in the EM RACK 4KB1 when the EM-RACK POINTER a4KB3 passes the four-em mark on the EM SCALE a9KB1. To put the light out again without restoring, before the EM-RACK POINTER has reached the four-em mark on the EM SCALE, the BELL HAMMER 2KB1 is pulled forward far enough to be caught and held by the BELL TRIP LEVER 3KB1.

Electrotype Guards. ¶414 and ¶524. One product of the TIE-UP SLUG MOLD (which see), consisting of a twelve-point slug with a recess for string in the side and a six-point electrotype height bearer cast at the side of the body. Like all products of the LEAD AND RULE MOLD family, these guards are cast in continuous strips of any length and

automatically cut to any desired length from six picas to twenty-five inches. (See also LEAD AND RULE MOLD UNIT and AUTOMATIC CUTTER UNIT.)

Em. ¶44 and ¶48. The width of the widest (18-unit) character of the font; cap M, for example. The MONOTYPE em is square only when the set of the face is the same as its point-size; for example, 10-point No. 8, which is ten-set. The EM SCALE of the KEYBOARD always indicates ems of the same set as the JUSTIFYING SCALE in use.

Em-quad. Fig. 8 (page 10), and ¶18. A space eighteen units (1 em, which see) wide. An em-quad KEY is carried at the bottom of both right and left KEYBANKS for convenience. In the MATRIX CASE, however, there is but one MATRIX for the em-quad and this is always carried in the right front corner of the CASE (operating position); that is, at the intersection of the right and front rows. No perforations are made in the ribbon by the em-quad KEYS.

Em Rack 4KB1. ¶98 and Plate V (at back of book). A rack on the KEYBOARD driven by the PINION on the SHAFT of the UNIT WHEEL (which see), and, therefore, moving in unison with it. Its POINTER a4KB3 measures on the EM SCALE (which see) its movement and indicates at all times the number of ems and half-ems the line is short of zero. Thus, the EM RACK measures the number of ems and half-ems required to complete the line, while the UNIT WHEEL measures the number of units (one-eighteenth of an em) required to complete a half-em.

Em-rack Pointer a4KB3. ¶98 and Plate V (at back of book). A finger attached to the EM RACK (which see). It indicates upon the EM SCALE of the KEYBOARD the ems and half-ems that must be added to the line to complete it.

Em-rack Stop X6KB. ¶177, Plate V, and Fig. 146 on Plate X (at back of book). A movable abutment on the KEYBOARD which limits the motion of the EM RACK to the left. It may be instantly adjusted to within one-half em of any desired measure, within the capacity of the KEYBOARD, by pressing its HANDLES together; the finer adjustment being obtained by the EM-RACK-STOP ADJUSTING SCREW (which see). For method of setting the STOP, see Plate X (Figs. 146 and 147).

Em-rack-stop Adjusting Screw X8KB. ¶178, Plate V, and Fig. 147 on Plate X (at back of book). A thumbscrew at the left end of the EM-RACK SLIDE on the KEYBOARD. Used to position the EM-RACK STOP (which see) accurately so that the UNIT INDICATOR (which see) will show the desired number of units after the EM-RACK STOP has been set to the nearest half-em.

Em Scale a9KB1. ¶99 and Plate V (at back of book). A strip of celluloid graduated into 130 equal parts, each of which represents a half-em; thus, the SCALE indicates any measure up to, and including, sixty-five ems of the set being composed. (The older KEYBOARDS are equipped to indicate any measure up to 60 ems inclusive and the EM SCALE on these is, therefore, graduated into 120 equal parts. On KEYBOARDS equipped with the Ninety-em Unit, which see, the EM SCALE indicates any measure up to 9 ems inclusive and is, therefore, divided into 180 equal parts.) The chief function of the EM SCALE is to measure the amount required to complete the line, and, therefore, since the EM RACK moves toward the right as the line progresses, the zero of the EM SCALE is at the right end. In setting tabular matter the points where the different sections of the line begin are marked with a china-marking pencil on the EM SCALE (footnote, page 33).

Em-scale Clip. ¶161, Fig. 25 (page 53), and Plate V (at back of book). A spring clip, one at each end of the EM SCALE, for holding Paper Em Scales and Double Em Scales (see both).

Em Scale, Double. See DOUBLE EM SCALE.

Em Scale, Paper. See PAPER EM SCALE.

En-quad. Fig. 8 (page 10). A fixed space nine units wide. An en-quad KEY is carried at the bottom of both right and left KEYBANKS for convenience. In the MATRIX CASE, however, there is but one MATRIX for the en-quad.

Even Em, or Half-em. When a graduation of the UNIT WHEEL (which see) coincides with zero of the UNIT INDICATOR, the KEYBOARD is said to be at even ems, or half-ems, depending upon whether the EM-RACK POINTER coincides with an em, or half-em, graduation on the EM SCALE (which see).

Even on the Wheel. Bringing the KEYBOARD to "even ems" (which see) by using eight- or ten-unit leaders or spaces.

Extra Characters. Chapter XXII (page 63). Any character used but not carried in the MATRIX CASE is an extra character; when one of these is required, the operator

strikes a KEY for a character of the same width; this is exchanged for the required character by the corrector without affecting the justification. (See SIGNAL CHARACTERS.)

Fixed Leader. See LEADERS.

Fixed Space. ¶192. A space cast the same size it is counted by the KEYBOARD; that is, counted and cast just the same as a character. A fixed space of any unit value, not regularly carried in the MATRIX CASE, can be obtained by omitting an infrequently used character of the size desired and substituting for it a blank MATRIX; the corresponding BUTTON on the KEYBOARD should, of course, be capped with a KEYBUTTON CLIP (which see) marked for the space. The justifying space becomes a fixed six-unit space after the twentieth justifying space has been put into the line, or it may be made a fixed six-unit space at the will of the operator at any time by pulling out the SPACE-CUT-OUT-OPERATING-ROD HEAD 16KA5, Plate V (at back of book). When constant justification (which see) is used, the justifying space becomes the equivalent of a fixed four-unit space.

Flux. See METAL CLEANER.

Font. Chapters XXXI (page 101), XXXV (page 119), and XXXVI (page 130). A full font consists of the COMPOSITION MATRICES for one point-size of a face, including caps, small caps, lower case, and figures of Roman, and caps, lower case, and figures of Italic, also punctuation marks, signs, fractions, etc., that is, the two hundred and twenty-five MATRICES, including blanks for spaces, required to fill the MATRIX CASE. A partial font consists of caps, lower case, figures, and points, from seventy-two to eighty-two characters, depending upon whether ligatures are supplied. A few partial fonts consist only of caps, points, and figures, about forty-six characters; or small caps only, twenty-seven characters.

Foreign Languages. ¶273. For setting foreign languages the MONOTYPE is in a class by itself: *First*, because the MATRICES for the necessary accents may be inserted in the MATRIX CASE (for example, see French Arrangement FC, Fig. 62 (page 126); *second*, because by using proper KEYBARS these accents may be grouped on the KEYBOARD with the alphabets with which they are used; *third*, because we furnish the accents for all MONOTYPE faces used in composition for the following languages: French, Spanish, Dutch, German, Italian, Portuguese, Swedish, Norwegian, Bohemian, Danish, Polish, Hungarian, Russian, Ruthenian, Lithuanian, and Greek.

Foundry Guards. See ELECTROTYPE GUARDS.

Fourteen- and Eighteen-point Composition Unit. ¶526 to ¶535 inclusive. An attachment for the Standard MONOTYPE (which see) which enables it to cast type in automatically justified lines for faces as large as eighteen-point and containing characters as wide as eighteen points; without this attachment the largest faces that can be composed are twelve-point, with a maximum width for characters of twelve and one-half points. At the KEYBOARD are required: (*a*) Special right and left KEYBARS; (*b*) special STOPBARS; (*c*) special adjustment of UNIT-RACK ABUTMENT. At the CASTING MACHINE are required: (*a*) Special MATRIX CASE and COMBS for holding the 135 MATRICES (Roman with either Italic or Boldface) composing the font; (*b*) special STOP RACKS and AUXILIARY LOCKING BARS for positioning this MATRIX CASE; (*c*) special NORMAL WEDGE; (*d*) special JUSTIFYING WEDGES; (*e*) Display Type Attachment to give increased stroke of MOLD BLADE and TYPE CARRIER and increased PUMP capacity; (*f*) Speed Regulating Attachment; (*g*) special adjustment of CHANNEL BLOCKS, COLUMN PUSHER, and SPACE TRANSFER WEDGE.

Full Font. See FONT.

Furnace. See MELTING FURNACE.

Galley Mechanism. Chapter XVII (page 49). That part of the CASTING MACHINE which pulls the assembled line out of the type channel and places it on the galley.

Gate. See JET.

Graduation. See UNIT WHEEL.

Guide Keys. ¶464. The KEYS on which the little fingers rest when the operator fingers the BOARD correctly—"*always hit the same Key with the same finger.*"

Hand Wheel. ¶447. A WHEEL on the COLUMN SCREW supporting the KEYBOARD. By turning this HAND WHEEL the KEYBOARD can be either raised or lowered.

Hand Wheel. ¶373. A WHEEL on the end of the WORM SHAFT on the CASTING MACHINE. Used for turning the CASTING MACHINE by hand.

Height-to-paper. ¶39, ¶42, and Fig. 16 (page 20). The distance from the surface on which the foot of the type rests to its face; that is, the surface which takes ink and prints on the paper. Height-to-paper equals .9186″. To determine whether a MOLD will produce type of the proper height-to-paper, measure the high quad; if this measure less than .886″ for a COMPOSITION MOLD, or .866″ for a SORTS MOLD (for use with SORTS MATRICES), the MOLD should be restored to height.

Interspacing. See LETTER SPACING.

Irregular Spacing. Chapter XXIX (page 93). Using larger size justifying spaces between certain words of a line (when a full height letter follows a similar letter) to preserve the typographic traditions of hand-set type when spacing could not be uniform.

Jet. ¶14. When a type is being cast, the metal is forced into the MOLD through a wedge-shaped chamber; the metal in this chamber cools with the type and forms what is known as a "jet" (sometimes called a "gate"). This jet is cut from the foot of the type by a slight movement of the CROSS BLOCK to the left, and is thrown back into the MELTING POT when the CROSS BLOCK (which see) moves to the right.

Justification. Chapter X (page 27) and ¶213. Making the line fill the measure. In general there are two methods of justification: first, justification with the justifying spaces (which see); second, justification with fixed spaces (which see). All forms of justification are a modification, or combination, of these two methods. When justifying spaces are used, the term "justification" may be still further defined as the process of distributing over the justifying spaces in a line, or portion of a line, after the last character has been struck, the difference between the length of this line, or portion of line, and the required measure for the line, or portion of line. If the justifying spaces in a line are not all of the same size, it is called "double justification" (which see).

Justification Wedge. See JUSTIFYING WEDGES.

Justification-wedge Gage. See JUSTIFYING-WEDGE GAGE.

Justifying Character. See LETTER SPACING.

Justifying Keys. ¶76 and ¶131. Thirty red KEYS in two horizontal rows at the top of the KEYBOARD, each row numbered in white, from left to right, 1 to 15 inclusive. Their chief function is to control the position of the JUSTIFYING WEDGES (the space-sizing mechanism) at the CASTING MACHINE. The upper row controls the front WEDGE which, for each position, as it moves from right to left, adds .0075″ to the size of the justifying space; thus, No. 1 KEY in the upper row adds nothing to the justifying space, No. 2 KEY adds .0075″, No. 3 KEY .0150″. In the same way the lower row of JUSTIFYING KEYS controls the rear WEDGE; No. 1 KEY in the lower row adds nothing to the justifying space, No. 2 KEY adds .0005″, No. 3 KEY adds .0010″. The perforations made by the JUSTIFYING KEYS indicate, on the ribbon, the end of the line, for the PUNCHES operated by these KEYS are larger than the character PUNCHES. In addition to controlling the JUSTIFYING WEDGES, these perforations also start the galley mechanism (which see) to place the completed line on the galley. When the VALVE HANDLE 29KC17 (Plate V, at back of book) at the left of the PAPER TOWER is turned to the rear, the lower row of JUSTIFYING KEYS act also as RESTORING KEYS (which see).

Justifying Leader. See LETTER SPACING.

Justifying Scale. ¶80, ¶102, Chapter XIII (page 38), Fig. 22 (page 38), and Plate VI (at back of book). A table made in cylindrical form and consisting of a celluloid coated card, on which the various combinations of JUSTIFYING KEYS (which see) are printed; this card is mounted, top and bottom, on aluminum heads. The SCALE of the set (which see) being composed is carried at the front of the KEYBOARD (see Plate V, at back of book) on a vertical axis and may be revolved by hand, to determine the JUSTIFYING KEYS required at any point in the line, and when the EM-RACK POINTER (which see) is within four ems of zero on the EM SCALE the SCALE revolves automatically and the JUSTIFYING-SCALE POINTER (which see) indicates on the SCALE the JUSTIFYING KEYS to strike to justify the line. NOTE: On older BOARDS not equipped with the Automatic Revolution of the JUSTIFYING SCALE it is necessary to press a KEY (see SCALE KEY) to revolve the JUSTIFYING SCALE when the EM-RACK POINTER has passed the four-em mark on the EM SCALE. The surface of the SCALE is divided into rectangles by lines that run around the SCALE and lines that run up and down it. In each rectangle are two numbers, one above the other, that refer to the upper and lower row of JUSTIFYING KEYS respectively. There are seventy-two vertical columns indicating units of the same set as the SCALE, and numbered at the bottom from zero to seventy-one inclusive; the twenty horizontal spaces represent justifying spaces; thus, the SCALE is in reality a table to indicate the JUSTIFYING KEYS to strike to justify a line that contains from one to twenty justifying spaces, and that is from zero to seventy-one units short of the measure. There are two diagonal red lines on the SCALE which are used as a guide to uniform spacing. A different SCALE is required for each set, and the set of the NORMAL WEDGE used at the CASTING MACHINE must always correspond with that of the SCALE. In double justification (which see) the SCALE is revolved by hand to obtain the justification for all sections of the line, except the last. The operator determines the number of units the section of the line is short from the EM SCALE and UNIT INDICATOR (which see), after striking the last character for this section of the line. He then revolves the SCALE, by hand, until the SCALE POINTER indicates the column on the SCALE for this number of units.

Justifying-scale Constant. See SCALE CONSTANT.

Justifying-scale Key. See SCALE KEY.

Justifying-scale Light. ¶558 and ¶559. An electric lamp carried in a frame with a magnifying LENS. The lamp automatically lights when the operator reaches that point in the line where it may be justified (four ems from zero); this lamp serves two purposes: (*a*) It acts as a signal to the operator to terminate the line; (*b*) it illuminates the JUSTIFYING SCALE so that the operator can read the magnified figures on the SCALE without leaning forward in his chair. This SCALE LIGHT is one part of the Electric Light Unit (which see).

Justifying-scale Pointer a14KB1. ¶103 and Plate V (at back of book). A horizontal finger on the KEYBOARD that indicates on the JUSTIFYING SCALE (which see) the number of perforations made by the JUSTIFYING-SPACE PUNCH (which see) for the line (or section of a line in double justification) being set. The POINTER rises one space on the SCALE each time the JUSTIFYING-SPACE BAR (which see) is struck to produce a justifying space, and each time the JUSTIFYING-SPACE-PUNCH KEY (which see) is struck, with a character KEY, to produce a character to be cast wider than it is counted by the KEYBOARD, that is, cast with justification added. The POINTER indicates on the SCALE the JUSTIFYING KEYS (which see) to strike to justify a line when the JUSTIFYING SCALE automatically revolves at the end of the line, provided the shortage to be distributed over the justifying spaces in the line is less than four ems. In the same way, for double justification, the POINTER indicates the JUSTIFYING KEYS to strike to justify a section of a line that is a known number of units short (obtained by reading the EM SCALE and UNIT INDICATOR) when the SCALE is rotated by hand to present to the POINTER the column for this number of units. When a RESTORING KEY (which see) or the RESTORING LEVER (which see) is depressed, the POINTER drops to its bottom position ready to count the spaces in the next line or section of a line. NOTE: The POINTER will not indicate more than twenty SPACE PUNCH perforations; therefore, that is the maximum number that can be used in a line or section of a line.

Justifying Space. ¶191. The space produced by the JUSTIFYING-SPACE BAR (which see). These spaces are counted by the KEYBOARD as four units, and the size they are cast (never less than the size they are counted) is determined by the JUSTIFYING KEYS (which see) struck at the end of the line in order to distribute evenly over these spaces the amount the line is short of the required measure after the last character for the line has been struck. In double-justified matter (which see) the shortage for a section of the line is distributed over the justifying spaces in that section of the line to justify it to its measure, without regard to the justifying spaces in another section of the same line. With constant justification (which see) justifying spaces become four-unit fixed spaces of the set in use; with three-eight justification (which see) justifying spaces become the equivalent of six-unit spaces. NOTE: With the Fourteen- and Eighteen-point Composition Unit (which see) the justifying space is counted as three units, and this is the minimum size justifying space cast on the CASTING MACHINE; with the Wide-spacing Unit (which see) the justifying space is counted as seven units and this is then the minimum size justifying space cast.

Justifying-space Bar. ¶86. A flat BAR at the bottom of each KEYBANK, occupying the width of five KEYS so that these BARS can be struck with either thumb without moving the hands from operating position. Striking either SPACE BAR operates the JUSTIFYING-SPACE PUNCH (which see) to produce justifying spaces which are counted as four units by the KEYBOARD. The size these spaces are cast, four units or larger, is determined by the JUSTIFYING KEYS struck at the end of the line. The SPACE BARS produce fixed six-unit spaces automatically after twenty justifying spaces have been put in the line, or, at the will of the operator, by pulling forward the KNURLED HEAD of the SPACE CUT OUT 16KA5, Plate V (at back of book).

Justifying-space Punch. ¶125. The PUNCH ("S" on the PUNCH-GUIDE INDEX PLATE, Fig. 24, page 48) used for justifying spaces or characters cast with justification added. This PUNCH makes the perforation in the ribbon that causes the CASTING MACHINE to back up the NORMAL WEDGE (which see) with the SPACE TRANSFER WEDGE (which see) and JUSTIFYING WEDGES (which see), instead of with the TYPE TRANSFER WEDGE (which see). Thus, the size of the justifying space cast from the six-unit position of the NORMAL WEDGE is determined by the position of the JUSTIFYING WEDGES and the justifying space is cast the size required instead of the four units it is counted by the

KEYBOARD. The SPACE PUNCH is operated in conjunction with the six-unit PUNCH by the SPACE BARS, or alone by the JUSTIFYING-SPACE-PUNCH KEY when this is struck with a character KEY, to cast the character wider than it is counted by the KEYBOARD.

Justifying-space-punch Key. ¶218. The lower right KEY on the right KEYBANK (KEY 238, Plate IX, at back of book) for operating the JUSTIFYING-SPACE PUNCH (which see). This KEY is never struck alone, but always with a character KEY, so that this character will be cast on a body wider than the KEYBOARD registered it. The amount of "justification" thus cast on a character depends upon the JUSTIFYING KEYS (which see) struck after the character.

Justifying Wedges 10D and 11D. ¶130, ¶131, ¶134, ¶135, ¶365, ¶366, ¶533, and Fig. 98 (page 162). Two WEDGES at the CASTING MACHINE which lie between the SPACE TRANSFER WEDGE (which see) and a fixed abutment. They are controlled by the perforations made by the JUSTIFYING KEYS at the KEYBOARD and, since these are the first perforations presented to the CASTING MACHINE for a line, these WEDGES are set to make the justifying spaces the size required for the line before a character in the line is cast. Each position of the front WEDGE 10D, as it is moved from right to left, adds .0075″ to the size of the justifying space; the increment for the rear WEDGE 11D is .0005″. When casting sorts of the smaller sizes, these WEDGES back up the NORMAL WEDGE 47S for all characters and spaces. For larger sizes of sorts, the rear JUSTIFYING WEDGE 11D is replaced by the special JUSTIFYING WEDGE 46S. For sorts casting the WEDGES are set by hand (see JUSTIFYING-WEDGE GAGE). With fourteen- or eighteen-point composition the regular JUSTIFYING WEDGES 10D and 11D are replaced by the special JUSTIFYING WEDGES.

Justifying-wedge Gage 46S1. ¶366 and Fig. 98 (page 162). A bar for setting the JUSTIFYING WEDGES by hand when casting sorts. It is graduated to correspond with the teeth of the JUSTIFYING WEDGES, and is numbered on every alternate graduation from one to eight inclusive, the intermediate lines on the GAGE being half graduations; that is, the second graduation from the left is 1½. When used to set the rear JUSTIFYING WEDGE 11D the graduations represent .0010″ difference in the width (set-size) of the type for each numbered graduation, or .0005″ for each half graduation; for the front JUSTIFYING WEDGE 10D the numbered graduations represent .0150″ or .0075″ for each half graduation. When used to set the display JUSTIFYING WEDGE 46S, which replaces the rear JUSTIFYING WEDGE 11D, the graduations represent one-eighth of a point, half graduations one-sixteenth of a point. In the right end of the GAGE is a hole which fits over a lug on the left end of the WEDGES. The reference mark for the GAGE is the left end of the TRANSFER-WEDGE-OPERATING-ROD-GUIDE CAP 54D1.

Justifying with Leaders. Bringing the EM-RACK POINTER (which see) and UNIT WHEEL to a given point by the use of eight- or ten-unit leaders (see both). (See also LEADERS.)

Kern. ¶62 and ¶295. The overhang of the character beyond the body on which it is cast. MONOTYPE type may kern at the right or left for certain Italic characters, for example "*f*," and at the top for figures cast from the DOUBLE MATRIX (which see).

Key. ¶9, ¶249, ¶250, ¶251, and Fig. 35 (Plate III, facing page 100). A LEVER carrying a celluloid BUTTON. There are 242 of these for characters and spaces (including the JUSTIFYING-SPACE-PUNCH KEY, which see), thirty JUSTIFYING KEYS (which see), one RESTORING KEY (which see), one SCALE KEY (which see), and two JUSTIFYING-SPACE BARS (which see); BOARDS equipped with the Automatic Repeater Unit (which see) have also a KEY for this. The compositor strikes the KEY for the character required; this causes the PUNCHES for this character to rise and perforate the ribbon while the counting mechanism automatically registers the width of the character and adds this to the sum of the widths of the characters previously struck.

Keybank. ¶253, ¶254, Fig. 33 (page 97), Fig. 36 (Plate III, facing page 100), and Figs. 140, 141, and 142 (Plate X, at back of book). A FRAME provided with thirteen RODS on which are 137 KEYS and one SPACE BAR. There are two of these FRAMES on each KEYBOARD, right and left. For different kinds of work, such as changing from a five to a six alphabet arrangement, the KEYBANK may be changed or the KEYS may be capped (see KEYBUTTON CLIP).

Keybar. ¶250, ¶255, ¶256, and Figs. 35 and 37 (Plate III, facing page 100). The BAR that connects the KEY with the ROCK SHAFTS (which see) that operate the VALVE-BANK PLUNGERS (which see) that admit air to the punching and the counting mechanisms. On the upper edge of each of the KEYBARS is a lug that the KEY engages; on the lower edge are two lugs so placed that theyen gage the two ROCK SHAFTS that operate the VALVES to make the perforations and register the unit width of the character for this KEY. In changing from one MATRIX CASE arrangement (which see) to another, the arrangement of characters on the KEYBOARD is not disturbed, but the same KEY may operate totally different PUNCHES for different arrangements. To change the

PUNCHES operated by a KEY change the KEYBARS; the position of the top lug on the new KEYBAR that is engaged by the KEY is not changed, but the lower lugs on the new BAR are placed so that they engage the ROCK SHAFTS for the new character. The KEYBARS are carried side by side in the KEYBAR FRAMES (which see). There are two of these FRAMES, one under the left and one under the right KEYBANK (which see); each FRAM ecarries 139 KEYBARS, one for each of the 137 KEYS and two for the SPACE BAR. For any change in MATRIX CASE arrangement change the right KEYBAR FRAME, the left also if necessary. The KEYBARS must never be changed in their FRAMES or taken from the FRAMES except to clean them. The speed of the KEYBOARD depends largely upon the KEYBARS being kept perfectly clean and free from oil and dirt. When not on the KEYBOARD, the FRAMES must be kept in their boxes. To protect the KEYBARS and other moving parts from dirt, the KEYBOARD should always be covered when not in use, see KEYBOARD COVER.

Keybar Frames. ¶255, ¶256, Fig. 37 (Plate III, facing page 100), and Figs. 143, 144, and 145 (Plate X, at back of book). The case that carries the 139 KEYBARS (which see). There are two of these FRAMES on each KEYBOARD, one under the right and one under the left KEYBANK. In changing from one MATRIX CASE arrangement (which see) to another, one or both FRAMES are changed. When not in use the FRAMES must be kept in their boxes to protect the KEYBARS from dirt. The KEYBARS are never removed from their FRAMES except for cleaning.

Keyboard. Frontispiece and Chapter I. A machine similar to a typewriter in that the characters for all alphabets are arranged the same as the keys on the universal typewriter keyboard. The KEYBOARD is used by the compositor to perforate the ribbon that controls the CASTING MACHINE, causing it to produce type in automatically justified lines, exactly as composed by the KEYBOARD operator. Briefly the KEYBOARD consists, in addition to the mechanism that feeds the paper, of a perforating and a counting mechanism; the former makes the required perforations in the paper when a KEY is struck, and the latter measures the width of this character and adds it to the total width of the characters and spaces already struck for the line being composed. In addition, the counting mechanism indicates, at the end of the line, the JUSTIFYING KEYS to strike to make the justifying spaces in the line the proper width so that the line will exactly fill the measure. The complete flexibility of this counting mechanism makes it possible to compose with ease on the MONOTYPE the most intricate tabular matter. The DOUBLE KEYBOARD (Chapter XLVIII, page 209, and Fig. 125, page 208) has two perforating and two counting mechanisms, which may be used separately, or in combination, with practically no limitations, for many classes of composition, including duplicating (which see).

Keyboard Cover. A cloth cover made to fit the KEYBOARD and *to be put on it* when the BOARD is not in use, to protect it from dirt and dust.

Keyboard Layout. ¶302 and Plate IX (at back of book). The arrangement of the characters on the KEYBANKS (which see). The arrangement of the characters for each alphabet (4, 5, or 6, as required) is identical. The layout may be changed for different MATRIX CASE arrangements (which see) by changing KEYBANKS and their corresponding KEYBARS (which see), or by capping the KEYS for the characters changed with KEYBUTTON CLIPS (which see).

Keyboard Ribbon Ticket. ¶334 to ¶337 inclusive, ¶346, Fig. 91 (page 146), and Fig. 92 (page 151). A blank form which provides space for full instructions to the KEYBOARD and CASTER operator for the job being set. It should be filled out (preferably by a copy preparer) and accompany the copy to the KEYBOARD and the ribbon to the CASTING MACHINE.

Keybutton Clip. ¶262 and Fig. 34 (page 99). A cap used for quickly changing characters without changing the KEYBANKS (which see). The CLIP consists of a metal frame carrying a character printed (or drawn) on paper and protected by a piece of celluloid above it. The CLIP is placed on the BUTTON for the character it replaces and is held in position by its four prongs which grip the BUTTON.

Keybutton Clip Board. ¶263. A board with pegs corresponding in size, number, and position with the BUTTONS on the KEYBANK; used for holding the KEYBUTTON CLIPS (which see), when these are not in use, for any special KEYBOARD layout (which see) in the same positions they occupy on the KEYBANK.

Keystroke. ¶463. The act of hitting the KEY; that is, following the KEY down with the finger as far as it will go, and then raising the finger so that the KEY can come up to its position of rest before the next KEY is struck.

Killing Lines or Characters. See DEAD LINE.

Layout. See KEYBOARD LAYOUT.

Layout. See MATRIX CASE ARRANGEMENT.

Lead and Rule Molds. Chapter XLIII (page 180). These MOLDS are used with the Lead and Rule Unit (which see) and include all MOLDS for casting in continuous strips of any length, rules, and high and low leads and slugs of any point-size from two to twelve inclusive. They work on the unique principle of casting and welding; each section as cast is welded to the section previously cast, and the strip, as fast as completed, is delivered toward the right of the machine (operating position) where it is cut to length by the Automatic Cutter Unit (which see).

Lead and Rule Unit. ¶524 and Fig. 131 (page 225). An attachment which can be applied to either the Standard MONOTYPE or to the TYPE & RULE CASTER for producing rules, high and low leads and slugs, tie-up slugs, and electrotype guards in continuous strips of any length from the same metal used for casting type. The LEAD AND RULE MOLDS and the Automatic Cutter Unit (see both) are part of this Lead and Rule Unit.

Leaders. Chapter XXIV (page 69). There are four different size leaders in common use—eight, nine, ten, and eighteen units in width. The eight- and ten-unit leaders (which see) are used to bring the UNIT WHEEL to even ems or half-ems. The nine-unit leader is used in some tabular work instead of a decimal point, also to bring the UNIT WHEEL to even ems, and, in the larger point-sizes (12-point, for example), it is sometimes used in combination with the eighteen-unit leader in leadering out, to prevent overheating the MOLD if a hard metal is used and there are many leaders in a line. The eighteen-unit leader is used for leadering out after the UNIT WHEEL has been brought to even ems by the use of the eight-, nine-, and ten-unit leaders. In some very narrow measure matter, such as baseball scores in newspapers, it is sometimes necessary to use special leaders—the five-, six-, and seven-unit; do not use these special leaders if it is possible to avoid it.

Leading. ¶36 and ¶280. A face is said to be leaded when it is cast on a larger size body, point-ways, than that for which it was designed, in order to save hand leading. When a face is thus cast on a larger body, it must be lined up by the LINE STANDARD (which see) for the body-size, not the point-size of the face. Faces cast on the leaded body line at the bottom with faces designed for that point-size; for example, eight-point faces cast on ten-point body line with ten-point faces.

Leads. See LEAD AND RULE MOLDS.

Letter Spacing. Chapter XXVI (page 77). Justifying a line by increasing the width of characters by casting them with justification added, just as a justifying space is counted as four units and cast larger than this to justify the line. This machine letter spacing is also known as "inter-spacing," to distinguish it from hair spacing by hand; for the MONOTYPE, to save time, combines the character and the hair space to the left of it and casts these two as one piece. This is done by striking the JUSTIFYING-SPACE-PUNCH KEY (which see) with the KEYS of the characters whose width is to be increased and striking the required JUSTIFYING KEYS at the end of the line, or section of the line, containing the letter-spaced characters. NOTE: The reading of the JUSTIFYING SCALE must be corrected, because the KEYBOARD counts these letter-spaced characters the same size (number of units) as the position of the NORMAL WEDGE (which see) when the characters are cast; whereas a justifying space is counted as four units and cast with the WEDGE in its six-unit position.

Line Counter Xa23KB. ¶36, ¶352, and Plate V (at back of book). A counter on the KEYBOARD for registering the number of lines set. It has two sets of figures; the lower is a continuous register of all the lines set, while the upper may be turned back to zero at any time and is used for registering the number of lines set from any particular point; for example, in allowing "deadwood" for a cut to be inserted. The COUNTER is operated by the RESTORING KEY (and the lower row of JUSTIFYING KEYS when used for restoring), so that each time this is depressed the line is registered by both sets of figures. In job work, where the matter must fill a given space, the COUNTER is used to determine whether to lead the face (cast it on a larger size body), for the number of lines the copy will make are known from the COUNTER before the matter is cast. If the job makes more than one galley, the operator determines by the COUNTER where to break the paper ribbon and start the next galley.

Line Hooks. ¶150. A mechanism on the CASTING MACHINE that pulls the completed line from the type channel (which see) forward, in front of the galley, so that the COLUMN PUSHER (which see) may push the line to the right onto the galley; to permit this, the RULE (which see) lifts and then descends to prevent the line falling to the left when the COLUMN PUSHER withdraws.

Line Standard. ¶281 and Fig. 48 (page 109). A hardened steel measure used with the lining gage (which see) in lining up (adjusting the STAND that carries the CENTERING-PIN BUSHING) to position the face on its body. The point-size of the MOLD determines the standard to use. The thickness of the standard equals the point-size of the MOLD, expressed as a decimal, plus .005"; thus, the standard for a ten-point MOLD is .105" thick (.100 + .005" = .105"). In lining up, the STAND that carries the CENTERING-PIN BUSHING is adjusted so that, when the type is compared with the line standard on the lining gage, the distance from the bottom of the serifs of a cap H to the side of the type opposite the nick equals the thickness of the line standard.

Lining Gage. ¶281 and Fig. 48 (page 109). A gage with steel knife edge, adjustable by a micrometer screw, used with the line standard (which see) in lining up (adjusting the STAND that carries the CENTERING-PIN BUSHING) to position the face on its body. The graduations on the micrometer screw of the lining gage correspond with the notches on the CENTERING-PIN MICROMETER SCREW (which see), so that, in lining up, the latter is moved as many notches as the graduations on the lining gage indicate the character is out of alignment.

Lining Up. ¶281 and ¶282. Adjusting the STAND that carries the CENTERING-PIN BUSHING (which see) so that the face of the type will be properly positioned on its body. In lining up a font for composition, one character only (the cap H) is lined up; when casting sorts, each individual character should be tested. The line standard and lining gage (see both) are the tools used for lining up.

Low Line. ¶283. A few abnormally tall faces (6-point No. 56J, for example) with short descenders are cast on low line; that is, .005" below Standard MATRIX Line (which see).

Mail-list Faces. ¶181. These, like typewriter faces (which see), have all characters, points, and figures on the same width body. Use at the KEYBOARD the TYPEWRITER ATTACHMENT (which see) and its corresponding WEDGE at the CASTING MACHINE; thus all characters are counted and cast nine units wide. Justifying spaces are not used with mail-list faces, consequently no JUSTIFYING SCALE is required.

Matrix. ¶16 and Fig. 5 (page 8). For composition: a piece of hardened bronze .2" square and 7/16" high. In its lower end is driven, to a depth of .030", the character it is to produce, and in the upper end is bored the cone-hole in which the taper end of the CENTERING PIN seats, as shown in Fig. 4 (page 6), when the MATRIX for the required character is brought to casting position. The sides of the MATRIX are slotted to fit between the teeth of the COMBS which carry the MATRICES in rows in the MATRIX CASE. (See also DOUBLE MATRIX, SORTS MATRIX, BLANK MATRIX, and RULE MATRIX.)

