THE MONOTYPE SYSTEM

THE MONOTYPE SYSTEM

A BOOK
FOR OWNERS & OPERATORS
OF
MONOTYPES

"The word Monotype means much more than the name of a machine; it includes a complete system of composing room practice based on the work of the Monotype both as a composing machine and as a type caster."

PHILADELPHIA
LANSTON MONOTYPE MACHINE CO.
1912

PREFACE

THE WORD *MONOTYPE* means today much more than the name of a machine; it includes a system of composing room practice based upon the work of the MONOTYPE both as a composing machine and as a type caster. The most striking characteristic of this system is its flexibility, for the "versatile machine" has successfully solved an almost infinite variety of composing room problems. It is quite impossible for this book to cover all the special uses of the MONOTYPE; indeed, if any such book were attempted, it would be out-of-date before it was off the press, because, every day, users of the MONOTYPE System are solving new problems and applying the MONOTYPE to new uses.

The object of this book is to describe the basic principles of the MONOTYPE, to explain, without technical detail, its most important mechanisms, to make clear the manner in which the KEYBOARD operator controls the CASTING MACHINE and to illustrate graphically various forms of simple and intricate composition; in short, to supply an explanation of the fundamentals 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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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 (see 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 desired may be made from the same ribbon.* The ribbon is "velvet" for tariff shops where the same station list is used on many different tables.

FIGURE 2
The RIBBON that controls the CASTING MACHINE, and the SPOOL on which this paper is wound by the KEYBOARD.

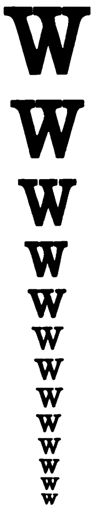


FIGURE 3
The product as a Type Caster: Type for the cases

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—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 two) of its PUNCHES is forced up by compressed air, the motive power of the BOARD, through the paper ribbon; the location

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

(*d*) **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.*

(*e*) **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.

(*f*) **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.

(*g*) **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 ensure 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.*

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 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 for each column is absolutely accurate 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 I, 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

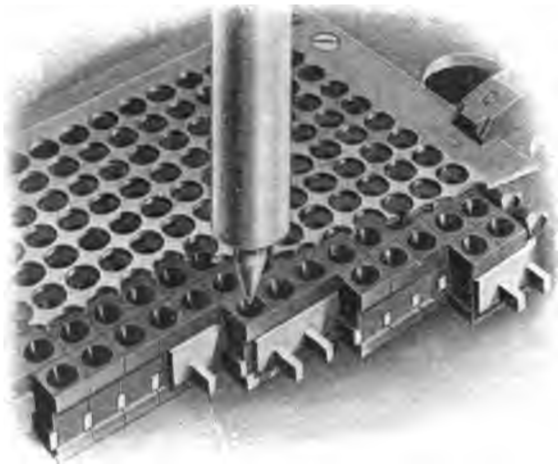


FIGURE 4

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

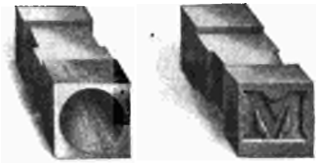
the taper end of the CENTERING PIN just ready to enter the cone-hole of the MATRIX to hold it in position over the opening in the MOLD while the character is being cast; for details of the MATRIX see Fig. 5, page 8. The PIN is accurately guided in its BUSHING so that, although it moves up and down, once 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 16, 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 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*. (See Fig. 39, facing page 122.)



THE CELLULAR MATRIX
(*Double Size*)

CONE-HOLE END SIDE FACE END
(*Actual Size*)

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

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. (See Fig. 6, page 9.) The back of the COMB and two of its teeth enclose 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

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).

be noted that no amount of 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 is a diagram of a Case arranged to carry

Figure 7
The Matrix Case contains 225 separate Matrices (Fig. 5) arranged in a square of 15 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 15 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*	*æ*	*œ*	*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. 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 (see Fig. 8), 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-nine 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 CASE, produce an entirely different character, 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.*

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 64 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

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* 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.

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 (see 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 (see 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.**

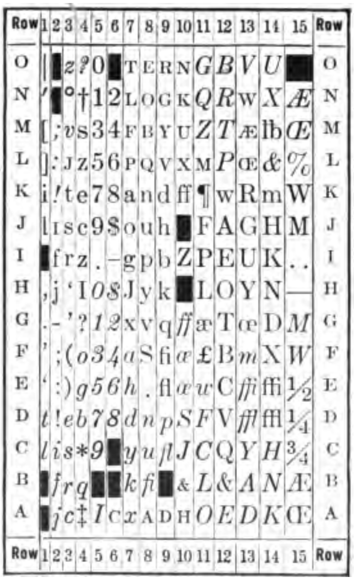

FIGURE 9

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 (see 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) 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

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.

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 16) in use. See Fig. 16, page 21.

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 accurately position 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, 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 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.

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 (see Fig. 10, page 15).

Refer again to the diagram showing the MATRIX CASE (Fig. 9, page 14) 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.

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 they be of the same point size or not; 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

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.

WEDGE; let us now see how different NORMAL 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" and 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

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

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

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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 of a set.

cast the characters on *wider bodies* and "open-up" the face (increase the space between letters) and lead the face linewise. 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 17, 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 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 18, 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 20, 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 shows a similar combination in which the Roman is "opened-up" one-half set.*

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).

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 (see Plate I, 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.

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; thus, .9186″.

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 each other. 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 (see Fig. 18, page 23) 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 23, is the MATRIX CASE Diagram (same as Fig. 8, page 10) except that it shows 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. NOTE: 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 (¶265).

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

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	I	*/*	*:*	*;*	■	■	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*	*œ*	*œ*	*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	*&*	℔	*X*	*U*	14
18	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 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.

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, 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.*

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 these two words state just as clearly that the lower case a, o, g, and x (9-unit characters) are four points wide and, in the same way, show the Set Size of every character in the font.

50. The set of a face indicates whether the face is extended or condensed and 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 above 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 pt. No. 98J) and the other a condensed eight-point (8 pt. 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 on page 26 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 (eighteen units of one set), or

$$\frac{.166''}{12} \div 18 = \frac{.166''}{12 \times 18} = \frac{.166''}{216} = .0007685'',$$ 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 (one 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.

$9 \times 8 = 72$
.0007685″ × 72 = .0553320″
Nine units of eight set = .0553″

```
 .0007685″
        72
 ---------
     15370
     53795
 ---------
 .0553320″
```

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

$6 \times 12 = 72$
.0007685″ × 72 = .0553320″
Six units of twelve set = .0553″

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

TABLE OF TYPE SIZES

Based on Pica = 0.166″

5 Point = .0692″
5½ Point = .0761″
6 Point = .0830″
7 Point = .0968″
8 Point = .1107″

9 Point = .1245″
10 Point = .1383″
11 Point = .1522″
12 Point = .1660″

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

TABLE OF SET FACTORS

Set	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Set
5	20.0	25.0	30.0	35.0	40.0	**45.0**	50.0	55.0	60.0	65.5	70.0	75.0	80.0	85.0	**90.0**	95.0	100.0	105.0	110.0	5
5¼	21.0	26.3	31.5	36.8	42.0	**47.3**	52.5	57.8	63.0	68.3	73.5	78.8	84.0	89.3	**94.5**	99.8	105.0	110.3	115.5	5¼
5½	22.0	27.5	33.0	38.5	44.0	**49.5**	55.0	60.5	66.0	71.5	77.0	82.5	88.0	93.5	**99.0**	104.5	110.0	115.5	121.0	5½
5¾	23.0	28.6	34.5	40.3	46.0	**51.8**	57.5	63.3	69.0	74.8	80.5	86.3	92.0	97.8	**103.5**	109.3	115.0	120.8	126.5	5¾
6	24.0	30.0	36.0	42.0	48.0	**54.0**	60.0	66.0	72.0	78.0	84.0	90.0	96.0	102.0	**108.0**	114.0	120.0	126.0	132.0	6
6¼	25.0	31.3	37.5	43.8	50.0	**56.3**	62.5	68.8	75.0	81.3	87.5	93.8	100.0	106.3	**112.5**	118.8	125.0	131.3	137.5	6¼
6½	26.0	32.5	39.0	45.5	52.0	**58.5**	65.0	71.5	78.0	84.5	91.0	97.5	104.0	110.5	**117.0**	123.5	130.0	136.5	143.0	6½
6¾	27.0	33.8	40.5	47.3	54.0	**60.8**	67.5	74.3	81.0	87.8	94.5	101.3	108.0	114.8	**121.5**	128.3	135.0	141.8	148.5	6¾
7	28.0	35.0	42.0	49.0	56.0	**63.0**	70.0	77.0	84.0	91.0	98.0	105.0	112.0	119.0	**126.0**	133.0	140.0	147.0	154.0	7
7¼	29.0	36.3	43.5	50.8	58.0	**65.3**	72.5	79.8	87.0	94.3	101.5	108.8	116.0	123.3	**130.5**	137.8	145.0	152.3	159.5	7¼
7½	30.0	37.5	45.0	52.5	60.0	**67.5**	75.0	82.5	90.0	97.5	105.0	112.5	120.0	127.5	**135.0**	142.5	150.0	157.5	165.0	7½
7¾	31.0	38.8	46.5	54.3	62.0	**69.8**	77.5	85.3	93.0	100.8	108.5	116.3	124.0	131.8	**139.5**	147.3	155.0	162.8	170.5	7¾
8	32.0	40.0	48.0	56.0	64.0	**72.0**	80.0	88.0	96.0	104.0	112.0	120.0	128.0	136.0	**144.0**	152.0	160.0	168.0	176.0	8
8¼	33.0	41.3	49.5	57.8	66.0	**74.3**	82.5	90.8	99.0	107.3	115.5	123.8	132.0	140.3	**148.5**	156.8	165.0	173.3	181.5	8¼
8½	34.0	42.5	51.0	59.5	68.0	**76.5**	85.0	93.5	102.0	110.5	119.0	127.5	136.0	144.5	**153.0**	161.5	170.0	178.5	187.0	8½
8¾	35.0	43.8	52.5	61.3	70.0	**78.8**	87.5	96.3	105.0	113.8	122.5	131.3	140.0	148.8	**157.5**	166.3	175.0	183.8	192.5	8¾
9	36.0	45.0	54.0	63.0	72.0	**81.0**	90.0	99.0	108.0	117.0	126.0	135.0	144.0	153.0	**162.0**	171.0	180.0	189.0	198.0	9
9¼	37.0	46.3	55.5	64.8	74.0	**83.3**	92.5	101.8	111.0	120.3	129.5	138.8	148.0	157.3	**166.5**	175.8	185.0	194.3	203.5	9¼
9½	38.0	47.5	57.0	66.5	76.0	**85.5**	95.0	104.5	114.0	123.5	133.0	142.5	152.0	161.5	**171.0**	180.5	190.0	199.5	209.0	9½
9¾	39.0	48.8	58.5	68.3	78.0	**87.8**	97.5	107.3	117.0	126.8	136.5	146.3	156.0	165.8	**175.5**	185.3	195.0	204.8	214.5	9¾
10	40.0	50.0	60.0	70.0	80.0	**90.0**	100.0	110.0	120.0	130.0	140.0	150.0	160.0	170.0	**180.0**	190.0	200.0	210.0	220.0	10
10¼	41.0	51.3	61.5	71.8	82.0	**92.3**	102.5	112.8	123.0	133.3	143.5	153.8	164.0	174.3	**184.5**	194.8	205.0	215.3	225.5	10¼
10½	42.0	52.5	63.0	73.5	84.0	**94.5**	105.0	115.5	126.0	136.5	147.0	157.5	168.0	178.5	**189.0**	199.5	210.0	220.5	231.0	10½
10¾	43.0	53.8	64.5	75.3	86.0	**96.8**	107.5	118.3	129.0	139.8	150.5	161.3	172.0	182.8	**193.5**	204.3	215.0	225.8	236.5	10¾
11	44.0	55.0	66.0	77.0	88.0	**99.0**	110.0	121.0	132.0	143.0	154.0	165.0	176.0	187.0	**198.0**	209.0	220.0	231.0	242.0	11
11¼	45.0	56.3	67.5	78.8	90.0	**101.3**	112.5	123.8	135.0	146.3	157.5	168.8	180.0	191.3	**202.5**	213.8	225.0	236.3	247.5	11¼
11½	46.0	57.5	69.0	80.5	92.0	**103.5**	115.0	126.5	138.0	149.5	161.0	172.5	184.0	195.5	**207.0**	218.5	230.0	241.5	253.0	11½
11¾	47.0	58.8	70.5	82.3	94.0	**105.8**	117.5	129.3	141.0	152.8	164.5	176.3	188.0	199.8	**211.5**	223.3	235.0	246.8	258.5	11¾
12	48.0	60.0	72.0	84.0	96.0	**108.0**	120.0	132.0	144.0	156.0	168.0	180.0	192.0	204.0	**216.0**	228.0	240.0	252.0	264.0	12
12¼	49.0	61.3	73.5	85.8	98.0	**110.3**	122.5	134.8	147.0	159.3	171.5	183.8	196.0	208.3	**220.5**	232.8	245.0	257.3	269.5	12¼
12½	50.0	62.5	75.0	87.5	100.0	**112.5**	125.0	137.5	150.0	162.5	175.0	187.5	200.0	212.5	**225.0**	237.5	250.0	262.5	275.0	12½

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:

$$9 \times 8 = 72 \text{ and } 6 \times 12 = 72$$

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 page 27 for Table of Set Factors; that is, the product of set and units, from one 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. NOTE: 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.

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?

$$80 \div 9 = 8.8$$

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:

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).

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 operator to make 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 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 to work with, 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.

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 ones *first* 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 cause the CASTING MACHINE to pull the line just cast out of the TYPE CHANNEL and 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. Beside 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 presses a KEY to revolve the JUSTIFYING SCALE and notes the two numbers on the SCALE indicated by its POINTER. In short, he presses the button, 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 above, "*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 character, just as the size of the justifying space is increased, by striking this character with the 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

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* 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.

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 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 I) 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 I, front view of upper part of KEYBOARD, at the back of the 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 I) 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 PISTON 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 I, 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 b26KB1 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 33KC, 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 its SPRING, 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.* It has been tested on BOARDS operated by power *and will work without a skip*, even at the rate of twenty thousand 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 25KB1 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 4KB3.

99. The Em Scale 9KB1 is a strip of celluloid divided into sixty 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 eight 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.*

101. As already stated, the counting mechanism consists of two parts: (*a*) the mechanism for measuring the

* 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 are most satisfactory, for the lead 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.

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 (Fig. 20, page 42) 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 14KB1 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 meantime (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 REVERSING KEY, instead of by the lower row of JUSTIFYING KEYS, the operator has only to turn the small VALVE HANDLE 29KC17 (Plate I) 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 percent. on $135 for ninety days, he turns to his table of five and one-half percent. 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 (see Fig. 20, page 42, and Plate I, at back of book), a cylinder which revolves about its axis when the JUSTIFYING-SCALE KEY (left green KEY at the bottom of the BOARD) is depressed. After the last character for a line has been struck, the operator presses the SCALE KEY; the SCALE revolves the proper amount and stops; 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—press the button, read two numbers, strike two KEYS. For detailed description of setting straight matter, beginning the take, justifying, etc., see Setting Straight Matter, Chap. XXXIX, page 164.

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 (see Fig. 20). 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 20KB (see Plate I, at back of book). The amount the SCALE revolves, when the SCALE KEY (¶122) is depressed, 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 20
A Justifying Scale

112. To change Justifying Scales: Figs. 14, 15, and 16, Plate VI, at back of book, Operating Adjustments, 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 II, at the back of the 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

* See foot-note, next page.

be less than 72 units short) the number of vertical columns that rotate past the JUSTIFYING-SCALE POINTER, when the SCALE KEY is depressed, 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 operator depresses the SCALE KEY, the SCALE revolves and stops 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 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*

* By using the JUSTIFYING SCALE in combination with the EM SCALE and UNIT INDICATOR it is quite possible to justify lines wherein the shortage is *greater than seventy-one units.* For details of this method of using the JUSTIFYING SCALE, see Exercise 5, Chap. XLVII.

justifying spaces the same size as the Keyboard has counted them; that is, four units of the set in use." (¶100.)

118. If the SCALE KEY be depressed, 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 reference to Plate II, 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, when the SCALE KEY is depressed 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 or 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, dividing words when necessary, 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 SCALE KEY is depressed) 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 23), with constant justification the SPACE BARS produce, not justifying spaces, but four-unit fixed spaces.

122. The Scale Key, the left green KEY at the bottom of the BOARD, is used to revolve the JUSTIFYING SCALE automatically. Depressing this KEY admits air to the JUSTIFYING-SCALE DRIVING RACK which, as it moves to the left, rotates the SCALE PINION, and this, through gears, rotates the JUSTIFYING SCALE; *the Scale Key cannot be used if the line be more than seventy-one units short.* NOTE: For special work (Double Justification, see ¶205) the SCALE is rotated by hand.

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 ones first 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 14), for the NORMAL WEDGE (Fig. 10) 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, page 15), MATRIX CASE with blank MATRIX O–2 (see Fig. 18, page 23) 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

* "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 (Chaps. XXVI to XXIX inclusive), but for the sake of simplicity it is assumed in this chapter that this WEDGE is used only for justifying spaces.

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 15); 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 larger 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 the left to right, 1 to 15 inclusive. (See Plate I, at back of book.) As already described, to justify a line the operator depresses the JUSTIFYING-SCALE KEY (left green KEY), which permits the SCALE to revolve the proper amount and stop 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 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.

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 = .00922″; one unit of one set equals .00922″ ÷ 12 = .0007685″. (See ¶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 (page 26), but they may be calculated by using .0007685″, the equivalent of one unit of one set.

6 units of 12 set (see Table of Type Sizes, page 26) .00922″×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
4 units of 12 set (see Table of Type Sizes, page 26) .00922″×4 =	.0369
Error	.0000

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

6 units of 8½ set (see Table of Type Sizes, page 26)...	.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 Justifying Wedges be as far to right as possible, if 1-1 Justifying Keys have been struck (.0392″ − .0184″ = .0208″)..................	.0208
4 units of 8½ set (see Table of Type Sizes, page 26) .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 " " lower " " .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 II, 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?

65 units of 8½ set	.00653″×65 =	.42445″
Amount to be added to each of the 16 justifying spaces (counted by the KEYBOARD as 4 units of 8½ 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 " " lower " "	.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 eight and one-half set SCALE, Plate II, 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.

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

No. 3 JUSTIFYING KEY top row adds ....0075″×2 =		.0150″
" 8 " " lower " " ....0005″×7 =		.0035
Difference between thickness of SPACE and TYPE WEDGES		.0185
		.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 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 .00922″ (¶139) and two units of twelve set equal .01844″ (error .00004″). 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.

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, 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	I	!	:	;	■	■	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	œ	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	&	℔	X	U	14
18	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 21

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 (|) is the front, left MATRIX. NOTE: The above diagram is identical with Fig. 18, page 23.

146. Fig. 21 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 CASE to move back and front (operating position), while PUNCHES one to fourteen 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. 22 shows the arrangement of the PUNCHES at the KEYBOARD, and the INDEX PLATE placed beneath them to designate the PUNCHES as described.