Matrix Case. ¶17 and Fig. 7 (page 9). A steel frame with an opening 3" square in which is carried a font of COMPOSITION MATRICES, 225 characters and blanks, arranged in a square with fifteen MATRICES on a side. The perforations in the ribbon cause the CASTING MACHINE to move the CASE to the right or left, forward or back, to bring the MATRIX for the character required to casting position. Within the CASE the MATRICES are carried in COMBS (as shown in Fig. 4, page 6, and Fig. 6, page 9) which fit in notches in the sides of the opening in the MATRIX CASE. To change faces, the font to be replaced is removed from the CASTING MACHINE complete with its MATRIX CASE and the new font in its MATRIX CASE is substituted. To change MATRICES in the CASE, the COVER PLATE is taken off the back of the CASE and the COMBS and MATRICES lifted out. (See also FOURTEEN- AND EIGHTEEN-POINT COMPOSITION UNIT.)

Matrix Case Arrangement. ¶17, ¶25, Chapters XXXI (page 101), XXXV (page 119), XXXVI (page 130), and Figs. 55 to 89 inclusive (pages 122 to 129 and 133 to 143 inclusive). The location of the 225 MATRICES (characters and spaces) in the MATRIX CASE. The arrangement depends upon the number of alphabets (4, 5, or 6) used together, and whether the Boldface used be extended or condensed; also whether double MATRICES are used, or modified characters (which see) to obtain "nut-body" figures on tabular work with faces whose sets are not the same as their point-size. For details of Standard MATRIX CASE arrangements see Chapters XXXV (page 119) and XXXVI (page 130). (See also FOURTEEN- AND EIGHTEEN-POINT COMPOSITION UNIT.)

Matrix Line. See STANDARD MATRIX LINE.

Matrix Markings. ¶367, ¶374, and Fig. 95 (page 159). Numbers stamped on the character side of SORTS MATRICES, giving the point-size, series number, and WEDGE settings for each character. See also MATRIX SYMBOLS.

Matrix Symbols. ¶293. Symbols composed of letters and figures stamped on the sides of the COMPOSITION MATRIX to indicate the point-size, set-size, series number, and to prevent confusion of MATRICES for similar characters; for example, lower case and small cap x x.

Measure, Chapters XVIII, XIX, XX, and XXI (pages 52 to 62 inclusive). The length of lines or column width of the matter to be set. The KEYBOARD is set for any measure by adjusting the EM-RACK STOP (which see) so that when the RESTORING KEY

is depressed, the BOARD will indicate the required measure in ems and units of the set to be composed. If, as is customary, the measure is given in picas, this is converted into ems and units of the set to be used by means of the table for Changing Pica Ems to Ems of Any Set (Plate VII, at back of book). If squeeze is to be added, or rules deducted (the measure for these being given in points), the table for Allowance for Rule and Squeeze (Plate VIII, at back of book) is used.

Melting Furnace. ¶431 and ¶432. Used for remelting type, cleaning it and casting it into pigs for the CASTING MACHINE.

Melting Pot. ¶14, ¶430, and ¶440. The part of the CASTING MACHINE in which the metal is melted and from which it is forced into the MOLD by the PUMP. The MELTING POT is heated by GAS BURNERS beneath it (kerosene or gasoline may be substituted if necessary). The MELTING POT holds about fifty pounds of metal.

Metal Cleaner. ¶433, ¶434, and ¶435. A compound of the following proportions by measure: Beef tallow, 4 parts; sal ammoniac, 4 parts; powdered rosin, 1 part. These are prepared as described in ¶435 and used in the cup on the lower end of the cleaning rod (which see) for cleaning the molten metal in the melting furnace; this insures that the cleaner will be carried through the metal to the bottom of the pot and will free the metal from dirt and dross.

Metal Pot. See MELTING POT.

Micrometer. ¶366. An instrument used for measuring the point-size and set-size of type by the movement of a screw; graduations on the frame, in which the screw works, permit of measuring accurately the amount the screw is moved.

Micrometer Screw. See LINING GAGE.

Micrometer Screw for Centering Pin. See CENTERING-PIN MICROMETER SCREW.

Micrometer-wedge Adjusting Screw. An adjusting screw on the CASTING MACHINE used to adjust exactly the set-size of type. This SCREW moves the MICROMETER WEDGE, the abutment for the SPACE and TYPE TRANSFER WEDGES (which see).

Modified Character. ¶267. A character which (because of change in unit-rows to meet special conditions) is redesigned so that it may be cast on a narrower or wider body. NOTE: This must not be confused with a character which, without being redesigned, is placed in a unit-row wider than that for which it is designed and cast with a shoulder to the left of the character.

Mold. See LEAD AND RULE MOLD.

Mold. See TYPE MOLD.

Mold Blade for Type Mold. ¶27 and ¶29. This forms the rear side of the opening in the TYPE MOLD (which see) in which type is cast. The amount the BLADE draws back for a character depends upon the position of the NORMAL WEDGE and determines the width line-ways (set-size) of the type-body. The thickness of the MOLD BLADE itself determines the thickness of the type-body column-ways (point-size). After a type is cast, the MOLD BLADE pushes it out of the MOLD into the TYPE CARRIER which has moved to the right to receive the type.

Mold-blade-abutment Screw. ¶366. An adjusting screw on the CASTING MACHINE for approximately sizing the type in changing from one set to another (changing NORMAL WEDGES); the size is accurately determined by adjusting the MICROMETER-WEDGE ADJUSTING SCREW (which see).

Mold-blade-abutment-screw Packing Piece 60S. ¶365 and Fig. 98 (page 162). A PACKING PIECE inserted between the MOLD BLADE and its ABUTMENT SCREW when casting the smaller point-sizes (19 points or less set-ways) with NORMAL WEDGE 47S. When casting sorts more than nineteen points set-ways, the PACKING PIECE is removed. The PACKING PIECE is seventeen points thick, so that, with the WEDGE in a given position, removing the PACKING PIECE increases the set-size seventeen points.

Monotype System. The word "MONOTYPE" means today much more than the name of a composing machine; it has come to be applied to a complete system of composing-room practice based on the use of the MONOTYPE both as a Composing Machine and as a Type & Rule Caster.

Ninety-em Unit. ¶556 and ¶557. This unit for the D KEYBOARD is the same in principle as a wide carriage for a typewriter; it provides for increasing the travel of the EM RACK (which see) from sixty-five to ninety ems. On wide measure work it saves on every line: (*a*) One justification; (*b*) one restoring; (*c*) one revolution at the CASTING MACHINE.

Non-distribution. Chapter XLI (page 170). The system by which compositors are continuously supplied with new type, spacing material, rules, and high and low leads and slugs directly from the MONOTYPE so economically that recasting replaces distribution. Briefly, the non-distribution system consists of a reservoir (the type-storage cabinets and their boxes) into which the material required by the compositor (type, spacing material, rules, leads, and slugs) is pumped from the source of supply (the TYPE & RULE CASTER or the COMPOSING MACHINE with the Lead and Rule Unit applied) and from which the compositor draws his material as required without any loss of time in waiting. When the job has been printed there is no time wasted in tearing it apart and distributing—the entire pages go to the melting furnace, where they are remelted into pigs ready to be again turned into new material. (See also TYPE-STORAGE CABINETS, TYPE-STORAGE BOXES, LEAD AND RULE UNIT, and TYPE & RULE CASTER.)

Normal Wedge. ¶27 to ¶31 inclusive, ¶124, ¶364, ¶365, Fig. 10 (page 14), and Fig. 98 (page 162). A WEDGE used in the CASTING MACHINE to control the set-size (width) of the type. Its right end (in casting position) is tapered to vary the type sizes; its central portion is toothed so that its LOCKING PIN can hold the WEDGE in position, after it is moved by the lug on its left end to present the required thickness of its tapered portion to the MOLD BLADE. The NORMAL WEDGE moves, right and left, with the MATRIX CASE and determines the amount the MOLD BLADE draws back to allow for the width of the character cast from the MATRIX brought to casting position when the WEDGE is moved. The NORMAL WEDGE must correspond in set with the set of the JUSTIFYING SCALE used at the KEYBOARD when the ribbon is perforated and also in arrangement of unit-rows with the STOPBARS used at the KEYBOARD. For sorts casting a special display type NORMAL WEDGE 47S is used; this is positioned by hand instead of automatically.

Normal-wedge Gage 47S1. ¶365 and Fig. 98 (page 162). A flat bar used to set the NORMAL WEDGE 47S by hand when casting sorts. In the right end of the GAGE is a hole which fits over the end of the HANDLE of the WEDGE. It is graduated to correspond to the teeth of the WEDGE, and these graduations are numbered from two to eighteen inclusive. Moving the WEDGE to the left one graduation on the GAGE adds one point to the thickness (set-size) of the type. The reference mark for this GAGE is the left end of the TRANSFER-WEDGE-OPERATING-ROD-GUIDE CAP 54D1.

Normal-wedge Locking Pin. ¶28 and ¶365. A rod whose lower end is wedge-shaped to fit in the toothed portion of the NORMAL WEDGE (which see) in which it seats to hold the NORMAL WEDGE in position while the MOLD BLADE is drawn back and a type cast; then the PIN raises, so that the NORMAL WEDGE may be shifted to its next position and, after the NORMAL WEDGE has come to rest, the LOCKING PIN again seats and holds it for the next type cast. When casting sorts, the LOCKING PIN is raised by hand to shift the display type NORMAL WEDGE 47S.

Nozzle. ¶14. The part of the PUMP that seats in the conical opening in the bottom of the MOLD, just before a type is cast, and through which metal is forced into the MOLD. After the type is cast, the PUMP descends and withdraws the NOZZLE to prevent it being chilled by continuous contact with the water-cooled MOLD.

Nut-body Figures. Chapter XXXIII (page 111) and ¶317. Figures whose set-size (width) is half of their point-size; thus, six-point nut-body figures are three points wide.

One-unit-of-one-set. ¶55, ¶56, and ¶57. The value of this expressed in inches is .0007685″, and this is the basic value on which all the MONOTYPE calculations are based. It is a theoretical size obtained by first dividing a twelve-set face (which is 12 points wide, or .166″) into twelve equal parts to find the value of eighteen units of a one-set face. This is again divided by eighteen to find the value of one unit of this one-set face thus: $\frac{.166''}{12} \div 18 = .0007685''$.

Opening-up Faces. Chapter VI (page 16) and ¶536 to ¶546 inclusive. A face is said to be "opened up" when it is composed on the KEYBOARD and cast on the CASTING MACHINE on a larger set than that for which it was designed. Thus every character is cast with a shoulder on the left of the body; the width of this shoulder is in proportion to the width of the characters. This is an exclusive MONOTYPE advantage.

Paper Em Scale. ¶161 and ¶336. An EM SCALE duplicating the celluloid EM SCALE on the KEYBOARD, but printed on paper, for use by the copy preparer, so that the cast for a table may be given the operator with the copy. They insure uniform work and save time of the operator and copy preparer, for the SCALES may be saved and used many times for similar matter.

Paper Feed Wheels. ¶9, ¶10, and ¶342. The WHEELS that feed the paper at both the KEYBOARD and the CASTING MACHINE. Their teeth engage the marginal perforations of the ribbon and they rotate enough to advance the paper one space (marginal perforation) each time a KEY is struck or a character cast.

Paper Guide. Figs. 150 and 151 (Plate X, at back of book). A frame on the rear of the PAPER TOWER of KEYBOARD, which insures uniform feed of the paper without tearing, and also guides the marginal perforations of the paper onto the PAPER FEED WHEELS.

Paper Ribbon. ¶2, Fig. 2 (page 2), Chapter II (page 5), and Plate V (at back of book). A strip of paper four and five-sixteenths inches wide, with holes uniformly spaced along both edges to fit on the teeth of the PAPER FEED WHEELS (which see) of the KEYBOARD and the CASTING MACHINE. The characters struck by the KEYBOARD operator are recorded on the ribbon by the perforations (2 or 1 for each character, none for the em-quad) made by the PUNCHES when a KEY is depressed. The location of these perforations, across the width of the ribbon, determine the character to be cast by permitting air, at the CASTING MACHINE, to pass through them into the AIR PIPES that control the movements of the MATRIX CASE. For each KEY struck, or character cast, the paper is advanced by the KEYBOARD or CASTING MACHINE one marginal perforation. In short, the ribbon enables the KEYBOARD operator to control absolutely the product of the automatic CASTING MACHINE. As the paper feeds through the KEYBOARD it is wound on a SPOOL which, when the take is completed, is placed on the CASTING MACHINE. As it feeds through the CASTER it winds on a SPOOL from which it may be taken and recast for matter that duplicates, or saved for repeat orders. This paper is supplied in rolls about four inches in diameter. For method of putting the rolls on the KEYBOARD, see Figs. 150, 151, and 152 (Plate X, at back of book).

Paper-spool Guide. Fig. 148 (Plate X, at back of book). A frame on the front of the PAPER TOWER of the KEYBOARD which positions the new SPOOL to receive its SHAFT when changing SPOOLS.

Paper Tower. ¶105, ¶483, and Plate V (at back of book). The mechanism of both the KEYBOARD and CASTING MACHINE (see Frontispiece) that carries the paper ribbon and advances it one marginal perforation for each character, or space, struck at the KEYBOARD or cast at the CASTING MACHINE.

Partial Font. See FONT.

Pawl Release. See RELEASE-PLATE LINK.

Perforation. ¶2 and ¶5. The holes made in the paper ribbon (which see) by the thirty-one PUNCHES (which see); also the holes in the margin of the ribbon that fit on the teeth of the PAPER FEED WHEELS (which see).

Pet Cock. See AIR-CHAMBER PET COCK.

Pet Cock. See STORAGE TANK.

Pica. ¶40, ¶54, ¶139, ¶158, and ¶159. Eighteen units of twelve-set (.166″). The printer's unit of measurement for the width and depth of columns, cuts, etc. Six picas are assumed to equal one inch; actually they are .004″ less than this. (See SET-EMS SYSTEM OF MEASUREMENT.)

Pica Ems to Ems of Any Set, Table for Changing. ¶159 and Plate VII (at back of book).

Piston. ¶14. The plunger in the PUMP mechanism of the CASTING MACHINE. When a type is to be cast, the PISTON makes its down stroke, forcing metal up into the MOLD.

Piston. ¶252 and Fig. 38 (Plate III, facing page 100). One member of the perforating mechanism at the KEYBOARD. These PISTONS are located in the PISTON BLOCK and, when a KEY is depressed, air is admitted beneath its PISTONS, which rise and drive their PUNCHES through the ribbon, making the perforations to indicate the character struck.

Piston-block-valve Handle 29KC17. ¶105, ¶207, footnote on page 213, and Plate V, (at back of book). The HANDLE at the left of the PAPER TOWER of the KEYBOARD which, when turned to the rear, causes the lower row of JUSTIFYING KEYS (which see) to act as RESTORING KEYS; when this HANDLE is turned to the left, the BOARD can be restored only by the green RESTORING KEY (which see).

Plunger. See VALVE-BANK PLUNGER.

Point. ¶40 and ¶41. One-twelfth of a pica, or .0138″ (nearly). This is the unit of measurement for type sizes, thickness of rules, leads, etc. Seventy-two points (6 picas) are assumed to equal one inch, actually they are .004″ less than this.

Pointer. See EM-RACK POINTER.

Pointer. See JUSTIFYING-SCALE POINTER.

Point-size. ¶37, ¶40, and Fig. 16 (page 20). The thickness of a type-body measured "columnwise." This is measured in points.

Pointways. ¶37, ¶40, and Fig. 16 (page 20). The dimension of a type that measures its size "columnwise"; that is, the distance from the nicked side to the opposite side of the body.

Pressure Gage. Placed on the storage tank (which see) so that the governor on the compressor (which see) may be set to prevent the air pressure from rising above fifteen pounds.

Pump. ¶14. The mechanism for forcing the metal into the MOLD to form the type. It consists, essentially, of the PUMP BODY and PISTON (working in the PUMP BODY), which are partly submerged in the metal in the MELTING POT. The PISTON makes a stroke for every revolution of the CASTING MACHINE unless the PUMP is locked by hand or automatically by the PUMP LOCK (which see) when the JUSTIFYING WEDGES are positioned.

Pump Lock. ¶132, ¶148, and ¶155. The mechanism which uncouples the CONNECTING ROD between the PUMP-CAM LEVER and the PUMP, so that the PUMP does not operate; thus the PUMP is locked automatically whenever a perforation made by a JUSTIFYING KEY is presented to the CASTING MACHINE to position a JUSTIFYING WEDGE. The pump lock may be operated by hand at any time.

Punch Bars. ¶92, ¶147, ¶252, ¶257, ¶259, and Fig. 38 (Plate III, facing page 100). The vertical rods in the punching mechanism of the KEYBOARD which, in their upper ends, carry the PUNCHES that perforate the paper; at the lower end they are connected with their respective PISTONS (which see), so that, when air is admitted under a PISTON by depressing a KEY, the PISTON rises and forces its PUNCH through the paper. There are thirty-one PUNCH BARS that operate PUNCHES and two additional BARS that have no PUNCHES, so that, to preserve the uniform touch for all characters, two BARS lift regardless of whether the KEY struck makes two, one, or no perforations. The PUNCH BARS corresponding to the unit-rows of the MATRIX CASE operate the UNIT-RACK STOPS (which see) to register the unit value of the character struck by determining the amount the UNIT WHEEL revolves. The PUNCH BARS are coupled to the STOPS by the STOPBARS (which see); to change the PUNCHES operated by a KEY change KEYBARS (which see); to change the unit value registered by a KEY change STOPBARS.

Punches. Chapter XVI (page 47). The small, hardened steel rods forced through the paper, to make the perforations for a character, when a KEY is depressed; to cut the paper cleanly, the PUNCHES are notched and sharpened at their upper ends. The location of the perforations (2, 1, or none, see following) across the ribbon determines the position of the MATRIX CASE and consequently the character, or space, cast. For the position of the PUNCHES, see Fig. 24 (page 48). Twenty-eight PUNCHES make the perforations that control the movement of the MATRIX CASE, making two or one perforations for each character or space struck, depending upon the position of its MATRIX in the CASE; the em-quad KEY feeds the paper one marginal perforation, the same as every other KEY, but makes no perforation in the ribbon. One additional PUNCH makes the perforation that causes the SPACE TRANSFER WEDGE to move into position when a justifying space is to be cast, and two additional PUNCHES control the JUSTIFYING WEDGES and the galley. These last two PUNCHES are larger in diameter than the other twenty-nine, so that these larger perforations will indicate the end of the line.

Punch Lock. ¶483 to ¶489 inclusive. The locking device for both the counting and the perforating mechanisms that prevents the PUNCHES from rising and the UNIT WHEEL from rotating when a KEY is struck. It is operated by the KNOB 18KC11 (Plate V, at back of book) on the left side of the PAPER TOWER, which is thrown over toward the front to lock the KEYBOARD and back again to release it. On the DOUBLE KEYBOARD the PUNCH LOCKS for the two PAPER TOWERS are operated by the SWITCH (which see) and by the LOCKING KEYS, the left green KEY locking the right TOWER and the right green KEY the left TOWER.

Quad. See EM-QUAD.

Quadding Out. ¶466, Fig. 124 (page 203), ¶547, ¶548, and ¶549. Striking several quads in succession to fill out a line (as the last line of a paragraph), or a portion of a line (as in tabular work). When the KEYBOARD is equipped with the Automatic Repeater Unit (which see), the quadding out is done automatically without any more effort on the part of the operator than the holding down of the REPEATER KEY together with the quad KEY.

Release-plate Link. ¶342 and Fig. 149 (Plate X, at back of book). A link on the KEYBOARD that is pulled forward and upward, as shown in Fig. 149, to release the PAPER FEED PAWLS so that the paper may be moved forward or backward, by turning the KNOB on the PAPER-FEED-WHEEL SHAFT.

Repeater Unit. See AUTOMATIC REPEATER UNIT.

Repeater Valve Bar. See VALVE BAR.

Restore. ¶104, ¶105, and ¶207. To return the EM RACK to the left side of the KEYBOARD so that it is in position to count the characters for the next line to be set. The EM RACK is restored by depressing the RESTORING KEY (which see), the right green KEY at the bottom of the BOARD, or a JUSTIFYING KEY in the lower row when these KEYS are made RESTORING KEYS by turning the PISTON-BLOCK-VALVE HANDLE 29KC17 (which see).

Restoring Key. ¶104, ¶105, ¶207, and ¶489. *First:* The right green KEY at the bottom of the KEYBOARD. When this is depressed, after the JUSTIFYING KEYS are struck at the end of the line, the EM RACK (which see) moves to the left, until it is stopped by the EM-RACK STOP, and the JUSTIFYING-SCALE POINTER (which see) drops to the bottom of its stroke; the BOARD is then in position to count the characters and justifying spaces for the next line to be set. *Second:* Any one of the JUSTIFYING KEYS in the lower row has all the functions of the RESTORING KEY, in addition to its regular function of justifying, when the PISTON-BLOCK-VALVE HANDLE 29KC17 (which see), at the left of the PAPER TOWER, is turned to the rear. With the VALVE HANDLE in this position the green RESTORING KEY is cut out altogether; when the HANDLE is to the left the BOARD can be restored only by the green KEY, and the JUSTIFYING KEYS perform their function of justification only.

Restoring Lever 24KB4. ¶206 and Plate V (at back of book). A lever on the KEYBOARD, part of the mechanism for restoring; that is, to put the EM RACK (which see) and JUSTIFYING-SCALE POINTER (which see) in position to count the ems and justifying spaces in the next line to be set. When a RESTORING KEY (which see) is depressed, the movement of the RESTORING LEVER lifts the UNIT-WHEEL PAWL (which see) so that the UNIT WHEEL (which see) may revolve, right-handed, to drive the EM RACK to the left. This same movement of the LEVER releases the JUSTIFYING-SCALE POINTER, permitting it to drop to its bottom position. The RESTORING LEVER is used by the KEYBOARD operator in setting double justified matter; that is, independently justifying, with justifying spaces, different sections of the same line. For example: The operator has struck the last character in the first section of a line of double justified matter and has made this part of the line the required length by striking the proper JUSTIFYING KEYS. Before beginning composition on the next section he must set the EM RACK and UNIT WHEEL at the proper measure for beginning this next section. To do this, he grasps the rim of the UNIT WHEEL firmly with the left hand and then presses down the right end of the RESTORING LEVER with the right hand. As this raises the PAWL out from mesh with the UNIT WHEEL, without raising the UNIT RACK to engage the WHEEL, he may now turn the UNIT WHEEL with his left hand and set the EM RACK and UNIT WHEEL at the required points. This done, he releases, first the RESTORING LEVER so that the PAWL will seat and lock the WHEEL, and then the UNIT WHEEL. In addition to releasing the UNIT WHEEL as described, pressing down the right end of the RESTORING LEVER also releases the JUSTIFYING-SCALE POINTER, permitting it to drop to its bottom position to count the justifying spaces in the next section of the line. Be sure to push the LEVER down as far as possible; if this is not done, the WHEEL will be released, but the POINTER will not drop. CAUTION: In setting the WHEEL by hand, it must be grasped firmly before the LEVER is depressed, for otherwise it may slip in the fingers and cut them.

Ribbon. See PAPER RIBBON.

Ribbon Ticket. See KEYBOARD RIBBON TICKET.

Rock Shaft. ¶251 and Fig. 35 (Plate III, facing page 100). One member of the KEY mechanism. The ROCK SHAFTS form the connecting links between the KEYBARS (which see) and the VALVE BARS (which see). Each ROCK SHAFT controls one VALVE BAR.

Rule. ¶150. That part of the CASTING MACHINE that closes the open (left) end of the galley. When a completed line is pushed onto the galley by the COLUMN PUSHER (which see), the RULE lifts so that the line may pass under it; as the PUSHER withdraws, the RULE descends to close the galley.

Rule, Allowance for. See ALLOWANCE FOR RULE.

Rule Matrix. ¶412. A steel MATRIX which clamps on top of the LEAD AND RULE MOLD when casting rule. Rule of any face may be cast for the body-size of the MOLD by changing MATRICES, and a different MATRIX is required for each point-size MOLD even for the same face of rule.

Rule Mold. See LEAD AND RULE MOLD.

Safety Valve. Attached to the storage tank (which see) to prevent the air pressure rising above fifteen pounds if the governor on the compressor (which see) fails to work.

Scale. See EM SCALE.

Scale. See JUSTIFYING SCALE.

Scale Constant. ¶120. The justification given in the zero column of the JUSTIFYING SCALE (which see); this is the same for all positions of the JUSTIFYING-SCALE POINTER because, if the line is no units short of the measure (if the POINTER indicates the zero column of the JUSTIFYING SCALE) there is no shortage to be distributed over the justifying spaces to increase the width of the line to make it the required measure, and consequently these spaces are cast four units wide, the same width that the KEYBOARD counts them.

Scale Key. Foot-note, page 40. A KEY whose function has been made obsolete by the Automatic Revolution of the JUSTIFYING SCALE (which see). This KEY is the green KEY in the lower right corner of the left KEYBANK. On older BOARDS not equipped with the automatic revolution this KEY is used to revolve the JUSTIFYING SCALE to determine the JUSTIFYING KEYS to strike, provided the line is not more than seventy-one units short. On BOARDS having the automatic revolution this KEY still remains but is inoperative. For justifying before four ems, as in double justification or special work, the SCALE is rotated by hand irrespective of whether or not the BOARD has the automatic revolution.

Scale Light. See JUSTIFYING SCALE LIGHT.

Set. ¶50 and ¶70. The width of the eighteen-unit characters of a face expressed in points and fractions of a point. The set of a face indicates whether it is extended or condensed.

Set-em. ¶475 to ¶479 inclusive. A unit of measure which point-ways is the same as the point-size of the face being measured and setways is the width of the widest or eighteen-unit characters of the face being measured. Thus, for eight-point No. 8A (8½-set) whose eighteen-unit characters are eight and one-half points wide, the set-em would be a rectangle eight points high and eight and one-half points wide.

Set-ems System of Measurement. ¶474 to ¶479 inclusive. The system of measurement that takes into account the fact that some faces are lean and others fat. Thus, to measure any matter by the set-ems system, multiply the measure, expressed in ems of the set of the face, by the number of lines, and the result will be the number of set-ems in the matter. (See also SET-EM.)

Set Factor. ¶60 to ¶64 inclusive. Used to compare the relative width of characters in making special MATRIX CASE arrangements; it is the set (which see) of the font to which the character belongs, multiplied by the unit-row for which it is made. (See Table of Set Factors, Fig. 20, Plate I, facing page 26.)

Set-size. ¶38 and Chapter VIII (page 21). The width of a type-body measured "linewise." This is expressed in points if applied to a complete font (see SET); when it is applied to individual characters it is expressed in thousandths of an inch.

Setways. ¶38. The width of a character, or characters, measured "linewise." (See SET-SIZE.)

Shearing Attachment. See AUTOMATIC CUTTER UNIT.

Signal Characters. ¶188. Black rectangles of different widths used to indicate that special characters, not carried in the MATRIX CASE, are to be substituted for these signals by the corrector at the case without affecting the justification; this substitution should be made before the first proof is taken. To allow for any width character, five MATRICES are required (1 each for 5-, 6-, 7-, 8-, and 9-unit rows) and five KEYS must be provided for these signal characters by capping (see CAP).

Single Justification. Chapter X (page 27). Using the same size justifying spaces throughout the line, as in straight matter. At the end of the line, after the BELL rings and the operator has struck the last character KEY for this line, the JUSTIFYING SCALE will have automatically revolved so that the JUSTIFYING-SCALE POINTER indicates on the JUSTIFYING SCALE (which see) the JUSTIFYING KEYS (which see) to strike, one in the upper row and one in the lower row, so that the CASTING MACHINE will increase the size of these spaces, counted by the BOARD as four units, and make them the size required to justify the line. With double justification (which see) different size justifying spaces are used in different sections of the same line, and for the last justification of the line, the operator strikes two JUSTIFYING KEYS together; that is, with the KEY in the lower row he strikes also the KEY directly above it to "trip the galley" (which see) for the complete line.

Sixty Pica Attachment. See WIDE MEASURE UNIT.

Slug. See Tie-up Slug.

Slur. ¶93 and ¶463. To fail to completely release a Key, so that it will rise to the top of its stroke, before the next Key is struck.

Sorts Boxes. See Type-storage Boxes.

Sorts Matrix. ¶362 and Fig. 95 (page 159). A flat Matrix used for casting type for the cases in sizes from fourteen- to thirty-six-point (also for a few faces below fourteen-point that are so extended setways that they will not go on a .2″ Cellular Matrix).

Sorts Matrix Holder. ¶363, Figs. 96 and 97 (page 160), and ¶376. A Holder for Sorts Matrices (which see). It holds one Matrix at a time and takes the place of the regular Matrix Case when casting sorts from fourteen- to thirty-six-point. By using a special Slide and its special Abutments in this Holder the alignment of the type may be changed any desired amount; for example, when casting figures or characters on a smaller point-size body than that for which they were designed. (See Varying the Type Line.)

Sorts Mold. See Type Mold.

Space. ¶191, ¶192, and ¶389 to ¶394 inclusive. A type shorter than type high, so that it will not print, used for filling in between words, etc. Either high or low spaces may be used: the former, if the matter is to be electrotyped; the latter, if printed direct from type. High spaces are also used to support the kern of characters cast from Double Matrices (which see). The high space is .030″ less than type high (see Height-to-paper; for sizes fourteen-point and larger cast with the Sorts Mold (see Type Mold) it is .050″ less than type high; the low space is shorter than the high by the thickness of the top Mold Blade. (See Fixed Space and also Justifying Space.)

Space Bar. See Justifying-space Bar.

Space Cut Out. ¶86. A mechanism for cutting out the Justifying-space Punch and causing the Space Bars to produce fixed six-unit spaces. It operates automatically when the twentieth justifying space has been put into the line or it can be operated at the will of the operator by pulling forward the Knurled Head 16KA5 (Plate V, at back of book).

Space Punch. See Justifying-space Punch.

Space-punch Key. See Justifying-space-punch Key.

Space Sizing Mechanism. See Space Transfer Wedge.

Space Transfer Wedge. ¶128 and ¶364. A Wedge at the Casting Machine controlled by the perforation in the ribbon made by the Justifying-space Bar (which see) or the Justifying-space-punch Key (which see). When this perforation is presented to the Caster the Space Transfer Wedge supports the Normal Wedge (which see) in casting position; without this perforation the Type Transfer Wedge (which see) supports the Normal Wedge. The Space Transfer Wedge lies on top of the Type Transfer Wedge and the thickness of the two together equals the thickness of the Normal Wedge. They are called "Transfer Wedges" because, through the mechanism controlled by the perforation made by the Space Punch, they transfer the support for the Normal Wedge from the fixed Abutment to the Justifying Wedges (which see), which are in turn supported by an abutment. *Summary:* In casting characters or spaces the same width as they are counted by the Keyboard the Space Punch perforation is not presented to the Caster and therefore the size of the character to be cast is determined by the position of the Normal Wedge supported by the Type Transfer Wedge and its fixed abutment. In casting justifying spaces or characters with justification added (Chapters XXVI to XXIX inclusive, pages 77 to 94 inclusive), the perforation made by the Space Punch causes the Space Transfer Wedge to take the place of the Type Transfer Wedge, as the support to the Normal Wedge, and consequently the set-size of the space or character depends, first, upon the position of the Normal Wedge and, second, upon the position of the Justifying Wedges, which support the Space Transfer Wedge. When casting sorts the Space Transfer Wedge backs up the Normal Wedge 47S for all characters and spaces in order that the set-sizes may be varied by using the Justifying Wedges.

Speed Regulating Unit. ¶373, ¶374, and ¶523. All Type & Rule Casters and all Composing Machines with the Display Type Unit, for casting type fourteen-point and larger, are equipped with this Speed Regulating Unit. By shifting three Levers this Attachment gives eighteen speeds through gearing and the nineteenth speed direct with all gears cut out.

Spool. Fig. 2 (page 2), ¶77, and Fig. 148 (Plate X, at back of book). The paper, as it is perforated on the Keyboard, is wound on a Spool and unwound from it as the ribbon passes through the Casting Machine. A different Spool, on which the paper is wound at the Caster, has but one flange, so that the ribbon may be slipped from it; thus, no Spools are required for ribbons kept for repeat orders.

Square-points. ¶478. A unit for measuring areas; as for example cuts, or space which cuts and copy are to fill. This unit is a square, one point on each side; thus a pica em contains 144 square-points, because it is twelve points each way ($12 \times 12 = 144$). This is used in conjunction with set-ems system of measurement (which see) and forms part of copyfitting (which see).

Squeeze, Allowance for. See Allowance for Squeeze.

Standard Matrix Line. Chapter XXXII (page 108). Monotype faces used for casting type in justified lines, regardless of their point-size, line perfectly when cast on the same size body. This is because, referring to the face of the Matrix that seats on the Mold, the distance from the lower serifs of the cap H to the side of the Matrix above the top of the letter (looking at the face of the Matrix) is the same for all point-sizes, which gives it the name "Standard Matrix Line." Note: A few faces, 6 point No. 56J, for example, with unusually high caps, are made to low line which is .005″ lower than standard line. (See Line Standard.)

Standard Monotype. ¶517. A composing machine and type caster which, without the application of any additional units, does the following: Casts and composes in automatically justified lines all kinds of matter, straight or tabular, in any measure up to forty-two picas, and any sizes of face from five- to twelve-point inclusive; twelve-point faces may be cast on thirteen- or fourteen-point bodies to save hand leading.

Stopbars. ¶257 to ¶261 inclusive, Figs. 38 and 39 (Plate III, facing page 100), and Plates V and X (at back of book). The mechanism used at the Keyboard to connect the Unit-rack Stops (which see), for registering the width (unit size) of the characters struck, and the Punch Bars (which see) that make the perforations that control the movement of the Matrix Case at the Casting Machine, to the right or left, to present the different unit-rows of the Case to the Mold. Standard Stopbars give the following unit values to the fifteen rows of the Matrix Case, 5 6 7 8 9 9 9 10 10 11 12 13 14 15 18; but for special Matrix Case arrangements (Chapter XXXVI, page 130) these unit values may be changed by changing Stopbars; that is, by coupling the Punch Bars to different Unit-rack Stops. To do this the Case containing the standard Stopbars is exchanged for the Case containing the special Stopbars, as shown in Figs. 156 and 157 (Plate X, at back of book). The individual Stopbars must never be taken from their Case or altered in any way.

Stop Motion. ¶156 and ¶157. That part of the galley mechanism of the Casting Machine that prevents improperly justified lines being placed on the galley. When a line too long or too short to lock up properly is presented to the galley, the Caster stops automatically, because the incorrectly justified line causes the Stop Motion to shift the Belt from the Driving to the Loose Pulley. The Keyboard operator takes advantage of this Stop Motion by making the first line keyboarded (last line cast) one em-leader long; this stops the Casting Machine, thus notifying the Caster operator that the take is finished; the em-leader is then removed by the Caster operator and the line is the correct length.

Storage Cabinet. See Type-storage Cabinet.

Storage System. See Non-distribution.

Storage Tank. Used to equalize the pressure of the air from the compressor (which see) and also to remove any moisture that may not be taken out by the condensing tank (which see) as the air passes through it from the compressor to the storage tank. The storage tank has a pet cock at the bottom which should be opened every morning to blow off any moisture that may have collected. A pressure gage is attached to the tank and also a safety valve to prevent the pressure rising above fifteen pounds if the governor on the compressor should fail to work. The compressor, condensing tank, and storage tank should be placed as close together as possible; if the Keyboards or Casting Machines are more than fifty feet from the compressor a second storage tank at the end of the air pipe should be used; the air from this second tank goes directly to the machines.

Strip Mold. See Lead and Rule Mold.

Strip Rule. ¶410, Fig. 110 (page 180), ¶411, ¶524, and ¶525. A continuous strip of rule, the product of the Lead and Rule Mold (which see), cast in any length from the same metal used in composition, and cut to exact lengths, as delivered, by the Automatic Cutter Unit (which see).

Switch. ¶484 and Fig. 127 (page 210). The LEVER at the front of the DD KEYBOARD (which see) just above the KEYS; used to control the PUNCH LOCKS (which see) for the right and left punching and counting mechanisms. Thus, when the SWITCH is turned to the right, the BOARD is exactly the same as a single BOARD using the left punching and counting mechanisms only, for the right side is locked out by its PUNCH LOCK. In the same way to use the right side of the BOARD only, turn the SWITCH to the left. With the SWITCH in central position, the KEYS operate both punching and counting mechanisms for duplicating (which see).

Ten-unit Leader. ¶199 and ¶200. A leader of exactly the same face as the nine-unit leader but cast central on a body ten units wide (it is *not* a 9-unit leader MATRIX carried in the 10-unit row). The ten-unit leader is used to bring the UNIT WHEEL to even ems when the UNIT INDICATOR shows any number from one to four inclusive. (See also LEADERS and EIGHT-UNIT LEADER.)

Three-eight Justification. ¶143. Striking the No. 3 JUSTIFYING KEY in the upper row and the No. 8 KEY in the lower row causes the CASTING MACHINE to cast the justifying space as a six-unit space of the set of the NORMAL WEDGE used, because this setting of the JUSTIFYING WEDGES exactly compensates for the SPACE TRANSFER WEDGE (which see) being .0184″ thicker than the TYPE TRANSFER WEDGE (which see). Thus, with three-eight justification and the NORMAL WEDGE in its six-unit position, for casting justifying spaces, the MOLD BLADE is pulled back exactly the same amount whether the NORMAL WEDGE is supported by the TYPE TRANSFER WEDGE or by the SPACE TRANSFER WEDGE, and consequently three-eight justification with any set produces a six-unit space of that set. NOTE: This is not true for sets larger than twelve-set, for with these a special setting of the SPACE TRANSFER WEDGE is required.

Three-font Arrangement. See TYPE-STORAGE CABINET.

Tie-up Slug. ¶414 and Fig. 112 (page 181). A twelve-point slug with a recess in the side for the string. Effects great savings in tying up pages, for the string remains in place when the page is locked up. These slugs are the product of the TIE-UP SLUG MOLD (which see), and may be either low or high or for guards for electrotyping may be cast with a six-point face on one side of the body.

Tie-up Slug Mold. ¶414 and ¶524. This MOLD is of the LEAD AND RULE MOLD family, but differs from the others in that its product is a slug twelve points thick with a recess in one side in which the string fits when tying up a page. This MOLD will cast low or high slugs or by the use of a special MATRIX will cast electrotype guards.

Trip the Galley. Chapter XVII (page 49) and ¶208. To trip the galley means to start the galley mechanism so that a completed line will be taken from the type channel of the CASTING MACHINE, where the individual type composing the line are assembled, and placed on the galley; any metal-bottomed galley may be used. The galley mechanism is operated by the GALLEY CAM, a disc which revolves about a vertical axis and has three separate cam surfaces that give the following motions: (*a*) the LINE HOOKS move forward, pulling the completed line in the type channel toward the operator and opposite the open end of the galley; (*b*) the RULE lifts so that the line may be pushed under it onto the galley; this done, the RULE descends to close the open end of the galley and keep the type from falling to the left; (*c*) the COLUMN PUSHER moves to the right, pushing the line under the RULE, onto the galley, and then moves back to its position of rest at the left. The GALLEY CAM is rotated, when necessary, by the GALLEY-CAM SHAFT, driven continuously from the CAM SHAFT and so geared to it that the GALLEY-CAM SHAFT makes one revolution for seven revolutions of the DRIVING PULLEY. On the upper end of the GALLEY-CAM SHAFT is a RATCHET that may be engaged by a PAWL on the GALLEY CAM and, when so engaged, the CAM and its SHAFT rotate as one piece. The galley is tripped by releasing this PAWL so that it will engage the RATCHET; this is done by any perforation made by a JUSTIFYING KEY. For double-justified matter (where different size justifying spaces are used in different sections of the same line) the CASTING MACHINE is adjusted so that the galley will not be tripped until the end of the line, when the perforations made by a JUSTIFYING KEY in the lower row and the KEY above it (both KEYS struck together) are presented to the CASTER. The galley may be tripped by hand at any time. Since the DRIVING PULLEY makes seven revolutions while the GALLEY CAM makes one, the CASTING MACHINE will not automatically deliver to the galley lines requiring less than seven keystrokes for characters and justification.

Two-font Arrangement. See TYPE-STORAGE CABINET.

Type Carrier. ¶14 and ¶149. That part of the CASTING MACHINE that carries the type from the MOLD to the left, so that the TYPE PUSHER may push the type forward out of the CARRIER and into the type channel, where the individual characters composing the line are assembled. The TYPE CARRIER is coupled to the CROSS BLOCK of the TYPE MOLD (which see) and moves this BLOCK to the right, so that the MOLD BLADE can push the finished type out of the MOLD into the CARRIER. As this moves to the left, to deliver the type to the type channel, the CROSS BLOCK moves with it, closing the MOLD for the next type to be cast.

Type Caster. See TYPE&RULE CASTER.

Type Channel. ¶14 and ¶149. That part of the CASTING MACHINE into which each type as cast is delivered from the TYPE CARRIER by the TYPE PUSHER. The individual types composing the line are here assembled until the line is complete, when it is placed on the galley.

Type High. See HEIGHT-TO-PAPER.

Type-line. ¶278 and ¶283. The distance from the bottom of the serifs of the cap H to the side of the type opposite the nick. Since all MONOTYPE faces used for casting type in justified lines regardless of their point-size, line perfectly when cast on the same size body, each point-size has its standard type-line which is always the point-size of the MOLD, written as a decimal, plus .005″; thus, the type-line for ten-point faces is .015″ (.10+.005″=.105″). NOTE: A few abnormally tall faces are cast on a type-line .005″ lower than this.

Type Mold. ¶13 and ¶14, Fig. 11 (page 15), and Chapter XLII (page 176). Into this, metal is forced, from the MELTING POT, by the PUMP in casting spaces and quads (high or low) and characters. The MATRIX seats on top of the opening in the MOLD, where it is held by the CENTERING PIN while the character or space is cast. The opening in which the type is cast is enclosed by the two TYPE BLOCKS, the MOLD BLADE that reciprocates between these two BLOCKS, and the CROSS BLOCK which reciprocates against the front faces of the two TYPE BLOCKS. Just before the MATRIX seats on the MOLD the sizing mechanism pulls the MOLD BLADE back so that the distance between its front end and the face of the CROSS BLOCK equals the thickness (set-ways) of the character to be cast. After the type is cast, the CROSS BLOCK, which is coupled to the TYPE CARRIER, is pushed to the right, as the CARRIER moves to the right into position to receive the type, pushed into it by the forward movement of the MOLD BLADE. The movement of the CROSS BLOCK cuts off the jet (which see) and throws this back into the MELTING POT. TYPE MOLDS are of two kinds, composition and sorts. COMPOSITION MOLDS are for casting type in automatically justified lines, with either high or low spaces and quads as desired, and also for casting type and spaces for the case. The SORTS MOLDS cast type and high and low quads and spaces for the case only, and will not compose type in justified lines. The COMPOSITION MOLDS have their point-size built into the MOLD and this cannot be changed; SORTS MOLDS are adjustable as to point-size within certain limits. All moving parts of all MOLDS reciprocate, there are no hinged joints to wear loose, and, in order that type may be cast at the highest possible speed, the MOLD and the top of the machine to which it is clamped are thoroughly water-cooled. (See also LEAD AND RULE MOLD and TIE-UP SLUG MOLD.)

Type Mold Blade. See MOLD BLADE FOR TYPE MOLD.

Type Pusher. ¶149. The rod that moves forward and pushes the type out of the TYPE CARRIER (which see) into the type channel, where the individual characters composing a line are assembled ready to be placed on the galley when the CARRIER delivers the last type for the line.

Type Sizing Mechanism. See TYPE TRANSFER WEDGE.

Type-storage Boxes. ¶382, Fig. 104 (page 172), ¶383, Figs. 105, 106, and 107 (page 173), and ¶385. Light but strong metal boxes, for the storage of type for use with the non-distribution system. These boxes are made in one length and height but in three widths, so that in arranging them in the type-storage cabinet (which see) the sizes are apportioned according to the frequency of use as well as the body-size of the characters. Each box has on the front a convenient handle and label holder; the back of the box is scoop-shaped for convenience in pouring out the type.

Type-storage Cabinet. ¶381 to ¶384 inclusive, Fig. 103 (page 171), Figs. 105, 106, and 107 (page 173), Fig. 108 (page 174), and Fig. 109 (page 175). The reservoir for the non-distribution system into which type is pumped from the TYPE&RULE CASTER and from which it is drawn as required by the compositors. Each cabinet has a capacity of 450 pounds of type and gives storage for two or for three fonts or for space material according to the arrangement of the type-storage boxes (which see) in the cabinet. A cabinet holds sufficient to fill completely nine type-cases. The cabinets may be combined two high by placing one on top of another for storage against a wall, or for storage in the waste space behind a standard type frame three of these cabinets side by side will just fit.

Type Transfer Wedge. ¶127, ¶137, ¶143, ¶144, and ¶364. The WEDGE that supports the NORMAL WEDGE (which see) and which in turn is supported by the fixed ABUTMENT in casting characters or spaces, the same width as they are counted by the KEYBOARD. The TYPE TRANSFER WEDGE moves to the right to permit the NORMAL WEDGE to be positioned for the next character to be cast, and then back to the left to support the NORMAL WEDGE. The movement of the TYPE TRANSFER WEDGE to the left is stopped by the MICROMETER WEDGE, an adjustable stop that may be regulated by the MICROMETER SCREW to make the set-size of characters the size required. After the TYPE TRANSFER WEDGE has thus been stopped, at the left end of its stroke, the MOLD BLADE is drawn back so that the set-size of the type cast is determined by the position of the NORMAL WEDGE and the adjustment of the MICROMETER WEDGE. *Summary:* The TYPE TRANSFER WEDGE moves to the left and then back to the right for every revolution of the CASTING MACHINE unless the perforation made by the SPACE PUNCH is presented to the CASTER; in this case the TYPE TRANSFER WEDGE remains at the right and, in its place, the SPACE TRANSFER WEDGE (which see) moves to the left to support the NORMAL WEDGE. The SPACE TRANSFER WEDGE is always used in casting sorts; *not* the TYPE TRANSFER WEDGE.

Typewriter Attachment. ¶274. A set of STOPBARS (which see) that causes the KEYBOARD to register all characters as nine units (⅛ em) wide, used for composing typewriter, mail-list, or other faces that have all characters on the same width body. When the TYPEWRITER ATTACHMENT is used the BOARD must be adjusted by pulling out the SPACE-CUT-OUT-OPERATING-ROD HEAD 16KA5 (Plate V, at back of book) so that the SPACE BARS will produce fixed size spaces, which, because the TYPEWRITER ATTACHMENT is used, are registered as nine units, the same width as the characters.

Typewriter Face. ¶179, ¶180, and ¶274. A face to imitate typewriting and consequently with all characters made for the same width body (set-size). Typewriter faces are designed to match the faces created by the manufacturers of different typewriters, and in some the set-size of the characters is based on the pica and in others on the tenth of an inch. Typewriter faces are made either to print direct from the type or to print through a ribbon. When composing these faces at the KEYBOARD the TYPEWRITER ATTACHMENT (which see) must be used to cause the BOARD to register all characters as nine units. Justifying spaces are not used, therefore the KEYBOARD must be adjusted so that the SPACE BARS will produce fixed size spaces which, because the TYPEWRITER ATTACHMENT is used, are registered as nine units. In setting typewriter faces the measure must be made an even multiple of the width of the characters for the face being set, see ¶179 and ¶180. No JUSTIFYING SCALE is required.

Type & Rule Caster. ¶360, Fig. 93 (page 158), and Fig. 131 (page 225). The casting mechanism of the Standard MONOTYPE (which see) plus the Lead and Rule Unit and the Display Type Unit (see both). Supplies all the material required by the hand compositor—type, borders, and high and low space material of any size from five- to thirty-six-point; rules, high and low leads and slugs of any thickness from two- to twelve-point. The TYPE & RULE CASTER pumps this material into the reservoir, the type-storage cabinet (which see), from which it is drawn as required by the compositor. By applying the additional units the TYPE & RULE CASTER can at any time be converted into the Standard MONOTYPE for casting type in automatically justified lines.

Unit. ¶44, ¶55, ¶68, and ¶69. One-eighteenth the width of the widest character of the font (the cap M). This unit is used in measuring the width of all the other characters in the font. The actual size of the unit in thousandths of an inch depends upon the set of the face; that is the width, in points, of the widest (18-unit) characters in the font. Thus, one unit of eight-set is one-eighteenth of eight points, or .00615″.

Unit Indicator a25KB1. ¶96, ¶99, ¶100, and Plate V (at back of book). A SCALE on the KEYBOARD in front of the UNIT WHEEL for indicating at a glance the number of spaces the UNIT WHEEL must revolve to bring the EM-RACK POINTER to the even em or half-em on the EM SCALE; that is, to seat the right tooth of the UNIT-WHEEL PAWL in a graduated space. Thus, when a graduation on the UNIT WHEEL coincides with eight on the UNIT INDICATOR, striking the eight-unit space will bring the EM-RACK POINTER to an even em or half-em.

Unit Rack c26KB1. ¶90 and Plate V (at back of book). Part of the counting mechanism of the KEYBOARD. When a KEY is struck, the UNIT RACK rises to engage the UNIT WHEEL (which see) and, after this RACK is fully seated in the WHEEL, the UNIT-WHEEL PAWL (which see) lifts clear of the WHEEL, which then revolves (in direction opposite the hands of a clock), carrying the UNIT RACK with it to the right. The revolution of the WHEEL is stopped by a lug on the RACK striking one of the UNIT-RACK STOPS (which see). When the KEY is released, the PAWL seats in the UNIT WHEEL and locks it; then the UNIT RACK drops down, out from mesh with the WHEEL, and the RACK is returned to its left position by its SPRING. The distance the UNIT WHEEL drives the

RACK to the right, and consequently the amount the WHEEL revolves, depends upon which STOP rises in the path of the RACK when the KEY is depressed; the location of this STOP corresponds to the unit width of the character struck.

Unit-rack Stops 31KB1. ¶91, ¶252, ¶257, ¶258, ¶259, Fig. 38 (Plate III, facing page 100), and Plate V (at back of book). One member of the counting mechanism of the KEYBOARD. When a KEY is struck one of these STOPS, depending upon the unit width of the character struck, rises in the path of the UNIT RACK (which see), stopping its movement to the right and consequently the rotation of the UNIT WHEEL. These STOPS are operated from the PUNCH BARS (which see) for the different unit-rows (which see) of the MATRIX CASE; the STOPBARS (which see) are the connection between the PUNCH BARS and the STOPS.

Unit-row. ¶45, ¶46, and Fig. 18 (page 22). The MATRICES carried in the same COMB (Fig. 6, page 9) of the MATRIX CASE are said to be in the same unit-row, because all characters on a COMB are cast on the same width body (same unit-size), unless this size be increased by adding justification. The unit-rows of the MATRIX CASE are therefore the rows that extend from front to back, operating position; thus, as the CASE moves to the right, or left, it presents a different unit-row to the MOLD.

Unit Space. See FIXED SPACE.

Unit System of Building Machinery. ¶509 to ¶516 inclusive. The MONOTYPE method of construction whereby the customer buys the equivalent of made-to-order machines containing just the units he requires, and then, as his business grows, he adds the other units as required. Furthermore all improvements are made as new units which can be applied to old machines, thus eliminating depreciation. That is why the MONOTYPE has *"Only one model—that always the latest."*

Unit Wheel a35KB1. ¶87 to ¶105 inclusive and Plate V (at back of book). Part of the counting mechanism of the KEYBOARD; a gear with 162 teeth that measures the width of each character struck, in units of the set of the face being composed. Each space between the teeth of this WHEEL represents a unit and the front face of the rim of the WHEEL is divided into eighteen equal parts by lines scribed on this face; thus, the distance between these graduations is nine spaces, or units (162 ÷ 18 = 9). The UNIT WHEEL is the principal member of the counting mechanism; it operates in conjunction with the following parts to measure the unit width of each character or space struck, and to add this number of units to the sum of the unit widths of the characters and spaces previously struck for the line: UNIT-WHEEL PAWL, UNIT RACK, UNIT-RACK STOPS, EM RACK, EM SCALE, UNIT INDICATOR, STOPBARS, etc. To avoid the necessity of several references to these parts, the counting mechanism will be here considered as a whole. The symbols of these parts refer to Plate V. **Unit-wheel Pawl:** The WHEEL is prevented from rotating by the UNIT-WHEEL PAWL a38KB1, except when a KEY is struck; then the PAWL lifts clear of the WHEEL, so that it revolves, left-handed (contra-clockwise), as many spaces as there are units in the character struck. When the KEY is released the PAWL again seats in the WHEEL. **Unit Rack:** The revolution of the WHEEL is stopped by the UNIT RACK c26KB1; this forms the second member of the UNIT WHEEL escapement, the PAWL being the first. When a KEY is struck, this RACK rises into mesh with the WHEEL, and after it is fully seated in the WHEEL, and not until then, the PAWL lifts out from mesh with the WHEEL, which then, as it rotates left-handed, drives this RACK to the right. Thus, the amount the WHEEL can rotate is determined by the movement to the right of this RACK. **Unit-rack Stops:** This movement of the RACK is stopped by the UNIT-RACK STOPS 31KB1. When a KEY is depressed a STOP rises up into the path of the UNIT RACK (whether the WHEEL rotates 5 spaces or 18 depends upon which STOP rises to stop the UNIT RACK). Thus, if the KEY for a five-unit character is struck, the PUNCH BAR rises to make the perforation that brings this row of the MATRIX CASE to casting position. As this BAR rises, its STOP rises with it and, at the same time, the UNIT RACK rises and engages the UNIT WHEEL. Then the PAWL lifts and the WHEEL revolves until its RACK strikes this five-unit STOP; that is, until the WHEEL revolves five spaces to register this five-unit character. The KEY released, the PAWL again seats in the WHEEL, the RACK drops out from mesh with the WHEEL and the RACK is moved to the left, by a spring, into position to engage the WHEEL for the next character struck. **Stopbars:** The STOPBARS form the connection between the UNIT-RACK STOPS and the PUNCH BARS for the different unit-rows of the MATRIX CASE: Thus, when the KEY for a five-unit character is struck, the PUNCH BAR rises to make the perforation to present the five-unit row of the MATRIX CASE to the MOLD. Since this PUNCH BAR is coupled to the five-unit UNIT-RACK STOP by the STOPBAR, the five-unit PUNCH BAR and STOP rise together. **Em Rack and Em Scale:** The UNIT WHEEL may be said to measure ems and half-ems, as well as units, because a PINION a35KB2, on the front end of its SHAFT, meshes with the EM RACK, driving this to the right as the WHEEL rotates left-handed. When the right tooth of the PAWL is seated in a graduated space of the WHEEL, the EM-RACK POINTER indicates on the EM SCALE the graduation for an em or half-em. **Unit Indicator:** In tabular work it is necessary to bring the BOARD to even ems for each column, that is, to seat the right tooth

of the PAWL in a graduated space, and to facilitate this the UNIT INDICATOR a25KB1 is provided. When a graduation on the WHEEL coincides with zero on the INDICATOR, the right tooth of the PAWL is seated in a graduated space of the WHEEL and the EM-RACK POINTER indicates an em, or half-em, graduation on the EM SCALE. If a graduation coincides with eight on the INDICATOR, striking an eight-unit space would bring the next graduation, to the right, to zero on the INDICATOR. **Motive Power for Unit Wheel:** The UNIT WHEEL is driven by compressed air. A PINION on its SHAFT is engaged by a RACK carrying on each end a PISTON; these PISTONS work in the UNIT-WHEEL DRIVING CYLINDERS a36KB1. There is constant air pressure in the right CYLINDER which drives the UNIT WHEEL left-handed whenever the PAWL releases the WHEEL. **Restoring Key:** When a RESTORING KEY is depressed, the air is cut off from the right UNIT-WHEEL DRIVING CYLINDER and admitted to the left CYLINDER; then the PAWL lifts clear of the WHEEL and the UNIT RACK does not rise, so that the WHEEL rotates right-handed until the BOARD is restored; that is, until the movement of the EM RACK to the left is stopped by the EM-RACK STOP. The RESTORING KEY is then released and the PAWL seats in the WHEEL.

Unit-wheel Pawl a38KB1. ¶89 and Plate V (at back of book). A PAWL which seats in the UNIT WHEEL (which see), locking it and preventing it from rotating except when a KEY is depressed; the PAWL then lifts, permitting the WHEEL to revolve left-handed to count the unit width of the character struck, and seats again when the WHEEL has come to rest and the KEY is released. When a RESTORING KEY (which see) is depressed the PAWL lifts and permits the UNIT WHEEL to revolve right-handed until stopped by the EM RACK striking its STOP; when the RESTORING KEY is released the PAWL seats again in the WHEEL.

Valve-bank Plunger 41KC12. ¶251 and Fig. 35 (Plate III, facing page 100). The valves on the KEYBOARD that control the admission of air to the PISTONS for driving the PUNCHES through the paper ribbon. Each PLUNGER is operated by its VALVE BAR (which see); each of these BARS is operated by a ROCK SHAFT (which see) and two of these are moved, when a KEY is depressed, by the KEYBAR (which see) that connects this KEY LEVER with its two ROCK SHAFTS.

Valve Bar. ¶251 and Fig. 35 (Plate III, facing page 100). That part of the KEY mechanism of the KEYBOARD that connects the ROCK SHAFT (which see) with its VALVE-BANK PLUNGER (which see). On BOARDS without the Repeater Unit the VALVE BARS are in one piece. On BOARDS having the Repeater Unit the VALVE BARS are in two pieces flexibly connected so that the air engine of the Repeater Unit can telescope the EXTENSION onto the BAR itself, thus alternately closing and opening the PLUNGER which admits air to operate the BOARD although the KEY for the character is held down continuously (¶551).

Valve Return Bar. A device on the KEYBOARD for seating any, or all, of the PLUNGERS in the VALVE BANK in case they fail to return after a KEY is released, due to their becoming gummy through neglect. This RETURN BAR is operated by the knurled HEAD 14KA7 (Plate V, at back of book) below the left end of the UNIT-WHEEL STANDARD.

Varying the Type Line. ¶279, ¶375, and ¶376. This is done on the CASTING MACHINE by moving the CENTERING-PIN BUSHING (in which the CENTERING PIN works) for any change in alignment not exceeding three and one-half points. When greater changes in alignment are required for SORTS MATRICES (14-point and larger), this is accomplished by using a special SLIDE and ABUTMENTS in the SORTS MATRIX HOLDER (which see).

Water-cooled Molds. ¶439 and Fig. 117 (page 189). Molds used for casting molten metal from the melting furnace into pigs for use again at the CASTING MACHINE. In order to cast quickly with the two molds, which form a set, these molds are cooled by a circulation of water through them. NOTE: All MONOTYPE MOLDS for making type, rules, leaders, and slugs on the CASTING MACHINE are thoroughly water-cooled.

Wedge, Justifying. See JUSTIFYING WEDGES.

Wedge, Normal. See NORMAL WEDGE.

Wide Measure Unit. ¶518. An attachment applied to the galley mechanism of the CASTING MACHINE to enable it to remove from the type channel, where the type for a line are assembled, and place upon the galley a line up to and including sixty picas in length; the standard CASTING MACHINE without this attachment will place on the galley any line not longer than forty-two picas.

Wide-spacing Unit. ¶536 to ¶546 inclusive and Figs. 136 and 137 (page 233). This unit automatically causes the operator to space wide between the words in a line, the spaces averaging three units wider than the normal MONOTYPE spaces. Thus the minimum space with the Wide-spacing Unit is seven units instead of four units, as with

normal composition. This unit is used in conjunction with Opening-up Faces (which see), and generally matter which is wide-spaced and opened-up line-wise is also opened-up point-wise by leading (which see). The Wide-spacing Unit consists of a special set of STOPBARS and KEYBARS at the KEYBOARD.

Zero. ¶100. The KEYBOARD is said to be at zero when the EM-RACK POINTER (which see) indicates zero on the EM SCALE and a graduation on the UNIT WHEEL coincides with zero on the UNIT INDICATOR (which see). If, then, the SCALE KEY is depressed, the JUSTIFYING SCALE will revolve until its POINTER indicates the zero column, or Scale Constant. If the JUSTIFYING KEYS thus indicated are struck, the justifying spaces in the line will be cast four units wide because, as there is no shortage to be distributed over them to increase their width, they must be made four units wide, the same size the KEYBOARD counted them.

PART II

TABULAR COMPOSITION

Key to Symbols Used in Tabular Exercises

Unit Value of Roman Characters

PLATE IV

Key to Symbols Used in Tabular Exercises

18 □	Em-quad (18-unit space).
10 ▯	Ten-unit space.
9 ▯	En-quad (9-unit space).
8 ▯	Eight-unit space.
7 ▯	Seven-unit space.
6 ▯	Six-unit space.
5 ▯	Five-unit space.
4 *	Justifying Space (registered as 4 units).
18 . .	Em-leader (18 units).
10 .	Ten-unit leader.
9 .	En-leader (9 units).
8 .	Eight-unit leader.
5 .	Period (5 units).
18 —	Em-dash (18 units).
10 –	Ten-unit dash.
9 –	En-dash (9 units).
8 –	Eight-unit dash.
✪	Any Key in the lower row of Justifying Keys.
0⁰	Number of ems (full size figure) and units (superior figure) below the brace.
0⁰↓ or ↓0⁰	Reading of the Em Scale and Unit Indicator at the point indicated by the arrow. Ems indicated by full size figure, units by superior figure.
Justifying Keys 0 0	Justification indicated by the Justifying Scale at the end of the line. (Note: On double justified matter the Scale is revolved by hand for all except the last section of the line.)
←0 Picas→	Width of measure in picas.
←0 Ems, 0 Units of 8½-Set→	Width of measure in ems and units of eight-and-one-half-set.

NOTE: Superior figures above a character or word always indicate the number of units in the character or word. If the character comes at the end of the line and has no connection with the text, it indicates allowance for rules which is to be discarded when the rules are inserted in making up the table.

Unit Value of Roman Characters

(Matrix Case Arrangement C)

Caps		Lower Case	
A = 13	units	a = 9	units
B = 13	"	b = 10	"
C = 13	"	c = 8	"
D = 15	"	d = 10	"
E = 13	"	e = 8	"
F = 12	"	f = 6	"
G = 14	"	g = 9	"
H = 15	"	h = 10	"
I = 8	"	i = 5	"
J = 9	"	j = 6	"
K = 15	"	k = 10	"
L = 12	"	l = 5	"
M = 18	"	m = 15	"
N = 15	"	n = 10	"
O = 13	"	o = 9	"
P = 12	"	p = 10	"
Q = 13	"	q = 10	"
R = 14	"	r = 7	"
S = 10	"	s = 7	"
T = 13	"	t = 7	"
U = 14	"	u = 10	"
V = 13	"	v = 10	"
W = 18	"	w = 13	"
X = 15	"	x = 9	"
Y = 14	"	y = 10	"
Z = 11	"	z = 8	"
Æ = 18	"	æ = 12	"
Œ = 18	"	œ = 14	"
& = 13	"	fi = 10	"
		fl = 10	"
		ff = 11	"
		ffi = 15	"
		ffl = 15	"

Points, Signs, and Figures			
. = 5	units	— = 9	units
, = 5	"	— = 18	"
- = 6	"	. = 9	"
; = 6	"	. . = 18	"
: = 6	"	| = 5	"
' = 5	"	% = 18	"
' = 5	"	£ = 12	"
? = 8	"	lb = 15	"
(= 7	"	. = 10	"
) = 7	"	$ = 9	"
[= 5	"	1 = 9	"
] = 5	"	2 = 9	"
½ = 18	"	3 = 9	"
¼ = 18	"	4 = 9	"
¾ = 18	"	5 = 9	"
° = 7	"	6 = 9	"
* = 8	"	7 = 9	"
† = 8	"	8 = 9	"
‡ = 8	"	9 = 9	"
¶ = 12	"	0 = 9	"

PLATE IV

CONTENTS

PART II

Tabular Composition

PART II

Tabular Composition

THE COMPOSITOR who understands the Monotype System and can "speak the Monotype Language" needs little, if any, instruction in tabular matter; he will find this quite as easy as making out a tabulated statement on a typewriter and will quickly realize that "all that a compositor can do with his stick, and more, he can do with this Keyboard."

To those who are hazy as to what "sets," "units," "eight-unit leaders," "scale constants," "fixed spaces," and "double justification" really are, we say with all earnestness, "Learn the Monotype language before trying to learn to set tabular matter." If this course be followed the question of "learning tabular matter" answers itself.

To those who have not yet mastered the correct finger motion and who cannot set on the Keyboard at least as clean a proof as they can set by hand, at not less than five times their speed on hand composition, we say with even more earnestness, "Postpone taking up tabular composition until you are competent on straight matter."

We have known operators to injure their future prospects because, in their anxiety to be "doing stunts," they neglected the fundamental principles, believing that they could learn to set straight matter properly any time. They forgot that the hardest of all learning is "unlearning," and that careless habits, dirty proofs and bad fingering require strength of character and earnest effort to overcome.

We make no apology for this "sermon"; the evident care we give to the preparation of our text-books is, we think, sufficient proof of our desire to aid compositors to become not only a credit to themselves, but also to their brother operators, whose skill has given the Monotype its well-earned title, "the versatile machine."

1 To illustrate by pictures (diagrams) the action of the Keyboard in setting various kinds of tabular matter is the object of this chapter; thus, the compositor who is learning to do with the MONOTYPE what he can do at the case sees each character added to the line, when a KEY is struck and the character counted, just as if he were putting the type in his stick. These examples illustrate only basic principles of the almost infinite uses of the MONOTYPE on tabular composition. After all, any kind of tabular matter can be but a combination of these principles, and the compositor who masters them will have no difficulty in setting any tabular matter that may be given him. We make no claim that these exercises give the "best method" for the work illustrated; different offices have different styles for setting the same matter. Let it be understood, therefore, that the *object of this chapter is not to help Monotype operators teach their employers how tabular matter should be set, but instead to ground students of the Monotype in the principles of "the versatile machine" and thus enable them to meet the requirements of any office.*

2 A great advantage of this graphical method is that it affords a ready means for the compositor to test his knowledge of the principles illustrated; for, in the same way, he can put down on paper the action of the KEYBOARD on any other line of the exercises. We believe that by this "pencil and paper" method the student can more quickly acquire the principles of tabular matter than by using a KEYBOARD; he can practise at home, for the only tools required are the table for Changing Pica Ems to Ems of Any Set (Plate VII, at back of book), table of Allowance for Rule and Squeeze (Plate VIII, at back of book), a Justifying Scale (Plate VI, at back of book), and Plate IV, facing page 2. For those who cannot test their work by trying on a KEYBOARD the lines thus analyzed, we will willingly criticize any examples sent us.

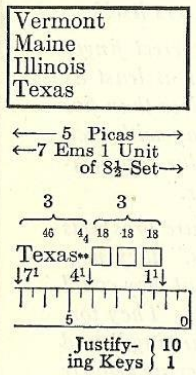
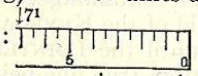
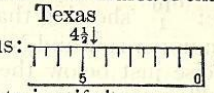


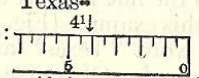
FIGURE 1
Use of justifying spaces and quads.

3 Follow the exercises in the order given; do not make the mistake of skipping indiscriminately from one to another; the exercises are arranged so that one leads up to the next and all the skipping has been done for you. Pay no attention to speed, either in laying out or setting tabular work, until you have mastered the principles these exercises illustrate.

4 All these examples are set in eight-point (8A series, 8½-set, Arrangement C); the Boldface rules enclosing the specimen are not part of the exercise. Refer now to Fig. 1, illustrating the use of justifying spaces and quads. The bottom line (Texas) of the specimen is the one illustrated graphically. Just below the specimen, between arrows extending the width of the specimen, is the measure in picas, thus: ←— 5 Picas —→ Below this, between similar arrows, is the measure for which the KEYBOARD would be adjusted in setting this specimen; that is, the equivalent of five picas in ems and units of

the set (8½) in use, thus: ←7 Ems 1 Unit of 8½-Set→ obtained from the measure in picas (5), from the table for Changing Pica Ems (Plate VII, at back of book). Next comes the graphical representation of the setting of the specimen line (Texas). When starting this line the EM-RACK POINTER indicates seven ems on the EM SCALE and the UNIT INDICATOR one unit, the measure for which the KEYBOARD would be set; this is shown in the exercise by the vertical arrow pointing just to left of the seven-em mark on the representation of the EM SCALE and the figures "7¹" beside this arrow (the superior figure being used for units and the full size figure for ems), thus: 

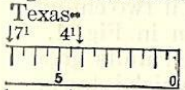
In setting word "Texas" the KEYBOARD registers the width, in units, of each character, as its KEY is struck; the total width of the word, in units, is shown by the superior figures "46" above the word, thus: ^{46}Texas The method of obtaining this total from the table of Unit Values (Plate IV, facing page 2) will be clear from Fig. 2. After striking the last letter (s) of the word "Texas" the KEYBOARD will indicate exactly four and one-half ems on the EM SCALE; thus: 

The two stars (**) after the word "Texas" indicate justifying spaces, and the width they are counted (4 units each) is shown by figure four above each, $^{4}_{**}$ After these two justifying spaces are put in line the KEYBOARD registers four ems one unit, thus: 

The total width of the word "Texas" and the two justifying spaces (**) is fifty-four units, or three ems (46+4+4=54 units=18×3=3 ems). This three ems is the difference between the seven ems one unit that the KEYBOARD registered at the beginning of the line (the measure for which the BOARD is set) and the four ems one unit the KEYBOARD registered after striking the second justifying space (indicated thus*)

T = 13 units
e = 8 units
x = 9 units
a = 9 units
s = 7 units
46 units

FIGURE 2
Shows forty-six units in word Texas.