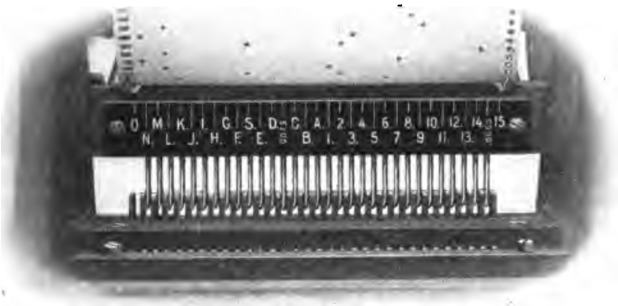

FIGURE 22

Arrangement of PUNCHES; shows the INDEX PLATE for identifying the 31 PUNCHES; viz., 14 numbered from 1 to 14 inclusive to move the MATRIX CASE right and left, 14 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. 21, page 54.

147. Two extra Punch Bars, shown at left and right of Fig. 22, that do not carry PUNCHES are provided; that is, while there are but thirty-one PUNCHES, there are thirty-three PUNCH BARS 33KC (Plate I, at back of book) and thirty-three PLUNGERS (¶9) for operating these BARS. In short, the KEYBOARD is built exactly as if PUNCHES were required for Row 15 and Row O, Fig. 21. The PUNCH BAR for Row 15 (at the right facing the KEYBOARD) is essential because the PUNCH BARS for the numbered rows in Fig. 21 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 PLUNGERS 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 16) 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," Chap. XXV, page 84.

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 ems and each em is subdivided into half-ems."* (¶99.) The EM-RACK POINTER a4KB3 (Plate I, 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.

159. Since measures are given in picas it is, of course, necessary to change the measure required, expressed in picas, into ems of the set to be composed before adjusting the KEYBOARD measure. Thus if the required measure be twenty picas and the face to be composed 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.

160. The Table for Changing Pica Ems to Ems of Any Set (Plate III, 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:

$$13 \text{ picas} \times \frac{12}{7} = \frac{156}{7} = 22\tfrac{2}{7} \text{ ems of seven set}$$

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.

161. 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 a point and one-half 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, see Plate IV, at back of book. NOTE: It is not customary to make any allowance for squeeze in setting tabular matter containing brass rules, where the entire table is made up of a number of columns that average not more than five picas in width. Brass rule, especially after it has been used and become dirty, is thicker than its rated point size, and this extra thickness has the same effect as allowing for squeeze.

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 required set, as described in the last chapter.

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 over-running 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 (page 26) 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 equals .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″. As 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 IV, 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 III, 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 same set selected for this comparison. This use of the table and scale will be clear from the example given on Plate IV, 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. 23 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. 23 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

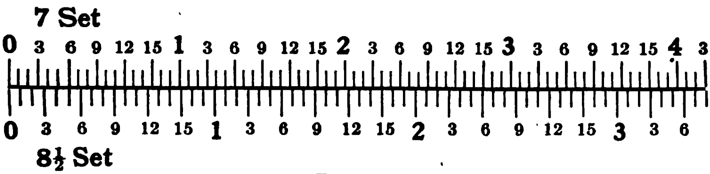

FIGURE 23
Scale for comparing two sets.

at the scale (Fig. 23) 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. 23, 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 three, 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 the one 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 (¶150). Then restore and strike the nine-unit vertical as many times as required for the length of the scale.

170. Cast this 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 on 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 two-point leads between the verticals and the figures; take as many press 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 ready for use.

171. Double Em Scales: In ¶163 was explained the conversion of sets required when side heads of a larger 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. 23, page 65) can save a great deal of time by making a scale of the proper proportion for this eleven-set face and attaching it to the EM SCALE of the KEYBOARD, with stickers, or paste, so that when the POINTER of the EM RACK is as far to the left as possible, at the beginning of a line, it will indicate the zero of this auxiliary scale, which is numbered from left to right, *not* from right to left, like the EM SCALE. Of course, this auxiliary scale must be fastened to the EM SCALE so that it does not cover up the graduations of that SCALE; that is, the top of the paper scale should be about a quarter of an inch below the top edge of the EM SCALE. If a side head, to be inserted when the matter is made up, is fourteen and one-half ems of eleven set, the operator, in allowing "dead wood" for this, pays no attention to the EM SCALE of the KEYBOARD but strikes the quad and necessary space KEYS to bring the EM-RACK POINTER to fourteen and one-half ems on the auxiliary scale; this done, he proceeds to set the balance of the line in seven set, paying no further attention to the auxiliary scale until he uses it to make the same allowance on the next line.*

172. Unlike the double scale shown in Fig. 23, these auxiliary scales for use on the EM SCALE are not graduated to units of the set they represent because the graduations on the EM SCALE bear no relation to the actual size, in points, of the em for the set JUSTIFYING SCALE in use on the KEYBOARD; no matter what JUSTIFYING SCALE be used, the EM SCALE is never changed. Therefore, before we can make one of these auxiliary scales we must determine the proportion between graduations on the EM SCALE, which represent ems of the JUSTIFYING SCALE on the KEYBOARD, and ems of the set for the auxiliary scale.

173. An em on the Em Scale is .15708", a half em is .07854", therefore, if a seven-set JUSTIFYING SCALE be used on the KEYBOARD and the matter to be inserted be 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*

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* Obviously, justifying spaces, which are not cast the same size as they are counted, must not be used between the words of the matter to be inserted; that is, the matter to be measured on the auxiliary scale. Use fixed spaces *between* the words of the inserted matter and justifying spaces *after* the last word.

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. 23, page 65. 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 is a table for comparing directly measures, varying by half-ems in any of the sets for which the table has been calculated (6, 7, 8, 8½, 10, 10½, and 12 set), up to and including fifteen ems and nine units of twelve set. This table is reproduced with slight modifications from the MONOTYPE Manual of the Government Printing Office where it 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, where the customer in most cases "standardizes" the work, this table may not be complete enough to meet all requirements, in which case use the most suitable of the methods of conversion described in this chapter or make a similar table sufficiently complete to cover the work of 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 do not use the table beyond its limit and, 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 III, at back of book). The method of using the table will be clear from the examples given with it; see opposite page.

CHAPTER XX

Setting the Keyboard Measure

177. The Em-rack Stop 6KB2 (Plate I, at back of book) is moved to adjust the KEYBOARD to the measure required, just as a compositor sets his stick or a stenographer the margin stop on a typewriter. 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 9KB1 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 ¶160 or Plate III, 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. 7 and 8, Plate VI, 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 a8KB1 (Plate I) is used, after the 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. 8, Plate VI), 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 (¶160) 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-size 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 STOPBAR, ¶277). 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.

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, 10 pt. 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 11 pt. No. 17L and 12 pt. No. 170L typewriter faces. Thus, the measure for 10 pt. 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, 8 pt. 74L has characters four points wide (8 points = .1107″; 4 points = .0553″). Since three of these 8 point 74L characters equal one pica (4 points $\times$ 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 KEYBOARD 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 III, 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; 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 and, 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 IV, at back of book) must be used in connection with the table for Changing Pica Ems (Plate III) if the insert is not cut 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 forty-two and one-half 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 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):

3 points........................	= 0	ems	6 units
12 picas........................	=16½	"	8 "
Allowance (in 8½ set) for a cut 12 picas 3 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 (boxheads, etc.) a combination of both methods is used. NOTE: Since no allowance for squeeze (¶161) is made in tabular matter containing brass rules, 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; see page 258.

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 V, at back of book, shows MATRIX CASE Arrangement C (same as Fig. 21, page 54), Roman CAPS, lower case, and SMALL CAPS 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 (¶122), the RESTORING KEY (¶104) and the SPACE BARS (¶86). These seventeen extra KEYS (242 KEYS—225 MATRICES=17 extra KEYS) are for the

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* 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 and XXXVI) until the details of the KEYBOARD mechanism have been explained in the chapter on KEYBANKS, KEYBARS, and STOPBARS, page 112.

† 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.

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 be replaced in the CASE by a space MATRIX and the operator would cap (¶267) 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 ⅛, ⅜, ⅝, and ⅞, the operator would cap KEYS Nos. 115, 116, 119, and 120 with these fractions and notify the CASTER operator to make the corresponding change of MATRICES in the MATRIX CASE (¶329). 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 at the KEYBOARD by capping (¶267); 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 are overlooked. A proof is then taken for the proof room of the matter complete with all characters inserted. 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 each other. 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 eight 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, before giving examples of this form of justification, 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

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

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 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 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

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

FIGURE 24
Justification with fixed spaces.

INDICATOR the number of 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:

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

194. In Fig. 24 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 III, 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	" "
r.......	7	" "
k.......	10	" "
Comma..	5	" "
Space....	6	" "
P.......	12	" "
a.......	9	" "
Period...	5	" "
Total....	77	units, or 4 ems 5 units.

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	"	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 25
Justification with fixed spaces.

195. Fig. 25 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 III. 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. 25, "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 " " " 2 " 6 "
Spain = 44 " " " 2 " 8 "

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 " 2 "

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
2 ten-unit spaces .... = 1 em 2 " = 3½ " 4 "

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 = $1\frac{1}{2}$ 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 depressing the SCALE KEY and reading the SCALE. *Second*, only one JUSTIFYING KEY stroke (to restore and trip galley) is required for each line; as each keystroke 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. 21, page 54) 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 ($6 \times 2 = 12 = 3 + 9$).

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 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 right tooth of the PAWL will be seated in a graduated space. If the INDICATOR shows seven, strike the eight-unit leader *twice;* 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 ($8\times2=16=9+7=\frac{1}{2}$ em 7 units). If six units must be added to bring the BOARD to "even ems," use the eight-unit leader *three* times ($8\times3=24=18+6$), adding one em and the six units required. To add five units strike the eight-unit leader *four* times ($8\times4=32=27+5=1\frac{1}{2}$ 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*, adding the one unit required and one-half em to the line ($10=9+1=\frac{1}{2}$ 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 ($10\times3=30=27+3=1\frac{1}{2}$ 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 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."* (¶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 independently justify different sections of the same line 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; it emphasizes, however, an exclusive MONOTYPE advantage that is of the greatest possible value in both straight and tabular matter; for example, to center a cut in a page and have the lines carry across the cut requires double justification, and many forms of tabular work would be quite impossible without it.

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 justification cannot be determined from the SCALE by depressing the SCALE KEY (¶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 KEY cannot be used, 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 II, at back of book) *is presented to the Scale Pointer; then read the Justifying Keys to be struck, exactly as though the Scale has been rotated by depressing its Key, 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 (see Plate I, 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

* For those who have not the knack of holding the UNIT WHEEL as described above, the UNIT-WHEEL POSITIONER (see Plate I) is provided. This can be applied to any KEYBOARD; of course it takes more time to use the POSITIONER than to work directly from the UNIT WHEEL. The method of setting the UNIT WHEEL by means of the POSITIONER is the same as described for setting it without the POSITIONER, except that, instead of grasping the rim of the UNIT WHEEL, grasp the KNURLED HEAD of the POSITIONER and push it to the rear until the teeth on the POSITIONER mesh with the teeth on the UNIT WHEEL. Then, pressing down on the right end of the LEVER 24KB4 with the right hand, turn the POSITIONER HEAD until the UNIT WHEEL reaches the required position; then release first the LEVER 24KB4, and, afterward, the POSITIONER, making sure the POSITIONER SPRING pushes the POSITIONER out from mesh with the UNIT WHEEL.

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 I) 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 57.

209. Fig. 26 illustrates both double justification and the allowance for rules (¶185). The measure between the right and left vertical rules (not including these 2 rules) is twelve and one-half picas, the equivalent of which in the set used ($8\frac{1}{2}$) is seventeen and one-half ems three units; see table for Changing Pica Ems, Plate III, at back of book. From this ($17\frac{1}{2}$ ems 3 units) deduct the equivalent in the set used ($8\frac{1}{2}$) of two two-point rules (8 units of $8\frac{1}{2}$ set, see table of Allowance for Rule, Plate IV at back of book) and set the KEYBOARD measure to seventeen ems four units ($17\frac{1}{2}$ 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-hand 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 $-$ $9\frac{1}{2}$ ems 4 units $=$ $7\frac{1}{2}$ 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

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

FIGURE 26
Double justification.

lines of Fig. 26. 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 " 4 "
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 $-$ $7\frac{1}{2}$ ems $=$ $\frac{1}{2}$ 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 (*not by depressing the Scale Key*), 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 Key depressed 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 II, 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 "
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 "	3 "
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 (see Plate I) to drop the JUSTIFYING-SCALE POINTER 14KB1 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

*If the KEYBOARD is equipped with an UNIT-WHEEL POSITIONER, the operator grasps this instead of the rim of the UNIT WHEEL. For method of using the UNIT-WHEEL POSITIONER see foot-note on page 85.

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-hand 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 " 0 "
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 KEY may be used to revolve the SCALE; the operator depresses the SCALE KEY and 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 II). 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	" 5	"
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	" 4	"
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 depresses the JUSTIFYING-SCALE KEY and reads the justification (2-13) from the SCALE (verify this by reference to the 8½ set SCALE, Plate II); 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 Chapter XLVII, 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.

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*M O N O T Y P E*K E Y B O A R D 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

† 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."

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, in consequence, the variation in size of the spaces between words in the different lines would be too great for good work. See Fig. 27.

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 27
Letter spacing.

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, of course, 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. See Fig. 28. 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.

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*

Oneof theprominentcharacteristicsofMONOTYPE composition is its close and uniform spacing. Forspecialwork"hairspaces"may be used between words as here shown. To savetime,the"hairspace"iscastasashoulder on the letter to the left of it.

FIGURE 28
Extra close spacing between words.

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.)

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 we have so far noted to the flexibility of the MONOTYPE,* 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 23. 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

* *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 bear a fixed ratio to the widest characters in the CASE.

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 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 V, 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

* 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.

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 backed up by the 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 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 ($8\frac{1}{2}$ set) shown on Plate II, 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 ($8\frac{1}{2}$), 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 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

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	1-11	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 29

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.

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 and the SCALE KEY is depressed what JUSTIFYING KEYS should the operator strike? As explained in the last 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 last 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. 29.

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. 29 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. 28, page 92) 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, "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:

$$4 \text{ units} = 6 \text{ units} - .0184'' + \text{Constant}$$

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

$$0 = 2 \text{ units} - .0184'' + \text{Constant}$$

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

$$2 \text{ units} = .0184'' - \text{Constant}$$

* This does not apply above twelve set; see foot-note on page 52.

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.)

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, page 26, gives the value of one unit of $8\frac{1}{2}$ set as .00653″; two units of $8\frac{1}{2}$ set equals .01306″ and the error in the above is but .00006″.

* This rule does not apply to SCALES larger than twelve set.

CHAPTER XXVII

Increasing Character Sizes by Justification

229. The last chapter explains the use of the JUSTIFYING-SPACE-PUNCH KEY (¶218) with character KEYS to justify lines by increasing the width of these characters whose KEYS are 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 ($18 \times 10 = 180$). Determine the unit value of these figures in eight and one-half set by dividing their Set Factor by this set ($180 \div 8.5 = 21.18$), 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 **$13.73** and a nine-unit period for a decimal point; thus, that is, we must make allowance for five twenty-two-unit figures and one nine-unit period (of $8\frac{1}{2}$ set), a total of 119 units, or six and one-half ems and two units ($22 \times 5 = 110$; $110 + 9 = 119$; $119 \div 18 = 6$ ems 11 units or $6\frac{1}{2}$ 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 the No. 13 KEY in the bottom because the JUSTIFYING SCALE for this set ($8\frac{1}{2}$), see Plate II 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 $6\frac{1}{2}$ 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 $-6\frac{1}{2}$ ems 2 units $=25\frac{1}{2}$ 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, page 26, 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 ($8\frac{1}{2}$) 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 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 M o n o t y p e. The same size spaces are used for this purpose 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 M o n o t y p e) 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 its 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 exactly the same width. With reasonable care, however, entirely satisfactory

* 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.

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 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 the KEYBOARD indicates eighteen ems six units after striking the justifying space preceding the word to be letter spaced; 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 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 third 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 II, 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. 29, page 97, 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 the No. 4 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 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 especial 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 NORMAL WEDGE in the six-unit position. Since in both cases the NORMAL WEDGE

* 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.

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 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 Style D KEYBOARD," wherein all the 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. 30 and 33, 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. 30 to 34 inclusive may be seen together they are grouped on one large sheet tipped in facing page 120, so that all may be used while reading this chapter.

251. Refer first to Fig. 30: 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. 33 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. 30) are moved by depressing a KEY, air enters two of the PIPES **A** (Fig. 33) 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. 31 and Fig. 35, page 114. Plate I, at back of book, shows the KEYBANKS (upper portion only) in place on the KEYBOARD, and Plate V shows the details of the arrangement of KEYS. Each BANK carries thirteen RODS (see **M**, Fig. 30) about which the KEY LEVERS oscillate, and there are eleven KEYS to a ROD, excepting the ROD nearest the operator, which has four characters KEYS, a SPACE BAR (¶86), and a green KEY, which, on the left BANK, is the JUSTIFYING-SCALE KEY (¶122), and, on the right BANK, 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 producing characters; that is, seventeen more

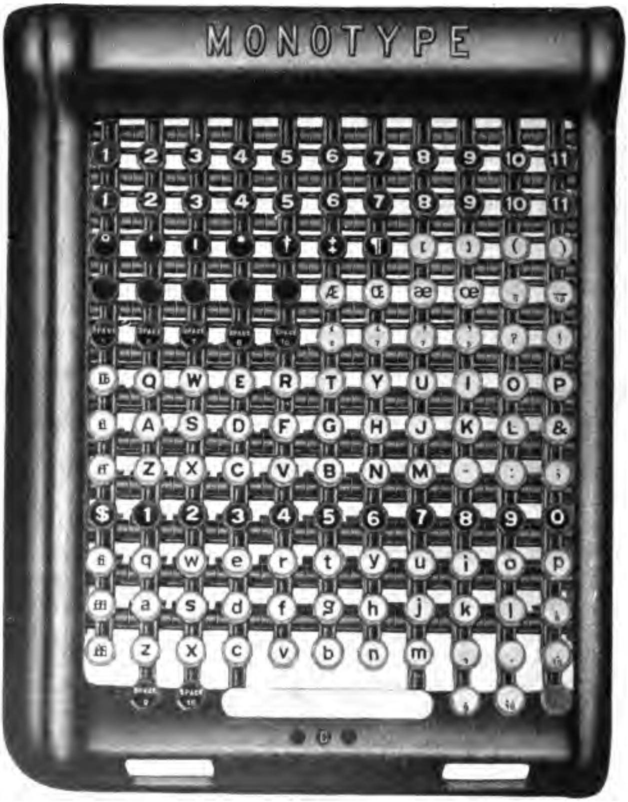


FIGURE 35
The STANDARD LEFT KEYBANK for straight matter with five alphabets; compare this with the TABULAR KEYBANK, Fig. 36.