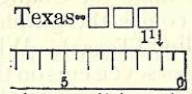
Texas*


This three ems is shown by the figure three above brace including the word and two justifying spaces (**), thus: $^{3}_{46\ 4_4}$Texas** Three quads are next inserted, represented by rectangles with superior figures "18" above (to show each is counted as 18 units), thus: $^{18\ 18\ 18}$□□□ The total width of the three quads is three ems, shown by the figure three above the brace, thus: $^{3}_{18\ 18\ 18}$ The KEYBOARD now indicates

□□□

that the line is one em and one unit short of the measure. This is

shown by the arrow below the last em-quad, which points just to the left of the one-em mark on the EM SCALE and the figures "11" at the left of the arrow, thus:



In setting this line at this KEYBOARD, the operator, after striking the last em-quad (□), would read the justification indicated by the JUSTIFYING-SCALE POINTER. By reference to eight-and-one-half-set SCALE (Plate VI, at back of book) the justification for this line, nineteen units short (1 em 1 unit = 18 units + 1 unit = 19 units), and containing two justifying spaces, may be obtained without the aid of the KEYBOARD. At the KEYBOARD the SCALE would revolve until the POINTER indicated the column numbered "19" at the bottom (the line being 19 units short); the POINTER would also point to the second space from the bottom in this nineteenth column, since there have been two justifying spaces put in the line and the POINTER rises one space on the SCALE for each justifying space struck. Therefore, to find, on the representation of the JUSTIFYING SCALE (Plate VI) the proper JUSTIFYING KEYS for this line, look in the second space from the bottom in the column numbered "19" at the bottom; the two figures found there are: "10 / 1" showing that the JUSTIFYING KEYS to be struck are No. 10 in upper row and No. 1 in the lower row. This is indicated in the exercise just below the representation of the EM SCALE, thus: Justifying Keys } 10 / 1 Striking these KEYS on the KEYBOARD will cause the CASTING MACHINE to cast the two justifying spaces, indicated in the exercise by the stars (**), of a width sufficient to distribute the nineteen units the line is short over the two justifying spaces in the line.

5 In this example (Fig. 1, page 4) two justifying spaces were used after the word "Texas" and these two spaces were followed by three em-quads. Of course, the principles would be the same if any other number of justifying spaces were used. With two justifying spaces, however, three em-quads are necessary; this will be clear from an examination of the eight-and-one-half-set SCALE (Plate VI, at back of book). The greatest number of units that can be distributed over two justifying spaces is thirty-two (the second space from the bottom in column 33 is blank); therefore, if two em-quads instead of three were used in the example shown in Fig. 1, the shortage at the end of the line would be eighteen units greater, making a total of thirty-seven units (18 + 19 = 37), which is too much to distribute over two justifying spaces.

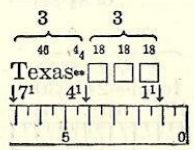
6 The Boldface heading over each specimen gives the subject of the exercise. In the Boldface line below the specimen is explained the basic principle illustrated by the exercise. Following this Boldface line is a brief description of the method of setting the sample line of the exercise. Be sure you understand the sample line; then with pencil and paper work out the other lines of the specimen graphically.

EXERCISE 1*

Justifying Spaces and Quads

Vermont
Maine
Illinois
Texas

←— 5 Picas —→
←7 Ems 1 Unit
of 8½-Set→



Justify- } 10
ing Keys } 1

Object: To use justifying spaces and quads to fill out lines containing one word.

In the above exercise, set the word flush to the left of the measure, put in two to four justifying spaces, quad out to within one or two ems of zero on the EM SCALE and justify from the JUSTIFYING SCALE. The justifying spaces are put in before the quads to avoid small spaces on the end of the line and also unnecessary movement of the MATRIX CASE.

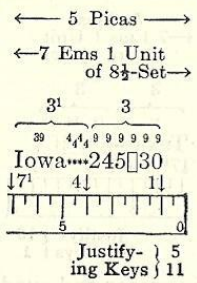
NOTE: By reference to the JUSTIFYING SCALE (Plate VI, at back of book) it will be noted that if there are two justifying spaces in the line and the line is two ems (36 units) short, the POINTER will indicate a blank rectangle. In such cases it will be necessary to strike another quad before obtaining the justification.

* This exercise is explained in complete detail on pages 4, 5, and 6, Part II.

EXERCISE 2

Justifying Spaces Between Columns

Idaho	113	60
Ohio	333	25
Kansas	116	85
Iowa	245	30



Object: Use of justifying spaces to bring the figure column flush to the right of the measure.

In this exercise the measure is so narrow that justifying spaces alone are required between the words and the figures. Note the use of the nine-unit space instead of the decimal point between dollars and cents in the figure column. Determine the width of the figure column (3 ems), and mark this off to the left of zero on the EM SCALE. Set up the word flush to the left of the measure, put in from two to four justifying spaces, being careful not to get beyond the three-em mark-off for the figure column. Put in the figures and justify from the JUSTIFYING SCALE.

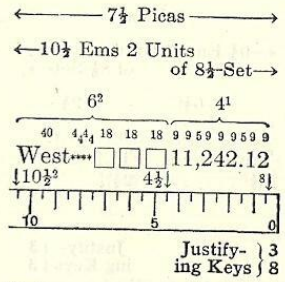
NOTE: By reference to the JUSTIFYING SCALE (Plate VI, at back of book) it will be noted that if there are two justifying spaces in the line and the line is two ems (36 units) short, the POINTER will indicate a blank rectangle. In such case it will be necessary to strike a quad before the figures in order to obtain the justification.

NOTE: It is not absolutely essential that a mark-off for the figure column be made on the EM SCALE when justifying spaces are used. It serves, however, as a guide to beginners, in order that, in spacing out the line, enough space may be left for the figure column.

EXERCISE 3

Justifying Spaces and Quads Between Columns

North	3,112.55
South	22,223.19
East	2,228.45
West	11,242.12



Object: Use of justifying spaces and quads to bring figure column flush to the right of the measure.

The above exercise is similar to Ex. 2, except that the measure is wider, necessitating the use of quads in addition to justifying spaces to bring the EM-RACK POINTER near the desired mark-off for the figure column. Note also the use of the period (5-unit) as a decimal point instead of the nine-unit space, as in Ex. 2. Determine the space required for the longest number in the figure column ("11,242.12" is 4 ems 1 unit; 7 figures each 9 units and a period and comma each 5 units, $7\times9=63$, $63+5+5=73$ units $=4$ ems 1 unit) and mark it off to the left of zero on the EM SCALE. Set up the word flush to the left of the measure, put in two to four justifying spaces, and quad out the line as if zero on the EM SCALE came at four ems one unit. Put in the figures with the comma and period in their proper places and justify from the JUSTIFYING SCALE.

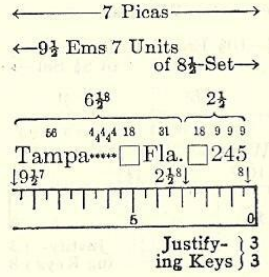
NOTE: By reference to the JUSTIFYING SCALE (Plate VI, at back of book) it will be noted that if there are two justifying spaces in the line, and the line is two ems (36 units) short, the POINTER will indicate a blank rectangle. In such cases it will be necessary to strike another quad before obtaining the justification; this quad will be transposed in front of the figure column by hand by the corrector.

NOTE: It is not absolutely essential that a mark-off for the figure column be made on the EM SCALE when justifying spaces are used. It serves, however, as a guide to beginners, in order that, in spacing out the line, enough space shall be left for the figure column.

EXERCISE 4

Justifying Spaces and Fixed Spaces Between Columns

Trenton	N. J.	245
Bristol	Pa.	15
Adams	N. Y.	5
Tampa	Fla.	245



Object: Use of justifying spaces to bring the last column flush to the right of the measure, and fixed spaces between the last two columns to line up the second column.

The width of the widest number in the figure column is one and one-half ems (1 em 9 units). Since some white space must be allowed between columns, mark off two and one-half ems (2 ems 9 units) to the left of zero on the EM SCALE. This leaves one em white space between the last two columns. Consider that the end of the line (0 on the EM SCALE) comes at the two and one-half em mark-off on the EM SCALE. Set up the word in the first column flush to the left of the measure. Put in two to four justifying spaces and the necessary quads, leaving space to put in the abbreviations in the second column without getting beyond the two and one-half em mark-off.* Put in one em-quad and nine units more for each figure the number is short of the longest number, then the figures of the last column, and justify from the JUSTIFYING SCALE.

NOTE: By reference to the JUSTIFYING SCALE (Plate VI, at back of book) it will be noted that if there are two justifying spaces in the line and the line is two ems (36 units) short, the POINTER will indicate a blank rectangle. In such cases it will be necessary to strike another quad before obtaining the justification; this quad will be transposed by the hand corrector.

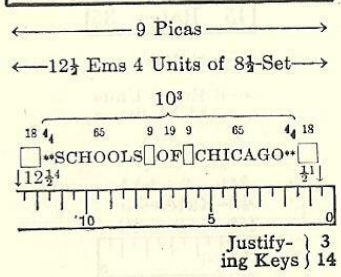
NOTE: Another way to set this exercise is to figure out the space necessary for each state abbreviation and use fixed spaces or leaders to bring the measure that number of ems and units short of zero, or a given mark-off on the EM SCALE, as described in Ex. 25.

* In case there are two-word abbreviations, use a fixed space between these words.

EXERCISE 5

Centering Small Cap Headings

SCHOOLS OF BOSTON
SCHOOLS OF OMAHA
SCHOOLS OF NEW YORK
SCHOOLS OF CHICAGO



Object: Use of fixed spaces between words in centering more than one word in a line.

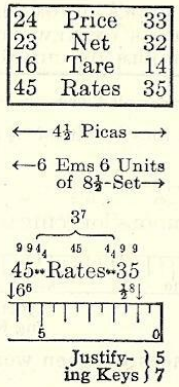
In such work, uniform spacing between the words of all the lines is essential and therefore fixed spaces must be used. As a general rule, twelve-unit spaces are used between words in a cap line, nine-unit between words in a small cap line, and six-unit between words in a lower case line.

In the above exercise, estimate the number of ems the words require and subtract this from the total number of ems in the full measure. Divide the remainder equally on each side of the words to be centered, using two to four justifying spaces and also quads when necessary. Set the quads and justifying spaces, put in the words to be centered, with nine-unit fixed spaces between them, put in the same number of justifying spaces and quads on the right as were used on the left side of the centered words, and justify from the JUSTIFYING SCALE.

NOTE: In setting matter like the above be careful not to use too many quads and justifying spaces *before* setting the matter to be centered, for if this be done, the same number of quads and spaces *after* the matter to be centered would make the line too long. While this mistake can be rectified by omitting two quads (after the matter) so that one quad may be transposed by hand from before the matter, it is much better to err on the side of *underestimating* the number of quads and justifying spaces to use *before* the matter to be centered. Thus, when the last quad for the line has been struck, if the EM-RACK POINTER is not within four ems of zero on the EM SCALE, determine the number of units the line is short, halve this shortage and the number of justifying spaces in the line, and find from the JUSTIFYING SCALE the justification for a line one-half as short with one-half as many justifying spaces as the line to be justified (¶355, Part I).

EXERCISE 6

Centering Word Column Between Two Figure Columns with Justifying Spaces



Object: To center a word column with one figure column flush to the right and one flush to the left of the measure by means of justifying spaces between columns.

This exercise is exactly the same as centering a heading in straight matter, except that space must be allowed on each side of the word for a figure column. It should be noted that an equal number of justifying spaces and quads must be placed on each side of the word, although the number may vary with words of different width. Set up the figure column flush to the left of the measure, put in two to four justifying spaces, set the word to be centered, put in two to four justifying spaces (being careful to use the same number of justifying spaces after the word as was used before it), put in the figure column, and justify from the JUSTIFYING SCALE.

NOTE: In case the figure columns on either side of the word to be centered are not of the same width, it would be necessary to equalize the columns by means of fixed spaces before justifying (see Ex. 7).

NOTE: If the measure used is too wide for the use of justifying spaces alone on either side of the word to be centered, use em-quads in combination with justifying spaces, being careful to put the same number of justifying spaces and quads on each side of the word.

NOTE: In setting matter like the above be careful not to use too many quads and justifying spaces *before* setting the matter to be centered, for if this be done, the same number of quads and spaces *after* the matter to be centered would make the line too long. While this mistake can be rectified by omitting two quads (after the matter) so that one quad may be transposed by hand from before the matter, it is much better to err on the side of *underestimating* the number of quads and justifying spaces to use *before* the matter to be centered. Thus, when the last quad for the line has been struck, if the EM-RACK POINTER is not within four ems of zero on the EM SCALE, determine the number of units the line is short, halve this shortage and the number of justifying spaces in the line, and find from the JUSTIFYING SCALE the justification for a line one-half as short with one-half as many justifying spaces (¶355, Part I).

EXERCISE 7

Centering a Word Column with Figure Column on One Side

Object: To center a word column with a figure column on one side of the measure only.

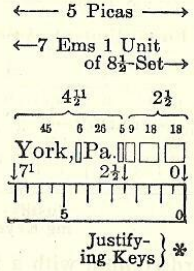
This exercise demonstrates the use of fixed spaces, on one side of a word to be centered, to equalize the space taken up by the figure column on the other side. If the figure column is on the right of the measure, allow an equal number of units of blank space on the left of the measure in addition to the spaces used to center the word column. If the figure column is on the left of the measure, allow an equal number of units on the right side of the measure. In other words, the width of the figure column plus the justifying spaces and quads on one side of a word column must equal the width of the justifying spaces and quads on the other side of the word. In setting, estimate the number of quads and justifying spaces necessary to center the word column the same as if there were no figure column. Put this amount in on the side having no figure column, and on the side having the figure column put in this amount *minus* the width of the figure column. Justify from the JUSTIFYING SCALE.

NOTE: In setting matter like the above be careful not to use too many quads and justifying spaces *before* setting the matter to be centered, for if this be done, the same number of quads and spaces *after* the matter to be centered would make the line too long. While this mistake can be rectified by omitting two quads (after the matter) so that one quad may be transposed by hand from before the matter, it is much better to err on the side of *underestimating* the number of quads and justifying spaces to use *before* the matter to be centered. Thus, when the last quad for the line has been struck, if the EM-RACK POINTER is not within four ems of zero on the EM SCALE, determine the number of units the line is short, halve this shortage and the number of justifying spaces in the line, and find from the JUSTIFYING SCALE the justification for a line one-half as short with one-half as many justifying spaces as the line to be justified (¶355, Part I).

EXERCISE 8

Fixed Spaces of Various Sizes

Bristol, Pa.
Trenton, N. J.
Dover, Del.
York, Pa.



Object: Use of fixed spaces only in bringing a line to zero on the Em Scale.

Change the justifying space on the KEYBOARD to a fixed six-unit space (¶86, Part I). Set up the words flush to the left of the measure, using fixed six-unit spaces between the words. Bring the UNIT WHEEL to even ems by the use of the various sized fixed spaces, quad to zero, and justify.*

NOTE: In MATRIX CASE Arrangement C (Plate IX, at back of book) the spaces regularly used are five-, six-, nine-, ten-, and eighteen-unit, but any sized space may also be obtained by omitting infrequently used characters, and calling the attention of the CASTER operator to this change by marking the space on the KEYBOARD ribbon ticket. This change should not be made except in cases where a large number of a certain sized space is required.

NOTE: To bring the UNIT WHEEL to an even em or en with the least number of units: When one unit short of an even em or en, use a ten-unit space (or the 5 twice); when two units short, use an eleven-unit space (or 5 and 6); when three units short, use a twelve-unit space (or 6 twice); when four units short, use a thirteen-unit space (or 6 and 7—a justifying space with constant justification will also give 4 units); when five units short, use a five-unit space; six units, use six; seven units, use seven; eight units, use eight.

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 9

Various Sized Fixed Spaces Between Word Columns

Japan	France	Russia
Canada	Wales	Egypt
Italy	Brazil	Peru
China	India	Spain

Object: To justify simple three-column matter without the use of the justifying space.

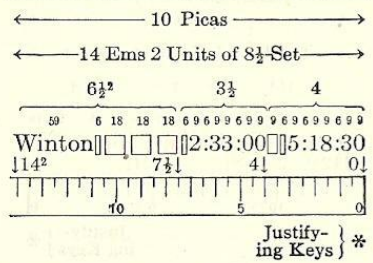
In setting the above three-column table, ascertain the measure for each column by setting up the longest word in that column. Equalize the space so that each column will be even ems, except the first, in which put the odd units. Mark the measure for each column from right to left, beginning at zero on the EM SCALE. Set up "China," bring the UNIT WHEEL to even ems by the use of the various sized fixed spaces, quad to the mark for the beginning of the next column; set up "India," bring the UNIT WHEEL to even ems as above described, quad to the mark for the beginning of the last column; set up "Spain," bring the UNIT WHEEL to even ems, quad to zero, and justify.*

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 10

Various Sized Fixed Spaces with Figure Columns

Panhard	2:16:00	5:00:01
Buick	2:28:27	5:03:26
Reo	2:30:00	5:16:35
Winton	2:33:00	5:18:30



Object: Use of fixed spaces in spacing out to figure columns.

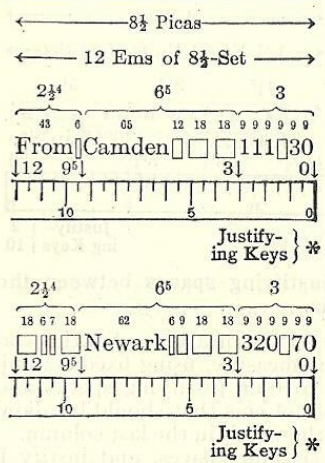
In setting the above exercise, determine the space required for the longest number in the last figure column; this is three ems three units. Some white space is required between the two figure columns, therefore mark off four ems to the left of zero on the EM SCALE, which will give a half-em and six units of white space. The longest number in the first figure column is three ems three units. To this add a fixed six-unit space in order to bring the mark-off on the EM SCALE to an even half-em. The mark-off for the two columns is seven and one-half ems. Set the word flush to the left of the measure, get on an even em or en on the EM SCALE by the use of the various sized fixed spaces, and quad to the mark-off for the beginning of the first figure column. Put in a fixed six-unit space, then the figures. Put in the blank space between the figure columns (a 9- and a 6-unit space), set the last figure column, and justify.*

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 11

Hanging Indentions and Fixed Spaces Between Columns

From	Camden	111	30
	Newark	320	75
	Bayonne	193	45
	Trenton	285	25



Object: Use of fixed spaces in setting hanging indentions and bringing the Pointer to a mark-off on the Em Scale.

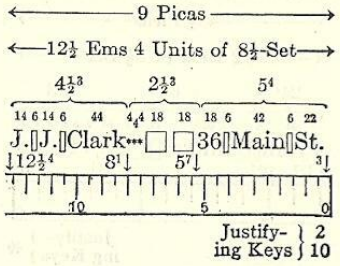
In the above exercise determine the space required for the longest number in the figure column. This is three ems. Mark off three ems to the left of zero on the EM SCALE. Set the first word flush to the left of the measure with a fixed six-unit space after the last letter of the word (a different sized space could be used to get on an even em or en on the EM SCALE if the space is not too great) and mark the EM SCALE. Set the next word and get on an even em or en by the use of the various sized fixed spaces, quad to the three-em mark-off to the left of zero on the EM SCALE, put in the figure column, and justify.* In the next line put in blank space to the first mark-off on the EM SCALE (the mark-off for the hanging indention), using quads and the various sized fixed spaces. Set the word, get on an even em or en by the use of the various sized fixed spaces, quad to the mark-off to the left of zero on the EM SCALE, put in the figure column, and justify.*

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 12

Spacing to Column of Uneven Width

Elias Duke	1122 Market St.
W. A. Jones	924 Race St.
B. A. Boyer	300 Fourth Pl.
J. J. Clark	36 Main St.



Object: Use of justifying spaces between the columns and fixed spaces in the columns.

Set the KEYBOARD for the measure. Set the words in the first column flush to the left of the measure, using fixed six-unit spaces between the words. Put in two to four justifying spaces and quad out the line, estimating the number of ems that should be allowed to the left of zero on the EM SCALE for the words in the last column. Set the words in this column, using fixed six-unit spaces, and justify from the JUSTIFYING SCALE.

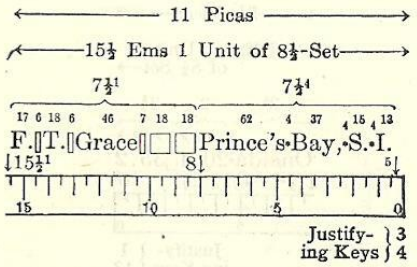
NOTE: In order to estimate the number of ems in the last column, a guide can be obtained by setting up the longest and shortest lines in the column and governing all other lines by these widths.

NOTE: In setting matter like the above be careful not to use too many quads and justifying spaces after the words in the first column, for, if this be done, it will make the line too long. It is much better to err on the side of *underestimating* the number of quads and justifying spaces to use. Thus, when the last character for the line has been struck, if the EM-RACK POINTER is not within four ems of zero on the EM SCALE, determine the number of units the line is short, halve this shortage and the number of justifying spaces in the line, and find from the JUSTIFYING SCALE the justification for a line one-half as short with one-half as many justifying spaces as the line to be justified (¶355, Part I).

EXERCISE 13

Fixed Spaces in One Column, Justifying Spaces in the Other

C. C. Compton	Jersey City, N. J.
F. A. Murphy	St. George, S. I.
E. W. Green	Bristol, Pa.
F. T. Grace	Prince's Bay, S. I.



Object: To line up the second column by the use of fixed spaces in the first column, and justify the second column by the use of justifying spaces.

This exercise differs from Ex. 12 in that the last column is lined up on its left at a mark-off on the EM SCALE instead of on its right at zero. Ascertain the width of the last column by setting up the longest line in that column with justifying spaces between the words, and mark the nearest number of even ems over this amount to the left of zero on the EM SCALE. Set the words in the first column flush to the left of the measure, using fixed six-unit spaces between the words. Get on an even em by the use of the various sized fixed spaces, and quad to the mark-off to the left of zero on the EM SCALE. Set the last column, using justifying spaces, and justify from the JUSTIFYING SCALE.

NOTE: In lines that fill the measure, justifying spaces should be used in the last column; in short lines use fixed six-unit spaces, get on an even em, quad to zero, and justify. If no justifying spaces are used and the line is brought exactly to zero by the use of fixed spaces, do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required since the line is full and contains no justifying spaces.

EXERCISE 14

Justifying Space Used as a Fixed Four-Unit Space

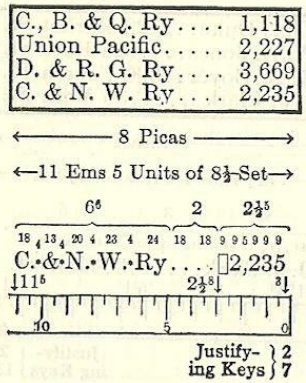
Object: To use the justifying space with constant justification as a four-unit fixed space in lines where regular fixed spaces could not be used.

Ascertain the width of the last column; this is two ems (note the use of the 9-unit leader for a decimal). Allow nine units for white space between the second and third columns. The width of the first figure column is two ems. Mark off four and one-half ems (the width of the 2 figure columns plus the white space between the 2 columns) to the left of zero on the EM SCALE. Set the word in the first column flush to the left of the measure. In the above example the space between the last letter of the word "Oneida" and the mark-off for the second column is four units only. Put in a justifying space. This brings the measure exactly to the four and one-half em mark-off for the second column; set the figures for this column, put in a nine-unit space, set the figures for the last column, and justify from the JUSTIFYING SCALE. The justification indicated is 1–12, which is the Constant Justification for eight-and-one-half-set, and the justifying space becomes a fixed four-unit space.

NOTE: The four-unit space is the smallest space that can be registered on the KEYBOARD, and should be used only when the space left will not admit of the use of the various sized fixed spaces.

EXERCISE 15

Justifying Spaces and Leaders in Making Alignments



Object: To use justifying spaces in the first column with nine- and eighteen-unit leaders only between columns.

Determine the width of the figure column; this is two ems five units. Allow nine units white space and mark the EM SCALE at two and one-half ems five units to the left of zero. Set the words in the first column flush to the left of the measure, using justifying spaces between the words. Put in em- and en-leaders as if zero on the EM SCALE came at the two-and-one-half-em five-unit mark-off. Put in a nine-unit space, then the figure column, and justify from the JUSTIFYING SCALE.

NOTE: The KEYBOARD may be so filled with other characters that it would be impossible to carry the eight- and ten-unit leaders for bringing the EM SCALE to the mark-off for the last column if fixed six-unit spaces were used between the words. This necessitates the use of justifying spaces as described above.

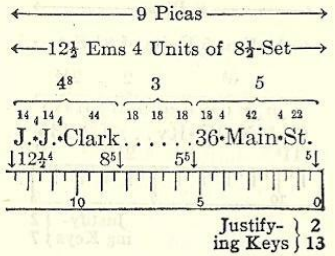
NOTE: It is not absolutely essential that a mark-off for the figure column be made on the EM SCALE when justifying spaces are used. It serves, however, as a guide to beginners, in order that, in spacing out the line, enough space may be left for the figure column.

NOTE: By reference to the JUSTIFYING SCALE (Plate VI, at back of book) it will be noted that if there are only two justifying spaces in the line and the line is two ems (36 units) short, the POINTER will indicate a blank rectangle. In such cases it will be necessary to strike another leader before obtaining the justification. This leader will be transposed by the hand corrector, and put between the columns.

EXERCISE 16

Leaders Between Two Columns of Uneven Widths

Elias Duke..1122 Market St.
W. A. Jones....924 Race St.
B. A. Boyer..300 Fourth Pl.
J. J. Clark.....36 Main St.



Object: To use justifying spaces in both columns and nine- and eighteen-unit leaders only between the columns.

Set the words in the first column flush to the left of the measure, using justifying spaces between the words. Put in em- and en-leaders, estimating the number of ems that should be allowed to the left of zero on the EM SCALE for the words in the last column. Set the words in this column, using justifying spaces between the words, and justify from the JUSTIFYING SCALE.

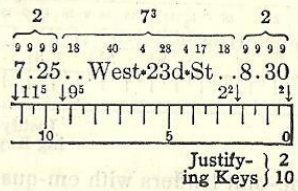
NOTE: In order to estimate the number of ems in the last column, a guide can be obtained by setting up the longest and shortest lines in the column (before starting the "take") and governing the width of all other lines by these guide lines.

NOTE: For good spacing the line should end approximately two units to the left of zero for each justifying space in the line. Should the operator estimate the width of the words in the last column so that when the last character is struck too much space is left, he can strike one or more leaders before obtaining the justification. These leaders will be transposed by the hand corrector and put between the columns.

EXERCISE 17

Centering a Word Column Between Two Figure Columns with Leaders

7.20..East 42d St..8.35
7.30.Desbrosses St.8.25
7.30..Cortland St..8.25
7.25..West 23d St..8.30



Object: To center a word column between two figure columns by means of justifying spaces in the word column and em- and en-leaders only between the columns.

The use of leaders on both sides of the word column necessitates the use of justifying spaces between the words of this column to justify the line. Use nine- and eighteen-unit leaders only. Set up the first figure column flush to the left of the measure. Estimate the width of the word column and the number of em- and en-leaders required on either side of this word column. (Note that the sum of these 3 plus the width of the 2 figure columns equals the full measure.) Put in the estimated number of em- and en-leaders, then the word column, using justifying spaces between the words. Put in the same number of em- and en-leaders as used before the word column, then the last figure column, and justify from the JUSTIFYING SCALE.

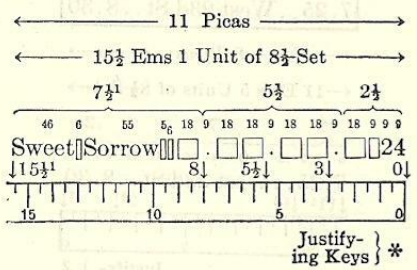
NOTE: In order to estimate the number of ems required in the word column, a guide can be obtained by setting up the longest and shortest lines in the column (before starting the "take") and governing the width of all other lines by these guide lines.

NOTE: If an operator estimates the width of the center column so that when the last column is set it comes to within four ems of zero on the EM SCALE, he can obtain a justification. By reference to the JUSTIFYING SCALE (Plate VI, at back of book) it will be noted that if there are only two justifying spaces in the line, and the line is two ems (36 units) short, the POINTER will indicate a blank rectangle on the JUSTIFYING SCALE. In such cases it will be necessary to strike two em- or en-leaders (always an even number) before obtaining the justification. These leaders will be transposed by the hand corrector and put one before and one after the word column. Where the justification obtained after the line is set up is such as to produce an extremely wide space, it is better, even though the line can be justified, to put in two or more leaders (always an even number) in order to produce a more nearly uniform spacing between the words.

EXERCISE 18

Open Leader Work

Sweet Marie . . .	22
Gay Wilkes . . .	23
The Rival	23
Sweet Sorrow . . .	24



Object: To use nine-unit leaders with em-quads between them.

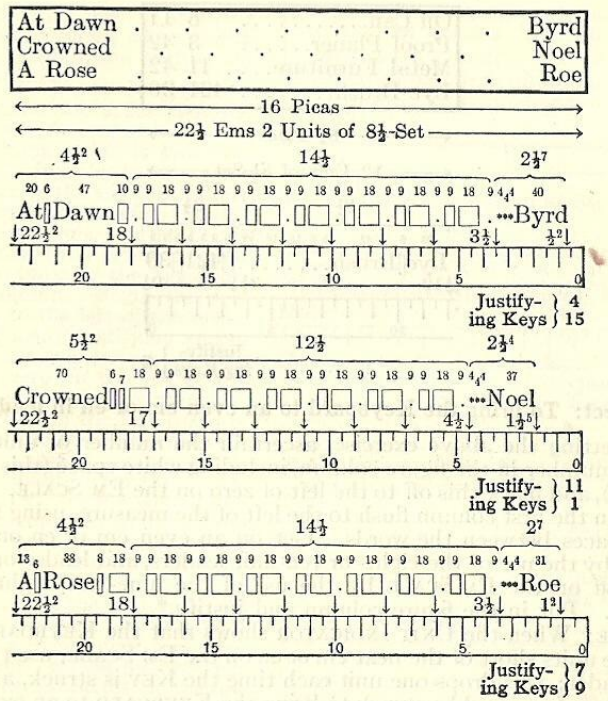
In this form of open leader work the leaders are lined up above one another. Decide how much space is to be allowed between the leaders (in this exercise 2 ems); it is customary to allow one-half em less space between the last leader and the figure column. Mark the EM SCALE where each leader is to be put in; in this case, beginning at zero mark off three ems, then every two and one-half ems to the left of this (5½, 8, 10½). Set the words in the first column flush to the left of the measure, using a fixed six-unit space between the words, get on an even em or en on the EM SCALE by the use of the various sized fixed spaces, and quad to the first mark-off for a leader. Put in a nine-unit leader, two em-quads, nine-unit leader, two em-quads, and repeat until the last leader is reached; then put in the last leader, one em-quad, one en-quad, the figure column, and justify.*

* Justification: Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 19

Diamond Leader Work

At Dawn	Byrd
Crowned	Noel
A Rose	Roe



Object: To set open leader work so that the leaders in every alternate line will be in alignment.

In diamond leader work every alternate line in the copy should be checked off. The leaders in each checked line should be in alignment, and the leaders in the lines not checked should be in alignment. Always use a nine-unit leader and a half-em measure between the nine-unit leaders (½, 1½, or 2½ ems). In the exercise above, the space allowed between the nine-unit leaders is one and one-half ems; this space plus the nine-unit leader equals two ems. Beginning at zero, mark off on the EM SCALE every two ems. In the first checked line, set up the word, or words, flush to the left of the measure (if there are 2 or more words, use a fixed 6-unit space between the words). Get on an even em or en on the EM SCALE by the use of the various sized fixed spaces, and quad to the nearest mark-off. Put in a nine-unit leader, one em-quad, one en-quad, a nine-unit leader, one em-quad, one en-quad, etc., until it is estimated that the word or words in the last column will nearly complete the measure. Then put in two to four justifying spaces, set the word or words, and justify from the JUSTIFYING SCALE. If there are two or more words at the end of the line, use fixed six-unit spaces between them. In the second line set the word or words flush to the left of the measure, get on an even em or en on the EM SCALE by the use of the various sized fixed spaces, and quad to the first even em beyond the nearest mark-off on the EM SCALE. Finish the line as above. In the third line, get on the nearest mark-off again and finish setting the line as above.

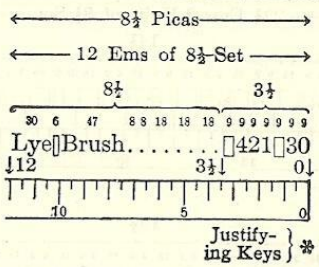
NOTE: A good rule to remember is that every line that is checked off should be brought to the nearest mark-off, and lines without a check should be brought to the first even em beyond the nearest mark-off.

NOTE: By reference to the JUSTIFYING SCALE (Plate VI, at back of book) it will be noted that if there are two justifying spaces in the line and the line is two ems (36 units) short, the POINTER will indicate a blank rectangle. In such case it will be necessary to strike another quad before justifying. This quad will be transposed by the hand corrector, and put between the last leader and the word or words in the last column.

EXERCISE 20

Eight- and Ten-Unit Leaders

Oil Can	6	11
Proof Planer	3	42
Metal Furniture	11	42
Lye Brush	421	30



Object: To bring the Keyboard to an even em or en in leader work.

In setting the above exercise, ascertain the number of units in the widest number in the figure column, including white space (this is 3 ems 9 units), and mark this off to the left of zero on the EM SCALE. Set the words in the first column flush to the left of the measure, using fixed six-unit spaces between the words. Get on an even em or en on the EM SCALE by the use of the eight- or ten-unit leaders, and leader out to the mark-off on the EM SCALE by the use of the nine- and eighteen-unit leaders. Put in the figure column and justify.*

NOTE: When the UNIT INDICATOR shows that the KEYBOARD is five or more units short of the next em or en on the EM SCALE, use the eight-unit leader; this drops one unit each time the KEY is struck, and never more than four need be struck to bring the KEYBOARD to an even em or en. When the UNIT INDICATOR shows that the KEYBOARD is four or less units short of the next em or en on the EM SCALE, use the ten-unit leader; this gains one unit each time the KEY is struck and never more than four need be struck to bring the KEYBOARD to an even em or en.

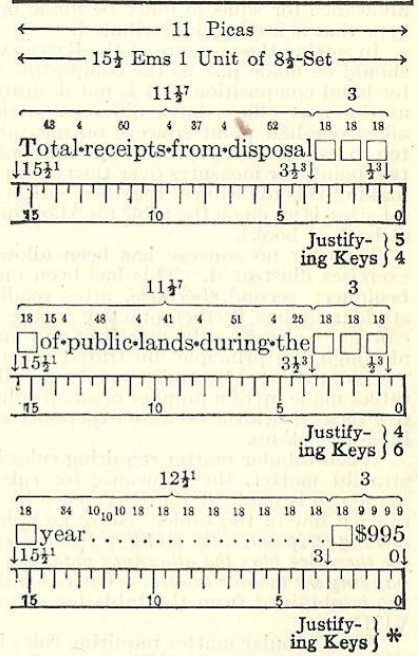
* Justification: Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 21

Hanging Indention

Object: The use of hanging indention and figure column, with justifying spaces and eight- and ten-unit leaders.

Number of claims filed in May	1,334
Total receipts from disposal of public lands during the year	$995



Determine the space required for the longest number in the figure column; this is two ems five units. In order to have some white space at the left of the figure column, make the measure of this column three ems, and mark the EM SCALE at three ems to the left of zero to indicate the beginning of this column. Begin the first line flush to the left of the measure, and, using justifying spaces between the words, set up this line as if zero on the EM SCALE came at the three-em mark-off. After putting in the last letter of the line, put in three em-quads for the blank space in the figure column, and justify from the JUSTIFYING SCALE. In the second line put in one em-quad to indent the line, then set the same as the line above. Indent the third line the same as the second by putting in one em-quad at the beginning, set the word (if there should be 2 words use a fixed 6-unit space between them), get on an even em or en on the EM SCALE by the use of the eight- or ten-unit leaders and leader out to the three-em mark-off with nine- and eighteen-unit leaders. The width of the figures "$995" is two ems. Since three ems are allowed for the figure column, put in one em-quad, then the figures "$995," which brings the EM-RACK POINTER exactly to zero, and justify.*

NOTE: When a line fills the measure or a single column completely, justifying spaces must be used between the words. When the line does not fill the measure or column (at the end of a paragraph, as in the above example), fixed spaces are used between the words and the line is justified by the use of leaders or spaces of various sizes after the last word.

NOTE: When the UNIT INDICATOR shows that the KEYBOARD is five or more units short of the next em or en, use the eight-unit leader; this drops one unit each time the KEY is struck, and never more than four need be struck to bring the KEYBOARD to an even em or en. When the UNIT INDICATOR shows that the KEYBOARD is four or less units short of the next em or en, use the ten-unit leader; this gains one unit each time the KEY is struck, and never more than four need be struck, to bring the KEYBOARD to an even em or en.

* Justification: Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

Allowance for Rule and Squeeze

When type is locked up, each line is compressed setways and becomes slightly shorter no matter how tight the type may have been in the measure before locking up. The amount the line is compressed depends on the number of type in the line, or, since the longer the line the more characters it contains, the amount that the type in a line is compressed depends on the measure. It is customary, when setting type by hand, to make the measure a little wider than is called for, so that when the type is compressed in locking up it will come the width desired, but will not bind on leads or rules. Since new type compresses more than type that has been used, more allowance for squeeze must be made on MONOTYPE type than on foundry type that is used and distributed.

In setting the measure at the KEYBOARD, allowance for squeeze in lock-up should be made just as the compositor allows for this in adjusting his stick for hand composition. It is not desirable to give any positive rule for this, as different offices have different methods. A good rule to follow is to allow one-half point squeeze on measures up to ten picas, one point from ten to twenty picas, one and one-half points from twenty to thirty picas, and two points for measures over thirty picas. An explanation of the method of making this allowance, together with a table of allowances for the various set sizes, is given on the table for Allowance for Rule and Squeeze (Plate VIII, at back of book).

Thus far no squeeze has been allowed in the lay-outs for the various exercises illustrated. This has been omitted, first, to avoid confusing the beginner; second, because, after reading the following explanation, if a student desires further practice in the preceding or following exercises, he can add squeeze to the measures and make an entirely new set of exercises, although the principle illustrated remains unchanged.

EXCEPTION: Most offices make no allowance for squeeze in setting ruled tables made up of a number of small columns that do not average more than five picas in width, because experience shows that such tables take up very little in lock-up.

When tabular matter requiring rules is to be run on the same galley with straight matter, the allowance for rule (to be inserted when the table is made up) is made at the KEYBOARD by striking extra characters at the end of each line of the table. *Since no squeeze is allowed on tabular matter containing strip rules, the width of these extra characters must equal the allowance for the rules plus the allowance made for squeeze in the straight matter accompanying the tabular matter.* The equivalent of the rule in units of the set in use is obtained from the table for Allowance for Rule and Squeeze (Plate VIII).

When tabular matter requiring rules is run alone, the extra characters for allowance for rules should be omitted if possible and the CASTING MACHINE measure reduced by the total thickness of the rules to be inserted. Since this generally results in a "bastard" measure at the CASTING MACHINE (odd points instead of picas or half-picas), of course, "bastard" leads and material for handling are required, unless the matter be ruled out as soon as it comes from the CASTING MACHINE. To avoid this, many offices put in the extra characters for allowance for rule even when the table is not run on the same galley with straight matter, although this requires extra key-strokes at the KEYBOARD and extra revolutions at the CASTING MACHINE. If these extra characters, to be replaced by the rules, are used in tabular matter that is not cast with straight matter as described above, they should not be included in the cast of the table on the EM SCALE of the KEYBOARD, but at the end of the line, thus: Reduce the KEYBOARD measure by the number of units to be allowed for rule, and, at the end of the line (so as not to affect justification), strike these characters for allowance for rule *after* the JUSTIFYING SCALE has been read, but *before* the JUSTIFYING KEYS, indicated by the JUSTIFYING SCALE, have been struck. For convenience in ruling out, characters allowed for rules should be put at the end of the line.

EXERCISE 22

Allowance for Rules Made at the Keyboard

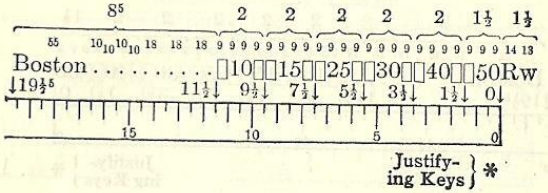
Chicago.....	11	16	26	30	40	50
Cleveland†.....	15	20	25	30	35	40
Pittsburg.....	9	14	24	29	39	49
Boston.....	10	15	25	30	40	50

†Rates from this point subject to a rebate.

←15 Picas, with Rules (2 point), plus 1 Point Squeeze→

←21 Ems 5 Units of 8½-Set→

←19½ Ems 5 Units of 8½-Set→



Object: To use characters as "deadwood" on the end of a line to make up space for the rules in a table.

The measure for the completed table, including rules, is to be fifteen picas. By reference to the table for Changing Pica Ems to Ems of Any Set (Plate VII, at back of book), it will be noted that the measure for fifteen picas, eight-and-one-half-set, is twenty-one ems three units. Assuming that this table is to be cast with straight matter, on which one point has been allowed for squeeze, the equivalent of this one point must be added to the measure, as explained on the preceding page; therefore, to the measure (21 ems 3 units of 8½-set) add one point squeeze, which, in eight-and-one-half-set, is two units (see Allowance for Rule and Squeeze, Plate VIII, at back of book). This makes the total measure twenty-one ems five units. Reduce the six two-point rules to units of eight-and-one-half-set, by reference to the table for Allowance for Rule and Squeeze (Plate VIII); this is found to be one em seven units (6×2=12 points=1 em 7 units in 8½-set); add to this the two units allowed for squeeze in the straight matter with which this table is to be cast, making a total allowance of one and one-half ems (1 em 7 units+2 units =1½ ems). Deduct this from the measure for the straight matter (21 ems 5 units) and make the measure for the table nineteen and one-half ems five units. Select characters equal to this em and one-half allowed for rules and squeeze (R=14 units+w=13 units; 14+13=27 units=1½ ems) to strike after the line is completed, but before the JUSTIFYING KEYS are struck, as explained on the preceding page. Allow nine units white space on each side of the figures in each figure column, except the last, in which allow nine units on the left side of the column only. This makes each column two ems wide except the last, which is one and one-half ems wide. Beginning at zero mark off the EM SCALE at one and one-half ems for the last column, at three and one-half ems for the column next to this, and at five and one-half, seven and one-half, nine and one-half, and eleven and one-half ems for the other columns. Set the word in the first column flush to the left of the measure, get on an even em or en on the EM SCALE by the use of the eight- or ten-unit leaders, and, using nine- and eighteen-unit leaders, leader out to the mark-off for the first figure column. For each figure column put in a nine-unit space on either side of the figures until the last column is reached, then put in a nine-unit space and the figures for the last column. Since no justifying spaces have been used, the line is now complete, but, before justifying, strike the "R" and "w" to allow for rules and squeeze. Follow this method of setting in all the lines of the table until the full line of reading matter at the foot is reached, "†Rates from this point subject to a rebate," when the KEYBOARD measure should be changed to the full measure (21 ems 5 units) and no characters (Rw) struck at the end of the line.

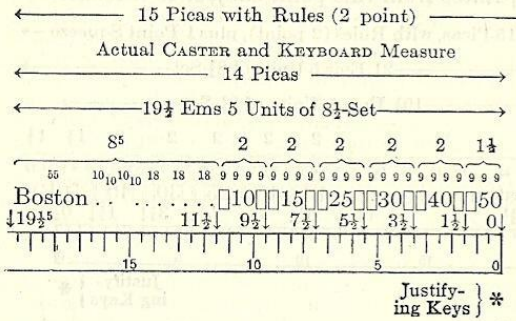
NOTE: For very short tables set with straight matter it would save time to put the characters allowed for rule and squeeze (Rw) at the beginning of the line in order to avoid changing the measure. It is much more convenient, however, in ruling out tabular matter to have these extra characters *at the end of the line.*

* Justification: Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 23

Allowance for Rules Deducted at the Keyboard

Chicago.....	11	16	26	30	40	50
Cleveland.....	15	20	25	30	35	40
Pittsburg.....	9	14	24	29	39	49
Boston.....	10	15	25	30	40	50



Object: To set the table the actual type measure with the allowance for rules deducted.

This exercise differs from Ex. 22 in that deduction is made for the six two-point rules and the table is set and cast the actual type measure instead of characters being inserted at the end of the line, to be replaced by the rules when the table is made up. There are no full measure lines either at the top or bottom of the table, and, therefore, no necessity for throwing in "deadwood" for the allowance for rules on the end of the measure, as illustrated in Ex. 22. The full measure for the table including rules is fifteen picas. Deduct from this the six two-point rules (1 pica) and the actual CASTER and KEYBOARD measure is fourteen picas, or nineteen and one-half ems five units of eight-and-one-half-set (see table for Changing Pica Ems to Ems of Any Set, Plate VII, at back of book); set the EM SCALE to this measure. Beginning at zero on the EM SCALE, mark off one and one-half ems for the first column and two ems for each of the other figure columns. This brings the mark-offs on the EM SCALE at one and one-half, three and one-half, five and one-half, seven and one-half, nine and one-half, and eleven and one-half ems. Set up the word in the first column flush to the left of the measure, get on an even em or en on the EM SCALE by the use of the eight- or ten-unit leaders, and leader to the mark-off on the EM SCALE for the first figure column with nine- and eighteen-unit leaders. Put in the figure columns, using a nine-unit space on either side of the figures (9 units on the left side only of last figure column), and justify.*

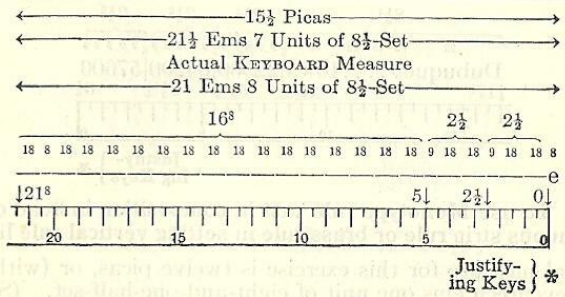
NOTE: The deduction for rules in the above exercise equals an even pica. This is not always the case, and when the rules deducted do not equal an even pica or half-pica, the result is a "bastard" measure on the KEYBOARD and CASTER (odd points instead of even picas or half-picas), see page 28, Part II.

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 24

Horizontal Monotype Rule

Annawan.....	Ill.	270	300
Barberton.....	Ohio	120	140
Clinton.....	Iowa	310	340
Dubuque.....	Iowa	310	340
East Burlington.....	Ill.	270	300
La Trobe.....	Pa.	175	195



Object: To use Monotype rule cast in composition instead of Monotype continuous strip rule or brass rule in setting rule lines across a table.

The width of the exercise after the allowance for rule (4 points) has been deducted is twenty-one ems eight units of eight-and-one-half-set. (See tables for Changing Pica Ems to Ems of Any Set, Plate VII, and Allowance for Rule and Squeeze, Plate VIII, at back of book.) The mark-off for the first column to the left of zero is two and one-half ems; the width of the second column is two and one-half ems, which brings the mark-off on the EM SCALE at five ems; the width of the "stub" or first column is sixteen ems eight units. In setting the rule line, put in an eighteen-unit dash flush to the left of the measure; bring the EM-RACK POINTER to an even em or en on the EM SCALE, by the use of the eight-unit dash, in exactly the same manner as an eight-unit leader or eight-unit space is used. Then bring the EM-RACK POINTER to the mark-off for the second column by the use of the nine- and eighteen-unit dash. In the second column put in one nine-unit and two eighteen-unit dashes to bring the EM-RACK POINTER to the mark-off for the last column. In the last column put in one nine-unit and two eighteen-unit dashes to bring the EM-RACK POINTER to zero and justify.* Before striking the JUSTIFYING KEYS, strike the eight-unit character "e" to be replaced by the rules (4 points = 8 units of 8½-set) when the table is made up, as explained on page 28, Part II.

NOTE: In the above specimen line the different pieces making up the line of horizontal rule have been cast purposely with a shoulder so that the separate pieces can be counted.

NOTE: If the figure columns must be set to even picas (which brings the KEYBOARD measure of the columns to odd units), use the eight-unit dash for getting on an even em or en in each figure column, as is explained above for the stub.

NOTE: The eight-unit dash is never carried regularly in the MATRIX CASE, or on the KEYBOARD, except in tabular arrangements. To use it with the standard arrangements it would be necessary to cap a KEY in the eight-unit row and mark the KEYBOARD ribbon ticket for the attention of the CASTER operator.

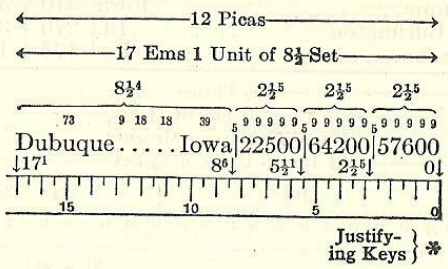
NOTE: When a MONOTYPE horizontal rule line is set, the shoulder above and below the rule should be noted when allowing for white space when the table is made up.

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 25

Vertical Monotype Rule

Aiken.....	Ill.	12300	13200	11300
Bard.....	Iowa	13200	44800	12200
Carman.....	Ill.	32500	32360	24250
Dubuque.....	Iowa	22500	64200	57600



Object: To use Monotype rule cast in composition instead of Monotype continuous strip rule or brass rule in setting vertical rule lines.

The total measure for this exercise is twelve picas, or (with 1 point squeeze) seventeen ems one unit of eight-and-one-half-set. (See tables for Changing Pica Ems to Ems of Any Set, Plate VII, and Allowance for Rule and Squeeze, Plate VIII, at back of book.) Set the KEYBOARD to this measure. Mark off on the EM SCALE the measure for each column, including the rule; that is, the rule should be put in after the EM-RACK POINTER is brought to the mark-off for that column. The width of each figure column, including the rule, in the above table, is two and one-half ems five units. The mark-offs for the columns, beginning at zero on the EM SCALE, are two and one-half ems five units, five and one-half ems one unit, and eight ems six units. Set the word in the first column flush to the left of the measure. Ascertain the correct space to allow for the state abbreviation, leader to this number of units short of the mark-off for the second column, and put in the state abbreviation. This brings the EM-RACK POINTER to the mark-off for the second column. Put in the vertical rule (5-unit), then the figures for the second column. This brings the EM-RACK POINTER to the mark-off for the third column. Put in the vertical rule (5-unit) and the figures for the third column. Put in the vertical rule (5-unit), then the figures for the last column, and justify.*

NOTE: In some plants, where the space for the columns will permit, it is customary to use the nine- or eighteen-unit vertical rule of the piece braces for the rule line instead of the five-unit vertical rule. In case the nine- or eighteen-unit vertical rule is used, the shoulder on this should be taken into account in making allowance for white space on each side of the rule.

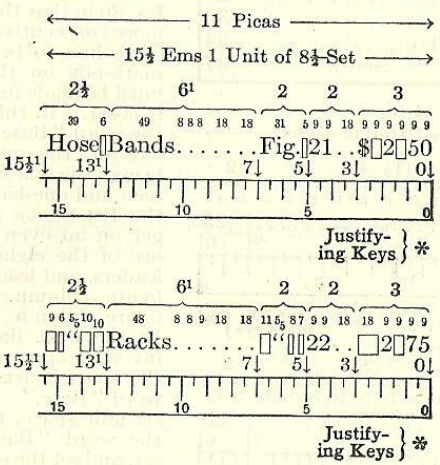
NOTE: When MONOTYPE rule, cast in position, is used instead of continuous strip rule, allowance for squeeze is, of course, made as usual.

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 26

Simple Ditto Work

Hose Bands.....	Fig.	21..	$ 2 50
" Racks.....	"	22..	2 75
" Nozzles.....	"	33..	5 50
" Spools.....	"	14..	1 00



Object: To center inverted commas (or special ditto marks) below a word.

Set the BOARD to the measure for the exercise. Ascertain the measure for the last two columns by setting one line of these on the KEYBOARD (beginning with "Fig.") before starting the "take," or by calculation. This is seven ems, which mark off to the left of zero on the EM SCALE. Set the word "Hose" in the first line, put a fixed six-unit space after the word, and mark the EM SCALE at this point (13 ems 1 unit). Set the word "Bands," get on an even em or en on the EM SCALE by the use of eight- or ten-unit leaders, and leader to the mark-off for the word "Fig." (7 ems from zero). Set the word "Fig.," putting a five-unit space after the period, to get on an even em, and mark the EM SCALE at this point (5 ems). Put in the figures "21," an eighteen-unit leader, dollar mark, nine-unit space, figure "2," nine-unit space, figures "50," and justify.* The word "Hose" and the fixed six-unit space after it occupy forty-five units. Subtract from this the width of the two inverted commas (10 units) plus the width of the six-unit space after the word "Hose," or sixteen units (10+6=16). The remainder is twenty-nine units (45−16=29). Half of this (use 15 units since 29 is not divisible by 2) is to be put in front of the inverted commas; after the inverted commas bring the POINTER to the mark-off for the second word by the use of the various sized fixed spaces. Set the word "Racks," leader to the mark-off for the word "Fig.," center two inverted commas (5 units each) beneath the word "Fig.," put in figures "22," an eighteen-unit leader, one em-quad, figure "2," nine-unit space, figures "75," and justify.*

NOTE: For words of narrow width the best rule to follow is to center the dittos (inverted commas) exactly. For words of wider measure, it is not objectionable to use even ems and ens before the ditto, thus throwing the ditto slightly out of center from the word above.

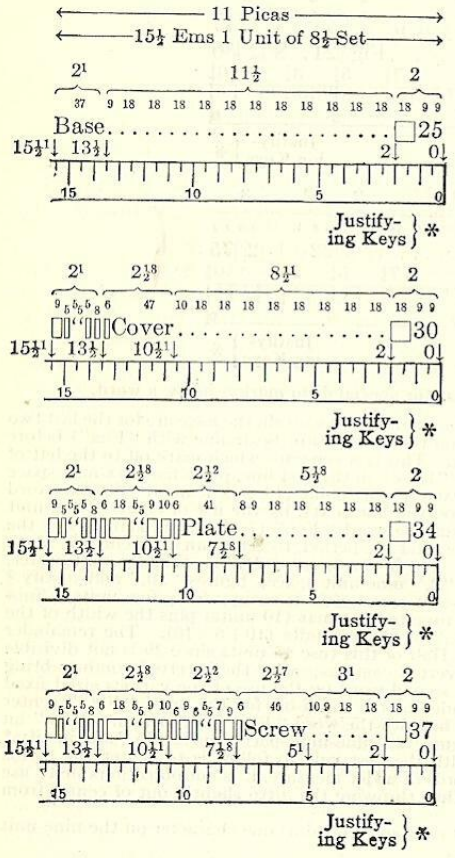
NOTE: Dittos (inverted commas) can be supplied as one character on the nine-unit or eighteen-unit body.

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 27

Intricate Ditto Work

Water..... 16
" Tank..... 19
" " Feed..... 18
" " " Valve..... 21
Base..... 25
" Cover..... 30
" " Plate..... 34
" " " Screw..... 37



Object: To center inverted commas or special ditto marks below two or more words to be repeated.

This exercise differs from Ex. 26 in that there are two or more consecutive words in the same line to be dittoed, and mark-offs on the EM SCALE must be made for each word as it is set. In this example set the word "Base" flush to the left of the measure. This brings the EM SCALE to thirteen and one-half ems. Mark the EM SCALE at this point, get on an even em or en by use of the eight- or ten-unit leaders, and leader out to the figure column. Put in the figure column and justify.* In the next line center two inverted commas (5-unit) in the space marked off for the word "Base." Put in a fixed six-unit space, the same as if the word "Base" had been set, and set the word "Cover." Mark the EM SCALE at this point and finish the line as described for the first line. In the third line, center two inverted commas (5-unit) in the space marked off for the word "Base," put in a fixed six-unit space, center two inverted commas (5-unit) in the space marked off for the word "Cover," put in a fixed six-unit space, and set the word "Plate." Mark off the EM SCALE and finish the line as above. In the last line center the inverted commas in the space marked off for the word "Base," put in a fixed six-unit space, center the inverted commas in the space for the word "Cover," put in a fixed six-unit space, center the inverted commas in the space for the word "Plate," put in a fixed six-unit space, and set the word "Screw." Finish the line as above.

NOTE: Dittos (inverted commas) can be supplied as one character on the nine-unit or eighteen-unit body.

* Justification: Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 28

Piece Braces

8 6 6 6 6 6 6
7 9 4 2 2 2 2
5 1 9 4 2 2
1 5 2 1 9 4
2 1 5 2 2 1
2 2 1 5 2 2
5 2 2 1 5 2
6 3 5 2 1 5
2 2 6 3 5 1
2 2 2 2 6 3 7
4 4 4 4 4 4 8

1 2 3 4 5 6 7 8 9

Object: To show the different combinations of the nine pieces making up a set of right and left piece braces for inclosing (right or left) any number of lines.

The length of a brace may be indefinitely extended by the use of the vertical line (No. 2).

Leads have been inserted between the pieces composing the braces so that they may be more easily distinguished.

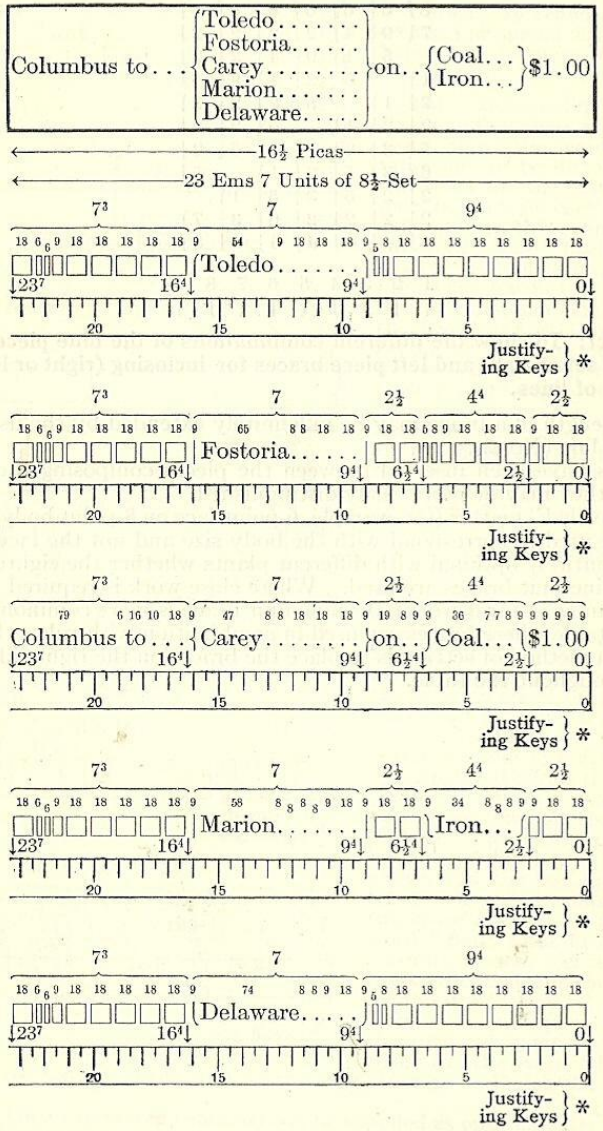
In "leaded" matter (for example, 6-point face on 8-point body) braces must be used to correspond with the body size and not the face size.

It is entirely optional with different plants whether the eighteen-unit or the nine-unit braces are used. Where close work is required (as narrow columns in tariff work), the nine-unit brace is more commonly used.

In a table where braces are used in combination with rules, the more common method of setting is to place the braces on the right side of the rule throughout the table.

EXERCISE 29

Braces in Combination



* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. TWO KEYS are not required, since the line is full and contains no justifying spaces.

Object: To illustrate the use of the various combinations of the nine pieces of the Monotype piece braces.

Set the EM SCALE to the full measure. Beginning at zero, mark off on the EM SCALE the measures where the different braces are to be inserted. These mark-offs should include the braces; that is, the braces should be put in after the EM-RACK POINTER is brought to the mark-off. Set up the first line, quadding to the mark-off for the first brace; put in piece brace No. 6 (see Ex. 28); set the word "Toledo," and leader to the mark-off for the next brace, put in piece brace No. 1, quad to zero, and justify.* In the second line quad to the mark-off for the first brace, put in No. 2, set the word "Fostoria," and leader to the mark-off for the next brace, put in No. 2, quad to zero (being careful to bring the UNIT WHEEL exactly to each mark-off by the use of the various sized fixed spaces) and justify.* In the third line set the words "Columbus to" flush to the left of the measure and leader to the mark-off for the first brace, put in No. 9, set the word "Carey," and leader to the mark-off for the next brace, put in No. 3, set the word "on" and leader to the mark-off for the third brace, put in No. 8, set the word "Coal," and leader to the mark-off for the last brace, put in No. 7, set the figures "$1.00" (which just fills the line), and justify.* In the next line quad to the mark-off for the first brace, put in No. 2, set the word "Marion," and leader to the second brace; put in No. 2, quad to the mark-off for the third brace, put in No. 7, set the word "Iron," and leader to the mark-off for the last brace, put in No. 8, quad to zero, and justify.* In the last line quad to the mark-off for the first brace, put in No. 5; set the word "Delaware," and leader to the mark-off for the second brace, put in No. 4, quad to zero, and justify.*

NOTE: Particular notice should be taken of the fact that a word cannot be centered on the KEYBOARD opposite a two-piece brace. The word should be set to line up with the first line of the two to be braced and quads used for the second line. The hand-corrector will take out this quad line and center the word with leads. In this example the word "on" and the figures "$1.00" being already centered opposite the large brace, it is necessary to center the two-line brace opposite these by taking out the quads above "⎰Coal⎱" and putting two two-point leads above and below this two-line brace. For this reason the section of the line to be centered should be set to even picas or half-picas, if possible, to save the time of cutting leads to "bastard" measures, and it is absolutely essential when putting in the space material to be removed for centering the word or brace that this be of the same width as the section to be centered.

NOTE: It is optional with different plants whether nine- or eighteen-unit piece braces are used. When close work is required (as in tariff work), the nine-unit braces are more commonly used.

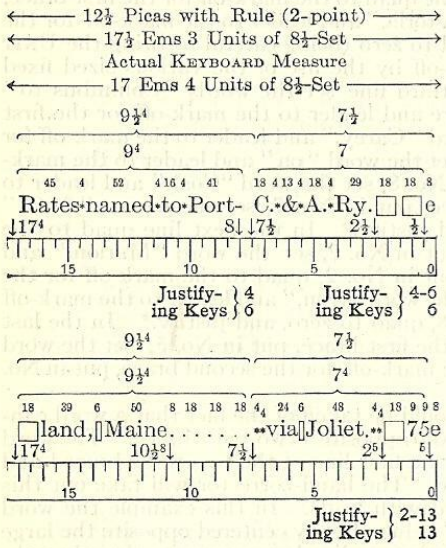
NOTE: It should be remembered that in leaded matter (for example, a 6-point face on an 8-point body) the braces must correspond with the body size and not the face size.

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. TWO KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 30

Double Justification and Allowance for Rules

Discount allowed on "Alpha" Oil shipments in bulk.....	Any line	13
Rates named to Portland, Maine.....	C. & A. Ry. via Joliet.	75



Object: Use of double justification on three-column matter and characters used as "dead-wood" for allowance for rules.

The allowance for two rules (2-point) is eight units (see Allowance for Rule and Squeeze, Plate VIII, at back of book). The measure of the completed table, including rules, is seventeen and one-half ems three units of eight-and-one-half-set (12½ picas); deduct from this the eight units allowance for rules and set the KEYBOARD to this measure (17 ems 4 units). Mark off on the EM SCALE the measures for each column, beginning at zero, two ems for the figure column; five and one-half ems (estimated width of the longest line) for the second column, and the remainder, nine and one-half ems four units, for the first column. Set the words of the first column flush to the left of the measure, using justifying spaces between the words. Set this line the same as if zero on the EM SCALE came at the mark-off for the second column (7½ ems), and note the number of units the line is short of this mark-off on the EM SCALE; turn the JUSTIFYING SCALE around by hand until its POINTER indicates the column for a shortage of this number of units (column number at bottom of SCALE) and read the numbers of the JUSTIFYING KEYS to strike and single justify. Set the UNIT WHEEL by hand exactly to the seven-and-one-half-em mark-off. Set the line in the second column, using justifying spaces between the words, the same as if zero on the EM SCALE came at the mark-off for the figure column (2 ems from zero). Put in the space (2 em-quads) for the last column, note the reading of the JUSTIFYING SCALE, but before striking the KEYS indicated, put in the allowance for rules, then *double justify*. There is no necessity for single justifying the second column, as no justifying spaces are used in the last column and the justification indicated at the end of the whole line is the correct justification for the second column. Should the last column contain justifying spaces, the preceding column would have to be single justified and the EM-RACK POINTER brought exactly to the two-em mark-off in the same manner as explained for the first column. In the second line, put in one em-quad for the indention, set up the words in the first column, using fixed six-unit spaces between the words. Get on an even em or en on the EM SCALE by the use of the eight- or ten-unit leaders and leader to the mark-off for the second column. Center the word in the second column by putting from two to four justifying spaces on either side of it. Put in the figure column, obtain the reading of the JUSTIFYING SCALE, put in the allowance for rules, and double justify.

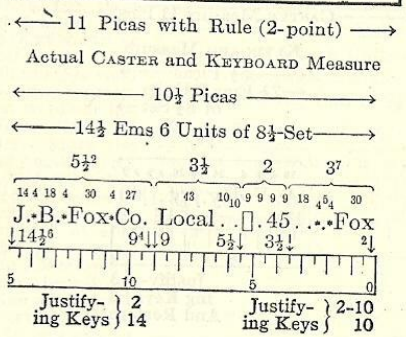
NOTE: When setting either single or double justified tables, always use justifying spaces between words that fill the measure, whether it be of the full measure or justified section of the full measure, and fixed spaces between words that do not fill the measure or section, which is then completed with fixed size spaces or leaders.

NOTE: When setting double justification on the Style D KEYBOARD the PISTON-BLOCK-VALVE HANDLE 29KC17 (Plate V, at back of book) must be turned to the left so that the KEYBOARD is restored by pressing the green RESTORING KEY and not by the lower row of JUSTIFYING KEYS. Otherwise the EM-RACK POINTER would be restored to the beginning of the measure when each column is single justified.

EXERCISE 31

Double Justification and Justifying Spaces with Periods for Leaders

W. J. Dunn.	.....	1.29	. .Dunn
Slater & Co.	Local..	.29	. Slatco
E. E. Ewing.	.....	3.36	. . Ewe
J. B. Fox Co.	Local..	.45	. . . Fox



Object: Use of double justification and the lining up of a column on the right by use of the justifying space and period.

Deduct for three two-point rules and set the KEYBOARD to the actual type measure. Mark off on the EM SCALE the width of each column; fourth column mark at three and one-half ems, third column at five and one-half ems, second column at nine ems. Set the words in the first column flush to the left of the measure, using justifying spaces between the words. Set this first column the same as if zero on the EM SCALE came at the mark-off for the second column; if the name is short, put in leaders to bring the EM-RACK POINTER nearly to the mark-off for the second column (9 ems in above specimen line). Note the number of units the line is short of this mark-off on the EM SCALE and turn the JUSTIFYING SCALE around by hand until the POINTER indicates the column for a shortage of this number of units (column number at bottom of SCALE), read the numbers of the JUSTIFYING KEYS to strike and single justify. Set the UNIT WHEEL by hand exactly at the mark-off for the second column. Set the second column, using the eight- or ten-unit leaders to bring the UNIT WHEEL to the mark-off for the third column. Put in the spaces and figures for the third column. Set the last column, putting in the number of em- and en-leaders estimated to be required to nearly fill the space in front of the word, put in a period with a justifying space on each side, then the word, and double justify.

NOTE: When setting single or double justified tables, always use justifying spaces between words that fill the measure, whether it be the full measure or justified section of the full measure, and fixed spaces between words that do not fill the measure or section, which is then completed with fixed size spaces or leaders.

NOTE: When setting double justification on the Style D KEYBOARD the PISTON-BLOCK-VALVE HANDLE 29KC17 (Plate V, at back of book) must be turned to the left so that the EM-RACK POINTER is restored by pressing the green RESTORING KEY and not by the lower row of JUSTIFYING KEYS. Otherwise the EM-RACK POINTER would be restored to the beginning of the measure when each column is single justified.

NOTE: Another method of setting the last column of the above table would be to indent all the words nine units from the rule.