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 (see Plate V), 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

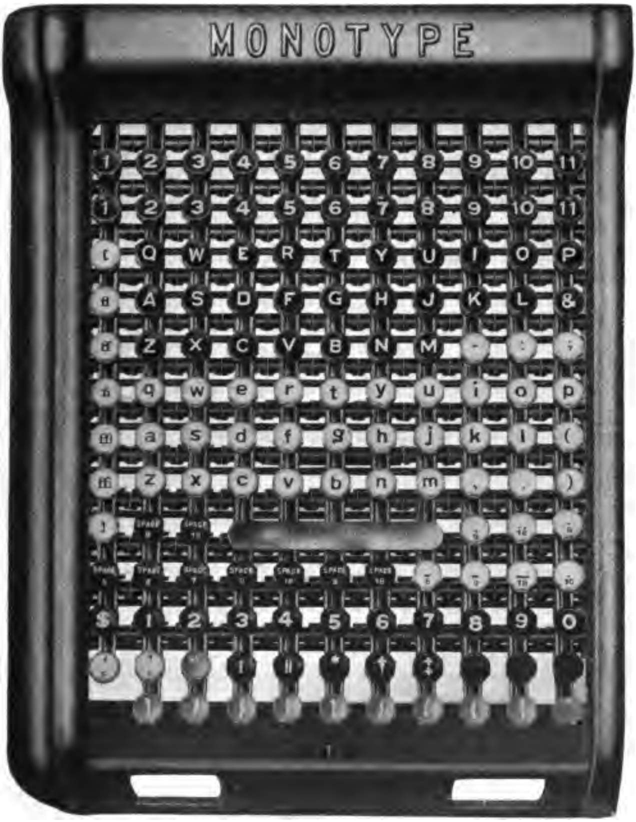


FIGURE 36

The TABULAR KEYBANK: "Two KEYBOARDS in one," replaces the standard left KEYBANK, Fig. 36, for tabular matter and especially tariffs.

and eighteen-unit leader KEYS are carried on both BANKS. In the MATRIX CASE Diagram (Plate V) the red figures beneath the characters and the spaces indicate the number of the KEYS that produce these positions of the MATRIX CASE; for KEYS double coupled as described, two, or more, KEY numbers are given in the square indicating the MATRIX CASE position.

254. The Tabular Keybank (Fig. 36), "*two Keyboards in one*," is a left KEYBANK designed for offices specializing on tabular work, tariffs, etc.; that is, matter in which the line begins with a word, or words, followed by leaders to the figure columns that complete the line. In such composition the KEYS for the alphabets (Roman caps and lower case) are not used as much as the figures and other characters used with them in the figure columns; consequently the arrangement and position of these characters is more important than the alphabets. Plate V, at back of book, shows the standard arrangement of KEYS for straight matter, with the lower case, the most frequently used characters, as near the operator as possible, and the SPACE BAR, with the nine and eighteen-unit spaces and leaders beside it, at the bottom of the KEYBOARD. The tabular KEYBANK on the left side of the KEYBOARD is used with the standard KEYBANK on the right side.

255. The tabular KEYBANK, Fig. 36, replaces the left standard KEYBANK: Just as the standard KEYBANK, Fig. 35, is the logical arrangement of KEYS, perfected after years of study, to enable the operator to transform words into keystrokes at the maximum speed with the minimum effort—just as the universal typewriter keyboard is best for straight matter, the tabular KEYBANK is the ideal KEY arrangement for tabular work because it applies the basic principles of the typewriter to the figures, signs, braces, and other characters used in tabular work grouping the KEYS for these so that the operator can "*always hit the same Key with the same same finger*."

256. *With the tabular Keybank applied, the Monotype is the only composing machine built expressly for tabular work.* It is then two KEYBOARDS in one, the seven upper rows for the stub of a table or straight matter, the four lower rows for rule and figure work. The use of the tabular KEYBANK sacrifices no speed on straight matter, for its SPACE BAR is directly under the lower case, exactly the same as the standard KEYBANK (Fig. 35), and, although the caps and lower case are further from the operator, they are closer together because they are not separated by the figure KEYS.

257. The advantages of the tabular KEYBANK are apparent from Fig. 36: Note that the nine and eighteen-unit space KEYS are duplicated at the left of the SPACE BAR, the same as the standard arrangement for straight matter, and also above the figures 5 and 6, so that the em quad may be struck with the right forefinger and the en quad with the left without moving the hands from their position above the figures. Also note that the leaders (8, 9, 10, and 18-unit, ¶198 and 199) are grouped at the right of the SPACE BAR, between the lower case and figures, so that they are equally convenient for leadering out the stub or for use in the figure column. Moving up the SPACE BAR makes room for five additional KEYS in the bottom row; the nine KEYS in that row are used for the right and left piece braces required to brace any number of lines against the same or any other number of lines, whether odd or even ⎫ ⎪ ⎬ ⎭ ⎩ ⎧ ⎱ ⎰ ⎨ For details of method of using these nine characters see Fig. 37.

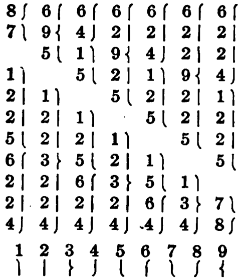


FIGURE 37

Piece Braces: The above examples show the method of using the nine pieces to brace, to the right or left, any number of lines. NOTE: Leads have been inserted between the pieces making up the braces, so that they may be more easily distinguished.

258. The Tabular Keybank requires corresponding Keybars and special Stopbars to give four nine-unit rows in the MATRIX CASE instead of three: See Chapter XXXIII, Nut-body Figures.

259. To change Keybanks: Figs. 1, 2, and 3, Plate VI, "Operating Adjustments," at back of book, shows how either KEYBANK may be removed without disturbing the other.

260. The Keybars C (Fig. 30), one for each KEY and two for each SPACE BAR, are arranged side by side in the KEYBAR FRAMES, as shown in Fig. 32; the position of the two KEYBAR FRAMES, beneath the right and left KEYBANKS, is shown in Fig. 4, Plate VI, at back of book. To make any change in the coupling of a KEY LEVER to the PISTONS (change a KEYBAR) the complete KEYBAR FRAME must be taken out of the KEYBOARD and a new FRAME 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, depends 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 FRAMES not in use on the KEYBOARD should be kept in their boxes.

261. To change Keybar Frames for different MATRIX CASE Arrangements, lift off the KEYBANK, as shown in Figs. 4, 5, and 6 (Plate VI, at back of book), slide out the KEYBAR FRAME not required and insert the new FRAME and replace the KEYBANK.

262. The Stopbars are carried in the STOPBAR CASE (Fig. 34, facing page 120), 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. 33) 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. 33, 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. 34: The lower part of the slots in the upper end of the BARS (these slots engage the LEVERS **W**, Fig. 33) 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.

263. Count the STOPBARS in Fig. 34, 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 (¶266), the upper end of this STOP is made so that the LEVER **W** (Fig. 33) for any one of the three nine-unit row PUNCH BARS will depress this STOP; that is, this nine-unit STOPBAR is made with its upper end wide enough for these three LEVERS to engage it. Therefore, when any nine-unit KEY is depressed this STOPBAR moves down; when the KEY is released, the SPRING connecting this BAR and the CASE raises the BAR just as the single STOPBAR is raised by the upward movement of the LEVER **W**. The ten-unit STOPBAR is made similar to the nine-unit, so that it can be operated by two of the LEVERS **W**, since there are two ten-unit rows in the MATRIX CASE.

264. The STOPBAR CASE shown in Fig. 34 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. 34 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.

265. 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 replace it with one carrying the required arrangement of unit rows. See Figs. 17 and 18, Plate VI, at back of book.

266. 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 15) 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, in 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 the 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.

267. The Keybutton Clips, shown in Fig. 38, 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 change must be made in Keybars as well as in Buttons, because capping a Button has no effect whatever 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 place in the frame of the Clip. A special character drawn on a piece of paper may be inserted in a Clip instead of ordering a complete Clip for this special character.

268. Keybutton Clip Boards are made with pegs of proper size ($\frac{9}{16}''$ 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 Buttons corresponding to the pegs on which the Clips are kept.

Figure 38

Keybutton Clip; placed over the regular Button on the Key Lever when changes in characters are made.

269. The advantage of standard Keybars: Chapter XXXV, on Matrix Case Arrangements, shows a number

Eight point No. 11J with No. 21

THE MONOTYPE stops the greate:
—IDLE TIME. No machine is worth
you can't run it. You can run the Mor
hours a year than any other composi
**"No matter to compose? No m
type."**

Eight point No. 25J with No. 21

THE MONOTYPE maintains price
it reduces cost it raises quality. Its
better than hand-set foundry type,
type be used for every job. Thus the
does more than save on "estimates"—
money in the cash drawer.

Eight point No. 25K with No. 21

***THE MONOTYPE user can't get o
he has "type on tap"***—His cases are
that can't go out of style because it i
make new type than to distribute anc
TYPE user can change the face when
utes."

Eight point No. 26J with No. 21

THE MONOTYPE wipes out the
and hand leading. After a job has
boarded it may be cast on the prop
to make the number of pages requir
the designated space. **This is but
exclusively Monotype advantages.**

Eight point No. 68J with No. 21

THE MONOTYPE gives the print
founder's profit on body and display
sizes from five-point to thirty-six point
and ornaments, on quads and spaces, **an
and cents spent turning letters and**
sorts.

Eight point No. 58J with No. 2

THE MONOTYPE is the only
tariffs, catalogs, price lists, directorie
kept standing and corrected; **alteratio
as easily as with foundry type and the
is less by eighty per cent.** MONOTYP
don't stop production of new matter.

Eight point No. 89J with No. 2

THE MONOTYPE enables its o
the work he wants, instead of takii
the "other fellow" doesn't want, b
is no job too intricate for it, nor too
and **no work can require greater fa
one Monotype can furnish.**

Eight point No. 89K with No. 2

THE MONOTYPE is called "the
machine" because it takes the work
plain or intricate. You don't have t
"special attachments," rules or fur
in most cases, ***"Double-priced Mat
Matter for the Monotype."***

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.

CHAPTER XXXI

Combination of Faces

270. The manner in which the KEYBOARD is arranged for different combinations of faces by changing KEYBANKS (¶253) and KEYBARS (¶260) 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 "rebuy" 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. 39, facing page 121, shows *twenty-four different Boldfaces combined perfectly with the same Roman Matrices.*

271. "*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.)

272. Monotype faces are designed for this standard arrangement of unit rows and for three different arrangements of characters in the Matrix Case (C, C1, and C2), but it is by no means necessary to use the MATRICES so designed on just these three 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

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

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 upon the arrangement of MATRICES in the MATRIX CASE, for the KEYBARS (¶260) provide for changing the position of MATRICES in the CASE and the STOPBARS (¶262) provide for changing the value of the unit rows of the MATRIX CASE. The more clearly these three basic arrangements (C, C1, and C2) are understood the greater the advantage that may be taken of the almost limitless flexibility of MONOTYPE MATRICES.

273. Arrangement C is for ROMAN CAPS, lower case, SMALL CAPS, 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 Plate V, at back of book, which gives the MATRIX CASE diagram for Arrangement C. The characters carried in the MATRIX CASE with Arrangement C are shown at the bottom of this diagram and the unit values of these characters may be determined by locating the character on the diagram which gives, at the right, 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:

A^{13} B^{13} C^{13} D^{15} E^{13} F^{12} G^{14} H^{15} I^{8} J^{9} K^{15} L^{12} M^{18} N^{15} O^{13} P^{12} Q^{13} R^{14} S^{10} T^{13} U^{14} V^{13} W^{18} X^{15} Y^{14} Z^{11}

A^{14} B^{13} C^{12} D^{14} E^{13} F^{12} G^{12} H^{15} I^{9} J^{11} K^{15} L^{12} M^{18} N^{15} O^{12} P^{13} Q^{12} R^{13} S^{11} T^{13} U^{15} V^{14} W^{18} X^{15} Y^{14} Z^{12}

A^{10} B^{10} C^{9} D^{10} E^{10} F^{9} G^{10} H^{11} I^{6} J^{7} K^{11} L^{9} M^{12} N^{11} O^{10} P^{9} Q^{10} R^{10} S^{8} T^{9} U^{11} V^{10} W^{14} X^{11} Y^{10} Z^{8}

a^{9} b^{10} c^{8} d^{10} e^{8} 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^{7} t^{7} u^{10} v^{10} w^{13} x^{9} y^{10} z^{8}

a^{9} b^{8} c^{7} d^{9} e^{7} f^{6} g^{8} h^{9} i^{6} j^{6} k^{9} l^{5} m^{14} n^{10} o^{8} p^{10} q^{8} r^{7} s^{7} t^{5} u^{10} v^{7} w^{12} x^{9} y^{9} z^{7}

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

GOTHIC and **ANTIQUE** 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 Roman.

274. Arrangement C1: Normal Boldfaces (those not extended—for specimen of a C1 face see below, Fig. 40) are designed with their letters of the unit values given by this arrangement; these unit values are as follows:

A^{12} B^{12} C^{12} D^{14} E^{12} F^{11} G^{14} H^{15} I^{7} J^{9} K^{14} L^{11} M^{18} N^{14} O^{14} P^{12} Q^{14} R^{13} S^{11} T^{12} U^{13} V^{12} W^{18} X^{12} Y^{12} Z^{11}

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^{9} q^{9} 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}

The MATRIX CASE positions for C1 Boldfaces, when used in combination with Roman faces (Arrangement C), replacing the Italic, are shown in Fig. 49, page 144, which gives also, beneath the MATRIX CASE diagram, the characters used with the C1 combination of Roman and Boldface.

Twelve point No. 111J: Arrangement C1

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

abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
$1234567890

Twelve point No. 11J: Arrangement C2

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.

abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
$1234567890

FIGURE 40

Two twelve-point faces, both twelve set; note how much more condensed the 111J is than the 11J, because the 111J is on Arrangement C1, the 11J on Arrangement C2. *Either of these faces may be used in combination with any twelve-set Roman face.*

275. Arrangement C2, see Fig. 40, page 124, for specimen, is for extended Boldfaces in which the characters have the following unit values:

A^{13} B^{13} C^{13} D^{14} E^{12} F^{12} G^{15} H^{15} I^{8} J^{10} K^{15} L^{12} M^{18} N^{14} O^{14} P^{12} Q^{14} R^{14} S^{11} T^{13} U^{14} V^{13} W^{18} X^{15} Y^{14} Z^{12}

a^{10} b^{11} c^{9} d^{11} e^{9} f^{7} g^{10} h^{12} i^{6} j^{7} k^{11} l^{6} m^{18} n^{12} o^{10} p^{11} q^{11} r^{8} s^{8} t^{8} u^{12} v^{9} w^{14} x^{9} y^{16} z^{9}

\$^{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. 50, page 144; beneath this MATRIX CASE diagram will be found all the Roman and Boldface characters used with this combination.

276. Foreign Language Faces, German, 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, or C2. Light and heavy face German may be used in combination, as may also the similar Greek faces, or, for vocabulary work, these foreign faces may be combined with English. Of course, these foreign faces require their own KEYBARS (¶260) and, in some cases (Greek, for example), they also take special STOPBARS (¶262). For these foreign faces see the MONOTYPE Specimen Book.

277. 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 (¶262) 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.

278. Keybars for use with Arrangements C, C1, and C2; for details of the KEYBARS used with these arrangements in the combinations described above, as well as the six and seven 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 140 to 156 inclusive.

CHAPTER XXXII

Standard Matrix Line

279. 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 ten-point body will line with any ten-point face when both are set by hand together. For exceptions see ¶282 and 287.

280. 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 (of course, bought from the type foundry) 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 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.

281. 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 ¶287.

282. 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.

283. 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.

284. Lining Gage and Line Standards are used by the CASTER operator in adjusting the CENTERING-PIN BUSHING (¶13). The gage (Fig. 41) is a small steel plate with a lug at one side, against which the type to be lined is placed; perpendicular to this lug and parallel to the front face of the plate is a steel knife edge, which is parallel to the surface of the plate; this knife edge may be raised, or lowered, from the plate by a micrometer screw. NOTE: In Fig. 41 this knife edge is represented to be transparent in order that the two type and the line standard behind it may be seen clearly. 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 a 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 his left thumb.

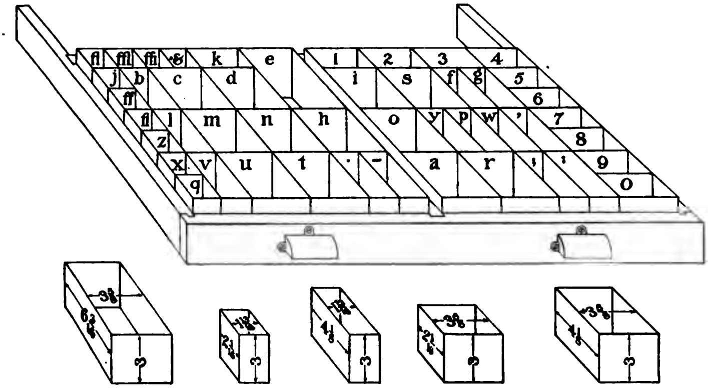
FIGURE 41

Lining gage 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 behind it.

He then adjusts the knife edge of the gage, by the screw, until it just coincides with the serifs of the cap H's, using a watchmaker's eye-glass to determine this exactly; if the knife edge does not then exactly coincide with the top edge of the line standard he adjusts the CENTERING-PIN BUSHING the amount required, casts more cap H's, which he tests in the same way. But before readjusting the BUSHING he also used 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 testing the alignment. In this way the adjustments for lining up and for centering the cap H can be made at the same time. If the cap H be lined and centered properly, the rest of the characters in the MATRIX CASE will be right. NOTE: In Italic faces line up by the cap H as usual but center the characters by means of the lower case *o*. In German faces line up by the cap 𝔘.

285. 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.

286. Sorts Boxes: When the CASTING MACHINE is set to cast a letter, it pays to cast a sufficient quantity and thus avoid frequent changes of the CASTING MACHINE and, therefore, most offices find it profitable to use sorts boxes, filling the type cases from these. Galvanized iron boxes made in the proper sizes to fill a blank type case are especially convenient; they may be taken one at a time to the CASTING MACHINE and are cheap and strong. (See Fig. 42.) While this is the cheapest form of storage case it is, of course, not as satisfactory as drawers of the same depth (inside) as the sorts boxes, so that the type is protected from dust when the drawers are closed. Changes at the CASTING MACHINE may be still further reduced by carrying in each sorts box a card giving the point size, the face, and the letter kept in that box; when the supply of this letter gets low this card is given to the CASTER operator, as a notification to cast that letter. He places the card in a pigeon hole, with other cards of the same point size; when he has this size MOLD on the machine he casts all the type of this size required before he changes the MOLD.



1 of this | 10 of these | 13 of these | 11 of these | 12 of these

FIGURE 42

Sorts Boxes: For storing sorts in quantity, to be used for filling the type cases. Specifications: Boxes to be of number twenty-eight gage galvanized iron; to have a hemmed edge around the top; all seams to be on the inside; each set to fit loosely in a standard blank type case. There are forty-seven boxes in a set, made up as follows, the dimensions here given being outside dimensions: One box $3\frac{5}{8}''\times 6\frac{3}{16}''\times 3''$; ten boxes $1\frac{13}{16}''\times 2\frac{3}{16}''\times 3''$; thirteen boxes $1\frac{13}{16}''\times 4\frac{1}{8}''\times 3''$; eleven boxes $3\frac{5}{8}''\times 2\frac{3}{16}''\times 3''$; twelve boxes $3\frac{5}{8}''\times 4\frac{1}{8}''\times 3''$.

287. 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

288. "*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 6 Pt. 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, 6 Pt. 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.

289. Nut-body figures may be used with faces whose sets are greater than the sets of the figures by using special STOPBARS (¶262 and 265) to change the value of the unit rows and special MATRICES for characters that must be modified (made more extended, or condensed, ¶272) 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 ($7 \times 6 = 42 = 6 \times 7$). 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.

290. 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. 43, in which the sizes of the different unit rows in six and seven set are taken from the Table of Type Sizes, page 26, and compared. Where the differences in the sizes are great enough to warrant it, MATRICES for modified characters (more extended or condensed; ¶272) are furnished for use with the STOPBARS for nut-body figures. NOTE: 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.

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 43

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).

291. 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 (¶266), to provide for two sets of figures, piece braces (¶257) 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 gives sixty nut-body (9-unit) characters instead of the forty-five furnished with standard STOPBARS S5.

292. 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 (¶272) 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 is shown in Fig. 44.

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&ÆŒ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzæœfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ
abcdefghijklmnopqrstuvwxyzæœ
$1234567890 **$1234567890**

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
abcdefghijklmnopqrstuvwxyzfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyz
$1234567890 **$1234567890**

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

FIGURE 44

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

293. 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. 45;

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	32	46	38
21	Warren.......Ga.	Boston.......Mass.	152			
22	Copeland.....Ga.	Washington..D. C.	89			
23	Mission Ridge.Ga.	Galveston....Tex.	123			
24	Rossville.....Ga.	New York...N. Y.	134			

ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzæœfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ
abcdefghijklmnopqrstuvwxyzæœ
$1234567890 **$1234567890**

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	32	46	38
21	Warren........Ga.	Boston.....Mass.	152			
22	Copeland......Ga.	Washington..D. C.	89			
23	Mission Ridge..Ga.	Galveston....Tex.	123			
24	Rossville......Ga.	New York...N. Y.	134			

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzæœ
$1234567890 **$1234567890**

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

FIGURE 45

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

the actual changes in set sizes may be determined from the Table of Type Sizes, page 26, just as the difference for S34 STOPBARS is shown in Fig. 43, page 131.

294. 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 8½ set faces into 8 set..............	6 6 8 9 9 9 9 10 11 12 13 14 15 16 18
S34: Transform 7 set faces into 6 set..............	6 7 8 9 9 9 9 10 12 12 13 14 15 16 18

295. 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 (¶272) it is obvious that special KEYBARS (¶260) 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 148 to 156 inclusive. These arrangements and the corresponding KEYBARS are as follows 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):

STOPBARS	FACES	LEFT KEYBARS	RIGHT KEYBARS	MATRIX CASE ARRANGEMENTS FIGURE	PAGE
S27: Standard, except four nine-unit rows.........	C and C	T	C	57	150
	C " C1	T	C1	58	150
	C " C2	T	C2	59	151
S29: Transform 8½ set faces into 8 set.............	C and C	TF	C	60	151
	C " C1	TF	C1	61	152
	C " C2	TF	C2	62	152
S34: Transform 7 set faces into 6 set.............	C and C	YF	YC	63	153
	C " C1	YF	YC1	64	153
	C " C2	YF	YC2	65	154

296. The Tabular Keybank must be used with all the KEYBARS specified in the preceding paragraph for use with S27, S29, and S34 STOPBARS: See Tabular KEYBANK ¶254 to 257 inclusive.

297. Faces for use with Tabular Keybank: As explained in ¶292 to 294 inclusive, MATRICES for modified characters (¶272) 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 (†).

298. Matrix Symbols: To avoid confusion with standard characters the MATRICES for modified characters (¶272) are carefully symboled; for details see the explanation of the MATRIX Symboling 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; **B**, the corresponding Italic; and **C**, the corresponding Roman small caps. If, therefore, a MATRIX for the letter x of the No. 8 Series is marked **8C** on the side of the MATRIX, 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.

CHAPTER XXXIV

The Double Matrix

299. 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. 46 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 (see 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. 47.

$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 46

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."

300. 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. 46. 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.

301. 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

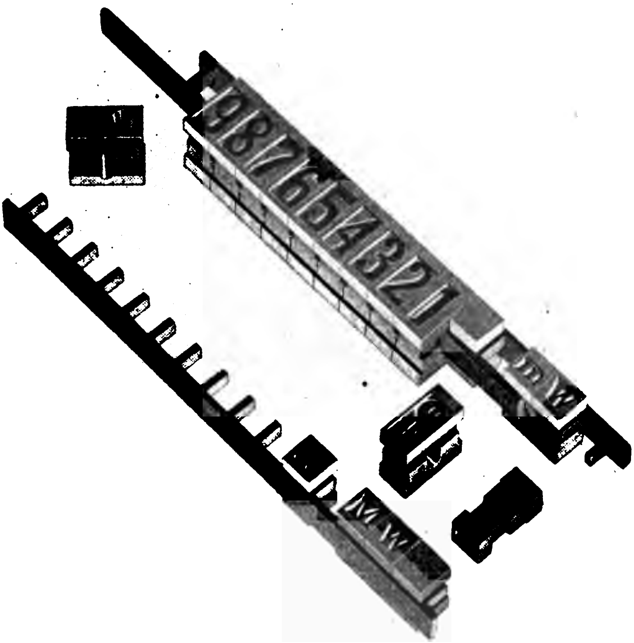


FIGURE 47
The double MATRIX: Note the manner in which it is carried by two COMBS, with teeth facing, and the BAR between the COMBS.

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.

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

303. 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. 48 shows a MATRIX CASE Arrangement with the double MATRICES carried in the eighteen-unit row, of which there

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

FIGURE 48

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.

are two. This requires special S15 STOPBARS (¶262) and provides for Roman and Boldface caps and lower case and three fonts of figures beside the double MATRIX figures; nine-unit Roman and Boldface and fourteen-unit Boldface figures: Fig. 46 was cast from this MATRIX CASE, but the third method was used, instead of the first, because these 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. NOTE: This method is not as satisfactory as the first described in this paragraph or the following. *Third,* the increased width body for these big figures may be obtained by casting them with justification added; see Chapter XXVII, page 101, "Increasing Character Sizes by Justification."

CHAPTER XXXV

Matrix Case Arrangements for Standard Stopbars

304. "*Monotype faces are designed for ...... three different arrangements of characters in the Matrix Case (C, C1, and C2), but it is by no means necessary to use the Matrices so designed on just these three arrangements. Speaking within limits, Matrices may be combined to meet the requirements of any kind of composition.*" (¶272.)

305. Combinations of faces on C, C1, and C2 Arrangements: Roman faces and their corresponding Italic faces, designed for Arrangement C (¶273), may be combined in the MATRIX CASE with normal Boldfaces on Arrangement C1 (¶274) or with extended Boldfaces on Arrangement C2 (¶275), and *these combinations may include five, six, or seven alphabets:* All of the arrangements of these faces (C, C1, and C2) described in this chapter are composed with standard STOPBARS S5 (¶266), which give the standard arrangement of unit rows (5 6 7 8 9 9 9 10 10 11 12 13 14 15 18).

306. Five Alphabet Arrangements, of which there are three (not counting the substitution of Gothic or Antique caps for the Roman small caps, see ¶273), provide for the following combinations: **Arrangement C** (see the MATRIX CASE diagram, Plate V at back of book) combines Roman CAPS, lower case, SMALL CAPS, figures, and points with *Italic CAPS, lower case, figures, and points;* **Arrangement C1** is similar to C, except that the Italic is replaced by normal **Boldface CAPS and lower case, figures, and points,** as shown in Fig. 49, page 144; **Arrangement C2** provides for a similar combination of Roman with an extended **Boldface CAPS and lower case, figures, and points,** see Fig. 50, page 144.

307. Keybanks and Keybars for Five Alphabet Arrangements: Plate V 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 (¶260), and standard STOPBARS S5 (¶266). In changing from Arrangement C to **Arrangement C1** no change whatever is required in the left KEYBANK and KEYBAR, for, in both of these arrangements, the position of the Roman MATRICES is identical; but, of course, since the C1 Boldface MATRICES occupy entirely different positions in the MATRIX CASE from the C Italic MATRICES, it is necessary to use a different right KEYBAR, 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 the Italic) will produce the required perforations to correspond with the C1 Boldface MATRICES as shown in Fig. 49, page 144. With Arrangement C1, therefore, use left KEYBANK and KEYBAR C, right KEYBANK C with right KEYBAR C1; that is, in changing from Arrangement C to C1 the only change required is to replace the right KEYBAR C with KEYBAR C1 and cap (¶267) the following BUTTONS on right KEYBANK C (see Plate V): Cap KEY No. 128 with the Boldface opening quote and KEY No. 159 with the Boldface closing quote; these caps are necessary because there are no quotes on right KEYBANK C, which is arranged for Italic that uses the Roman quotes carried on the left KEYBANK (see KEYS 28 to 31 inclusive). **Arrangement C2** uses the same left KEYBANK C, KEYBAR C, and right KEYBANK C as do Arrangements C and C1; but, since the MATRIX CASE positions for the extended Boldface characters (Fig. 50, page 144) are quite different from the positions for Italic C or Boldface C1, it is necessary to use different right KEYBARS C2. The following BUTTONS on the right KEYBANK must be capped: KEY No. 128 with the Boldface opening quote and KEY No. 159 with the Boldface closing quote.

308. "Matrix Case Arrangements for the Style D Keyboard:" This book of charts, similar to Plate V at back of book, gives the details of KEYBANKS, KEYBARS, and cappings for the various 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. As the book of charts should always be referred to in changing the KEYBOARD from one arrangement to another, the cappings required will not be repeated in the following description of the six and seven alphabet arrangements.

309. Six Alphabet Arrangements: These two arrangements are shown in Figs. 51 and 52, page 145. They both 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. 51 shows **Arrangement 6C1** for C1 (normal) Boldfaces (¶274), and Fig. 52 shows **Arrangement 6C2** for C2 extended Boldfaces

(¶275). Space in the MATRIX CASE for these six alphabets is obtained by omitting from the five alphabet arrangement (¶306) the diphthongs, the Italic and Boldface ligatures ffi and ffl, and some infrequently used signs. It should also be noted 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, in composition, the cap always follows a space, this shoulder makes no difference unless entire words are to be composed in Italic or Boldface caps; in this case the shoulder at the left of the letter in print 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 required caps cast on their true body when corrections are made at the case (¶186).

310. Keybanks and Keybars for Six Alphabet Arrangements: There are two of these: **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 except that the right KEYBAR 6C2 is used instead of 6C1; also, four KEYS must be capped (¶308).

311. Seven Alphabet Arrangements each provide for Roman, *Italic*, and **Boldface** CAPS and lower case, like the six alphabet arrangements (¶309), *and* the Roman SMALL CAPS. Fig. 53, page 146, shows the seven alphabet arrangement for C1 (normal) Boldfaces and Fig. 54, page 146, for C2 (extended) Boldfaces. The additional alphabet (SMALL CAPS) is made possible by omitting the diphthongs and ligatures and by moving some of the caps from their standard positions, as described in ¶309.

312. Keybanks and Keybars for Seven Alphabet Arrangements: Both **Arrangement 7C1,** for C1 (normal) Boldfaces, and **Arrangement 7C2,** for C2 (extended) Boldfaces, use the six alphabet left KEYBANK (6C1), the same left KEYBAR 7C1, right KEYBANK 7C1, and standard STOPBARS S5; **Arrangement 7C1** uses right KEYBAR, 7C1, and **Arrangement 7C2** uses right KEYBAR 7C2. With Arrangement 7C2 four caps are required for the left KEYBANK (¶308). Note the caution in ¶309 about setting words in Italic and Boldface caps.

313. French Arrangement: This arrangement is the same as the five alphabet arrangements (¶306) except that it provides for the French accents in Roman, and eighteen-unit quotes. **Arrangement FC,** Fig. 55, page 147, combines ROMAN CAPS, lower case, SMALL CAPS, figures, and points with *ITALIC CAPS, lower case, figures, and points.*

314. Keybanks and Keybars for French Arrangement: Arrangement FC takes left and right KEYBANKS C, left and right KEYBARS FC, and standard STOPBARS S5. NOTE: If many changes be made from English to French, it is advisable to use French KEYBANKS FC or KEYBUTTON CLIP BOARDS (¶268). MATRIX CASE arrangements and capping sheets for French combinations of Roman and Boldface (C1 or C2) will be furnished upon application.

315. German Arrangement, GC, combines light and heavy German faces and their accents as shown in Fig. 56, page 147.

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

Arrangement C1

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

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

LEFT
Keybank C—Keybar C

Stopbars S5

RIGHT
Keybank C—Keybar C1

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ*&*

ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ

abcdefghijklmnopqrstuvwxyzæœfiflffffiffl

ABCDEFGHIJKLMNOPQRSTUVWXYZÆŒ&

abcdefghijklmnopqrstuvwxyzæœfiflffffiffl

‘’.,-:;’‘!?()[]°*†‡¶-— .. % ℔ **.,-:;!?‘’**

$1234567890 ½¼¾ **$1234567890**

FIGURE 49

Arrangement C2

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

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

LEFT
Keybank C—Keybar C

Stopbars S5

RIGHT
Keybank C—Keybar C2

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyzæœfiflffffiffl

ABCDEFGHIJKLMNOPQRSTUVWXYZÆŒ&

abcdefghijklmnopqrstuvwxyzæœfiflffffiffl

‘’.,-:;’‘′!?()[]°*†‡¶-— .. | % ℔ **.,:;-!?‘**

$1234567890 **$1234567890**

FIGURE 50

Arrangement 6C1

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

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	**l**	**l**	**.**	**,**	1
6	2	*j*	*f*	*i*	**‘**	*:*	*;*	*-*	j	f	**!**	**j**	**f**	**t**	:	▮	2
7	3	*c*	*r*	*s*	*e*	**:**	**;**	**-**	**I**	r	s	t	**r**	*v*	*;*	*z*	3
8	4	*	*q*	**?**	*b*	*g*	*o*	?	I	z	c	e	**z**	**c**	**s**	*?*	4
9^1	5	**y**	**o**	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	5
9^2	6	**g**	**v**	**p**	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	▮	6
9^3	7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	**e**	**a**	**q**	**x**	7
10^1	8	*I*	*fi*	*u*	*n*	.	S	v	y	p	u	n	**J**	**b**	**d**	**k**	8
10^2	9	‡	†	*fl*	*p*	fl	fi	q	k	b	h	d	**h**	**u**	**n**	**fi**	9
11	10	**Z**	**F**	*J*	*S*	**L**	**S**	*ff*	*Q*	Z	*Z*	ff	**fi**	**ff**	*G*	¶	10
12	11	*F*	**V**	*C*	*O*	*w*	**B**	**P**	L	P	F	**C**	**E**	**A**	**T**	**Y**	11
13	12	**X**	&	Q	V	C	B	T	O	E	A	w	**w**	**R**	**U**	*L*	12
14	13	*B*	*P*	**O**	**K**	**G**	*m*	**D**	Y	U	G	R	**N**	*R*	*T*	*E*	13
15	14	*D*	*A*	*&*	ffl	ffi	X	D	N	K	H	m	*V*	**m**	**H**	**Q**	14
18	15	*H*	*Y*	*N*	**W**	**M**	*W*	*M*	—	. .	M	W	*K*	*U*	*X*	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank 6C1—Keybar 6C1 Stopbars S5 RIGHT Keybank 6C1—Keybar 6C1

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzfiflff
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzfiflff
' ' . , - : ; ! ? * † ‡ . ¶ — — . . . : : ? **. , : ; - ! ? ‘ ’**
$1234567890 **$1234567890**

FIGURE 51

Arrangement 6C2

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

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	**.**	**,**	**l**	**i**	**'**	▮	2
7	3	*c*	*r*	*s*	*e*	**:**	**;**	**j**	**f**	r	s	t	**!**	*v*	*;*	*z*	3
8	4	**s**	*q*	**I**	*b*	*g*	*o*	?	I	z	c	e	**r**	**t**	**-**	*?*	4
9^1	5	*I*	**z**	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	5
9^2	6	**x**	**v**	**c**	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	▮	6
9^3	7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	**e**	**?**	*	†	7
10^1	8	**J**	*fi*	*u*	*n*	*F*	S	v	y	p	u	n	**a**	*J*	*Q*	*Z*	8
10^2	9	**g**	**o**	*fl*	*p*	fl	fi	q	k	b	h	d	*L*	*G*	**y**	*S*	9
11	10	*O*	*B*	*C*	*E*	**q**	**p**	*ff*	**b**	Z	**d**	ff	**k**	**fi**	**fl**	**S**	10
12	11	**Z**	**F**	**V**	*T*	*w*	**E**	**h**	L	P	F	**u**	**n**	**P**	**L**	**ff**	11
13	12	*V*	&	Q	V	C	B	T	O	E	A	w	**B**	**C**	**Á**	**T**	12
14	13	*A*	*R*	*P*	**U**	**R**	*m*	**w**	Y	U	G	R	**N**	**D**	**O**	*D*	13
15	14	*Y*	**X**	**G**	ffl	ffi	X	D	N	K	H	m	**K**	**H**	**Y**	**Q**	14
18	15	*H*	*X*	**m**	**W**	**M**	*W*	*M*	—	. .	M	W	*K*	*U*	*N*	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank 6C1—Keybar 6C1 Stopbars S5 RIGHT Keybank 6C1—Keybar 6C2

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzfiflff
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzfiflff
' ' . , - ; : ′ ! ? ? ; [ ] * † — — . . . \| **. , : ; - ! ? ‘ ’**
$1234567890 **$1234567890**

FIGURE 52

Arrangement C1

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

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

LEFT Keybank C—Keybar C

Stopbars S5

RIGHT Keybank C—Keybar C1

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ*&*
ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ
abcdefghijklmnopqrstuvwxyzæœfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZÆŒ&
abcdefghijklmnopqrstuvwxyzæœfiflffffiffl
‘’.,-;:’‘!?()[]°*†‡¶–—...% ℔ **.,-:;!?‘’**
$1234567890 ½¼¾ **$1234567890**

FIGURE 49

Arrangement C2

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

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

LEFT Keybank C—Keybar C

Stopbars S5

RIGHT Keybank C—Keybar C2

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzæœfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZÆŒ&
abcdefghijklmnopqrstuvwxyzæœfiflffffiffl
‘’.,-;:’‘!?()[]°*†‡¶–—...|% ℔ **.,:;-!?‘**
$1234567890 **$1234567890**

FIGURE 50

Arrangement 6C1

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

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	**l**	**i**	**.**	**,**	1
6	2	*j*	*f*	*i*	*‘*	:	;	-	j	f	**!**	**j**	**f**	**t**	*:*	▮	2
7	3	*c*	*r*	*s*	*e*	**:**	**;**	**-**	**I**	r	s	t	**r**	*v*	*;*	*z*	3
8	4	*	*q*	**?**	*b*	*g*	*o*	?	I	z	c	e	**z**	**c**	**s**	*?*	4
9¹	5	**y**	**o**	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	5
9²	6	**g**	**v**	**p**	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	■	6
9³	7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	**e**	**a**	**q**	**x**	7
10¹	8	*I*	*ﬁ*	*u*	*n*	.	S	v	y	p	u	n	**J**	**b**	**d**	**k**	8
10²	9	‡	†	*ﬂ*	*p*	ﬂ	ﬁ	q	k	b	h	d	**h**	**u**	**n**	**ﬂ**	9
11	10	**Z**	**F**	*J*	*S*	**L**	**S**	*ﬀ*	*Q*	Z	*Z*	ﬀ	**ﬁ**	**ﬀ**	*G*	¶	10
12	11	*F*	**V**	*C*	*O*	*w*	**B**	**P**	L	P	F	**C**	**E**	**A**	**T**	**Y**	11
13	12	**X**	*&*	Q	V	C	B	T	O	E	A	w	**w**	**R**	**U**	*L*	12
14	13	*B*	*P*	**O**	**K**	**G**	*m*	**D**	Y	U	G	R	**N**	*R*	*T*	*E*	13
15	14	*D*	*A*	*&*	ﬄ	ﬃ	X	D	N	K	H	m	*V*	**m**	**H**	**Q**	14
18	15	*H*	*Y*	*N*	**W**	**M**	*W*	*M*	—	..	M	W	*K*	*U*	*X*	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT **Keybank 6C1—Keybar 6C1** | **Stopbars S5** | **RIGHT** **Keybank 6C1—Keybar 6C1**

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzﬁﬂﬀﬃﬄ
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzﬁﬂﬀ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzﬁﬂﬀ
‘’.,-;:!?*†‡.¶-—...:;?.,:;-!?‘’
$1234567890 **$1234567890**