EXERCISE 32

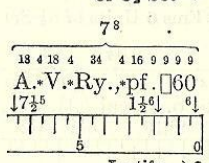
Double Justification in Twin-Column Matter

N. Y. C., pf...110	N. Y. C., com.113
B. & M., 1st pf 40	B. & M. 2d pf. 44
So. Pacific... 36	So. Pacific pf. 75
A. V. Ry., pf. 60	A. V. Ry., x d. 44

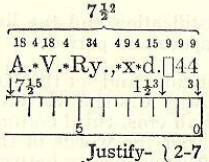
←——11½ Picas with Rule and Leads——→

←——CASTER Measure 11 Picas——→

KEYBOARD Measure
←——5½ Picas——→
←7½ Ems 5 Units of 8½-Set→



Justify- } 3
ing Keys } 8
And Restore



Justify- } 2-7
ing Keys } 7
And Restore

Object: Setting two columns of the same width by double justification.

The full measure of this exercise is eleven and one-half picas. Deduct six points (½ pica) from this measure to allow for inserting a two-point rule down the center and a two-point lead each side of this rule when the table is made up. This makes the actual KEYBOARD measure eleven picas, the width of each column being five and one-half picas. Set the EM SCALE measure to five and one-half picas (7½ ems 5 units of 8½-set). Set the first column and single justify from the JUSTIFYING SCALE. The PISTON-BLOCK-VALVE HANDLE 29KC17 (Plate V, at back of book) must be turned to the rear in order that the EM-RACK POINTER may be restored by the lower row of JUSTIFYING KEYS instead of by the green RESTORING KEY. Set the second column and double justify. This brings both sections onto the galley as one full line eleven picas long.

NOTE: Ascertain both justifications from the JUSTIFYING SCALE in the usual manner.

NOTE: This table could be set by adjusting the KEYBOARD to the full measure and ascertaining the justification for the first column by turning the JUSTIFYING SCALE by hand. The above described method is, however, much better, as the JUSTIFYING SCALE automatically revolves for each column, and the lower JUSTIFYING KEYS can be used to restore each column to the beginning of the full measure.

EXERCISE 33

Simple Box Headings

Object: To center words in box headings, in the same line, over columns of different widths, by means of double justification.

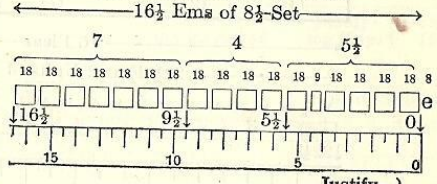
Name.	Shares.	Total Par.
E. Jones.....	100	111
J. J. Davis	336	366
E. F. Maule ...	117	138

←—— 12 Picas ——→

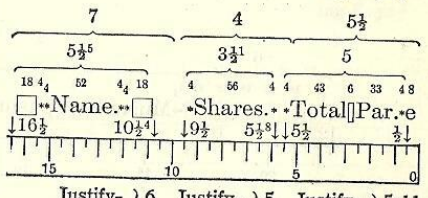
←——16½ Ems 8 Units of 8½-Set——→

Actual KEYBOARD Measure

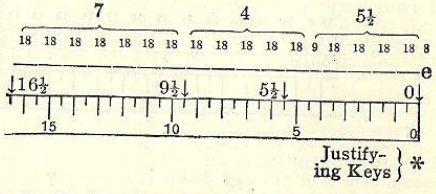
←——16½ Ems of 8½-Set——→



Justify- } *
ing Keys }



Justify- } 6 Justify- } 5 Justify- } 5-11
ing Keys } 9 ing Keys } 4 ing Keys } 11



Justify- } *
ing Keys }

Object: To center words in box headings, in the same line, over columns of different widths, by means of double justification.

The rule allowance here is eight units (4 points = 8 units of 8½-set; see Allowance for Rule and Squeeze, Plate VIII, at back of book). Subtracting this from the total width of the completed table (16½ ems 8 units) set the KEYBOARD at sixteen and one-half ems. The width of the third column (5½ ems) and second column (4 ems) is determined by the longest words or figures in each; the first column (7 ems) is the remainder. Mark the EM SCALE at five and one-half ems and at nine and one-half ems. Set the first line with fixed spaces only, taking care that each column contains the correct number of ems and units, as otherwise the columns could not be split and MONOTYPE continuous strip rules or brass rules inserted, unless the line was rejustified. Read the JUSTIFYING SCALE, strike the character to be replaced by the rule (e=8 units), and double justify.* In the second line, beginning at the left of the measure, put in an em-quad, one or more justifying spaces (the number depending on the amount of blank space each side of the word), then the word to be centered, the same number of justifying spaces and quads as before the word, and ascertain the number of units the column is short of the mark-off for the second column. Turn the JUSTIFYING SCALE by hand to this number of units and single justify. Bring the EM-RACK POINTER exactly to the mark-off for the second column by turning the UNIT WHEEL by hand. In the second column put in one or more justifying spaces, then the word to be centered, the same number of justifying spaces as before the word, ascertain the number of units the column is short of the mark-off for the third column, and single justify. Bring the EM-RACK POINTER exactly to the mark-off for the third column by turning the UNIT WHEEL by hand, center the word as explained for the preceding column, read the justification direct from the JUSTIFYING SCALE, then put in the allowance for rule and double justify. Set the third line exactly as described for the first (quad) line, with the exception that dashes are used for the rule line instead of the quads in the first line.

NOTE: While in this exercise the measure for each column is even ems and ens, this is not always the case, and the various sized fixed spaces or the eight-unit dash may have to be used to bring the EM SCALE to the correct mark-off for the next column.

NOTE: When setting double justification on the Style D KEYBOARD, the PISTON-BLOCK-VALVE HANDLE 29KC17 (Plate V, at back of book) must be turned to the left so that the KEYBOARD is restored by pressing the green RESTORING KEY and not by the lower row of JUSTIFYING KEYS. Otherwise, the EM-RACK POINTER would be restored to the beginning of the measure when each column is single justified.

* Justification: Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row and the KEY above it in the upper row at the same time, to trip the galley and restore. It is not necessary to strike a KEY in the upper row first, since the line is full and contains no justifying spaces.

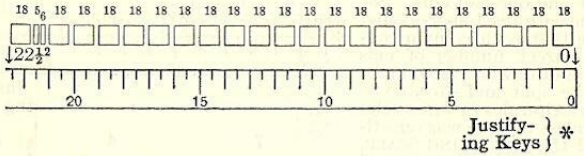
EXERCISE 34

Intricate Box Headings

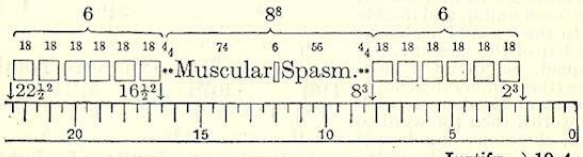
Muscular Spasm. ($22\frac{1}{2}^2$)			
Sex. (8^3)		Intensity.	Duration.
Female. (4^7)	Male. ($3\frac{1}{2}$)	(7)	(7)

16 Picas

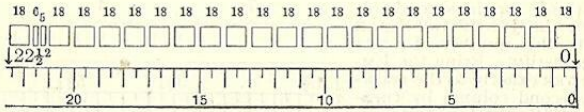
$22\frac{1}{2}$ Ems 2 Units of $8\frac{1}{2}$-Set



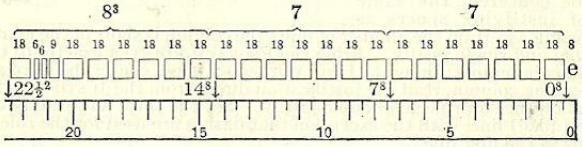
Justify-ing Keys *



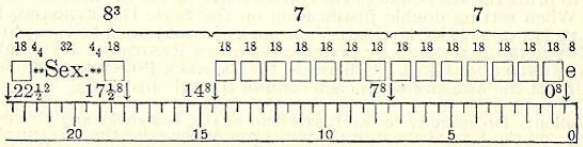
Justify-ing Keys 10-4 / 4



Justify-ing Keys *

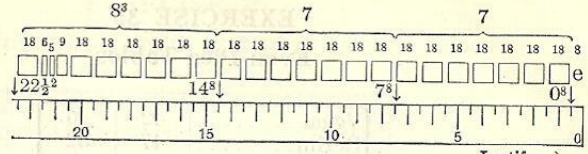


Justify-ing Keys *

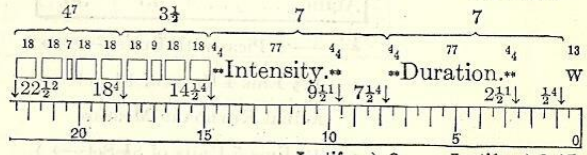


Justify-ing Keys 15-8 / 8

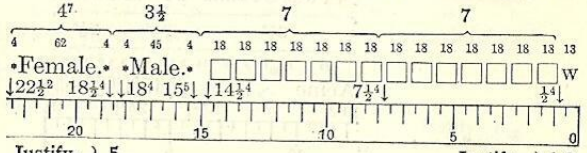
Object: Use of double justification in centering words in box headings over single columns, double columns, and the full measure combined.



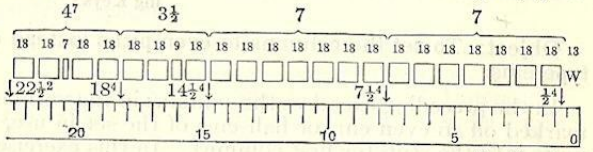
Justify-ing Keys *



Justify-ing Keys 8 / 15 — Justify-ing Keys 8-15 / 15



Justify-ing Keys 5 / 11 — Justify-ing Keys 6-2 / 2



Justify-ing Keys *

The full measure for this exercise is sixteen picas or twenty-two and one-half ems two units of eight-and-one-half set (see table for Changing Pica Ems to Ems of Any Set, Plate VII, at back of book). Set the KEYBOARD for this measure. The first three lines of the exercise are set this full measure. Set the quad line, putting in an em-quad first, then fixed spaces to bring the POINTER to an even em on the EM SCALE, em-quads to bring the line to zero, and double justify.* Center the words in the next line and double justify. Set the third line in the same manner as described for the first and double justify.* Mark on the EM SCALE the measure for each column. Beginning at zero, mark off eight units for the allowance for rule, seven ems for the first column to the left of zero, seven ems for the second column, and the remainder, eight ems three units, for the third column. Set a quad line, putting in the correct number of ems and units for each column, using the various sized fixed spaces. Put in the rule allowance (e=8 units) and double justify.* In the next line center the word "Sex" in the first column by the use of justifying spaces and quads; then quad out the next two columns, put in the rule allowance, and double justify. Set the next quad line as described for the fourth line. Then mark the EM SCALE for the next line, allowing thirteen units for three two-point rules, seven ems for the last column, seven ems for the third column, three and one-half ems for the second column, and four ems seven units for the first column. Put in the correct number of spaces and quads for the first and second columns. Center the word "Intensity" in the third column and single justify. Center the word "Duration" in the last column, put in the rule allowance, and double justify. In the next line, center the word "Female" in the first column and single justify; center the word "Male" in the second column; put in the correct number of quads for the third and the last columns, put in the rule allowance, and double justify. In the next line set the correct amount of quads and spaces for each column, put in the rule allowance, and double justify.*

NOTE: In setting quad lines, care should be taken that each column contains the correct number of ems and units for that column. Otherwise the column could not be split and MONOTYPE continuous strip rules or brass rules inserted unless the line was rejustified.

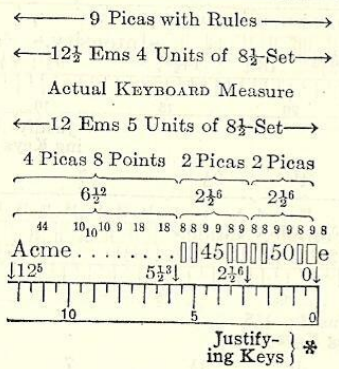
NOTE: When setting double justification on the Style D KEYBOARD, the PISTON-BLOCK-VALVE HANDLE 29KC17 (Plate V, at back of book) must be turned to the left so that the KEYBOARD is restored by the green RESTORING KEY. Otherwise the EM-RACK POINTER would be restored to the beginning of the measure when each column is single justified.

* **Justification:** Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row and the KEY above it in the upper row at the same time, to trip the galley and restore. It is not necessary to strike a KEY in the upper row first, since the line is full and contains no justifying spaces.

EXERCISE 35

Even Pica Tables

Vega.....	42	46
Berlin.....	47	52
Omega.....	59	63
Acme.....	45	50



Object: To set the columns to even picas instead of to even Monotype ems.

In the preceding exercises the columns in the various tables have been marked off to even ems or half-ems of the set in use, throwing the odd units into the stub (or first column). In this exercise, the columns are set to exact picas except the stub (first column) which contains the odd points left after deducting four points for rules from the whole measure. The same principles for setting are followed in even pica matter as in tables set to even MONOTYPE ems, the only difference being that each mark-off of the EM SCALE comes to odd units instead of even ems of the set in use, and the SCALE must be marked the number of units it is short of an even em.

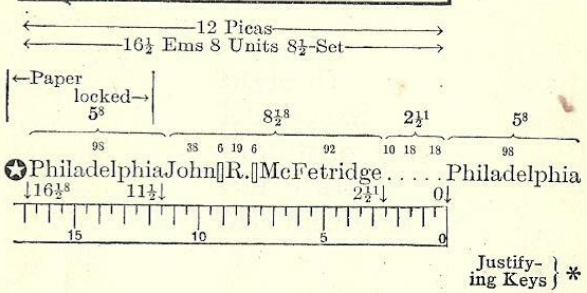
Mark off the EM SCALE for the equivalent of these even pica columns in ems and units of eight-and-one-half-set. Set the word in the first column flush to the left of the measure, and by the use of the eight- or ten-unit leaders bring the EM-RACK POINTER the same number of units short of an even em or en as the mark-off for the second column. Leader to this mark-off with the nine- and eighteen-unit leaders, center the figures in the second and last columns by the use of various sized fixed spaces, put in the allowance for rules, and justify.*

* Justification: Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

EXERCISE 36

Word of Unknown Length at End of Leader Line

Andrew McNally.....	Chicago
Horace T. Rockwell.....	Boston
A. G. Pugh.....	Cincinnati
W. A. Shepard.....	Toronto
W. H. Woodward.....	St. Louis
John R. McFetridge.....	Philadelphia



Object: To allow for a word of unknown length at the end of a leader line containing no justifying spaces.

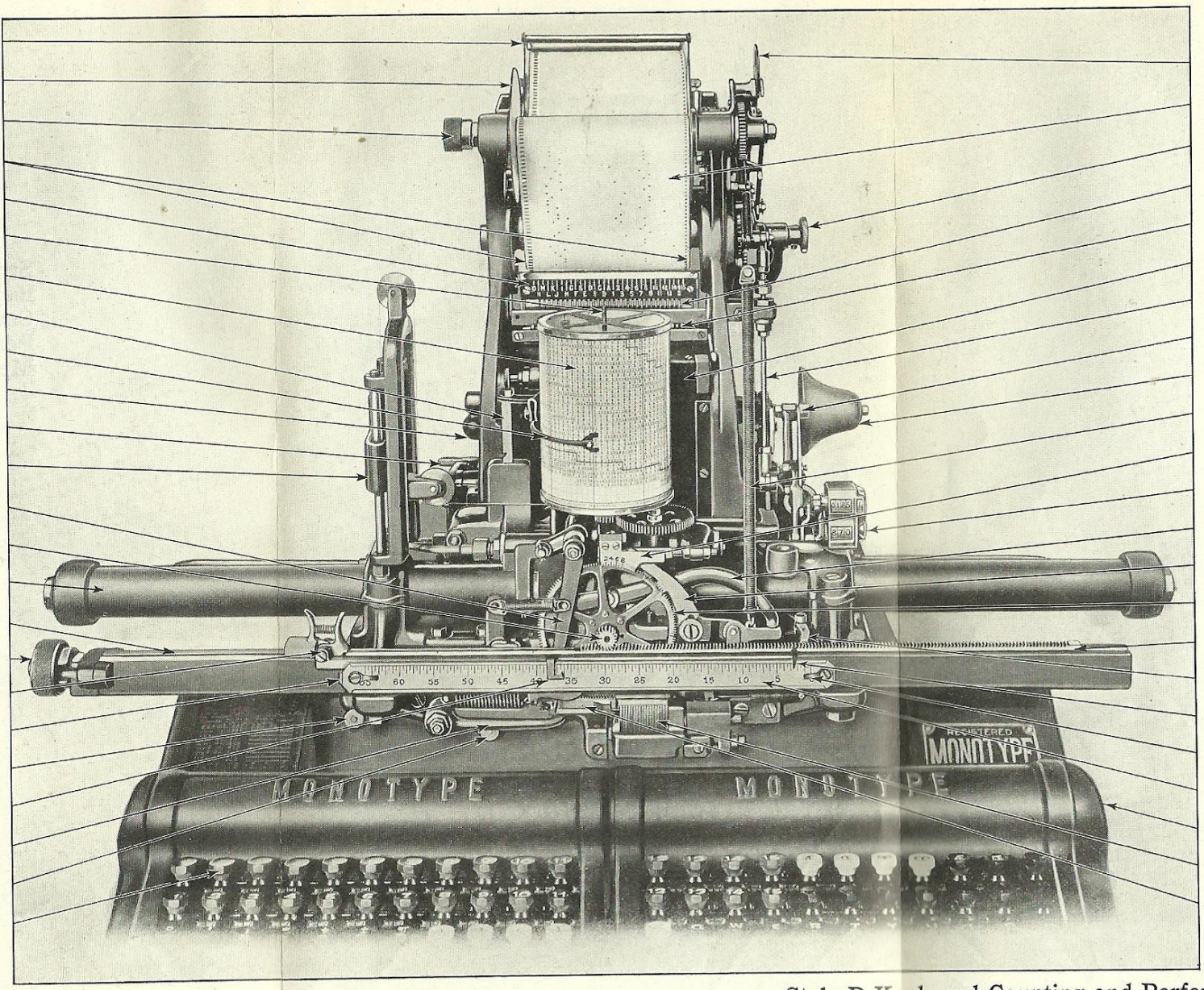
Insert a wooden wedge between the upper PAPER-FEED-ROD STOP NUT 9KC4 and the lug on the right of the PAPER TOWER, to prevent the paper feeding. Strike any KEY in the lower row of JUSTIFYING KEYS (indicated by ✪); this makes a perforation which locks the PUMP to prevent any type being cast for this row of perforations made by striking KEYS while the paper is locked; since it is a KEY in the lower row of JUSTIFYING KEYS, it also restores, so that no units are counted by the BOARD for this JUSTIFYING KEY. Now set up the letters "Philadelphi," remove the wedge from beneath the PAPER-FEED-ROD STOP NUT to permit the paper to feed after the next KEY is struck, and strike the KEY for the last letter (a) of "Philadelphia." All of the characters struck to this point will be registered on one line across the ribbon and will not be cast at the CASTER. With the exception, however, of the JUSTIFYING KEY struck first, each KEY struck has been counted by the UNIT WHEEL and properly registered on the EM SCALE, as if the word "Philadelphia" had been set in the ordinary manner. In short, the word "Philadelphia" has been counted by the counting mechanism, but has not been recorded on the paper. Now set up the words "John R. McFetridge," using fixed six-unit spaces between the words, get on an even em or en on the EM SCALE, and leader to zero. Set up the word "Philadelphia" (which has been counted but not recorded on the paper) without reference to the EM SCALE, for since the EM-RACK POINTER has reached zero it will not register these characters; then justify.*

* Justification: Do not refer to the JUSTIFYING SCALE, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

Style D
Keyboard
Counting and
Perforating
Mechanisms

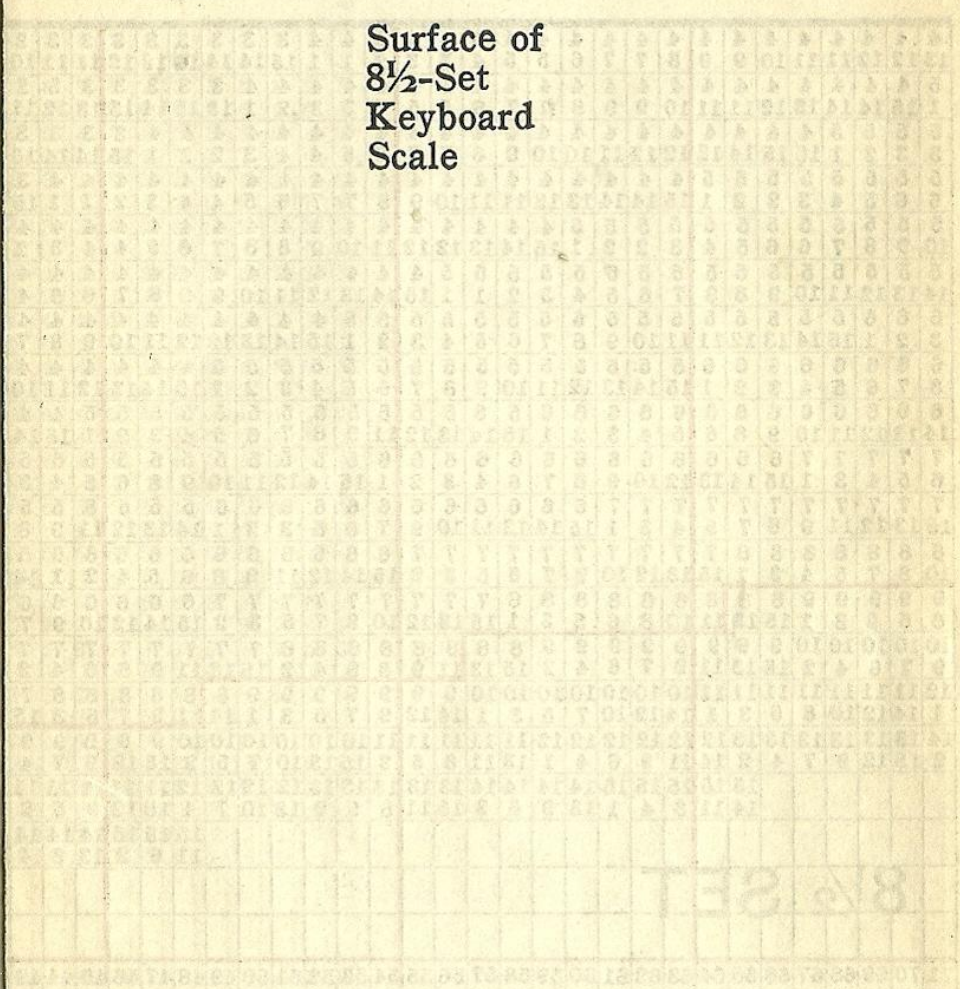
PLATE V

Paper Guide	X45KC
Paper Spool	X15KC
Paper-spool Shaft	Xa16KC
Paper Feed Wheel (also a13KC2)	a13KC1
Paper Tower punch guide index plate	18KC30
Justifying-scale Pinion stud	a13KB5
Justifying Scale	10KB1
Justifying-scale Pointer rack	a14KB3
Justifying-scale Pointer	a14KB1
Paper Tower housing punch lock knob	18KC11
Piston Block valve handle	29KC17
Justifying Scale Weight	69KB1
Unit-rack Lever	73KB1
Unit Wheel shaft	a35KB2
Unit-wheel Driving Cylinder (left)	36KB1
Em-rack Slide	a5KB1
Em-rack-stop-rack Adjusting Screw head	a8KB2
Em-rack Stop	X6KB
Em Scale holder	a9KB2
Valve Returning Rock Shaft operating arm rod head	14KA7
Em-rack Stop pointer	6KB3
Unit-rack Slide	a29KB1
Space Cut Out operating rod head	16KA5
Keybank button (137)	7KA6



b8KC2	Paper Feed Release Plate link
. . . . .	Paper Ribbon
13KC10	Paper Feed Wheel shaft knob (knurled)
32KC1	Punch (29) [also 32KC2 (2)]
a33KC1	Punch Bars (10) [also a33KC2 (11) and a33KC3 (12)]
a32KB3	Unit-rack-stop Bar case
9KC1	Paper Feed Rod
2KB1	Bell Hammer
a1KB1	Bell
a41KB1	Unit-wheel-pawl Spring
a25KB1	Unit Indicator
a23KB1	Line Counter
24KB4	Restoring Rocker Arm link lever
a38KB1	Unit-wheel Pawl
a35KB1	Unit Wheel
4KB1	Em Rack
3KB1	Bell Trip Lever
a4KB3	Em Rack pointer
a9KB5	Em Scale clip
a9KB1	Em Scale
7KA1	Keybank (right)
31KB1	Unit-rack Stop (9) [also 31KB2 (9)]
c26KB1	Unit Rack

Style D Keyboard Counting and Perforating Mechanisms—PLATE V



Surface of
8½-Set
Keyboard
Scale

PLATE VI

Surface of 8½-Set Keyboard Scale

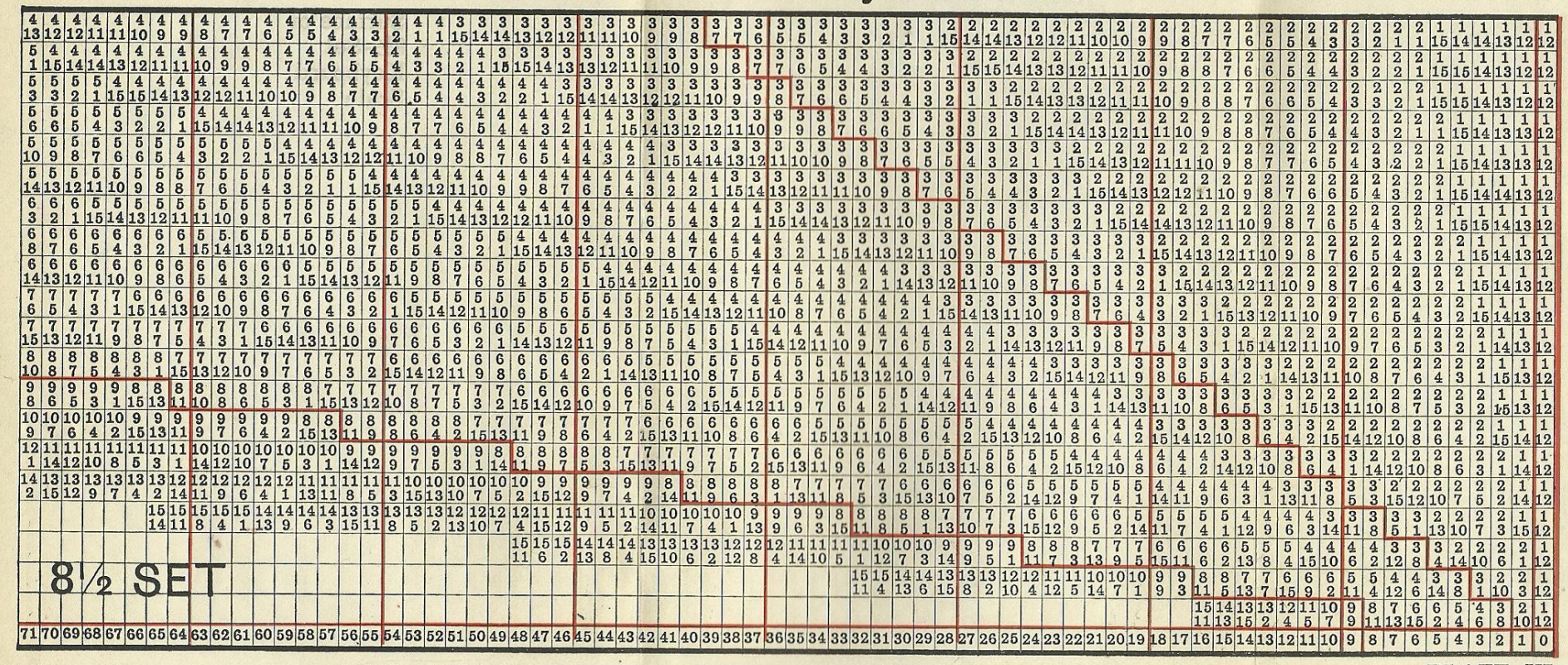


PLATE VI

Table for
Changing
Pica Ems
to Ems of
Any Set

PLATE VII

Directions for Using

Table for Changing Pica Ems to Ems of Any Set

Pica Ems	Set-Size										Pica Ems	
	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼		7½
½	1–4	1–3	1–2	1–1	1–0	0⅛8	0⅛8	[illegible]	0⅛6	0⅛6	½	0⅛5
1	2–7	2–5	2–3	2–2	2–0	1⅛8	[illegible]	[illegible]	1⅛4	1⅛3	1	1⅛2
1½	3⅛2	3–8	3–5	3–2	3–0	2⅛7	[illegible]	[illegible]	2⅛1	2⅛0	1½	2–7
2	4⅛5	4⅛1	4–7	4–3	4–0	3⅛6	[illegible]	3⅛1	3–8	3–6	2	3–4
2½	6–0	5⅛4	5–8	5–4	5–0	4⅛5	4⅛2	4–8	4–5	4–2	2½	4–0
9½	22⅛5	21⅛4	20⅛4	19⅛6	19–0	18–4	17⅛1	16⅛7	16–5	15⅛4	9½	15–4
10	24–0	22⅛6	21⅛6	20⅛7	20–0	19–4	18–8	17⅛5	17–3	16⅛1	10	16–0
	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼		7½
10½	25–4	24–0	22⅛7	21⅛7	21–0	20–3	19–7	18⅛3	18–0	17–7	10½	16⅛5
11	26–7	25–3	24–0	22⅛8	22–0	21–2	20–6	19⅛1	18⅛6	18–4	11	17⅛2
11½	27⅛2	26–5	25–2	24–0	23–0	22–1	21–4	20–8	19⅛4	19–1	11½	18–7
12	28⅛5	27–8	26–3	25–1	24–0	23–1	22–3	21–6	20⅛1	19⅛7	12	19–4
12½	30–0	28⅛1	27–5	26–2	25–0	24–0	23–1	22–4	21–8	20⅛3	12½	20–0
13	31–4	29⅛4	28–7	27–2	26–0	24⅛8	[illegible]	[illegible]	22–5	21⅛0	13	[illegible]
13½	32–7	30⅛6	29–8	28–3	27–0	25⅛	[illegible]	[illegible]–0	23–3	22–6	13½	[illegible]
14	33⅛2	32–0	30⅛1	29–4	28–0	26⅛7	[illegible]	24⅛7	24–0	23–3	14	22–7
14½	34⅛5	33–3	31⅛2	30–5	29–0	27⅛6	26⅛5	25⅛5	24⅛6	24–0	14½	23–4

The EM-RACK POINTER on the KEYBOARD always indicates ems of the same set as the face being composed. If the measure be given in pica ems it is, therefore, necessary to change this to ems of the set of the face being composed.

Example: A column of matter 13 picas wide is to be composed in a 7-set face, how many ems and units wide must the Keyboard measure be set? Refer to the "fists" and numbers in the section of the table below.

Find the column at the top of the table headed 7 (under the heading "Set-Size") and look down this until you come to

The line of the table for 13, the width in picas of the matter to be set; at this point of the table you read

22 ems and 5 units, the number of ems and units of 7-set equal to 13 picas. Therefore, the EM-RACK STOP on the KEYBOARD must be set so that when the BOARD is reversed and the EM RACK is against its STOP (as far to the left as possible) the EM-RACK POINTER will be between 22 and 22½ ems on the EM SCALE and a graduation on the UNIT WHEEL will coincide with the 5 of the UNIT INDICATOR. Note that the UNIT-WHEEL PAWL meshes squarely with the teeth of the UNIT WHEEL without the teeth rubbing on either side as they mesh.