FIGURE 51

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

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

LEFT **Keybank 6C1—Keybar 6C1** | **Stopbars S5** | **RIGHT** **Keybank 6C1—Keybar 6C2**

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzﬁﬂﬀﬃﬄ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzﬁﬂﬀ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyzﬁﬂﬀ
‘’.,-;:’!??;[]*†-—...|.,:;-!?‘’
$1234567890 **$1234567890**

FIGURE 52

Arrangement 7C1

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

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	**l**	**i**	**.**	**,**	1
6	2	*j*	*f*	*i*	!	:	;	-	j	f	I	**j**	**f**	**t**	;	▮	2
7	3	*c*	*r*	*s*	*e*	**:**	**;**	**-**	**I**	r	s	t	J	*v*	**r**	*z*	3
8	4	**z**	*q*	**c**	*b*	*g*	*o*	?	I	z	c	e	Z	S	**s**	*I*	4
9¹	5	**y**	**o**	**9**	**7**	**5**	**3**	**1**	**0**	**g**	9	7	5	3	1	0	5
9²	6	**v**	**p**	**x**	**8**	**6**	**4**	**2**	**q**	**a**	**e**	8	6	4	2	▮	6
9³	7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	P	F	L	T	7
10¹	8	C	**b**	*u*	*n*	**h**	S	v	y	p	u	n	A	B	O	E	8
10²	9	**J**	**n**	**u**	*p*	**k**	**d**	q	k	b	h	d	D	Y	G	R	9
11	10	H	Q	V	*S*	*J*	**Z**	**F**	**L**	Z	**S**	$	X	U	K	N	10
12	11	**T**	**A**	**E**	**C**	*w*	**P**	**B**	L	P	F	**Y**	**V**	**X**	M	*O*	11
13	12	*G*	*Q*	Q	V	C	B	T	O	E	A	W	**w**	**R**	**U**	*F*	12
14	13	*Z*	**O**	**K**	**G**	*T*	*m*	*R*	Y	U	G	R	*L*	*C*	W	*D*	13
15	14	*B*	*P*	**D**	**N**	&	**m**	D	N	K	H	m	**H**	*A*	*E*	**Q**	14
18	15	*H*	*Y*	X	**W**	**M**	*W*	*M*	*X*	*U*	M	W	*V*	*K*	*N*	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank 6C1—Keybar 7C1 **Stopbars S5** **RIGHT** Keybank 7C1—Keybar 7C1

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRSTUVWXYZ
' ' . , - abcdefghijklmnopqrstuvwxyz ; : ! ?
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz ;
ABCDEFGHIJKLMNOPQRSTUVWXYZ
. , : ; abcdefghijklmnopqrstuvwxyz - ' '
$1234567890 **1234567890**

Arrangement 7C2

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

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*	I	:	;	-	j	f	**.**	**'**	**,**	**l**	**i**	▮	2
7	3	*c*	*r*	*s*	*e*	**:**	**;**	**j**	**f**	r	s	t	J	*v*	**!**	*z*	3
8	4	**s**	*q*	**I**	*b*	*g*	*o*	?	I	z	c	e	**r**	S	**t**	**-**	4
9¹	5	**v**	Z	**9**	**7**	**5**	**3**	**1**	**0**	**e**	9	7	5	3	1	0	5
9²	6	C	**z**	**x**	**8**	**6**	**4**	**2**	**?**	**c**	*I*	8	6	4	2	▮	6
9³	7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	P	F	L	T	7
10¹	8	A	**g**	*u*	*n*	**o**	S	v	y	p	u	n	Q	B	O	E	8
10²	9	D	**a**	**y**	*p*	**J**	*J*	q	k	b	h	d	V	Y	G	R	9
11	10	H	**S**	*O*	*S*	**q**	**p**	**b**	**d**	Z	**k**	*Q*	X	U	K	N	10
12	11	**n**	**P**	**L**	*P*	*w*	**F**	**E**	L	P	F	*G*	M	**Z**	**h**	**u**	11
13	12	*E*	*C*	Q	V	C	B	T	O	E	A	W	**T**	**A**	**B**	**C**	12
14	13	*L*	*F*	**V**	**R**	**N**	*m*	**w**	Y	U	G	R	**D**	**O**	W	**Y**	13
15	14	**Q**	**U**	*B*	*R*	*T*	**G**	D	N	K	H	m	**K**	**H**	*D*	*A*	14
18	15	*H*	*Y*	X	**W**	**M**	*W*	*M*	**m**	*U*	M	W	*V*	*K*	*N*	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank 6C1—Keybar 7C1 **Stopbars S5** **RIGHT** Keybank 7C1—Keybar 7C2

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ
' ' . , - ; : abcdefghijklmnopqrstuvwxyz ' ? [ ] |
ABCDEFGHIJKLMNOPQRSTUVWY
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWYZ
. , : ; abcdefghijklmnopqrstuvwxyz - ! ? '
1234567890 **1234567890**

Arrangement FC

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

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

LEFT Keybank FC—Keybar FC | Stopbars S5 | RIGHT Keybank FC—Keybar FC

Characters in Matrix Case

ABCÇDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ
ABCDEFGHIJKLMNOPQRSTUVWXYZÆŒ
aàâbcçdeèéêfghiîïjklmnoôpqrstuùûvwxyzæœfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&ÆŒ
aàâbcçdeèéêfghiîïjklmnoôpqrstuùûvwxyzæœfiflffffiffl
. , - ; : ‘ ’ ′ ! ? ( ) [ ] — – . . % « » ; :
$1234567890½ *$1234567890*

FIGURE 55

GERMAN LIGHTFACE CAPS and lower case in combination with **GERMAN BOLDFACE CAPS and lower case;** Roman and Boldface figures.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
5	1	:	;	.	,	i	’	:	;	.	,	ſ	ſ	i	l	i	1
6	2	’	j	k	f	l	ſ	t	!	=	k	z	c	t	e	■	2
7	3	=	!	z	c	r	e	]	[	“	„	)	(	?	x	r	3
8	4	■	d	ö	ä	q	d	y	ß	p	g	h	d	o	a	b	4
9¹	5	“	„	)	(	ö	ß	y	ß	.	9	7	5	3	1	0	5
9²	6	ö	■	■	■	ü	x	tz	v	–	$	8	6	4	2	■	6
9³	7	ä	q	g	u	p	h	n	b	a	ß	ü	ß	tz	u	n	7
10¹	8	■	■	■	†	?	ß	ff	ſſ	ſt	ll	ff	ck	ſſ	ll	.	8
10²	9	■	■	■	§	*	x	ck	ſl	ſi	ſi	x	fl	fi	ſt	ſi	9
11	10	■	■	■	■	$	0	9	8	7	6	5	4	3	2	1	10
12	11	■	■	■	Ü	U	Ü	Ä	Y	F	C	U	A	C	ch	w	11
13	12	Ä	T	K	F	C	J	A	C	ch	w	Z	K	P	T	J	12
14	13	■	■	■	■	■	Z	Y	m	V	N	H	G	B	R	m	13
15	14	Ö	B	S	R	O	N	H	G	P	B	D	Ö	O	S	D	14
18	15	■	■	■	■	rc.	Q	M	W	rc.	Q	M	—	. .	W	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank GC—Keybar GC | Stopbars S5 | RIGHT Keybank GC—Keybar GC

Characters in Matrix Case

AÄBCDEFGHIJKLMNOÖPQRSTUÜVWXYZ
aäbcdefghijklmnoöpqrſstuüvwxyzrc.chckffſſſiflllſſſtſtz
AÄBCDEFGHIJKLMNOÖPQRSTUÜVWXYZ
aäbcdefghijklmnoöpqrſstuüvwxyzrc.chckffſſſiflllſſſtſtz
„ “ . , = ; : ’ ! ? ( ) [ ] * † – — . . . . § . , = ; : ! ? ’ ( ) „ “
$1234567890 **$1234567890**

FIGURE 56

CHAPTER XXXVI

Matrix Case Arrangements for Special Stopbars

317. The MATRIX CASE arrangements described in the last chapter are for use with standard STOPBARS S5 (¶262): The arrangements in this chapter all require special STOPBARS and the MATRICES for modified characters (¶272) for use with these STOPBARS.

318. Matrix Case Arrangements for Nut-body Figures: see Chapter XXXIII, page 130. Three sets of STOPBARS are furnished for these arrangements: S27 (¶294) 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 (¶293) which transform eight and one-half set faces into eight set and supply four nine-unit rows; and STOPBARS S34 (¶292) for changing seven-set faces to six set with four nine-unit rows.

319. Arrangements for Stopbars S27: These three arrangements (T, T1, and T2) provide for four, instead of three, nine-unit rows and are shown in Figs. 57, 58, and 59, pages 150 and 151; they all provide for ROMAN CAPS and lower case, two sets of nut-body figures, piece braces (¶257), most of the **GOTHIC** caps (or SMALL CAPS in place of these) and caps and lower case of *Italic* or **C1** or **C2 Boldfaces.** Fig. 57 shows the Roman with C *Italic* and requires, in addition to the tabular KEYBANK (¶254) and the S27 STOPBARS, right KEYBANK C, left KEYBAR T, and right KEYBAR C. Fig. 58 is the arrangement for Roman with **C1 Boldfaces;** it takes the same equipment as the Roman and *Italic* combination except that right KEYBAR C1 is used instead of KEYBAR C. Fig. 59 shows the Roman with **C2 Boldfaces;** with this use the same equipment as the Roman and *Italic* combination, shown in Fig. 57, except right KEYBAR C2 instead of C. The capping sheets (¶308) for these combinations will be furnished upon application.

320. Arrangements for Stopbars S29: These three arrangements (TF, TF1, and TF2) for using eight and one-half set faces with nut-body figures are shown in Figs. 60, 61, and 62, pages 151 and 152, which will be clear from the preceding paragraph; the KEYBANKS and KEYBARS required are given beneath each MATRIX CASE Arrangement.

321. Arrangements for Stopbars S34 (YF, YF1, and YF2) which transform seven-set faces into six-set faces, using modified characters, are shown in Figs. 63, 64, and 65, pages 153 and 154, which give full information as to the KEYBANKS and KEYBARS used with these arrangements.

322. Matrix Case Arrangements for Double Matrices; see Chapter XXXIV, page 136. But one set of STOPBARS S15 (unit values 5 6 7 8 9 9 9 10 11 12 13 14 15 18 18) is required for use with the four arrangements for newspaper ad composition shown on pages 155 and 156. **Arrangement NC1,** Fig. 66, page 155, provides for Roman CAPS, 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. With this combination, shown in Fig. 66, use STOPBARS S15, left and right KEYBANKS NC, left KEYBAR NC, and right KEYBAR NC1. Fig. 67, page 155, shows a similar arrangement for **C2 Boldface** in combination with the Roman; the same equipment is used except that right KEYBAR NC2 is required instead of NC1. Figs. 68 and 69, page 156, are the MATRIX CASE Arrangements for six alphabet combinations for newspaper ad work; they provide for the *Italic CAPS and lower case* in addition to the Roman and **Boldface,** but omit the fourteen-unit figures. The MATRICES for modified characters (¶272), for use with these combinations, provide for setting complete words in caps of any of the faces used. Fig. 68 is the arrangement for **C1 Boldfaces,** and Fig. 69 for **C2 Boldfaces;** the required KEYBANKS and KEYBARS are given beneath the MATRIX CASE arrangements.

Arrangement T

ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* Roman SMALL CAPS or **GOTHIC CAPS**; Roman and Gothic figures and Roman fractions.

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	I	*!*	*:*	*;*	|	■	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
9¹	5	*I*	■	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	5
9²	6	“	■	■	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	■	6
9³	7	*x*	*k*	*y*	*d*	*h*	*a*	x	J	g	o	a	)	)	}	|	7
9⁴	8	‡	*fi*	*u*	*n*	†	*	v	y	∫	‖	\	Q	(	(	{	8
10	9	fl	n	*fl*	*p*	u	.	q	k	b	h	d	p	Y	■	R	9
11	10	H	&	*J*	*S*	*æ*	*œ*	*ff*	■	Z	■	S	fi	U	K	N	10
12	11	*O*	*L*	*C*	*F*	*w*	*£*	■	L	P	F	ff	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*	■	Y	U	G	R	Œ	Æ	W	*V*	13
15	14	*K*	*N*	*H*	ffl	ffi	X	D	N	K	H	m	*&*	■	*X*	*U*	14
18	15	3/8	1/8	3/4	1/4	1/2	*W*	*M*	—	. .	M	W	%	7/8	5/8	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank T—Keybar T | Stopbars S27 | RIGHT Keybank C—Keybar C

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzflfiffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzflfiffflffiææ
HIJKMNQRSUWYZÆŒ&
''.,:;-][|)(“-.‡†—..*.‖)|}|{|(|{-!:;?
$1234567890 £⅜⅛¾⅞¼⅝½% **$1234567890**

Arrangement T1

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman SMALL CAPS or **GOTHIC CAPS**; Roman and Boldface figures and Roman fractions.

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

LEFT Keybank T—Keybar T | Stopbars S27 | RIGHT Keybank C—Keybar C1

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzflfiffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzflfiffffifflæœ
HIJKMNRSUWZ&ÆŒ
''.,:;-][|-)(.“.-‡†—..*‖.)|}|{(|)(**''.,:;-!?**
$1234567890 ⅛⅜⅝⅞¼¾½% **$1234567890**

FIGURE 57

Arrangement T2

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman SMALL CAPS or **GOTHIC CAPS**; Roman and Boldface figures and Roman fractions.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
5	1	■	■	■	■	‘	’	.	,	■	l	i	]	[	■	■	1
6	2	‘	’	.	■	:	;	-	j	f	ɪ	,	l	i	|	■	2
7	3	:	;	j	f	)	(	■	■	r	s	t	J	!	■	■	3
8	4	–	s	.	I	r	t	■	I	z	c	e	z	s	■	-	4
9¹	5	?	■	9	7	5	3	1	0	.	9	7	5	3	1	0	5
9²	6	“	■	■	8	6	4	2	$	–	$	8	6	4	2	■	6
9³	7	■	z	x	v	c	e	x	J	g	o	a	⎞	⎠	}	|	7
9⁴	8	‡	g	o	a	†	*	v	y	∫	‖	⎝	Q	⎛	⎝	{	8
10	9	fl	n	J	y	u	.	q	k	b	h	d	p	Y	■	R	9
11	10	H	fl	S	q	p	b	d	fl	Z	k	S	fi	U	K	N	10
12	11	n	P	L	Z	F	E	■	L	P	F	ff	M	ff	h	u	11
13	12	V	&	Q	V	C	B	T	O	E	A	w	T	A	B	C	12
14	13	æ	R	N	D	O	w	■	Y	U	G	R	U	Y	w	Q	13
15	14	X	G	K	ffl	ffi	X	D	N	K	H	m	H	■	œ	&	14
18	15	¾	¼	ffi	ffi	m	W	M	—	. .	M	W	%	⅛	½	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank T—Keybar T | Stopbars S27 | RIGHT Keybank C—Keybar C2

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzflfiffffifl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzflfiffflffiffiæœ
HIJKMNQRSUWYZ
‘’.,:;-][[|-)(.“.–‡†—..*||.)}|||(((‘’.,-:;!?
$1234567890 ⅛¼¾½% **$1234567890**

FIGURE 59

Arrangement TF

ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* Roman SMALL CAPS or **GOTHIC CAPS**; Roman and Italic figures and Roman fractions.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
6¹	1	■	■	l	t	‘	’	.	,	■	l	i	]	[	■	■	1
6²	2	j	f	i	■	:	;	-	j	f	I	!	:	;	|	■	2
8	3	c	r	s	e	)	(	–	.	r	s	t	J	v	■	z	3
9¹	4	‡	q	*	b	g	o	“	I	z	c	e	‖	⎠	†	?	4
9²	5	I	■	9	7	5	3	1	0	.	9	7	5	3	1	0	5
9³	6	∫	■	■	8	6	4	2	$	–	$	8	6	4	2	■	6
9⁴	7	x	k	y	d	h	a	x	J	⎠	}	|	⎛	⎝	{	⎞	7
10	8	A	fi	u	n	.	g	o	a	p	u	n	Q	B	■	E	8
11	9	D	■	fl	p	S	v	y	k	b	h	d	v	Y	G	R	9
12	10	H	&	J	S	æ	æ	ff	■	fl	■	fi	q	U	K	N	10
13	11	O	L	C	F	w	£	Z	L	P	F	ff	M	Z	Q	G	11
14	12	E	&	Q	V	C	B	T	O	E	A	w	P	T	R	B	12
15	13	D	A	Y	ffl	ffi	m	■	Y	U	G	R	Œ	Æ	W	V	13
16	14	K	N	H	ffl	ffi	X	D	N	K	H	m	&	■	X	U	14
18	15	⅜	⅛	¾	¼	½	W	M	—	. .	M	W	%	⅞	⅝	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank T—Keybar TF | Stopbars S29 | RIGHT Keybank C—Keybar C

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzflfiffffifl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzflfiffflffiæœ
ABDEGHIJKMNQRUVWYÆŒ&
‘’.,:;-][[|-)(.“.–‡†—..*||.)}}|(({{!:;?
$1234567890 £⅛⅜⅝⅞¼¾½% *$1234567890*

FIGURE 60

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman SMALL CAPS or **GOTHIC CAPS**; Roman and Boldface figures and Roman fractions.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
6¹	1	’	‘	l	i	‘	’	.	,	■	l	i	]	[	.	,	1
6²	2	■	■	■	■	:	;	-	j	f	I	j	f	t	|	■	2
8	3	:	;	-	I	)	(	—	.	r	s	t	J	r	■	!	3
9¹	4	‡	?	*	z	c	s	“	I	z	c	e	‖	)	†	■	4
9²	5	y	o	9	7	5	3	1	0	.	9	7	5	3	1	0	5
9³	6	∫	v	p	8	6	4	2	$	–	$	8	6	4	2	■	6
9⁴	7	J	x	q	g	a	e	x	J	)	}	|	(	(	{	)	7
10	8	A	b	h	n	.	g	o	a	p	u	n	fi	B	■	E	8
11	9	D	Q	k	d	S	v	y	k	b	h	d	v	u	G	R	9
12	10	H	&	■	Z	F	L	S	fl	fl	ff	fi	q	U	K	N	10
13	11	B	P	C	E	A	T	Z	L	P	F	ff	M	Y	V	X	11
14	12	&	&	Q	V	C	B	T	O	E	A	w	w	R	U	æ	12
15	13	œ	O	K	G	D	N	■	Y	U	G	R	Œ	Æ	w	Q	13
16	14	■	ffi	ffi	ffl	ffi	X	D	N	K	H	m	■	■	m	H	14
18	15	⅜	⅛	¾	¼	½	W	M	—	. .	M	W	%	⅞	⅝	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank T—Keybar TF

Stopbars S29

RIGHT Keybank C—Keybar C1

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzfiflffffiffliæœ
ABDEGHIJKMNQRUVW&ÆŒ
‘’.,:;-][|–“)(.‖.‡†—..*.–)∫∫}|((()‘’.,:;-!?
$1234567890 ⅛⅜⅝⅞¼¾½% $1234567890