Note: This table must not be used to set the Keyboard measure for matter to be run with the old style Normal Wedges, S, S1, or S2 as they are based on Pica 0.1667"

½ Pica to 30 Picas

Table for Changing Pica E

Pica Ems	Set-Size 5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼
½	1-4	1-3	1-2	1-1	1-0	0-8	0-8	0-7	0-6	0-6
1	2-7	2-5	2-3	2-2	2-0	1-8	1-6	1-5	1-4	1-3
1½	3-2	3-8	3-5	3-2	3-0	2-7	2-5	2-3	2-1	2-0
2	4-5	4-1	4-7	4-3	4-0	3-6	3-3	3-1	3-8	3-6
2½	6-0	5-4	5-8	5-4	5-0	4-5	4-2	4-8	4-5	4-2
3	7-4	6-6	6-1	6-5	6-0	5-5	5-1	5-6	5-3	4-8
3½	8-7	8-0	7-2	7-5	7-0	6-4	6-8	6-4	6-0	5-5
4	9-2	9-3	8-4	8-6	8-0	7-3	7-7	7-2	6-6	6-2
4½	10-5	10-5	9-6	9-7	9-0	8-3	8-6	8-0	7-4	7-8
5	12-0	11-8	10-7	10-8	10-0	9-2	9-4	8-7	8-1	8-5
5½	13-4	12-1	12-0	11-10	11-0	10-1	10-3	9-5	9-8	9-2
6	14-7	13-4	13-2	12-10	12-0	11-0	11-1	10-3	10-5	9-8
6½	15-2	14-6	14-3	13-11	13-0	12-0	12-0	11-1	11-3	10-5
7	16-5	16-0	15-5	14-2	14-0	13-0	12-8	12-8	12-0	11-2
7½	18-0	17-3	16-7	15-3	15-0	14-0	13-6	13-6	12-6	12-7
8	19-4	18-5	17-8	16-4	16-0	15-6	14-5	14-4	13-4	13-4
8½	20-7	19-8	18-9	17-4	17-0	16-6	15-3	15-2	14-1	14-1
9	21-2	20-9	19-9	18-5	18-0	17-5	16-2	16-0	15-8	14-7
9½	22-5	21-4	20-4	19-6	19-0	18-4	17-1	16-7	16-5	15-4
10	24-0	22-6	21-6	20-7	20-0	19-4	18-8	17-5	17-3	16-1
	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼
10½	25-4	24-0	22-7	21-7	21-0	20-3	19-7	18-3	18-0	17-7
11	26-7	25-3	24-0	22-8	22-0	21-2	20-6	19-1	18-6	18-4
11½	27-2	26-5	25-2	24-0	23-0	22-1	21-4	20-8	19-4	19-1
12	28-5	27-8	26-3	25-1	24-0	23-1	22-3	21-6	20-1	19-7
12½	30-0	28-1	27-5	26-2	25-0	24-0	23-1	22-4	21-8	20-3
13	31-4	29-4	28-7	27-2	26-0	24-8	24-0	23-2	22-5	21-0
13½	32-7	30-6	29-8	28-3	27-0	25-8	24-8	24-0	23-3	22-6
14	33-2	32-0	30-1	29-4	28-0	26-7	25-6	24-7	24-0	23-3
14½	34-5	33-3	31-2	30-5	29-0	27-6	26-5	25-5	24-6	24-0
15	36-0	34-5	32-4	31-5	30-0	28-5	27-3	26-3	25-4	24-6
15½	37-4	35-8	33-6	32-6	31-0	29-5	28-2	27-1	26-1	25-3
16	38-7	36-1	34-7	33-7	32-0	30-4	29-1	28-0	27-0	26-0
16½	39-2	37-4	36-0	34-8	33-0	31-3	30-8	29-6	28-5	27-6
17	40-5	38-6	37-2	35-9	34-0	32-3	31-7	30-4	29-3	28-2
17½	42-0	40-0	38-3	36-9	35-0	33-2	32-6	31-2	30-0	28-8
18	43-4	41-3	39-5	37-9	36-0	34-1	33-4	32-0	30-6	29-5
18½	44-7	42-5	40-7	38-9	37-0	35-0	34-3	32-7	31-4	30-2
19	45-2	43-8	41-8	39-3	38-0	36-0	35-1	33-5	32-1	31-8
19½	46-5	44-1	42-1	40-4	39-0	37-8	36-0	34-3	33-8	32-5
20	48-0	45-4	43-2	41-4	40-0	38-7	36-8	35-1	34-5	33-2
	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼
20½	49-4	46-6	44-4	42-5	41-0	39-6	37-6	36-8	35-3	33-8
21	50-7	48-0	45-6	43-6	42-0	40-6	38-5	37-6	36-0	34-5
21½	51-2	49-3	46-7	44-7	43-0	41-5	39-3	38-4	36-6	35-2
22	52-5	50-5	48-0	45-7	44-0	42-4	40-2	39-2	37-4	36-7
22½	54-0	51-8	49-2	46-8	45-0	43-4	41-1	40-0	38-2	37-4
23	55-4	52-1	50-3	48-0	46-0	44-3	42-8	40-7	39-8	38-1
23½	56-7	53-4	51-5	49-1	47-0	45-2	43-7	41-5	40-5	38-7
24	57-2	54-6	52-7	50-2	48-0	46-1	44-6	42-3	41-3	39-4
24½	58-5	56-0	53-8	51-2	49-0	47-1	45-4	43-1	42-0	40-1
25	60-0	57-3	54-1	52-3	50-0	48-0	46-3	44-8	42-6	41-7
25½	61-4	58-5	55-2	53-4	51-0	48-8	47-1	45-6	43-4	42-4
26	62-7	59-8	56-4	54-5	52-0	49-8	48-0	46-4	44-1	43-1
26½	63-2	60-1	57-6	55-5	53-0	50-7	48-8	47-2	45-8	43-7
27	64-5	61-4	58-7	56-6	54-0	51-6	49-6	48-0	46-5	44-3
27½	66-0	62-6	60-0	57-7	55-0	52-5	50-5	48-7	47-3	45-0
28	67-4	64-0	61-2	58-8	56-0	53-5	51-3	49-5	48-0	46-6
28½	68-7	65-3	62-3	59-10	57-0	54-4	52-2	50-3	48-6	47-3
29	69-2	66-5	63-5	60-10	58-0	55-3	53-1	51-1	49-4	48-0
29½	70-5	67-8	64-7	61-11	59-0	56-3	54-8	52-8	50-1	48-6
30	72-0	68-11	65-8	62-12	60-0	57-2	55-7	53-6	51-8	49-3
Pica Ems	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼

Set-Size

Pica Ems	Set-Size 7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10
½	0-5	0-5	0-5	0-4	0-4	0-4	0-3	0-3	0-2	0-2	0-2
1	1-2	1-1	1-0	1-8	1-7	1-7	1-6	1-5	1-5	1-4	1-4
1½	2-7	2-6	2-5	2-3	2-2	2-1	2-0	1-8	1-7	1-6	1-5
2	3-4	3-2	3-0	2-7	2-6	2-4	2-3	2-2	2-0	2-8	2-7
2½	4-0	3-7	3-5	3-2	3-1	3-8	3-6	3-4	3-3	3-1	3-0
3	4-5	4-3	4-0	4-7	4-4	4-2	4-0	3-7	3-5	3-3	3-2
3½	5-2	5-8	5-5	5-2	4-8	4-5	4-3	4-1	4-8	4-6	4-4
4	6-7	6-3	6-0	5-6	5-3	5-0	5-6	5-3	5-1	4-8	4-5
4½	7-4	6-8	6-5	6-1	6-6	6-3	6-0	5-6	5-3	5-1	5-7
5	8-0	7-4	7-0	7-5	7-1	6-6	6-3	6-0	6-6	6-3	6-0
5½	8-5	8-0	8-5	8-0	7-5	7-1	7-6	7-2	6-8	6-5	6-2
6	9-2	9-5	9-0	8-4	8-8	8-4	8-0	7-5	7-1	7-7	7-4
6½	10-7	10-1	9-5	9-8	9-3	8-7	8-3	8-8	8-4	8-0	7-5
7	11-4	10-6	10-0	10-3	9-7	9-2	9-6	9-1	8-6	8-2	8-7
7½	12-0	11-2	11-5	10-7	10-2	10-5	10-0	9-4	9-0	9-4	9-0
8	12-5	12-7	12-0	11-2	11-5	10-8	10-3	10-7	10-2	9-6	9-2
8½	13-2	13-3	12-5	12-7	12-0	11-3	11-6	11-0	10-4	10-8	10-4
9	14-7	13-8	13-0	13-2	12-4	12-6	12-0	11-3	11-7	11-1	10-5
9½	15-4	14-4	14-5	13-6	13-7	13-1	12-3	12-6	12-0	11-3	11-7
10	16-0	15-0	15-0	14-1	14-2	13-4	13-6	13-0	12-2	12-6	12-0
	7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10
10½	16-5	16-5	15-5	15-5	14-6	14-7	14-0	13-2	13-5	12-8	12-2
11	17-2	17-1	16-0	16-0	15-1	15-2	14-3	14-5	13-7	13-1	13-4
11½	18-7	17-6	17-5	16-4	16-4	15-5	15-6	14-8	14-0	14-3	13-5
12	19-4	18-1	18-0	17-8	16-8	16-8	16-0	15-1	15-3	14-5	14-7
12½	20-0	19-6	18-5	18-3	17-3	17-3	16-3	16-4	15-5	15-7	15-0
13	20-5	20-2	19-0	18-7	18-6	17-6	17-6	16-7	16-8	16-0	15-2
13½	21-2	20-7	20-5	19-2	19-1	18-0	18-0	17-0	17-1	16-2	16-4
14	22-7	21-3	21-0	20-7	19-5	19-4	18-3	18-3	17-4	17-6	16-5
14½	23-4	22-8	21-5	21-2	20-8	19-7	19-6	18-6	18-6	17-6	17-7
15	24-0	23-4	22-0	21-6	21-3	20-1	20-0	19-8	18-8	18-8	18-0
15½	24-5	24-0	23-5	22-1	21-7	21-5	20-3	20-2	19-1	19-1	18-2
16	25-2	24-5	24-0	23-5	22-2	21-8	21-6	20-5	20-4	19-3	19-4
16½	26-7	25-1	24-5	24-0	23-5	22-2	22-0	21-7	20-6	20-6	19-5
17	27-4	26-6	25-0	24-4	24-0	23-6	22-3	22-1	21-0	20-8	20-7
17½	28-0	27-2	26-5	25-8	24-4	24-0	23-6	22-4	22-2	21-1	21-0
18	28-5	27-7	27-0	26-3	25-7	24-3	24-0	23-6	22-4	22-3	21-2
18½	29-2	28-3	27-5	26-7	26-2	25-7	24-3	24-0	23-7	22-5	22-4
19	30-7	29-8	28-0	27-2	26-6	26-1	25-6	24-3	24-0	23-7	22-5
19½	31-4	30-3	29-5	28-7	27-1	26-4	26-0	25-5	24-2	24-0	23-7
20	32-0	30-8	30-0	29-2	28-4	27-8	26-3	25-8	25-5	24-2	24-0
	7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10
20½	32-5	31-4	30-5	29-6	28-8	28-2	27-6	26-8	25-7	25-4	24-2
21	33-2	32-0	31-0	30-1	29-3	28-5	28-0	27-4	26-0	25-6	25-4
21½	34-7	33-5	32-5	31-5	30-6	29-0	28-3	27-7	27-3	26-8	25-5
22	35-4	34-1	33-0	32-0	31-1	30-3	29-6	28-1	27-5	27-1	26-7
22½	36-0	34-6	33-5	32-4	31-5	30-6	30-0	29-3	28-8	27-3	27-0
23	36-5	35-2	34-0	33-8	32-8	31-1	30-3	29-6	29-1	28-6	27-2
23½	37-2	36-7	35-5	34-3	33-3	32-4	31-6	30-0	29-3	28-8	28-4
24	38-7	37-3	36-0	34-7	33-7	32-7	32-0	31-2	30-6	29-1	28-5
24½	39-4	37-8	36-5	35-2	34-2	33-2	32-3	31-5	30-8	30-3	29-7
25	40-0	38-4	37-0	36-7	35-5	34-5	33-6	32-8	31-1	30-5	30-0
25½	40-5	39-0	38-5	37-2	36-0	34-8	34-0	33-1	32-4	31-7	30-2
26	41-2	40-5	39-0	37-6	36-4	35-3	34-3	33-4	32-6	32-0	31-4
26½	42-7	41-1	39-5	38-1	37-7	36-6	35-6	34-7	33-0	32-2	31-5
27	43-4	41-6	40-0	39-5	38-2	37-1	36-0	35-0	34-2	33-4	32-7
27½	44-0	42-1	41-5	40-0	38-6	37-4	36-3	35-3	34-4	33-6	33-0
28	44-5	43-6	42-0	40-4	39-1	38-7	37-6	36-6	35-7	34-8	33-2
28½	45-2	44-2	42-5	41-8	40-4	39-2	38-0	37-0	36-0	35-1	34-4
29	46-7	44-7	43-0	42-3	40-8	39-5	38-3	37-2	36-2	35-3	34-5
29½	47-4	45-3	44-5	42-7	41-3	40-8	39-6	38-5	37-5	36-6	35-7
30	48-0	46-8	45-0	43-2	42-6	41-3	40-0	38-8	37-7	36-8	36-0
Pica Ems	7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10

Set-Size

Pica Ems	Set-Size 10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½
½	0-2	0-1	0-1	0-1	0-1	0-1	0-0	0-0	0-0	0-0
1	1-3	1-3	1-2	1-2	1-1	1-1	1-0	1-0	1-0	0-8
1½	1-5	1-4	1-3	1-2	1-2	1-1	1-1	1-0	1-8	1-8
2	2-6	2-5	2-4	2-3	2-2	2-2	2-1	2-0	1-8	1-8
2½	2-8	2-6	2-5	2-4	2-3	2-2	2-1	2-0	2-8	2-7
3	3-0	3-8	3-6	3-5	3-4	3-2	3-1	3-0	2-8	2-7
3½	4-2	4-0	3-7	3-6	3-4	3-3	3-1	3-0	3-8	3-6
4	4-3	4-1	4-8	4-7	4-5	4-3	4-2	4-0	3-8	3-6
4½	5-5	5-3	5-0	4-7	4-5	4-4	4-2	4-0	4-7	4-6
5	5-6	5-4	5-1	5-8	5-6	5-4	5-2	5-0	4-7	4-5
5½	6-8	6-5	6-3	6-0	5-7	5-4	5-2	5-0	5-7	5-5
6	7-0	6-6	6-4	6-1	6-7	6-5	6-2	6-0	5-7	5-5
6½	7-2	7-8	7-5	7-2	6-8	6-5	6-2	6-0	6-7	6-4
7	8-4	8-0	7-6	7-2	7-8	7-5	7-3	7-0	6-6	6-4
7½	8-5	8-1	8-7	8-3	8-0	7-6	7-3	7-0	7-6	7-4
8	9-7	9-3	8-8	8-4	8-1	8-6	8-3	8-0	7-6	7-3
8½	9-8	9-4	9-0	9-5	9-1	8-7	8-3	8-0	8-6	8-3
9	10-1	10-5	10-1	9-6	9-2	9-7	9-3	9-0	8-6	8-3
9½	11-2	10-6	10-2	10-7	10-2	9-7	9-4	9-0	9-6	9-2
10	11-4	11-8	11-3	10-7	10-3	10-8	10-4	10-0	9-5	9-2
	10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½
10½	12-5	12-0	11-4	11-8	11-4	10-8	10-4	10-0	10-5	10-1
11	12-7	12-1	12-5	12-0	11-4	11-0	11-4	11-0	10-5	10-1
11½	13-8	13-3	12-6	12-1	12-5	12-0	11-4	11-0	11-5	11-1
12	14-1	13-4	13-7	13-2	12-5	12-0	12-5	12-0	11-5	11-0
12½	14-2	14-5	13-8	13-2	13-6	13-1	12-5	12-0	12-4	12-0
13	15-4	14-6	14-0	14-3	13-7	13-1	13-5	13-0	12-4	12-0
13½	15-5	15-8	15-1	14-4	14-7	14-2	13-5	13-0	13-4	12-8
14	16-7	16-0	15-2	15-5	14-8	14-2	14-5	14-0	13-4	13-8
14½	17-0	16-1	16-3	15-6	15-8	15-2	14-6	14-0	14-4	13-8
15	17-1	17-3	16-4	16-7	16-0	15-3	15-6	15-0	14-3	14-7
15½	18-3	17-4	17-5	16-7	16-1	16-3	15-6	15-0	15-3	14-7
16	18-4	18-5	17-6	17-8	17-1	16-4	16-6	16-0	15-2	15-6
16½	19-6	18-6	18-8	18-0	17-2	17-4	16-6	16-0	16-3	15-6
17	19-7	19-8	19-0	18-1	18-2	17-4	17-7	17-0	16-3	16-6
17½	20-0	20-2	19-1	19-2	18-3	18-5	17-7	17-0	17-3	16-5
18	21-1	20-1	20-2	19-2	19-4	18-5	18-7	18-0	17-2	17-5
18½	21-3	21-3	20-3	20-3	19-4	19-5	18-7	18-0	18-2	17-5
19	22-4	21-4	21-4	20-4	20-5	19-6	19-7	19-0	18-2	18-4
19½	22-6	22-5	21-5	21-5	20-5	20-6	19-7	19-0	19-2	18-4
20	23-7	22-6	22-6	21-6	21-6	20-7	20-8	20-0	19-2	19-4
	10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½
20½	24-0	23-8	22-7	22-7	21-7	21-7	20-8	20-0	20-1	19-3
21	24-2	24-0	23-8	22-7	22-7	21-7	21-8	21-0	20-1	20-3
21½	25-3	24-1	24-0	23-8	22-8	22-8	21-8	21-0	21-1	20-3
22	25-5	25-3	24-1	24-0	23-8	22-8	22-8	22-0	21-1	21-2
22½	26-6	25-4	25-2	24-1	24-0	23-8	23-0	22-0	22-1	21-2
23	26-8	26-5	25-3	25-2	24-1	24-0	23-8	23-0	22-1	22-1
23½	27-0	26-6	26-4	25-4	25-1	24-0	24-0	23-8	23-0	22-1
24	28-2	27-8	26-5	26-3	25-2	25-1	24-0	24-0	23-8	23-1
24½	28-3	28-0	27-6	26-4	26-2	25-1	25-0	24-8	24-0	23-8
25	29-5	28-1	27-7	27-5	26-3	26-2	25-1	25-0	24-8	24-0
25½	29-6	29-3	28-8	27-6	27-4	26-2	26-1	25-0	25-0	24-8
26	30-8	29-4	29-0	28-7	27-4	27-2	26-1	26-0	25-8	24-8
26½	31-0	30-5	29-1	28-7	28-5	27-3	27-1	26-0	25-8	25-8
27	31-2	30-6	30-3	29-8	28-5	28-3	27-1	27-0	26-8	25-8
27½	32-4	31-8	30-4	30-0	29-6	28-4	28-2	27-0	26-8	26-7
28	32-5	32-0	31-5	30-1	29-7	29-4	28-2	28-0	27-8	26-7
28½	33-7	32-1	31-6	31-2	30-7	29-4	29-2	28-0	27-8	27-6
29	33-8	33-3	32-7	31-2	30-8	30-5	29-2	29-0	28-7	27-6
29½	34-1	33-4	32-8	32-3	31-8	30-5	30-2	29-0	28-7	28-6
30	35-2	34-5	33-0	32-4	32-0	31-5	30-2	30-0	29-7	28-5
Pica Ems	10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½

Set-Size

Pica Ems
½
1
1½
2
2½
3
3½
4
4½
5
5½
6
6½
7
7½
8
8½
9
9½
10
10½
11
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24½
25
25½
26
26½
27
27½
28
28½
29
29½
30
Pica Ems

Pica Ems to Ems of Any Set

30½ Picas to 60 Picas

Based on Pica = 0.166″

Pica Ems	Pica Ems	Set-Size										
		5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼	
½	30½	73–4	69¾4	66⅛1	63⅜3	61–0	58⅜1	56–6	54–4	52–5	50⅜0	30½
1	31	74–7	70⅜6	67½2	64¼4	62–0	59⅜0	57–4	55–2	53–3	51–6	31
1½	31½	75½2	72–0	68¾4	65¼4	63–0	60⅜0	58–3	56–0	54–0	52–2	31½
2	32	76⅜5	73–3	69⅜6	66⅛5	64–0	61–8	59–1	56⅜7	54⅛6	52⅜8	32
2½	32½	78–0	74–5	70⅜7	67⅛6	65–0	62–7	60–0	57⅜5	55¼4	53⅜5	32½
3	33	79–4	75–8	72–0	68⅜7	66–0	63–6	60⅜8	58⅜3	56⅛1	54½2	33
3½	33½	80–7	76⅛1	73–2	69⅜7	67–0	64–6	61⅛6	59⅜1	57–8	55–8	33½
4	34	81½2	77¾4	74–3	70⅜8	68–0	65–5	62⅛5	60–8	58–5	56–5	34
4½	34½	82⅜5	78⅛6	75–5	72–0	69–0	66–4	63⅛3	61–6	59–3	57–2	34½
5	35	84–0	80–0	76–7	73–1	70–0	67–4	64½2	62–4	60–0	57⅜8	35
5½	35½	85–4	81–3	77–8	74–2	71–0	68–3	65⅛1	63–2	60⅜6	58⅛5	35½
6	36	86–7	82–5	78⅛1	75–2	72–0	69–2	66–8	64–0	61¼4	59½2	36
6½	36½	87½2	83–8	79½2	76–3	73–0	70–1	67–7	64⅛7	62⅛1	60–7	36½
7	37	88⅛5	84⅛1	80¼4	77–4	74–0	71–1	68–6	65⅛5	63–8	61–4	37
7½	37½	90–0	85¼4	81⅛6	78–5	75–0	72–0	69–4	66⅛3	64–5	62–1	37½
8	38	91–4	86⅛6	82⅛7	79–5	76–0	72⅛8	70–3	67⅛1	65–3	62⅛7	38
8½	38½	92–7	88–0	84–0	80–6	77–0	73⅛8	71–1	68–8	66–0	63¼4	38½
9	39	93½2	89–3	85–2	81–7	78–0	74⅛7	72–0	69–6	66⅛6	64⅛1	39
9½	39½	94⅛5	90–5	86–3	82–8	79–0	75⅛6	72⅛8	70–4	67¼4	65–7	39½
10	40	96–0	91–8	87–5	83½0	80–0	76½5	73⅛6	71–2	68½1	66–4	40
		5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼	
10½	40½	97–4	92½1	88–7	84½0	81–0	77⅛5	74⅛5	72–0	69–8	67–1	40½
11	41	98–7	93¾4	89–8	85½1	82–0	78¼4	75⅓3	72⅛7	70–5	67⅛7	41
11½	41½	99½2	94⅛6	90½1	86½2	83–0	79⅓3	76½2	73⅛5	71–3	68⅓3	41½
12	42	100⅛5	96–0	91½2	87⅓3	84–0	80⅓3	77⅓1	74⅓3	72–0	69⅓0	42
12½	42½	102–0	97–3	92¾4	88¾4	85–0	81½2	78–8	75⅓1	72⅛6	70–6	42½
13	43	103–4	98–5	93⅛6	89¾4	86–0	82⅓1	79–7	76–8	73¾4	71–3	43
13½	43½	104–7	99–8	94⅛7	90⅛5	87–0	83½0	80–6	77–6	74½1	72–0	43½
14	44	105½2	100½1	96–0	91⅛6	88–0	84½0	81–4	78–4	75–8	72⅛6	44
14½	44½	106⅛5	101¼4	97–2	92⅛7	89–0	85–8	82–3	79–2	76–5	73⅓3	44½
15	45	108–0	102⅛6	98–3	93⅛7	90–0	86–7	83–1	80–0	77–3	74½0	45
15½	45½	109–4	104–0	99–5	94⅛8	91–0	87–6	84–0	80⅛7	78–0	75–6	45½
16	46	110–7	105–3	100–7	96–0	92–0	88–6	84⅛8	81½5	78⅛6	76–2	46
16½	46½	111½2	106–5	101–8	97–1	93–0	89–5	85⅛6	82⅓3	79¼4	76⅛8	46½
17	47	112⅛5	107–8	102¼1	98–2	94–0	90–4	86⅛5	83¼1	80½1	77½5	47
17½	47½	114–0	108½1	103½2	99–2	95–0	91–4	87⅓3	84–8	81–8	78½2	47½
18	48	115–4	109¾4	104¾4	100–3	96–0	92–3	88½2	85–6	82–5	79–8	48
18½	48½	116–7	110⅜6	105⅛6	101–4	97–0	93–2	89½1	86–4	83–3	80–5	48½
19	49	117½2	112–0	106⅛7	102–5	98–0	94–1	90–8	87–2	84–0	81–2	49
19½	49½	118⅛5	113–3	108–0	103–5	99–0	95–1	91–7	88–0	84⅛6	81⅛8	49½
20	50	120–0	114–5	109–2	104–6	100–0	96–0	92–6	88½7	85¼4	82½5	50
		5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼	
20½	50½	121–4	115–8	110–3	105–7	101–0	96⅛8	93–4	89½5	86½1	83½2	50½
21	51	122–7	116½1	111–5	106–8	102–0	97⅛8	94–3	90½3	87–8	84–7	51
21½	51½	123½2	117¾4	112–7	107½0	103–0	98⅛7	95–1	91⅛1	88–5	85–4	51½
22	52	124⅛5	118⅛6	113–8	108½0	104–0	99⅛6	96–0	92–8	89–3	86–1	52
22½	52½	126–0	120–0	114½1	109½1	105–0	100½5	96⅛8	93–6	90–0	86¾7	52½
23	53	127–4	121–3	115½2	110½2	106–0	101⅛5	97⅛6	94–4	90⅛6	87¼4	53
23½	53½	128–7	122–5	116¼4	111⅓3	107–0	102¼4	98⅛5	95–2	91¼4	88⅛1	53½
24	54	129½2	123–8	117⅛6	112¼4	108–0	103⅓3	99⅓3	96–0	92⅛1	89–7	54
24½	54½	130⅛5	124⅛1	118⅛7	113¾4	109–0	104⅓3	100½2	96⅜7	93–8	90–4	54½
25	55	132–0	125¾4	120–0	114⅛5	110–0	105½2	101⅛1	97⅛5	94–5	91–1	55
25½	55½	133–4	126⅛6	121–2	115½6	111–0	106⅛1	102–8	98⅓3	95–3	91⅛7	55½
26	56	134–7	128–0	122–3	116⅛7	112–0	107½0	103–7	99⅛1	96–0	92⅓3	56
26½	56½	135½2	129–3	123–5	117⅛7	113–0	108½0	104–6	100–8	96⅛6	93½0	56½
27	57	136⅛5	130–5	124–7	118⅛8	114–0	109–8	105–4	101–6	97¼4	94–6	57
27½	57½	138–0	131–8	125–8	120–0	115–0	110–7	106–3	102–4	98½1	95–3	57½
28	58	139–4	132½1	126½1	121–1	116–0	111–6	107–1	103–2	99–8	96–0	58
28½	58½	140–7	133¾4	127½2	122–2	117–0	112–6	108–0	104–0	100–5	96⅛6	58½
29	59	141½2	134⅛6	128¼4	123–2	118–0	113–5	108⅛8	104⅛7	101–3	97⅓3	59
29½	59½	142⅛5	136–0	129⅛6	124–3	119–0	114–4	109½6	105⅛5	102–0	98½0	59½
30	60	144–0	137–3	130⅜7	125–4	120–0	115–4	110⅛5	106⅓3	102½6	99–6	60
Pica Ems	Pica Ems	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼	Pica Ems
		Set-Size										

Pica Ems	Pica Ems	Set-Size										
		7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10
30½	48⅛5	47–4	45⅛5	44–7	43–1	41⅛6	40⅜3	39½1	38½0	37⅛1	36½2	30½
31	49½2	48–0	46½0	45–2	43⅛5	42½0	41–6	40–4	39–3	38–3	37–4	31
31½	50–7	48⅛5	47–5	45⅛6	44–8	43–4	42–0	40⅜7	39⅛5	38⅛5	37⅛5	31½
32	51–4	49½1	48–0	46⅛1	45–3	43⅛7	42⅛3	41½0	40–8	39–7	38–7	32
32½	52–0	50–6	48⅛5	47–5	45⅛7	44⅛1	43–6	42–3	41–1	40–0	39–0	32½
33	52⅛5	51–2	49½0	48–0	46½2	45–5	44–0	42⅛6	41⅓3	40½2	39½2	33
33½	53½2	51⅛7	50–5	48¾4	47–5	45⅛8	44⅓3	43–8	42–6	41–4	40–4	33½
34	54–7	52⅓3	51–0	49–8	48–0	46½2	45–6	44–2	42⅛8	41⅛6	40⅜5	34
34½	55–4	53–8	51⅛5	50–3	48¾4	47–6	46–0	44⅛5	43⅛1	42–8	41–7	34½
35	56–0	54–3	52½0	50⅛7	49–7	48–0	46⅓3	45–7	44–4	43–1	42–0	35
35½	56⅛5	54⅛8	53–5	51⅛2	50–2	48⅛3	47–6	46–1	44⅛6	43⅛3	42⅛2	35½
36	57⅛2	55¼4	54–0	52–7	50⅛6	49–7	48–0	46¾4	45⅛0	44–6	43–4	36
36½	58–7	56½0	54⅛5	53–2	51⅛1	50–1	48⅛3	47–6	46–2	44⅛8	43⅛5	36½
37	59–4	57–5	55½0	53⅛6	52–4	50¾4	49–6	48–0	46¼4	45⅛1	44–7	37
37½	60–0	58–1	56–5	54⅛1	52⅛8	51–8	50–0	48⅓3	47–7	46–3	45–0	37½
38	60⅜5	58⅛6	57–0	55–5	53⅓3	52–2	50⅓3	49–5	48–0	46⅛5	45½2	38
38½	61½2	59½2	57⅛5	56–0	54–6	52⅛5	51–6	49⅛8	48½2	47–7	46–4	38½
39	62–7	60–7	58½0	56¾4	55–1	53½0	52–0	50½2	49–5	48–0	46⅛5	39
39½	63–4	61–3	59–5	57–8	55⅛5	54–3	52⅓3	51–4	49⅛7	48½2	47–7	39½
40	64–0	61⅜8	60–0	58–3	56–8	54⅛6	53–6	51⅛7	50½0	49–4	48–0	40
		7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10
40½	64⅛5	62¾4	60⅛5	58⅛7	57–3	55½1	54–0	52⅛1	51–3	49⅛6	48½2	40½
41	65½2	63½0	61½0	59½2	57⅛7	56–4	54⅛3	53–3	51⅛5	50–8	49–4	41
41½	66–7	64–5	62–5	60–7	58½2	56⅛7	55–6	53⅛6	52–8	51–1	49⅛5	41½
42	67–4	65–1	63–0	61–2	59–5	57½2	56–0	54½0	53–1	51⅓3	50–7	42
42½	68–0	65⅜6	63⅛5	61⅛6	60–0	58–5	56⅓3	55–2	53⅓3	52–6	51–0	42½
43	68⅛5	66⅛1	64½0	62⅛1	60¾4	58½8	57–6	55⅛5	54–6	52⅛8	51½2	43
43½	69½2	67–6	65–5	63–5	61–7	59⅓3	58–0	56–8	54⅛8	53¼1	52–4	43½
44	70–7	68–2	66–0	64–0	62–2	60–6	58⅓3	57–1	55⅛1	54–3	52⅛5	44
44½	71–4	68⅛7	66⅛5	64¾4	62⅛6	61–1	59–6	57¼4	56–4	54⅛5	53–7	44½
45	72–0	69⅓3	67½0	65–8	63¾1	61¼4	60–0	58–7	56⅛6	55–7	54–0	45
45½	72⅛5	70–8	68–5	66–3	64–4	62–7	60⅓3	59–0	57½0	56–0	54½2	45½
46	73½2	71–4	69–0	66⅛7	64⅛8	63–2	61–6	59⅓3	58–2	56½2	55–4	46
46½	74–7	72–0	69⅛5	67½2	65⅓3	63⅛5	62–0	60–6	58¼4	57–4	55⅛5	46½
47	75–4	72⅛5	70½0	68–7	66–6	64–8	62⅓3	61–0	59–7	57⅛6	56–7	47
47½	76–0	73¾1	71–5	69–2	67–1	65–3	63–6	61½2	60–0	58–8	57–0	47½
48	76⅛5	74–6	72–0	69⅛6	67⅛5	65⅛6	64–0	62–5	60½2	59–1	57½2	48
48½	77½2	75–2	72⅛5	70½1	68–8	66½0	64⅓3	62⅛8	61–5	59⅓3	58–4	48½
49	78–7	75⅛7	73½0	71–5	69–3	67–4	65–6	63¾1	61⅛7	60–6	58⅛5	49
49½	79–4	76⅓3	74–5	72–0	69⅛7	67⅛7	66–0	64–4	62½0	60⅜8	59–7	49½
50	80–0	77–8	75–0	72¾4	70½2	68½1	66⅓3	64⅛7	63–3	61⅛1	60–0	50
		7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10
50½	80⅛5	78–3	75⅛5	73–8	71–5	69–5	67–6	65½0	63⅛5	62–3	60½2	50½
51	81½2	78⅛8	76½0	74–3	72–0	69⅛8	68–0	66–3	64–8	62⅛5	61–4	51
51½	82–7	79¾4	77–5	74⅛7	72¾4	70½2	68⅓3	66⅛6	65–1	63–7	61⅛5	51½
52	83–4	80½0	78–0	75½2	73–7	71–6	69–6	67–8	65⅓3	64–0	62–7	52
52½	84–0	81–5	78⅛5	76–7	74–2	72–0	70–0	68–2	66–6	64½2	63–0	52½
53	84⅛5	82–1	79½0	77–2	74⅛6	72⅓3	70⅓3	68⅛5	66⅛8	65–4	63½2	53
53½	85½2	82⅛6	80–5	77⅛6	75¼1	73–7	71–6	69–7	67⅛1	65⅛6	64–4	53½
54	86–7	83½2	81–0	78⅛1	76–4	74–1	72–0	70–1	68–4	66–8	64⅛5	54
54½	87–4	84–7	81⅛5	79–5	76⅛8	74¾4	72⅓3	70¾4	68⅛6	67–1	65–7	54½
55	88–0	85–3	82½0	80–0	77⅓3	75–8	73–6	71–6	69½0	67⅓3	66–0	55
55½	88⅛5	85⅛8	83–5	80¾4	78–6	76–2	74–0	72–0	70–2	68–6	66½2	55½
56	89½2	86¾4	84–0	81–8	79–1	76½5	74⅓3	72⅓3	70¾4	68⅛8	67–4	56
56½	90–7	87½0	84⅛5	82–3	79⅛5	77½0	75–6	73–5	71–7	69¼1	67⅛5	56½
57	91–4	88–5	85½0	82⅛7	80–8	78–3	76–0	73⅛8	72–0	70–3	68–7	57
57½	92–0	89–1	86–5	83½2	81–3	78⅛6	76⅓3	74½2	72½2	70½5	69–0	57½
58	92⅛5	89⅛6	87–0	84–7	81⅛7	79¼1	77–6	75–4	73–5	71–7	69¼2	58
58½	93½2	90¼1	87⅛5	85–2	82¼2	80–4	78–0	75⅛7	73⅛7	72–0	70–4	58½
59	94–7	91–6	88½0	85⅛6	83–5	80⅛7	78⅓3	76¼1	74½0	72½2	70⅛5	59
59½	95–4	92–2	89–5	86¼1	84–0	81½2	79–6	77–3	75–3	73–4	71–7	59½
60	96–0	92⅛7	90–0	87–5	84¾4	82–5	80–0	77⅛6	75⅛5	73⅛6	72–0	60
Pica Ems	Pica Ems	7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10
		Set-Size										

Pica Ems	Pica Ems	Set-Size										
		10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½	
30½	35¼4	34⅛6	34–1	33–5	32¾1	31⅛6	31–3	30⅜0	29⅛7	29–5	30½	
31	36–5	35–8	34½2	33⅛6	33–1	32–6	31⅛3	31–0	30–7	29⅛5	31	
31½	36⅛7	36–0	35–3	34–7	33½2	32⅛7	32–3	31⅜0	30⅛6	30–4	31½	
32	37–8	36¾1	35¼4	34⅛7	34–2	33–7	32⅛3	32–0	31–6	30¼4	32	
32½	38–1	37–3	36–5	35–8	34⅓3	33⅛7	33–3	32⅜0	31⅛6	31–4	32½	
33	38½2	37¼4	36⅛6	36–0	35–4	34–8	33¼4	33–0	32–6	31⅛3	33	
33½	39–4	38–5	37–7	36⅛1	35¼4	34⅛8	34–4	33⅜0	32⅛6	32–3	33½	
34	39⅛5	38⅛6	37⅛8	37–2	36–5	35⅜0	34¼4	34–0	33–6	32⅛3	34	
34½	40–7	39–8	38⅜0	37½2	36⅛5	36–0	35–4	34⅜0	33⅛5	33–2	34½	
35	41–0	40–0	39–1	38–3	37–6	36⅜0	35¼4	35–0	34–5	33½2	35	
35½	41⅛1	40⅛1	39½2	38¼4	37⅛7	37–1	36–5	35⅜0	34⅛5	34–1	35½	
36	42–3	41–3	40–3	39–5	38–7	37⅛1	36⅛5	36–0	35–5	34⅛1	36	
36½	42¼4	41¼4	40¼4	39⅛6	38⅛8	38–2	37–5	36⅜0	35⅛5	35–1	36½	
37	43–6	42–5	41–5	40–7	39–8	38½2	37⅛5	37–0	36–4	35⅜0	37	
37½	43⅛7	42⅛6	41⅛6	40⅛7	40–0	39–2	38–5	37⅜0	36¼4	36–0	37½	
38	44⅜0	43–8	42–8	41–8	40½1	39⅓3	38⅛6	38–0	37–4	36⅜0	38	
38½	45–1	44–0	43–0	42–0	41–1	40–3	39–6	38⅜0	37¼4	36⅛8	38½	
39	45⅛3	44⅛1	43⅛1	42⅛1	41½2	40¼4	39⅛6	39–0	38–4	37–8	39	
39½	46–4	45–3	44–2	43–2	42–1	41–4	40–6	39⅜0	38⅓3	37⅛8	39½	
40	46⅛6	45¼4	44⅓3	43½2	42⅓3	41¼4	40⅛6	40–0	39–3	38–7	40	
		10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½	
40½	47–7	46–5	45–4	44–3	43–4	42–5	41–7	40⅜0	39½2	38⅛7	40½	
41	48–0	46⅜6	45⅛5	44¼4	43¼4	42⅛5	41⅛7	41–0	40–3	39–6	41	
41½	48½2	47–8	46–6	45–5	44–5	43–6	42–7	41⅓0	40⅓3	39⅓6	41½	
42	49–3	48–0	46⅓7	45⅛6	44⅛5	43⅛6	42⅛7	42–0	41–3	40–6	42	
42½	49⅛5	48⅛1	47–8	46–7	45–6	44–6	43–7	42⅜0	41½2	40⅛5	42½	
43	50–6	49–3	48–0	46⅛7	45⅛7	44⅛7	43⅛7	43–0	42–2	41–5	43	
43½	50⅜8	49¼4	48⅛1	47–8	46–7	45–7	44–8	43⅜0	42½2	41⅛5	43½	
44	51⅜0	50–5	49–2	48–0	46⅜8	45⅛7	44⅛8	44–0	43–2	42–4	44	
44½	52–2	50⅛6	49⅓3	48⅛1	47–8	46–8	45–8	44⅜0	43½2	42⅛4	44½	
45	52⅓3	51–8	50–4	49–2	48–0	46⅜8	45⅜8	45–0	44–1	43–4	45	
45½	53–5	52–0	50⅛5	49½2	48⅛1	47½0	46–8	45⅜0	44⅛1	43⅓3	45½	
46	53⅛6	52⅛1	51–6	50–3	49–1	48–0	47–0	46–0	45–1	44–3	46	
46½	54–8	53–3	51⅛7	50¼4	49½2	48⅜0	47⅛0	46⅜0	45⅛1	44⅓3	46½	
47	55–0	53¼4	52–8	51–5	50–2	49–1	48–0	47–0	46–1	45–2	47	
47½	55½2	54–5	53–0	51⅛6	50⅛3	49½1	48⅜0	47⅜0	46⅛1	45½2	47½	
48	56–4	54⅛6	53⅛1	52–7	51–4	50–2	49–0	48–0	47–0	46–1	48	
48½	56⅛5	55–8	54–3	52⅛7	51¼4	50½2	49⅛1	48⅜0	47⅜0	46⅛1	48½	
49	57–7	56–0	54¼4	53–8	52–5	51–2	50–1	49–0	48–0	47–1	49	
49½	57⅜8	56⅛1	55–5	54–0	52⅛5	51⅓3	50⅛1	49⅜0	48⅜0	47⅜0	49½	
50	58⅛1	57–3	55½6	54⅛1	53–6	52–3	51–1	50–0	49–0	48–0	50	
		10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½	
50½	59–2	57¼4	56–7	55–2	53⅛7	52¼4	51⅛1	50⅜0	49⅝8	48⅜0	50½	
51	59¼4	58–5	56⅛8	55½2	54–7	53–4	52–2	51–0	49⅜8	48⅛8	51	
51½	60–5	58⅜6	57⅜0	56–3	54⅜8	53¼4	52⅛2	51⅜0	50–8	49–8	51½	
52	60⅛7	59–8	58–1	56¼4	55–8	54–5	53–2	52–0	50⅜8	49⅜8	52	
52½	61–8	60–0	58½2	57–5	56–0	54⅛5	53⅛2	52⅜0	51–8	50–7	52½	
53	62–1	60⅛1	59–3	57⅛6	56⅛1	55–5	54–2	53–0	51⅜8	50⅛7	53	
53½	62½2	61–3	59¼4	58–7	57–1	55⅛6	54⅛2	53⅜0	52–7	51–6	53½	
54	63–4	61¼4	60–5	58⅛7	57½2	56–6	55–3	54–0	52⅛7	51⅛6	54	
54½	63⅛5	62–5	60⅛6	59–8	58–2	56⅛7	55⅓3	54⅜0	53–7	52–6	54½	
55	64–7	62⅛6	61–7	60–0	58⅓3	57–7	56–3	55–0	53⅛7	52⅛5	55	
55½	65–0	63–8	61⅛8	60⅛1	59–4	57⅛7	56⅓3	55⅜0	54–7	53–5	55½	
56	65½1	64–0	62½0	61–2	59¾4	58–8	57–3	56–0	54⅛6	53⅛5	56	
56½	66–3	64⅛1	63–1	61½2	60–5	58⅜8	57¼4	56⅜0	55–6	54–4	56½	
57	66¾4	65–3	63½2	62–3	60⅜5	59⅜0	58–4	57–0	55⅛6	54¼4	57	
57½	67–6	65¼4	64–3	62¼4	61–6	60–0	58¾4	57⅜0	56–6	55–4	57½	
58	67⅞7	66–5	64¼4	63–5	61⅛7	60½0	59–4	58–0	56⅛6	55⅓3	58	
58½	68½0	66⅛6	65–5	63⅛6	62–7	61–1	59¾4	58⅜0	57–6	56–3	58½	
59	69–1	67–8	65⅛6	64–7	62⅛8	61½1	60–5	59–0	57⅛5	56⅓3	59	
59½	69⅓3	68–0	66–8	64⅛7	63–8	62–2	60⅜5	59⅜0	58–5	57–2	59½	
60	70–4	68½1	67–0	65–8	64–0	62½2	61–5	60–0	58⅜5	57½2	60	
Pica Ems	Pica Ems	10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½	Pica Ems
		Set-Size										

Scale for
Changing Units

Allowance for
Rule and Squeeze

PLATE VIII

Scale for Changing Units of Any Set to

This Scale is used with the Table for Changing Pica Ems to Ems of any Set, to change any measure, in

Set-Size	Units														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
5	4	8	12	15	19	23	27	31	**35**	38	42	46	50	54	58
5¼	4	8	12	16	20	24	28	32	**36**	40	44	48	53	57	61
5½	4	9	13	17	21	25	30	34	**38**	42	47	51	55	59	63
5¾	4	9	13	18	22	27	31	35	**40**	44	49	53	57	62	66
6	5	9	14	18	23	28	32	37	**42**	46	51	55	60	65	69
6¼	5	10	14	19	24	29	34	38	**43**	48	53	58	62	67	72
6½	5	10	15	20	25	30	35	40	**45**	50	55	60	65	70	75
6¾	5	10	16	21	26	31	36	42	**47**	52	57	62	67	73	78
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
7	5	11	16	22	27	32	38	43	**48**	54	59	65	70	75	81
7¼	6	11	17	22	28	33	39	45	**50**	56	61	67	72	78	84
7½	6	12	17	23	29	35	40	46	**52**	58	63	69	75	81	87
7¾	6	12	18	24	30	36	42	48	**54**	60	66	72	77	83	89
8	6	12	18	25	31	37	43	49	**55**	62	68	74	80	86	92
8¼	6	13	19	25	32	38	44	51	**57**	63	70	76	82	89	95
8½	7	13	20	26	33	39	46	52	**59**	65	72	78	85	92	98
8¾	7	13	20	27	34	40	47	54	**61**	67	74	81	87	94	101
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
9	7	14	21	28	35	42	48	55	**62**	69	76	83	90	97	104
9¼	7	14	21	28	36	43	50	57	**64**	71	78	85	92	100	107
9½	7	15	22	29	37	44	51	58	**66**	73	80	88	95	102	110
9¾	7	15	23	30	38	45	53	60	**67**	75	82	90	97	105	112
10	8	15	23	31	38	46	54	62	**69**	77	85	92	100	108	115
10¼	8	16	24	32	39	47	55	63	**71**	79	87	95	102	110	118
10½	8	16	24	32	40	48	57	65	**73**	81	89	97	105	113	121
10¾	8	17	25	33	41	50	58	66	**74**	83	91	99	107	116	124
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
11	8	17	25	34	42	51	59	68	**76**	85	93	101	110	118	127
11¼	9	17	26	35	43	52	61	69	**78**	87	95	104	112	121	130
11½	9	18	27	35	44	53	62	71	**80**	88	97	106	115	124	133
11¾	9	18	27	36	45	54	63	72	**81**	90	99	108	117	126	136
12	9	18	28	37	46	55	65	74	**83**	92	101	111	120	129	138
12¼	9	19	28	38	47	57	66	75	**85**	94	104	113	122	132	141
12½	10	19	29	38	48	58	67	77	**87**	96	106	115	125	135	144
Set-Size	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Units														

Set-Size	Units										
	16	17	18	19	20	21	22	23	24	25	26
5	62	65	**69**	73	77	81	85	88	92	96	100
5¼	65	69	**73**	77	81	85	89	93	97	101	105
5½	68	72	**76**	80	85	89	93	97	102	106	110
5¾	71	75	**80**	84	88	93	97	102	106	111	115
6	74	78	**83**	88	92	97	101	106	111	115	120
6¼	77	82	**87**	91	96	101	106	110	115	120	125
6½	80	85	**90**	95	100	105	110	115	120	125	130
6¾	83	88	**93**	99	104	109	114	119	125	130	135
	16	17	18	19	20	21	22	23	24	25	26
7	86	92	**97**	102	108	113	118	124	129	135	140
7¼	89	95	**100**	106	111	117	123	128	134	139	145
7½	92	98	**104**	110	115	121	127	132	138	144	150
7¾	95	101	**107**	113	119	125	131	137	143	149	155
8	98	105	**111**	117	123	129	135	141	148	154	160
8¼	101	108	**114**	121	127	133	140	146	152	159	165
8½	105	111	**118**	124	131	137	144	150	157	163	170
8¾	108	114	**121**	128	135	141	148	155	161	168	
	16	17	18	19	20	21	22	23	24	25	26
9	111	118	**125**	131	138	145	152	159	166	173	
9¼	114	121	**128**	135	142	149	156	164	171		
9½	117	124	**131**	139	146	153	161	168			
9¾	120	127	**135**	142	150	157	165	172			
10	123	131	**138**	146	154	161	169				
10¼	126	134	**142**	150	158	165	173				
10½	129	137	**145**	153	161	170					
10¾	132	140	**149**	157	165	173					
	16	17	18	19	20	21	22	23	24	25	
11	135	144	**152**	161	169						
11¼	138	147	**156**	164	173						
11½	141	150	**159**	168							
11¾	145	154	**163**	172							
12	148	157	**166**								
12¼	151	160	**170**								
12½	154	163	**173**								
Set-Size	16	17	18	19	20	21	22	23	24	25	
	Units										

Points
⅛
¼
⅜
½
⅝
¾
⅞
1
1¼
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Points

Allowance for Squeeze In setting the measure at the KEYBOARD, allowance for squeeze in lock-up should be made just as the compositor allows for this in adjusting his stick for hand composition. This is not a definite rule, as different offices have different methods, but a good average rule is to allow ½ point squeeze on measures up to 10 picas, 1 point from 10 to 20 picas, 1½ points from 20 to 30 picas, and 2 points for over 30 picas; this allowance is made as follows: ***Example:*** A page is to be composed in 8-set, 22 picas wide, and the allowance for squeeze on 22 picas is 1½ points. The equivalent of 22 picas in 8-set is 33 ems 0 units (see table for "Changing Pica Ems to Ems of Any Set," Plate VII). The equivalent of 1½ points in 8-set is 3.3 units (see table at right). Since 0.3 is less than half discard it (if it had been half or over it would have been added as a whole unit) add the 3 units to the 33 ems previously found, and set the KEYBOARD to 33 ems 3 units.

Allowance for Rule If the matter to be composed contains rules, allowance for these must be made at the KEYBOARD. The number of units allowed for rules varies with the set of the face to be composed and with the thickness of the rule. ***Example:*** A table is to be composed in 8½-set, 30 picas wide, and is to contain 11 two-point rules. The equivalent of 30 picas in 8½-set is 42 ems 6 units. The total allowance for rules is 22 points (11×2=22), and the equivalent of 22 points in 8½-set is shown in this table at right to be 2½ ems 1.5 units, or (calling it 2 units, since the decimal is 0.5 or over) 2½ ems 2 units. Subtracting this from 42 ems 6 units gives 39½ ems 4 units (42 ems 6 units − 2½ ems 2 units = 39½ ems 4 units), to which the KEYBOARD measure should be set.

f Any Set to Units of Any Other Set

to change any measure, in Ems and Units of any Set, to Ems and Units of any other Set desired

Units										Set-Size	Units														
21	22	23	24	25	26	27	28	29	30		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
81	85	88	92	96	100	**104**	108	111	115	5	119	123	127	130	134	**138**	142	146	150	154	157	161	165	169	**173**
85	89	93	97	101	105	**109**	113	117	121	5¼	125	129	133	137	141	**145**	149	153	157	161	165	169	173		
89	93	97	102	106	110	**114**	118	123	127	5½	131	135	140	144	148	**152**	157	161	165	169	173				
93	97	102	106	111	115	**119**	124	128	133	5¾	137	141	146	150	155	**159**	164	168	172			42	43	44	45
97	101	106	111	115	120	**124**	129	134	138	6	143	148	152	157	161	**166**	171								
101	106	110	115	120	125	**130**	134	139	144	6¼	149	154	158	163	168	**173**									
105	110	115	120	125	130	**135**	140	145	150	6½	155	160	165	170											
109	114	119	125	130	135	**140**	145	151	156	6¾	161	166	171												
21	22	23	24	25	26	27	28	29	30		31	32	33	34	35	36	37	38	39	40	41				
113	118	124	129	135	140	**145**	151	156	161	7	167	172													
117	123	128	134	139	145	**150**	156	162	167	7¼	173														
121	127	132	138	144	150	**156**	161	167	173	7½															
125	131	137	143	149	155	**161**	167	173																	
129	135	141	148	154	160	**166**	172																		
133	140	146	152	159	165	**171**																			
137	144	150	157	163	170																				
141	148	155	161	168																					
21	22	23	24	25	26	27	28	29	30		31	32													
145	152	159	166	173																					
149	156	164	171																						
153	161	168																							
157	165	172																							
161	169																								
165	173																								
170																									
173																									
21	22	23	24	25																					
21	22	23	24	25																					

Changing Units

At left of Scale find known Set, follow this line across Scale to column for known number of units (given at top of columns); at intersection of these two lines will be found the Key Number for this number of units of known set. Then find required Set in column at left of Scale, follow this line across Scale to number in this line equal to, or most nearly equal to, the Key Number; at top of this column will be found required number of units equal to, or most nearly equal to, number of units for given set.

Example: Given 15 Units of 11¼-set; find its equivalent in units of 7¾-set. The Key Number for 15 units of 11¼-set is 130; following across the line of the Scale for 7¾-set we find that 131 is the nearest number to this Key Number and that 131 is in the column headed 22: Therefore, 22 units of 7¾-set is the equivalent of 15 units of 11¼-set.

CAUTION: This Scale does not provide for fractions of a unit and, therefore, it must not be used for finding the equivalent of measures greater than the Scale gives; for these use this Scale in connection with the Table for Changing Pica Ems to Ems of Any Set, Plate VII, as follows:

Example: Given 15 ems 7 units of 11¼-set; find its equivalent in ems and units of 7¾-set. Find in Table for Changing Pica Ems, Plate VII, in column headed 11¼-set, nearest measure to given measure, in this case 15 ems 8 units. Follow that line across Table to column headed with set desired (7¾) to get equivalent of 15 ems 8 units of 11¼-set; this is 22 ems 8 units of 7¾-set. Correct this by using this Scale thus: Since measure in 11¼-set taken from Table was 15 ems 8 units, that is, one unit more than given measure, to get equivalent of 15 ems 7 units we must subtract from measure found on Table (22 ems 8 units of 7¾-set) the equivalent of one unit of 11¼-set which we find from this Scale. The Key Number for one unit of 11¼-set is 9; in line of Scale for 7¾-set we find 6 and 12, Key Number (9) is exactly between these two and in such a case use larger number (12), which is in two-unit column, and equivalent of one unit of 11¼-set is two units of 7¾-set. This must be subtracted from 22 ems 8 units of 7¾-set, measure found in Table for Changing Pica Ems. Thus, 22 ems 6 units of 7¾-set is equivalent of 15 ems 7 units of 11¼-set. NOTE: In converting a smaller set into a larger use smaller number if Key Number is exactly between two numbers of set required.

CAUTION: In tabular, or similar work, where it is necessary to find the equivalents of different sections of a line, always check the total measure by finding its equivalent and seeing that this equals the sum of the equivalents of the different sections of the line. Since no Table and Scale can provide for fractions of a unit, it may be necessary to correct the equivalent of the widest section of the line by adding or subtracting a unit.

Allowance for Rule and Squeeze in Ems and Units of the Various Sets

Points	Set-Size										Points
	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼	
½	0–1.8	0–1.7	0–1.6	0–1.5	0–1.5	0–1.4	0–1.3	0–1.3	0–1.2	0–1.2	½
1	0–3.6	0–3.4	0–3.2	0–3.1	0–3.0	0–2.8	0–2.7	0–2.6	0–2.5	0–2.4	1
1½	0–5.4	0–5.1	0–4.9	0–4.6	0–4.5	0–4.3	0–4.1	0–3.9	0–3.8	0–3.7	1½
2	0–7.2	0–6.8	0–6.5	0–6.2	0–6.0	0–5.7	0–5.5	0–5.3	0–5.1	0–4.9	2
3	0⅜1.8	0⅜1.2	0⅜0.8	0⅜0.3	0⅜0.0	0–8.6	0–8.3	0–7.9	0–7.7	0–7.4	3
4	0⅜5.4	0⅜4.7	0⅜4.0	0⅜3.5	0⅜3.0	0⅜2.5	0⅜2.0	0⅜1.6	0⅜1.2	0⅜0.9	4
5	1–0.0	0⅜8.1	0⅜7.3	0⅜6.6	0⅜6.0	0⅜5.3	0⅜4.8	0⅜4.3	0⅜3.8	0⅜3.4	5
6	1–3.6	1–2.5	1–1.6	1–0.7	1–0.0	0⅜8.2	0⅜7.6	0⅜6.9	0⅜6.4	0⅜5.8	6
7	1–7.2	1–6.0	1–4.9	1–3.9	1–3.0	1–2.1	1–1.3	1–0.6	1–0.0	0⅜8.3	7
8	1⅜1.8	1⅜0.4	1–8.1	1–7.0	1–6.0	1–5.0	1–4.1	1–3.2	1–2.5	1–1.8	8
9	1⅜5.4	1⅜3.8	1⅜2.4	1⅜1.1	1⅜0.0	1–7.9	1–6.9	1–5.9	1–5.1	1–4.3	9
10	2–0.0	1⅜7.2	1⅜5.6	1⅜4.3	1⅜3.0	1⅜1.7	1⅜0.6	1–8.6	1–7.7	1–6.8	10
11	2–3.6	2–1.7	1⅜8.9	1⅜7.4	1⅜6.0	1⅜4.6	1⅜3.4	1⅜2.3	1⅜1.2	1⅜0.3	11
12	2–7.2	2–5.1	2–3.2	2–1.5	2–0.0	1⅜7.5	1⅜6.2	1⅜4.9	1⅜3.8	1⅜2.7	12
13	2⅜1.8	2–8.5	2–6.5	2–4.7	2–3.0	2–1.4	2–0.0	1⅜7.6	1⅜6.4	1⅜5.2	13
14	2⅜5.4	2⅜3.0	2⅜0.8	2–7.8	2–6.0	2–4.3	2–2.7	2–1.3	2–0.0	1⅜7.7	14
	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼	
15	3–0.0	2⅜6.4	2⅜4.0	2⅜1.9	2⅜0.0	2–7.1	2–5.5	2–3.9	2–2.5	2–1.2	15
16	3–3.6	3–0.8	2⅜7.3	2⅜5.1	2⅜3.0	2⅜1.0	2–8.3	2–6.6	2–5.1	2–3.7	16
17	3–7.2	3–4.3	3–1.6	2⅜8.2	2⅜6.0	2⅜3.9	2⅜2.0	2⅜0.3	2–7.7	2–6.2	17
18	3⅜1.8	3–7.7	3–4.8	3–2.3	3–0.0	2⅜6.8	2⅜4.8	2⅜2.9	2⅜1.2	2–8.6	18
19	3⅜5.4	3⅜2.1	3–8.1	3–5.5	3–3.0	3–0.6	2⅜7.6	2⅜5.6	2⅜3.8	2⅜2.1	19
20	4–0.0	3⅜5.5	3⅜2.4	3–8.6	3–6.0	3–3.5	3–1.3	2⅜8.3	2⅜6.4	2⅜4.6	20
21	4–3.6	4–0.0	3⅜5.7	3⅜2.7	3⅜0.0	3–6.4	3–4.1	3–1.9	3–0.0	2⅜7.1	21
22	4–7.2	4–3.4	3⅜8.9	3⅜5.9	3⅜3.0	3⅜0.3	3–6.9	3–4.6	3–2.5	3–0.6	22
23	4⅜1.8	4–6.8	4–3.2	4–0.0	3⅜6.0	3⅜3.2	3⅜0.7	3–7.3	3–5.1	3–3.0	23
24	4⅜5.4	4⅜1.3	4–6.5	4–3.1	4–0.0	3⅜6.0	3⅜3.4	3⅜0.9	3–7.7	3–5.5	24
25	5–0.0	4⅜4.7	4⅜0.8	4–6.3	4–3.0	3⅜8.9	3⅜6.2	3⅜3.6	3⅜1.3	3–8.0	25
26	5–3.6	4⅜8.1	4⅜4.0	4⅜0.4	4–6.0	4–2.8	4–0.0	3⅜6.3	3⅜3.8	3⅜1.5	26
27	5–7.2	5–2.5	4⅜7.3	4⅜3.5	4⅜0.0	4–5.7	4–2.7	3⅜8.9	3⅜6.4	3⅜4.0	27
28	5⅜1.8	5–6.0	5–1.6	4⅜6.6	4⅜3.0	4–8.6	4–5.5	4–2.6	4–0.0	3⅜6.5	28
29	5⅜5.4	5⅜0.4	5–4.8	5–0.8	4⅜6.0	4⅜2.4	4–8.3	4–5.3	4–2.5	3⅜8.9	29
30	6–0.0	5⅜3.8	5–8.1	5–3.9	5–0.0	4⅜5.3	4⅜2.0	4–7.9	4–5.1	4–2.4	30
Points	5	5¼	5½	5¾	6	6¼	6½	6¾	7	7¼	Points
	Set-Size										

Points	Set-Size											Points
	7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10	
½	0–1.2	0–1.1	0–1.1	0–1.0	0–1.0	0–1.0	0–1.0	0–0.9	0–0.9	0–0.9	0–0.9	½
1	0–2.4	0–2.3	0–2.2	0–2.1	0–2.1	0–2.0	0–2.0	0–1.9	0–1.8	0–1.8	0–1.8	1
1½	0–3.6	0–3.4	0–3.3	0–3.2	0–3.1	0–3.0	0–3.0	0–2.9	0–2.8	0–2.7	0–2.7	1½
2	0–4.8	0–4.6	0–4.4	0–4.3	0–4.2	0–4.1	0–4.0	0–3.8	0–3.7	0–3.6	0–3.6	2
3	0–7.2	0–6.9	0–6.7	0–6.5	0–6.3	0–6.1	0–6.0	0–5.8	0–5.6	0–5.5	0–5.4	3
4	0⅜0.6	0⅜0.2	0–8.9	0–8.7	0–8.4	0–8.2	0–8.0	0–7.7	0–7.5	0–7.3	0–7.2	4
5	0⅜3.0	0⅜2.6	0⅜2.2	0⅜1.9	0⅜1.5	0⅜1.2	0⅜1.0	0⅜0.7	0⅜0.4	0⅜0.2	0⅜0.0	5
6	0⅜5.4	0⅜4.9	0⅜4.4	0⅜4.0	0⅜3.7	0⅜3.3	0⅜3.0	0⅜2.6	0⅜2.3	0⅜2.0	0⅜1.8	6
7	0⅜7.8	0⅜7.2	0⅜6.7	0⅜6.2	0⅜5.8	0⅜5.4	0⅜5.0	0⅜4.6	0⅜4.2	0⅜3.9	0⅜3.6	7
8	1–1.2	1–0.5	0⅜8.9	0⅜8.4	0⅜7.9	0⅜7.4	0⅜7.0	0⅜6.5	0⅜6.1	0⅜5.7	0⅜5.4	8
9	1–3.6	1–2.9	1–2.2	1–1.6	1–1.0	1–0.5	1–0.0	0⅜8.5	0⅜8.0	0⅜7.6	0⅜7.2	9
10	1–6.0	1–5.2	1–4.4	1–3.8	1–3.1	1–2.5	1–2.0	1–1.4	1–0.9	1–0.4	1–0.0	10
11	1–8.4	1–7.5	1–6.7	1–6.0	1–5.2	1–4.6	1–4.0	1–3.3	1–2.8	1–2.3	1–1.8	11
12	1⅜1.8	1⅜0.8	1–8.9	1–8.1	1–7.4	1–6.6	1–6.0	1–5.3	1–4.7	1–4.1	1–3.6	12
13	1⅜4.2	1⅜3.1	1⅜2.2	1⅜1.3	1⅜0.5	1–8.7	1–8.0	1–7.2	1–6.6	1–5.9	1–5.4	13
14	1⅜6.6	1⅜5.5	1⅜4.4	1⅜3.5	1⅜2.6	1⅜1.8	1⅜1.0	1⅜0.2	1–8.5	1–7.8	1–7.2	14
	7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10	
15	2–0.0	1⅜7.8	1⅜6.7	1⅜5.7	1⅜4.7	1⅜3.8	1⅜3.0	1⅜2.1	1⅜1.4	1⅜0.6	1⅜0.0	15
16	2–2.4	2–1.1	1⅜8.9	1⅜7.9	1⅜6.8	1⅜5.9	1⅜5.0	1⅜4.1	1⅜3.3	1⅜2.5	1⅜1.8	16
17	2–4.8	2–3.4	2–2.2	2–1.1	1⅜8.9	1⅜7.9	1⅜7.0	1⅜6.0	1⅜5.2	1⅜4.3	1⅜3.6	17
18	2–7.2	2–5.8	2–4.4	2–3.2	2–2.1	2–1.0	2–0.0	1⅜8.0	1⅜7.1	1⅜6.2	1⅜5.4	18
19	2⅜0.6	2–8.1	2–6.7	2–5.4	2–4.2	2–3.0	2–2.0	2–0.9	2–0.0	1⅜8.0	1⅜7.2	19
20	2⅜3.0	2⅜1.4	2–8.9	2–7.6	2–6.3	2–5.0	2–4.0	2–2.9	2–1.8	2–0.9	2–0.0	20
21	2⅜5.4	2⅜3.7	2⅜2.2	2⅜0.8	2–8.4	2–7.2	2–6.0	2–4.8	2–3.7	2–2.7	2–1.8	21
22	2⅜7.8	2⅜6.0	2⅜4.4	2⅜3.0	2⅜1.5	2⅜0.2	2–8.0	2–6.7	2–5.6	2–4.6	2–3.6	22
23	3–1.2	2⅜8.4	2⅜6.7	2⅜5.2	2⅜3.6	2⅜2.3	2⅜1.0	2–8.7	2–7.5	2–6.4	2–5.4	23
24	3–3.6	3–1.7	2⅜8.9	2⅜7.3	2⅜5.8	2⅜4.3	2⅜3.0	2⅜1.6	2⅜0.4	2–8.2	2–7.2	24
25	3–6.0	3–4.0	3–2.2	3–0.5	2⅜7.9	2⅜6.4	2⅜5.0	2⅜3.6	2⅜2.3	2⅜1.1	2⅜0.0	25
26	3–8.4	3–6.3	3–4.4	3–2.7	3–1.0	2⅜8.5	2⅜7.0	2⅜5.5	2⅜4.2	2⅜2.9	2⅜1.8	26
27	3⅜1.8	3–8.7	3–6.7	3–4.9	3–3.1	3–1.5	3–0.0	2⅜7.5	2⅜6.1	2⅜4.8	2⅜3.6	27
28	3⅜4.2	3⅜2.0	3–8.9	3–7.1	3–5.2	3–3.6	3–2.0	3–0.4	2⅜8.0	2⅜6.6	2⅜5.4	28
29	3⅜6.6	3⅜4.3	3⅜2.2	3⅜0.2	3–7.3	3–5.6	3–4.0	3–2.4	3–0.9	2⅜8.5	2⅜7.2	29
30	4–0.0	3⅜6.6	3⅜4.4	3⅜2.4	3⅜0.5	3–7.7	3–6.0	3–4.3	3–2.8	3–1.3	3–0.0	30
Points	7½	7¾	8	8¼	8½	8¾	9	9¼	9½	9¾	10	Points
	Set-Size											

Points	Set-Size										Points
	10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½	
½	0–0.8	0–0.8	0–0.8	0–0.8	0–0.8	0–0.7	0–0.7	0–0.7	0–0.7	0–0.7	½
1	0–1.7	0–1.7	0–1.6	0–1.6	0–1.6	0–1.5	0–1.5	0–1.5	0–1.4	0–1.4	1
1½	0–2.6	0–2.5	0–2.5	0–2.4	0–2.4	0–2.3	0–2.2	0–2.2	0–2.2	0–2.1	1½
2	0–3.5	0–3.4	0–3.3	0–3.2	0–3.2	0–3.1	0–3.0	0–3.0	0–2.9	0–2.8	2
3	0–5.2	0–5.1	0–5.0	0–4.9	0–4.8	0–4.6	0–4.5	0–4.5	0–4.4	0–4.3	3
4	0–7.0	0–6.8	0–6.6	0–6.5	0–6.4	0–6.2	0–6.1	0–6.0	0–5.8	0–5.7	4
5	0–8.7	0–8.5	0–8.3	0–8.1	0–8.0	0–7.8	0–7.6	0–7.5	0–7.3	0–7.1	5
6	0⅜1.5	0⅜1.2	0⅜1.0	0⅜0.8	0⅜0.6	0⅜0.3	0⅜0.1	0⅜0.0	0–8.8	0–8.6	6
7	0⅜3.2	0⅜2.9	0⅜2.7	0⅜2.4	0⅜2.2	0⅜1.9	0⅜1.7	0⅜1.5	0⅜1.2	0⅜1.0	7
8	0⅜5.0	0⅜4.7	0⅜4.3	0⅜4.0	0⅜3.8	0⅜3.5	0⅜3.2	0⅜3.0	0⅜2.7	0⅜2.5	8
9	0⅜6.7	0⅜6.4	0⅜6.0	0⅜5.7	0⅜5.4	0⅜5.0	0⅜4.7	0⅜4.5	0⅜4.2	0⅜3.9	9
10	0⅜8.5	0⅜8.1	0⅜7.7	0⅜7.3	0⅜7.0	0⅜6.6	0⅜6.3	0⅜6.0	0⅜5.6	0⅜5.3	10
11	1–1.2	1–0.8	1–0.4	0⅜8.9	0⅜8.6	0⅜8.2	0⅜7.8	0⅜7.5	0⅜7.1	0⅜6.8	11
12	1–3.0	1–2.5	1–2.0	1–1.6	1–1.2	1–0.7	1–0.3	1–0.0	0⅜8.6	0⅜8.2	12
13	1–4.8	1–4.2	1–3.7	1–3.2	1–2.8	1–2.3	1–1.9	1–1.5	1–1.1	1–0.6	13
14	1–6.5	1–5.9	1–5.4	1–4.9	1–4.4	1–3.9	1–3.4	1–3.0	1–2.5	1–2.1	14
	10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½	
15	1–8.3	1–7.7	1–7.1	1–6.5	1–6.0	1–5.4	1–4.9	1–4.5	1–4.0	1–3.5	15
16	1⅜1.0	1⅜0.4	1–8.7	1–8.1	1–7.6	1–7.0	1–6.5	1–6.0	1–5.5	1–5.0	16
17	1⅜2.8	1⅜2.1	1⅜1.4	1⅜0.8	1⅜0.2	1–8.6	1–8.0	1–7.5	1–6.9	1–6.4	17
18	1⅜4.5	1⅜3.8	1⅜3.1	1⅜2.4	1⅜1.8	1⅜1.1	1⅜0.5	1⅜0.0	1–8.4	1–7.8	18
19	1⅜6.3	1⅜5.5	1⅜4.8	1⅜4.0	1⅜3.4	1⅜2.7	1⅜2.1	1⅜1.5	1⅜0.9	1⅜0.3	19
20	1⅜8.0	1⅜7.2	1⅜6.4	1⅜5.7	1⅜5.0	1⅜4.3	1⅜3.6	1⅜3.0	1⅜2.3	1⅜1.7	20
21	2–0.8	1⅜8.9	1⅜8.1	1⅜7.3	1⅜6.6	1⅜5.8	1⅜5.1	1⅜4.5	1⅜3.8	1⅜3.2	21
22	2–2.5	2–1.6	2–0.8	1⅜8.9	1⅜8.2	1⅜7.4	1⅜6.7	1⅜6.0	1⅜5.3	1⅜4.6	22
23	2–4.3	2–3.4	2–2.5	2–1.6	2–0.8	1⅜8.9	1⅜8.2	1⅜7.5	1⅜6.8	1⅜6.0	23
24	2–6.1	2–5.1	2–4.1	2–3.2	2–2.4	2–1.5	2–0.7	2–0.0	1⅜8.2	1⅜7.5	24
25	2–7.8	2–6.8	2–5.8	2–4.9	2–4.0	2–3.1	2–2.3	2–1.5	2–0.7	1⅜8.9	25
26	2⅜0.6	2–8.5	2–7.5	2–6.5	2–5.6	2–4.6	2–3.8	2–3.0	2–2.2	2–1.3	26
27	2⅜2.3	2⅜1.2	2⅜0.2	2–8.1	2–7.2	2–6.2	2–5.3	2–4.5	2–3.6	2–2.8	27
28	2⅜4.1	2⅜2.9	2⅜1.8	2⅜0.8	2–8.8	2–7.8	2–6.9	2–6.0	2–5.1	2–4.2	28
29	2⅜5.8	2⅜4.6	2⅜3.5	2⅜2.4	2⅜1.4	2⅜0.3	2–8.4	2–7.5	2–6.6	2–5.8	29
30	2⅜7.6	2⅜6.4	2⅜5.2	2⅜4.0	2⅜3.0	2⅜1.9	2⅜0.9	2⅜0.0	2–8.0	2–7.1	30
Points	10¼	10½	10¾	11	11¼	11½	11¾	12	12¼	12½	Points
	Set-Size										

should be made just
tion. This is not a
ge rule is to allow ½
0 to 30 picas, and 2
mposed in 8-set, 22
2 picas in 8-set is 33
ivalent of 1½ points
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