Figure 61

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman SMALL CAPS or **GOTHIC CAPS**; Roman and Boldface figures and Roman fractions.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
6¹	1	■	■	■	■	‘	’	.	,	■	l.	i	]	[	■	■	1
6²	2	‘	’	.	■	:	;	-	j	f	I	,	l	i	|	■	2
8	3	:	;	j	f	)	(	—	.	r	s	t	J	!	■	■	3
9¹	4	‡	s	*	I	r	t	“	I	z	c	e	‖	)	†	-	4
9²	5	?	■	9	7	5	3	1	0	.	9	7	5	3	1	0	5
9³	6	∫	■	■	8	6	4	2	$	–	$	8	6	4	2	■	6
9⁴	7	■	z	x	v	c	e	x	J	)	}	|	(	(	{	)	7
10	8	A	g	o	a	.	g	o	a	p	u	n	Q	B	■	E	8
11	9	D	■	J	y	S	v	y	k	b	h	d	v	Y	G	R	9
12	10	H	fi	S	q	p	b	d	fl	fl	k	fi	q	U	K	N	10
13	11	n	P	L	Z	F	E	Z	L	P	F	ff	M	ff	h	u	11
14	12	V	&	Q	V	C	B	T	O	E	A	w	T	A	B	C	12
15	13	æ	R	N	D	O	w	■	Y	U	G	R	U	Y	w	Q	13
16	14	X	G	K	ffl	ffi	X	D	N	K	H	m	H	■	œ	&	14
18	15	¾	¼	ffi	ffi	m	W	M	—	. .	M	W	%	⅛	½	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank T—Keybar TF

Stopbars S29

RIGHT Keybank C—Keybar C2

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzfiflffffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzfiflffffiffliæœ
ABDEGHIJKMNQRUVWY
‘’.,:;-.][|–“)(‡†—..*‖.%.)∫∫}|((()‘’.,:;!-?
$1234567890 ⅛ ¼ ¾ ½ $1234567890

Figure 62

Arrangement YF

ROMAN CAPS and lower case; *ITALIC CAPS and lower case;* Roman SMALL CAPS or **GOTHIC CAPS**; Roman and Italic figures and Roman fractions.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
6	1	'	l	t	.	‘	’	.	,	■	l	i	]	[	|	■	1
7	2	j	f	i	!	:	;	-	j	f	I	!	:	;	)	(	2
8	3	c	r	s	e	v	–	’	‘	r	s	t	J	z	.	■	3
9¹	4	‡	q	*	b	g	o	I	I	z	c	e	z	s	†	?	4
9²	5	x	½	9	7	5	3	1	0	–	9	7	5	3	1	0	5
9³	6	¼	“	‖	8	6	4	2	$	.	$	8	6	4	2	■	6
9⁴	7	⅜	⅛	¾	⌠	⎞	⌡	⎠	⎝	⌠	}	{	|	L	C	F	7
10	8	Y	k	y	d	h	a	x	J	g	o	a	.	P	V	T	8
12¹	9	A	p	u	n	R	S	v	y	p	u	n	Q	B	O	E	9
12²	10	D	G	ﬂ	ﬁ	ﬂ	ﬁ	q	k	b	h	d	X	U	K	N	10
13	11	H	&	■	J	S	■	■	ﬀ	Z	■	ﬀ	■	■	■	M	11
14	12	&	Q	V	O	L	C	F	L	P	F	w	Z	Q	G	£	12
15	13	E	P	C	B	T	O	E	A	w	U	D	V	T	R	B	13
16	14	W	ﬄ	ﬃ	Y	G	R	m	N	K	A	Y	&	X	U	X	14
18	15	D	H	K	N	H	W	M	—	. .	M	W	m	ﬃ	ﬄ	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank T—Keybar YF | Stopbars S34 | RIGHT Keybank C—Keybar YF

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzﬂﬁﬀﬃﬄ
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzﬂﬁﬀﬄﬃ
‘’.,:;!-][|–‘’‘’–)(.‡†.*.“||.—..⌠⎞⌡⎠⎝⌠}{|!:;?
$1234567890 £⅛¼⅜½¾ *$1234567890*

FIGURE 63

Arrangement YF1

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman SMALL CAPS or **GOTHIC CAPS**; Roman and Boldface figures and Roman fractions.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
6	1	.	l	l	.	‘	’	.	,	,	l	i	]	[	|	■	1
7	2	‘	’	!	!	:	;	-	j	f	I	j	f	t	)	(	2
8	3	:	;	-	I	¢	–	’	‘	r	s	t	J	r	.	■	3
9¹	4	‡	?	*	z	c	s	?	I	z	c	e	z	s	†	■	4
9²	5	⅛	½	9	7	5	3	1	0	–	9	7	5	3	1	0	5
9³	6	¼	“	‖	8	6	4	2	$	.	$	8	6	4	2	■	6
9⁴	7	⅜	T	¾	⌠	⎞	⌡	⎠	⎝	⌠	}	{	|	L	C	F	7
10	8	g	a	e	o	y	p	x	J	g	o	a	q	P	V	X	8
12¹	9	A	h	n	J	b	S	v	y	p	u	n	Q	B	O	E	9
12²	10	D	G	d	u	ﬂ	ﬁ	q	k	b	h	d	k	Y	R	V	10
13	11	H	&	ﬁ	ﬀ	ﬂ	F	L	S	Z	Z	ﬀ	X	U	K	N	11
14	12	&	Q	V	B	P	C	E	L	P	F	A	T	Y	V	M	12
15	13	&	R	C	B	T	O	E	A	w	U	w	X	U	■	■	13
16	14	W	ﬃ	ﬄ	Y	G	R	O	N	K	D	N	K	G	Q	X	14
18	15	D	H	W	M	m	H	■	—	. .	M	W	m	ﬃ	ﬄ	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT Keybank T—Keybar YF | Stopbars S34 | RIGHT Keybank C—Keybar YF1

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzﬂﬁﬀﬃﬄ
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzﬂﬁﬀﬃﬄ
‘’.,!:;-?][|-‘’)(“.–‡†.*||.¢—..⌠⎞⌡⎠⎝⌠}{|.,‘’!:;-?
$1234567890 ⅛¼⅜½¾ **$1234567890**

FIGURE 64

Arrangement YF2

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** Roman SMALL CAPS or **GOTHIC CAPS**; Roman and Boldface figures and Roman fractions.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
6	1	▮	▮	▮	.	‘	’	.	,	▮	l	i	]	[	|	▮	1
7	2	**‘**	**’**	**.**	!	:	;	-	j	f	I	**,**	**l**	**i**	)	(	2
8	3	**:**	**;**	**j**	**f**	¢	–	’	‘	r	s	t	J	**!**	.	▮	3
9^1	4	‡	**s**	*	**I**	**r**	**t**	?	I	z	c	e	Z	S	†	**-**	4
9^2	5	**?**	½	**9**	**7**	**5**	**3**	**1**	**0**	–	9	7	5	3	1	0	5
9^3	6	¼	“	‖	**8**	**6**	**4**	**2**	**$**	.	**$**	8	6	4	2	▮	6
9^4	7	⅜	⅛	¾	⎛	⎝	⎠	⎞	⎩	⎧	⎬	⎨	|	L	C	F	7
10	8	Y	**z**	**x**	**v**	**c**	**e**	x	J	g	o	a	.	P	V	T	8
12^1	9	A	**g**	**o**	**a**	R	S	v	y	p	u	n	Q	B	O	E	9
12^2	10	D	G	**J**	**y**	fl	fi	q	k	b	h	d	X	U	K	N	10
13	11	H	**fl**	**S**	**q**	**p**	**b**	**d**	**fl**	Z	**k**	ff	**Z**	**F**	**E**	M	11
14	12	&	Q	V	**P**	**L**	**ff**	**n**	L	P	F	**h**	**u**	**V**	**B**	**C**	12
15	13	**A**	**T**	C	B	T	O	E	A	w	U	**R**	**N**	**U**	**Y**	**Q**	13
16	14	w	**D**	**O**	Y	G	R	**w**	N	K	**G**	**K**	**H**	**&**	**X**	X	14
18	15	D	H	**ffl**	**ffl**	**m**	**W**	**M**	—	..	M	W	m	ffi	ffl	▮	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT
Keybank T—Keybar 600

Stopbars S34

RIGHT
Keybank C—Keybar 601

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyzflfiffffiffl

ABCDEFGHIJKLMNOPQRSTUVWXYZ&

abcdefghijklmnopqrstuvwxyzflfiffffiffl

‘’.,!:;-?][|–‘’)(“–‡†—..*‖..⎛⎝⎠⎞⎩⎧⎬⎨| ..**‘’.,:;!-?**

$1234567890 ½¼⅜⅛¾ **$1234567890¢**

FIGURE 65

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.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
5	1	■	.	l	i	‘	’	,	,	.	l	i	]	[	‘	’	1
6	2	,	■	!	.	:	;	-	j	f	•	,	j	f	t	■	2
7	3	:	;	r	I	)	(	’	‘	r	s	t	!	-	.	■	3
8	4	‡	?	*	z	c	s	?	I	z	c	e	.	■	†	■	4
9¹	5	y	o	9	7	5	3	1	0	½	¼	¾	v	3	1	0	5
9²	6	g	e	a	8	6	4	2	$	J	x	q	c	4	2	■	6
9³	7	q	5	6	7	8	p	x	9	$	.	–	a	J	g	o	7
10	8	b	n	u	d	h	d	v	y	p	u	n	k	k	b	h	8
11	9	■	■	Z	F	L	S	fl	ff	Z	■	ff	S	■	C	■	9
12	10	B	P	C	E	A	T	&	L	P	F	Q	V	$	V	Y	10
13	11	&	R	U	■	C	B	T	O	E	A	w	w	X	■	■	11
14	12	0	9	8	7	6	5	4	3	2	1	0	Y	U	G	R	12
15	13	K	G	D	ffl	ffi	X	D	N	K	H	m	m	H	N	Q	13
18¹	14	0	9	8	7	6	5	4	3	2	1	—	$	W	M	■	14
18²	15											. .		M	W	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT
Keybank NC—Keybar NC

Stopbars S15

RIGHT
Keybank NC—Keybar NC1

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzfffiffl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
. , - ; : abcdefghijklmnopqrstuvwxyzffl ‘ ’ ? !
. , - ; : ‘ ’ ! ? * ( ) ½ ¼ ¾ [ ] † ‡ – — . . . . . ‘ ’
$1234567890 **$1234567890** $1234567890c., **$1234567890c.,**

FIGURE 66

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.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
5	1	■	‘	■	■	‘	’	■	,	.	l	i	]	[	’	|	1
6	2	,	’	.	.	:	;	-	j	f	•	,	,	l	l	■	2
7	3	:	;	j	f	)	(	’	‘	r	s	t	!	!	.	■	3
8	4	‡	s	*	I	r	t	?	I	z	c	e	.	■	†	-	4
9¹	5	?	v	9	7	5	3	1	0	½	¼	¾	⅛	3	1	0	5
9²	6	z	x	c	8	6	4	2	$	⅜	⅝	⅞	c	4	2	■	6
9³	7	q	5	6	7	8	e	x	9	$	.	–	a	J	g	o	7
10	8	g	o	a	y	fl	d	v	y	p	u	n	fi	k	b	h	8
11	9	fl	S	q	p	b	d	fi	k	Z	J	ff	S	Z	C	■	9
12	10	n	P	L	F	E	ff	&	L	P	F	Q	V	$	h	u	10
13	11	Q	U	Y	V	C	B	T	O	E	A	w	T	A	B	C	11
14	12	0	9	8	7	6	5	4	3	2	1	w	Y	U	G	R	12
15	13	O	K	G	&	X	X	D	N	K	H	m	R	N	D	H	13
18¹	14	0	9	8	7	6	5	4	3	2	1	■	$	m	W	M	14
18²	15											. .		M	W	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT
Keybank NC—Keybar NC

Stopbars S15

RIGHT
Keybank NC—Keybar NC2

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXYZ&
abcdefghijklmnopqrstuvwxyzfffifl
ABCDEFGHIJKLMNOPQRSTUVWXYZ&
. , - ; : abcdefghijklmnopqrstuvwxyzfffifl ‘ ’ ! ?
. , - ; : ‘ ’ ! ? ( ) ½ ¼ ¾ ⅛ ⅜ ⅝ ⅞ [ ] * † ‡ – — . . . . . | ‘ ’
$1234567890 **$1234567890** $1234567890c., **$1234567890c.,**

FIGURE 67

Arrangement 6N1

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** *ITALIC CAPS and lower case;* Roman and Boldface figures, and two-line price figures.

Unit Value	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Row
5	1	**l**	**i**	*l*	*t*	‘	’	.	,	■	l	i	:	;	**.**	**,**	1
6	2	**:**	?	*j*	*f*	*i*	**;**	-	j	f	•	**,**	**j**	**f**	**t**	■	2
7	3	(	)	**-**	**I**	**r**	*r*	*e*	*s*	r	s	t	*c*	*v*	*z*	*q*	3
8	4	*x*	*k*	*y*	**v**	**z**	**c**	**s**	*o*	I	z	c	e	*I*	*b*	*g*	4
9¹	5	*d*	*h*	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	5
9²	6	*a*	■	*p*	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	■	6
9³	7	**y**	**o**	**p**	**g**	**a**	**e**	x	J	g	o	a	q	y	v	**x**	7
10	8	S	**b**	**h**	**n**	**d**	p	u	n	k	b	h	d	**u**	*n*	*u*	8
11	9	*J*	*S*	**F**	**L**	**S**	*G*	*C*	*O*	*B*	*R*	*P*	*F*	**k**	**C**	**J**	9
12	10	*L*	**B**	**P**	**C**	**E**	**A**	**T**	*w*	L	P	F	**Y**	**V**	**X**	*E*	10
13	11	**&**	*&*	Q	V	C	B	T	O	E	A	w	**w**	**R**	**U**	*T*	11
14	12	**O**	**K**	**G**	**D**	**N**	**Q**	*m*	Y	U	G	R	*D*	*A*	*Y*	*V*	12
15	13	*K*	*N*	*H*	■	X	*&*	D	N	K	H	m	**m**	**H**	*X*	*U*	13
18¹	14	**0**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**$**	■	**M**	**W**	*W*	14
18²	15												*M*	M	W	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT — **Keybank 6N1—Keybar 6N1** | **Stopbars S15** | **RIGHT** — **Keybank 6N1—Keybar 6N1**

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXY&
‘ ’ . , - ; abcdefghijklmnopqrstuvwxyz : ? ( ) . –
ABCDEFGHIJKLMNOPRSTUVWXY&
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXY&
. , abcdefghijklmnopqrstuvwxyz ; : -
$1234567890 $1234567890c., $1234567890

FIGURE 68

Arrangement 6N2

ROMAN CAPS and lower case; **BOLDFACE CAPS and lower case;** *ITALIC CAPS and lower case;* Roman and Boldface figures, and two-line price figures.

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*	**i**	-	j	f	•	**,**	**.**	**,**	**l**	■	2
7	3	(	)	**-**	**j**	**f**	*r*	*e*	*s*	r	s	t	*c*	*v*	*z*	*q*	3
8	4	*x*	*k*	*y*	**s**	**I**	**r**	**t**	*o*	I	z	c	e	*I*	*b*	*g*	4
9¹	5	*d*	*h*	**9**	**7**	**5**	**3**	**1**	**0**	.	9	7	5	3	1	0	5
9²	6	*a*	■	*p*	**8**	**6**	**4**	**2**	**$**	–	$	8	6	4	2	■	6
9³	7	*S*	**z**	**x**	**v**	**c**	**e**	x	J	g	o	a	q	y	v	*J*	7
10	8	S	**a**	**o**	**g**	**y**	p	u	n	k	b	h	d	**J**	*n*	*u*	8
11	9	*L*	*F*	**S**	**q**	**p**	**b**	**d**	**k**	*G*	*C*	*O*	*B*	*R*	**C**	*P*	9
12	10	*E*	**P**	**L**	**F**	**E**	**n**	*T*	*w*	L	P	F	*V*	*Y*	**h**	**u**	10
13	11	**V**	*&*	Q	V	C	B	T	O	E	A	w	**T**	**A**	**B**	**C**	11
14	12	*A*	**R**	**N**	**D**	**O**	**w**	*m*	Y	U	G	R	**U**	**Y**	*D*	**Q**	12
15	13	**G**	**K**	*K*	**X**	X	*N*	D	N	K	H	m	**H**	*H*	*U*	**&**	13
18¹	14	**0**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**$**	**m**	**M**	**W**	*W*	14
18²	15												*M*	M	W	■	15
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	

LEFT — **Keybank 6N1—Keybar 6N1** | **Stopbars S15** | **RIGHT** — **Keybank 6N1—Keybar 6N2**

Characters in Matrix Case

ABCDEFGHIJKLMNOPQRSTUVWXY&
‘ ’ . , - ; abcdefghijklmnopqrstuvwxyz : ? ( ) . –
ABCDEFGHIJKLMNOPRSTUVWY
; abcdefghijklmnopqrstuvwxyz :
ABCDEFGHIJKLMNOPQRSTUVWXY&
‘ ’ . abcdefghijklmnopqrstuvwxyz , - ;
$1234567890 $1234567890c., $1234567890

FIGURE 69

CHAPTER XXXVII

Changing Matrix Case Arrangements

323. 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. 39, facing page 121, shows twenty-four 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.*"

324. 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. By transferring the Roman MATRICES from one COMB at a time in this way, mistakes are avoided and the time of making changes reduced to the minimum. The Boldface MATRICES taken out of the MATRIX CASE, with their COMBS, should then 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.

325. 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.

326. Change boxes for making special arrangements. A place for everything and everything in its place is the Golden Rule for handling MONOTYPE MATRICES. The MOLD and MATRIX cabinets made by the different manufacturers of composing room furniture, 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

FIGURE 70

CHANGE BOX: To hold the regular MATRICES removed from a MATRIX CASE to make room for other MATRICES for a special job.

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.

327. Fig. 70 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 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.

328. *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 Metal Pot.*

329. 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 to each ribbon, to give the faces, point size, measure, allowance for squeeze (¶161), etc. A form of ribbon ticket in general use is shown in Fig. 71, page 160; 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.

330. 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

Keyboard Ribbon Ticket

Name		Key-board No.	Date Set
Job No.	Spool & Galley No.	Folios of Copy	SINGLE / DOUBLE } Justi-fication
Name of Job			Matrix Case Arrangement
Faces and Point Sizes	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.

Unit	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	1															
6	2															
7	3															
8	4															
9	5															
9	6															
9	7															
10	8															
10	9															
11	10															
12	11															
13	12															
14	13															
15	14															
18	15															

FIGURE 71

RIBBON TICKET: One of these is made out for each SPOOL sent to the CASTER to give the operator instructions for the job.

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 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.

331. Written instructions on tabular matter: The most progressive offices even 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 (see Plate I, 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, the same as the auxiliary scales (¶171). This paper scale may be 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. 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 ¶171 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 copy preparer, 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.

332. Record of Output: The ribbon ticket (Fig. 71), 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

333. Plate VI, 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 (¶288) and that the next job is the straight matter of this book, which is set in ten-point 21E combined with a ten point C1 Boldface, the 25J ($10\frac{1}{4}$ set), seven alphabet arrangement (Fig. 53, page 146); the measure is twenty-two picas, with one and one-half points allowance for squeeze.

334. Changing Keybanks and Keybars: Lift off the KEYBANKS (¶253), as shown in Figs. 1 and 2, Plate VI, take out both the left and right KEYBARS, Figs. 4 and 5, and put on in their place the left and right KEYBARS 7C1 (see Fig. 6, Plate VI) which are required for the seven alphabet combination of Roman and Italic with a C1 Boldface. Then put on the corresponding KEYBANKS, left 6C1 and right 7C1, and push them up into operating position, as shown in Fig. 3. Look up Arrangement 7C1, in the book of "MATRIX CASE Arrangements" (¶308), to see whether any KEYBUTTON CLIPS (¶267) are required. Since we used KEYBANKS 6C1 and 7C1 no clips are necessary; if the office had not been equipped with these, the KEYBANKS most nearly corresponding would have been capped for the seven alphabet arrangement.

335. Change the Stopbars, as shown in Figs. 17 and 18, Plate VI, taking out the special STOPBARS for nut-body figures and inserting the standard STOPBARS S5 (¶262).

336. The Justifying Scale ($10\frac{1}{4}$ set) for the faces to be composed is now put in place, see Figs. 14, 15, and 16, Plate VI. 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) 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.

337. Put on a new ribbon, if necessary, as shown in Figs.

11 and 12, Plate VI, 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. 22, page 55. Release the PAPER FEED WHEELS by pulling forward the RELEASE-PLATE LINK, as shown in Fig. 10, Plate VI, 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. 9, Plate VI, and start the paper in this as shown in Fig. 13. *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.

338. Set the measure, adjusting the EM-RACK STOP, as shown in Figs. 7 and 8, Plate VI, 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 III, at back of book) twenty-two picas equals 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 IV; 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 seven 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

339. The preceding chapter explains the necessary adjustments of the KEYBOARD for the measure (22 picas) and combination of faces in which this book is set; that is, Roman CAPS, SMALL 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 and lower case of 25J,** see MATRIX CASE Arrangement 7C1 (Fig. 53, page 146), 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 the paragraph numbers. The JUSTIFYING-SPACE-PUNCH KEY (¶218) must be used with these figures to increase their width the amount required.

340. The Boldface figures for paragraph references have a Set Factor of 123; by reference to the Table of Set Factors, page 27, 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 $ (MATRIX CASE position K-10, see Fig. 72, page 165), and cap KEY 67, Plate V, at back of book, for this with a KEYBUTTON CLIP (¶267) for the period.

341. Fill out the ribbon ticket (¶329) for this work, as shown in Fig. 72, page 165, noting in the blank MATRIX CASE diagram the positions for the special figures for the paragraph numbers and the eleven-unit period.

342. 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.

343. Strike a Justifying Key (¶155) in the top row six times and then a JUSTIFYING KEY in the lower row once, so

Keyboard Ribbon Ticket

Name John Smith		**Key-board No.** 3	**Date Set** 3-22-12
Job No. 3182	**Spool & Galley No.** 5	**Folios of Copy** 52-63	~~SINGLE~~ DOUBLE } **Justi-fication**
Name of Job Monotype System			**Matrix Case Arrangement** 7C1
Faces and Point Sizes 10-21E and 25J	**Mold** 10 pt	**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** 7C1 **Right**		**KEYBARS** 7C1 **Left** 7C1 **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.

Unit	Row	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	1															
6	2															
7	3															
8	4											10F-57				
9	5			9	7	5	3	1	0							
9	6				8	6	4	2								
9	7															
10	8															
10	9															
11	10				10F-31		Period					.				
12	11															
13	12															
14	13															
15	14															
18	15															

FIGURE 72

Prepared RIBBON TICKET: Shows method of filling out for setting the text of this book.

that the CASTING MACHINE will cast no quads, to be left in the TYPE CHANNEL, after this last line cast is placed on the GALLEY; then restore with the RESTORING KEY and strike the em quad KEY once for the indention of the first line of the paragraph.

344. 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 (¶340). *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.

345. Justify to preserve even spacing: Before starting composition determine whether the work is to be closely spaced or not, 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 the line so that the justification indicated, when the SCALE KEY (¶122) is depressed, 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.

346. 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 (¶344) 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.

347. 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 readily estimate 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.

348. Quotation Marks: Four of these are provided (see MATRIX CASE diagram, Fig. 21, page 54), a five and a seven-unit opening quote (‘) and a five and 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 enclose. 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.

349. Measures beyond the capacity of the Em Scale: In the smaller sets the equivalent of forty-two picas (the maximum measure for the CASTING MACHINE without the SIXTY 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 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 (¶338) 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 (¶345) 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 III, at back of book, forty picas equals 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 IV. 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 = $68\frac{1}{2}$ ems 7 units). NOTE: 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.

350. Justifying before reaching the four em mark: Although the JUSTIFYING-SCALE KEY cannot be used to rotate the SCALE unless the EM-RACK POINTER is within four ems of zero (¶111), 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 so that the SCALE KEY can be used; 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 II, 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.

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* 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.

351. 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* can quickly fix this error by lifting out this "dead wood" and inserting the characters required without altering the justification. It is possible to "kill a line" by turning back the ribbon and striking a JUSTIFYING KEY to cancel the incorrect character perforations, for, as explained in ¶148, the JUSTIFYING KEY perforations lock the PUMP so that no characters are cast; this should not be done except at the beginning of a line, for it wastes revolutions of the CASTING MACHINE. It is much better to set the line, including the type to correct the error by hand. 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.*

* Speed in making corrections 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

352. 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. In the previous chapters we have looked at the machine from the view-point 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. We will now assume that the KEYBOARD does not exist and regard the CASTING MACHINE simply as a type-caster producing type to be set by hand from the cases. To eliminate entirely the question of ribbon control, consider the TYPE CASTER [Convertible].

353. The Type Caster [Convertible], Fig. 73, page 172, is the type casting mechanism only of the standard MONOTYPE Composing Machine and Type Caster (see Frontispiece); the standard machine may be compared to a piano equipped with an automatic player, the Pianola, for example, for its product is determined by the perforations in the ribbon which controls it, just as the paper ribbon on a Pianola determines the music produced by the piano. The TYPE CASTER [Convertible] is the piano without the Pianola; it is operated by hand, instead of by the ribbon; the operator inserts the MATRIX for the required character and adjusts the sizing mechanism for the body width of this character, which the machine continues to cast until the MATRIX is changed by hand. It is called "Convertible" because the "Pianola" may be applied to it at any time and the machine converted into the standard MONOTYPE for casting type in automatically justified lines from a ribbon perforated at the KEYBOARD. It should be noted that this change increases the range of the machine and in no way limits it, for *the standard Monotype will do all that the Type Caster can do and*, when controlled by a ribbon, *it will cast type in automatically justified lines.* The TYPE CASTER is no more altered when the extra units for composition are applied than is a sectional bookcase when its usefulness is increased by adding a card index unit; the bookcase section remains the same—the type-casting feature is not affected. When the owner of the TYPE CASTER wishes to make his

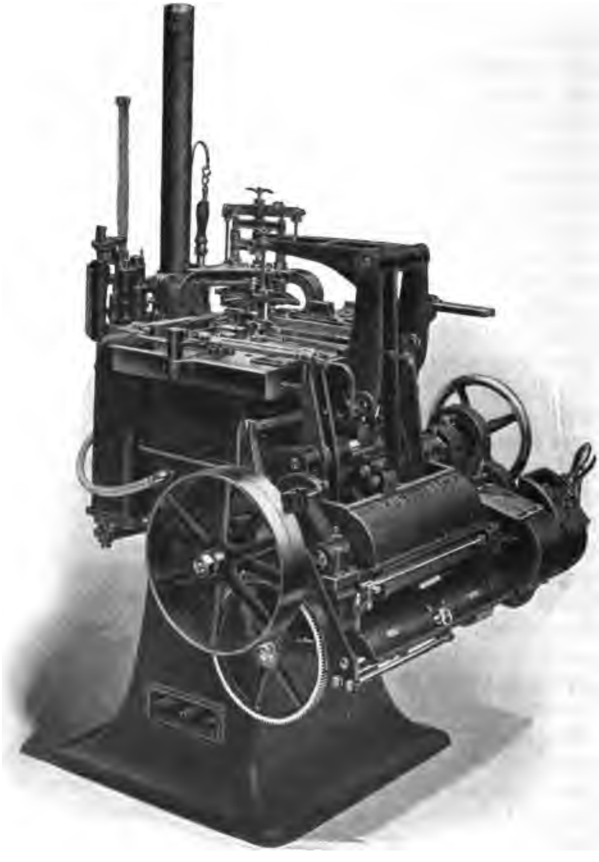

FIGURE 73
The TYPE CASTER [Convertible].

type in justified lines, he buys the additional units and converts it into the COMPOSING MACHINE: Built on the unit system, "the MONOTYPE helps you grow and grows with you." In a number of the larger MONOTYPE plants the TYPE CASTER is used for casting all sorts because it is a simpler and cheaper machine than the standard MONOTYPE Composing Machine and Type Caster.

354. Holder for Composition Matrices, Fig. 74, 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. 47, page 137. It is also used with the MATRICES, twelve point and smaller, supplied by our MATRIX Library (¶363), for casting type to be set by hand.

FIGURE 74

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.

This HOLDER should 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. 74) 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 in 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 ¶359.

355. The Sorts Matrix, Fig. 75, 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. 76, 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. 75 the figures beneath the character (18 8) indicate the setting of 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. Fonts for any faces made in Sorts Matrices may be obtained through our MATRIX Library (¶363).

FIGURE 75

SORTS MATRIX; for casting type for the case from fourteen to thirty-six point.

356. The Sorts Matrix Holder, Fig. 76, is used with the SORTS MATRICES, Fig. 75. Like the HOLDER for COMPOSITION MATRICES (¶354) it takes the place of a MATRIX CASE: To change MATRICES the HOLDER is taken out of the CASTING MACHINE, just as the MATRIX CASE is slid out; the knurled screw is slacked off, opening the clamps so that

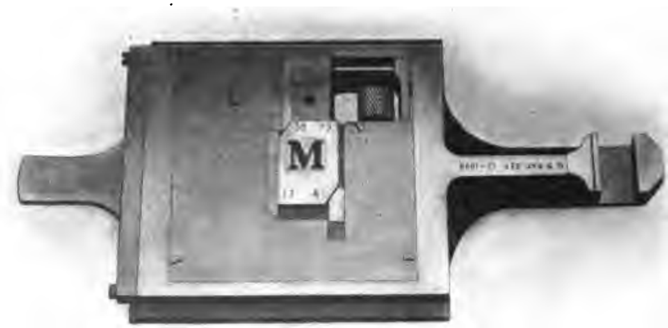

FIGURE 76

SORTS MATRIX HOLDER: Holds SORTS MATRICES (Fig. 75) one at a time for casting type for the case.

the MATRIX may be lifted out and the MATRIX for the next character inserted. A turn of the screw brings the MATRIX to correct position and locks it in place; the HOLDER is then put back in the CASTING MACHINE. The MATRICES used with this HOLDER have no cone-hole for the CENTERING PIN to seat in, like the COMPOSITION MATRICES, see Fig. 4 page 6; instead the cone-hole is in a bushing in the HOLDER itself, on the side opposite that shown in Fig. 76. The MATRIX is accurately positioned in the HOLDER by stops against which the MATRIX is moved by the clamps when these are closed up by turning the screw; it makes no difference at what angle the MATRIX is placed in the HOLDER, these clamps will position it perfectly, provided the MATRIX and HOLDER are clean. The CENTERING PIN accurately positions the HOLDER, and consequently the MATRIX it carries, when the PIN seats in the bushing of the HOLDER. For special ABUTMENTS 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 ¶370.

357. 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 15, 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 (Symbol 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 (¶354) 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 (¶355) the rear JUSTIFYING WEDGE is replaced with a special WEDGE (Symbol 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.

358. The Wedges used for sorts casting with the GAGES for setting them, are shown in Fig. 77. The lower WEDGE (47S) in this cut takes the place of the NORMAL WEDGE, Fig. 10 page 15, and is moved, by means of its GAGE, shown beneath this WEDGE, when the NORMAL-WEDGE LOCKING

FIGURE 77

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.

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 picture, replaces the rear JUSTIFYING WEDGE when casting characters from SORTS MATRICES (¶355); 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 (Symbol 60S), shown at the lower right corner of Fig. 77, 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 points when the PACKING PIECE (60S) is inserted, for this takes seventeen points off the size of the character. Both WEDGES (46S and 47S) are set by bringing the required graduation on their GAGES to the left edge of the TRANSFER-WEDGE-OPERATING-ROD-GUIDE CAP (Symbol 54D1).

359. To set the Type Sizing Mechanism for Composition Matrices; that is, MATRICES used with the HOLDER for COMPOSITION MATRICES, Fig. 74, page 173, determine the width body required, in thousandths of an inch, from the Table of Type Sizes, page 26, and use the Table of WEDGE Positions for Casting Sorts from Composition MATRICES, Fig. 78, page 178, 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 GAGE, Fig. 77, page 176, in the position indicated and, in the same way, set the front (10D) and rear (11D) JUSTIFYING WEDGES using the upper GAGE shown in Fig. 77. If the table, Fig. 78, 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. NOTE: The ABUTMENT-SCREW PACKING PIECE (60S), see Fig. 77, 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, page 26, we find that the body of this character is to be .0523" wide; the table, Fig. 78, 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.

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	.0805	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 78

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. Note that for some sizes the MOLD-BLADE ABUTMENT SCREW must be adjusted.

360. To set the Type Sizing Mechanism for Sorts Matrices, Fig. 75, page 174, it is not necessary to use the Table of Type Sizes, as described in the preceding paragraph, for the marks on the MATRIX (¶355) indicate the setting of the WEDGES to make the body the required width. As described in ¶358, 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. 77, page 176. 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. 75, 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. 75, is the position for the special JUSTIFYING WEDGE (46S). Both WEDGES are positioned with their respective GAGES as described in ¶358.

361. Arrange the characters in a font according to set sizes when casting sorts, in order to avoid unnecessary settings of the WEDGES. Thus, Fig. 75, page 174, 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. 75; 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.

362. Casting Spaces and Quads: The table of WEDGE Positions for Casting Spaces and Quads, Fig. 79, page 180, 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 ¶359, which describes the use of the similar Table of WEDGE Positions for Casting Sorts from Composition MATRICES.

363. The Matrix Library supplies MATRICES for casting type, to be set by hand from the case, of all faces shown in the MONOTYPE Specimen Book. For series fourteen points and larger, the MATRICES shown in Fig. 75, page 174, are used for this purpose, but for series twelve points and smaller, MATRICES similar to the COMPOSITION MATRICES shown in Fig. 5, page 8, are furnished. The MATRICES for

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
*2¼	.0311	2	2	.2663	19¼	*10¾	.1487	10	6	.3839	27¾
*2½	.0346	2	4	.2698	19½	*11	.1522	10	8	.3873	28
*2¾	.0380	2	6	.2732	19¾	*11¼	.1556	11	2	.3908	28¼
*3	.0415	2	8	.2767	20	*11½	.1591	11	4	.3943	28½
*3¼	.0450	3	2	.2801	20¼	*11¾	.1625	11	6	.3977	28¾
*3½	.0484	3	4	.2836	20½	*12	.1660	11	8	.4012	29
*3¾	.0519	3	6	.2870	20¾	*12¼	.1695	12	2	.4046	29¼
*4	.0553	3	8	.2905	21	*12½	.1729	12	4	.4081	29½
*4¼	.0588	4	2	.2940	21¼	*12¾	.1764	12	6	.4115	29¾
*4½	.0623	4	4	.2974	21½	*13	.1798	12	8	.4150	30
*4¾	.0657	4	6	.3009	21¾	*13¼	.1833	13	2	.4185	30¼
*5	.0692	4	8	.3043	22	*13½	.1868	13	4	.4219	30½
*5¼	.0726	5	2	.3078	22¼	*13¾	.1902	13	6	.4254	30¾
*5½	.0761	5	4	.3113	22½	*14	.1937	13	8	.4288	31
*5¾	.0795	5	6	.3147	22¾	*14¼	.1971	14	2	.4323	31¼
*6	.0830	5	8	.3182	23	*14½	.2006	14	4	.4358	31½
*6¼	.0865	6	2	.3216	23¼	*14¾	.2040	14	6	.4392	31¾
*6½	.0899	6	4	.3251	23½	*15	.2075	14	8	.4427	32
*6¾	.0934	6	6	.3285	23¾	*15¼	.2110	15	2	.4461	32¼
*7	.0968	6	8	.3320	24	*15½	.2144	15	4	.4496	32½
*7¼	.1003	7	2	.3355	24¼	*15¾	.2179	15	6	.4530	32¾
*7½	.1038	7	4	.3389	24½	*16	.2213	15	8	.4565	33
*7¾	.1072	7	6	.3424	24¾	*16¼	.2248	16	2	.4600	33¼
*8	.1107	7	8	.3458	25	*16½	.2283	16	4	.4634	33½
*8¼	.1141	8	2	.3493	25¼	*16¾	.2317	16	6	.4669	33¾
*8½	.1176	8	4	.3528	25½	*17	.2352	16	8	.4703	34
*8¾	.1210	8	6	.3562	25¾	*17¼	.2386	17	2	.4738	34¼
*9	.1245	8	8	.3597	26	*17½	.2421	17	4	.4773	34½
*9¼	.1280	9	2	.3631	26¼	*17¾	.2455	17	6	.4807	34¾
*9½	.1314	9	4	.3666	26½	*18	.2490	17	8	.4842	35
*9¾	.1349	9	6	.3700	26¾	*18¼	.2525	18	2	.4876	35¼
*10	.1383	9	8	.3735	27	*18½	.2559	18	4	.4911	35½
*10¼	.1418	10	2	.3770	27¼	*18¾	.2594	18	6	.4945	35¾
*10½	.1453	10	4	.3804	27½	*19	.2628	18	8	.4980	36

*** 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 79

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.

composition, which are sold, and the MATRICES for casting sorts, which are leased, are made from the same punches and the characters cast from either kind of MATRIX are identical. The only difference is that the MATRICES leased for sorts casting only, have but two slots, on opposite sides, to enable them to be used in the HOLDER shown in Fig. 74, page 173, while the MATRICES sold have slots in all four sides so that they may be carried in a MATRIX CASE and used for casting type in justified lines; of course, they can be used also in the HOLDER for casting sorts. Thus, the MONOTYPE user may fill his cases with type cast from MATRICES obtained through our Library System and, when he finds that the demand for a face warrants his casting this in automatically justified lines, instead of setting it by hand, he buys the COMPOSITION MATRICES—*The Monotype user "buys what he wants when he wants it."*

364. Wedge Positions for Library Fonts twelve points and smaller: There is not room on these MATRICES to mark the WEDGE positions like the MATRICES for fourteen points, and larger, Fig. 75, page 174, and therefore, with Library fonts, twelve points and smaller, a Table of WEDGE Positions is furnished for each font, see Fig. 80, page 182. Before using one of these fonts be sure that the characters are arranged according to their set sizes as shown in Fig. 80 and explained in ¶361 for MATRICES for fonts fourteen points and larger.

365. Always take a proof of a font cast from Library Matrices before returning the font, setting the caps between cap H's and the lower case between lower case m's as explained in ¶285.

366. 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 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 points 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

6 Point 8A : 81 Matrices in Font

Line Standard on same body as face .065

Character	Normal Wedge *47S	Front Just. Wedge 10D	Rear Just. 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

*** Abutment-screw Packing Piece must be in position.**
To avoid unnecessary settings of the Wedges, cast all characters on the same line of the table before shifting the Wedges.
Line by Cap H; it is not necessary to line up for each character.
Before returning a font lock up one type of each character (caps between cap H's, lower case between lower case m's) and take a press proof to test the accuracy with which they have been cast.

FIGURE 80
Size Card, with WEDGE positions, furnished with fonts of Library MATRICES twelve point and smaller.

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

MATRIX MARKING	36P	30P	24P	18P	14P
18–8	1AD	2AD	1BD	1CD	3CD
14–8	2AD	3AD	2BD	2CD	1AE
11–8	3AD	1BD	3BD	2CD	1AE
8–8	1BD	2BD	1CD	3CD	2AE
5–8	2BD	3BD	2CD	1AE	3AE
2–8	3BD	1CD	3CD	2AE	1BE
*17–8	1CD	2CD	1AE	3AE	2BE
*15–8	2CD	3CD	2AE	1BE	3BE
*13–8	3CD	1AE	2AE	2BE	1CE
*12–6	1AE	2AE	1BE	2BE	1CE
*10–6	2AE	3AE	2BE	1CE	2CE
*9–4	3AE	1BE	2BE	1CE	3CE
*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 81

SPEED INDEX PLATE: Gives the positions for the TUMBLER, SECTOR LEVER, and BACK GEAR for the various point sizes and MATRIX markings.

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.

• **367. The Speed Regulating Attachment:** The TYPE CASTER and all COMPOSING MACHINES with the Display Type Attachment, for casting type fourteen points and larger, are equipped with the Speed Regulating Attachment shown on the TYPE CASTER in Fig. 73, page 172. 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. 73 at the extreme right; 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 the knob directly above the right corner of the base in Fig. 73. The SECTOR LEVER, not shown in this view, is directly under the HAND WHEEL at the front of the machine; it 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.

368. Changing speed in casting type from Sorts Matrices (Fig. 75, page 174): As explained in ¶360 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. 81, page 183, 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 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.

369. 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 (¶283). 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 (¶284). 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 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.

370. Special Abutments for Sorts Matrix Holder, Fig. 76, page 174: In casting type from SORTS MATRICES (14 points 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 an eighteen-point face on fourteen-point body. This may be done by changing the ABUTMENT of the HOLDER, against which the clamp locks the MATRIX to hold it while the type is cast. In short, while the amount the CENTERING PIN may be adjusted to change the alignment is limited to three and one-half points, there is no limit to the amount the SORTS MATRIX may be moved in its HOLDER. These special abutments are as follows:

SYMBOL 61S19: for casting 20 point faces on 18 point body
SYMBOL 61S20: for casting 18 point faces on 14 point body
SYMBOL 61S21: for casting 30 point faces on 24 point body; for casting 36 point faces on 30 point body
SYMBOL 61S22: for casting 24 point faces on 18 point body
SYMBOL 61S23: for casting 24 point faces on 20 point body

371. Molds for use with Sorts Matrices: See next chapter.

CHAPTER XLI

Molds

372. Two kinds of 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 CASTER (Fig. 73, page 172), 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 points and larger the COMPOSING MACHINE must be equipped with the Speed Regulating Attachment (¶367).

373. Composition Molds, Fig. 11, page 16, 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 quite as well as for casting type in justified lines with high or low quads and spaces. To do this latter, these MOLDS are made with two BLADES one above the other; the thickness of the TOP BLADE is about one-eighth of an inch. When casting type and high quads and spaces, both BLADES move together as though they were one piece of steel. While the MATRIX for the character to be cast is being positioned over the MOLD opening, 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 as described in ¶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 CASTING MACHINE automatically unlatches the TOP BLADE of the MOLD, from the PIN which pulls it back, so that this BLADE is not pulled back with the BOTTOM BLADE, to make the width of the type the size required; therefore the top of a low quad or space is cast against the bottom of the TOP BLADE, instead of against the bottom of a blank MATRIX.

374. 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 15) 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 ¶300, high quads and spaces are used to support the overhang of characters cast from DOUBLE MATRICES, but if the matter containing these big figures is to be printed from type, or stereotyped in the rush of a newspaper office, 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 recast with high quads and spaces, if plates are to be made, by turning a lever at the Casting Machine.*

375. 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 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 (shown in Fig. 11, page 16) 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.*

376. 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.

377. 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.

378. 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 fool proof. 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.

379. Don't run Molds dirty: The first half (¶380) 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.

380. Don't run Molds without proper oil: This is the second half (¶379) 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.

381. 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.

382. 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.

383. 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 and in proper order, so as not to spring the MOLD. Oil carefully and turn on the water, then turn the machine over by hand once, to make sure that everything is working properly—then start the machine, not before.

384. 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.

385. 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.

386. 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.

387. 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.

388. 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. New COMPOSITION MOLDS (¶373) make high quads .8889″ in height. When the MATRIX SEATS of a COMPOSITION MOLD wear so that the high quad is .8868″ high, the MOLD must be restored to height. A SORTS MOLD (¶377) should be restored to height-to-paper if it makes high quads shorter than .8668″. 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.

389. Don't try to repair Molds: No operator, no matter how skilful, can repair a broken MOLD or lap one that has worn out of true, 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 with it samples of the type it produces and a memorandum giving details of the defects.

390. 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 re-adjust it if necessary. Repeat this examination after the MOLD has run a half a day and also a full day.

391. 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 of 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 XLII

Metal

392. 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.

393. 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?

394. 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.

395. 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 it is these ingredients that keep the MOLD from leading. The lead that sticks to the MOLD wears it out of true, causes burrs 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 only "save" 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.

396. 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.

397. 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.

398. Do not use linotype metal on the Monotype; it is very soft, for it must be cast at a temperature 200° lower than the MONOTYPE uses, and a metal to cast at such a low temperature cannot carry enough tin and antimony to wear well or work properly in the MONOTYPE MOLD.

399. 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, a most important point 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 "
Tin	9 "

For unusually long runs the antimony and tin must be increased.

Lead	58 per cent.
Antimony	26 "
Tin	16 "

400. 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 POT at the proper level and at uniform temperature; a shelf is provided on the side of the 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.

401. The melting furnace 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 1000 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 melting 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 underwriter's 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. There are several excellent furnaces made that provide for drawing the metal from the bottom of the pot, instead of ladling it from the top, and also for thoroughly mixing the metal by means of a mechanical puddler operated by a lever. These furnaces not only save time in melting, but also insure cleaner metal. The puddling brings the lighter dross and dirt to the top of the metal; it is very difficult to get perfectly clean ingots when the metal is ladled from the top of the pot, because the metal must be lifted through this dross and dirt. By drawing off the metal from the bottom of the pot considerable loss by oxidation is saved.

402. 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 kept at 730° 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 get 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 shovelled in, to fill the pot, and then churned into the molten metal; repeat this until the pot is full of the molten metal.

403. Pouring: A suitable flux is a great aid in keeping the metal in good condition; the following has been found most satisfactory for MONOTYPE metal:

$\frac{1}{8}$	by	weight	sal ammoniac
$\frac{1}{8}$	"	"	powdered rosin
$\frac{1}{4}$	"	"	tallow or lard oil
$\frac{1}{2}$	"	"	charcoal

Mix thoroughly and use a heaping tablespoonful with each thousand pounds of metal. Do not use rosin alone as a flux; it makes the metal brittle and, unless it be thoroughly worked out, is liable to make the PUMP stick. When the metal is melted, add the flux and stir it into the metal; then ignite the flux and dirt on top of the metal (if it does not ignite readily the metal is not hot enough) and stir from the bottom of the pot with the skimmer for five minutes, or until the flux and dirt in the dross stop burning. This separates the dross from the metal and causes it to lie as a black powder on the surface of the metal, from which it may be skimmed, leaving the surface bright and clean. To avoid taking up metal with the dross, work the dross toward the side of the pot with the blade of the skimmer held perpendicular, then tilt the blade of the skimmer on an angle, and gradually work the dross above the level of the metal between the skimmer and the side; then lift the dross out. After this the metal should be still further mixed as described in ¶404. The dross should be saved and sold. It is essential to have the metal hot enough when skimming (730°, but no more), for, unless the metal be hot enough, the most valuable part will cling to the dross and be skimmed off with it; the skimmings should be a black powder and not cakes of metal.

404. The importance of stirring: Type metal is a mechanical as well as a chemical mixture of lead, tin, and antimony. Because of the difference in specific gravity of these metals it is essential that the entire mixture be thoroughly stirred all the time it is in a 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 metals are liable to be lost with the skimmings. A furnace with a mechanical puddler (¶401) is not only a time saver but also a metal saver, but if the furnace is not equipped with this, a white potato or a block of juicy yellow pine may be used as a substitute. To use either of these, make a small hole in the cover of the furnace and through this pass an iron rod, pointed on the lower end and long enough to reach to the bottom of the metal pot; place the potato or block of wood on this and push it down to the bottom of the metal. The rod should be held in this position by a clamp on the cover of the furnace or a weight on its upper end. When inserting the potato or wood do not stand in front of the opening of the furnace (better still, close it), for the metal will boil vigorously and small particles may be thrown out. Let the metal boil for fifteen minutes; be sure that the temperature does not go above 730°. Stir the metal with the skimmer, scraping the sides and bottom of the pot. This brings to the surface a light colored scum which should be skimmed off and saved to be melted over again with the next melting; this scum contains tin and antimony which must not be lost. After this second skimming, cast into pigs as described in ¶405. If the metal be drawn from the bottom of the furnace, the dross and dirt should be left on the surface until the metal in the pot is quite low. The valve should then be shut tight and all dross and dirt skimmed off; do not allow this to run through the spout. If ladling from the top, it will probably be necessary to skim once or twice while pouring. Save these skimmings and put them into the next melting. *Always dip the metal from the bottom of the pot.*

405. Water cooled molds, ladle, and skimmer: To save time and to avoid oxidation the metal should be poured into pigs as quickly as possible; water cooled molds enable the operator to cast the metal as fast as he can ladle it from the furnace. Special MONOTYPE water cooled molds are furnished by makers of furnaces; do not use the molds made for linotype pigs, they are too large to use on the MONOTYPE. A large ladle with a wooden handle and a suitable skimmer are a necessary part of the furnace equipment.

406. Care of 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 POT to bring up any dirt that may have collected. Then rub the material on top of the metal against the side of the 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. Never skim when the temperature is less than 720°, for at a lower temperature a large part of the skimmings will be antimony. Observing these cautions about using good metal and keeping it clean will greatly prolong the life of PUMPS and MOLDS.

407. "Doctoring" metal—*Don't.* A MONOTYPE owner or 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 for 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.

408. Old foundry type: Do not sell this, keep it for use in your own foundry; it should be cleaned, run into pigs, and reserved for casting the larger sizes, fourteen point and over, of type to be set by hand from the case. This metal 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, at the slower speeds used for the larger sizes. The speed of casting may be increased considerably by adding one per cent. of tin.

CHAPTER XLIII

Operating the Keyboard

409. "*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 hit the KEYS correctly he may depart, with some show of reason, from standard practice if he wants to—*but he won't.*

410. 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 enough anti-toxin 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, perhaps the most important part of so-called scientific management, of such great value; it means the conservation of energy of workmen by observing, in most minute detail, the motions required to perform a given piece of work and then analyzing and studying this data so that, by changing the methods of working and the tools used, all useless motions are eliminated. The results 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 in both his working and in his leisure hours.

411. 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 even 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.

412. 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. 82 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. 83. 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, leaning back from perpendicular one and one-half inches to the foot. The front legs of the chair shown in Fig. 82 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.

FIGURE 82
KEYBOARD CHAIR: Note the solid construction and the straight back to give support to the operator.

413. 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.

FIGURE 83

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. 82).

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. 83.

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 side the fingers do not become tired and numb, as they soon do if held higher than the elbows.

414. 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. 83, page 203, 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.

415. 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 complete 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, to strike the JUSTIFYING KEYS while depressing the JUSTIFYING-SCALE KEY with the forefinger of the left hand; as soon as the JUSTIFYING SCALE has been read, move the left hand from the SCALE KEY to the COPY HOLDER and strike the JUSTIFYING KEYS with the right hand while advancing the copy with the left. For very wide copy the twenty-inch COPY HOLDER should be used.

416. Justifying: The preceding paragraph explains the movements of the right and left hands at the end of the line if the copy is adjusted; if this is not necessary, use the JUSTIFYING KEYS as follows: Depress the JUSTIFYING-SCALE KEY with the little finger of the *right hand* (the finger nearest this KEY when setting Roman) and, at the same time, raise the left hand to the top of the BOARD ready to justify as soon as the SCALE is read. If any of the JUSTIFYING KEYS on the right KEYBANK (12 to 15 inclusive) be required, it is easier to raise the right hand from the SCALE KEY than to reach across for these KEYS with the left. Most operators could increase their product at least ten per cent. by a little study of their motions between hitting the last character KEY for the finished line and the first KEY for the next line.

417. 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 (¶412), 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 the eyes so that it can be read easily and without strain when leaning back in the chair (¶412). Do not have the copy too low; Fig. 83, page 203, 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.

418. 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 to attach an adjustable lamp bracket to the left side of the KEYBOARD (Fig. 83, page 203) 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, JUSTIFYING 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.

419. Operating position: Fig. 83, page 203, 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 BOARD 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. 83. 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 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 XLIV

Fingering

420. 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?*

421. 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.

422. The fundamental idea of the universal keyboard is to reduce to the minimum the motions, for motions require effort, of the two hands and 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, see Fig. 84. 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

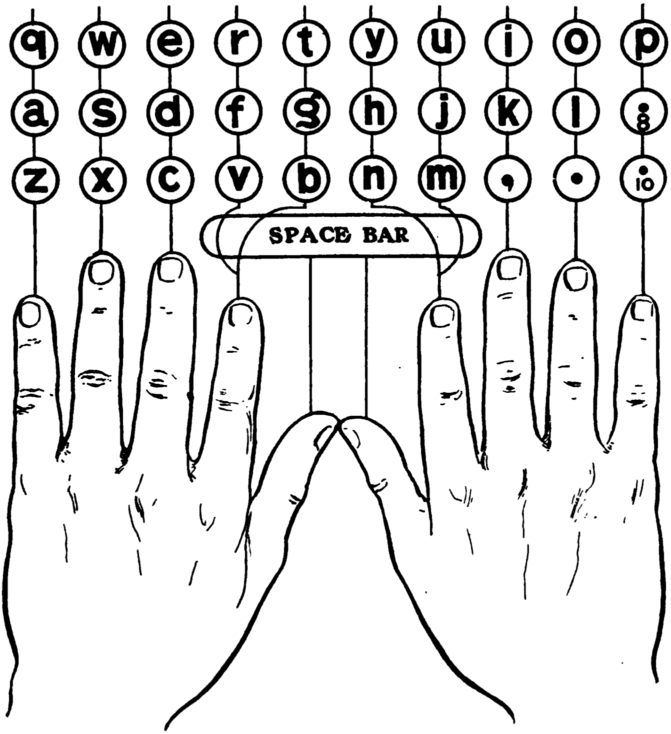

FIGURE 84
The arrangement of the KEYS of the alphabet and the finger which is responsible for each.

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 inch and one-eighth.

423. 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 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 can not 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. 84, page 209, 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

424. Distribution of work between the right and left hands: A study of Fig. 84, page 209, 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	"	"	*right* forefinger	h	"	"	*right* "
d	"	"	*left* second finger	e	"	"	*left* second finger
space	"	"	*right* thumb	space	"	"	*right* thumb

425. 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 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.*" (¶411.)

426. 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.

427. Learn both the arrangement of Keys and the fingers that control the different Keys; that is, memorize the diagram, Fig. 84, page 209, 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 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 signboard 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.

428. The finger position: It is almost impossible to hit the KEYS correctly unless the operator is properly seated

FIGURE 85
The hands in correct operating position, each finger resting naturally on the KEY assigned to it and the two thumbs on the SPACE BAR.

and the KEYBOARD and copy correctly adjusted to suit his physical requirements. Before proceeding further, reread the preceding chapter on "Operating the KEYBOARD," paying especial attention to ¶412 to 419 inclusive. Let the tips of the fingers rest lightly upon the KEYS in the second row above the SPACE BAR, as explained in ¶423, and as shown in Fig. 85. 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. 86, 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 (¶423), then drop the thumbs so that they will rest on the SPACE BAR.

429. 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 can not 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 86

The method of evening up the finger-tips before placing them on the KEYS, as shown in Fig. 85.

430. 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.

431. 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*.

432. "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. 87. In this work the expert operator uses both quad (or leader) KEYS, striking the KEY on the left KEYBANK 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 (¶429), 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 ems to zero without losing a unit.

FIGURE 87
The second finger supported by the thumb and forefinger for quadding and leadering out lines.

433. 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, 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 to acquire an easy, accurate finger motion. To those who are in earnest in this we urge especial 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 XLV

Preparing Copy

434. "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?

435. 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; for the operator who must slow up for bad copy inevitably loses the free and easy finger motion necessary for speed.

436. 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 proofroom, as carefully as a first proof is read from unedited copy? After this has been done, proofreading consists of comparing the proof with this edited copy. Certainly it is quicker and cheaper to correct a mistake in the copy with a lead-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 five thousand ems an hour is hitting three KEYS every second, setting thirty words a minute, a word every two seconds. Surely no further argument on the advantage of furnishing the operator proper written instructions (clean copy) is necessary.

Figure 88
The Style DD Keyboard.

CHAPTER XLVI

The Double Keyboard

437. The Style DD Double Keyboard is two Keyboards in one (Fig. 88): 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. 89.

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.*

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.*

FIGURE 89

Duplicating with the Style DD KEYBOARD; setting the same matter in two different measures and sizes of type.

438. "*When the Plungers* **F** *(Fig. 30, facing page 120) are moved by depressing a Key, air enters two of the Pipes* **A** *(Fig. 33) 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).

439. 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, were it not for a locking device, the PUNCHES corresponding to this KEY would be forced through the paper on both PAPER TOWERS and the unit value of the character struck 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 KEYBOARD is shown on Plate I, at the back of the book: "*A mechanism, not shown* (the 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 struck. Therefore, beyond the PLUNGERS, the DOUBLE KEYBOARD is exactly the same as two single KEYBOARDS, *plus a "switch" for controlling the Punch Locks for the right and left Paper 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.

440. The Switch (Fig. 90) 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

FIGURE 90

Details of the SWITCH, one-half actual size; see Fig. 88, page 218, which shows the DOUBLE KEYBOARD complete. The SWITCH controls the 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 BOARD duplicates as shown in Fig. 89, page 219.

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.*

This chapter was composed on the DOUBLE KEYBOARD: The same KEYS that produce the ten-point matter above now produce this eight point, exactly as if the operator had moved with his copy to another KEYBOARD as quickly as he could turn the SWITCH. The eight-point insert finished, to go on with the ten-point matter—"*Turn the Switch, that's all.*"

441. For duplicating turn the Switch to its central position: This double product (Fig. 89, page 219), 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 the 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?

442. The Justifying-scale Keys also operate the Punch Locks of the Double Keyboard. "*The left green Key at the bottom of the Board is used to revolve the Justifying Scale automatically*" (¶122). "*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 I, 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 both green KEYS at the bottom of the BOARD are SCALE KEYS; the left one of these KEYS operates the left JUSTIFYING SCALE and the right green KEY operates the right JUSTIFYING SCALE. There is no special RESTORING KEY—the lower row of JUSTIFYING KEYS are always used for this purpose. But, besides operating the JUSTIFYING SCALES, the green KEYS of the DOUBLE KEYBOARD also operate the PUNCH LOCKS, just as they are operated by the SWITCH, Fig. 90, page 220. Thus, when the SWITCH is in central position for duplicating (¶441) and the left green KEY is depressed, to rotate the left JUSTIFYING SCALE, the PUNCHES of the right PAPER TOWER are locked, and, so long as this SCALE KEY is held down, the right PAPER TOWER is locked out exactly as if the SWITCH were turned from central position, for duplicating, 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 Key, to rotate the left Justifying Scale, and holds this Scale Key down while he strikes the Justifying Keys indicated by the 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 the possible confusion of using two BELLS on the same KEYBOARD, the signal to justify, when the EM-RACK POINTER is within four ems of zero, is given by the lighting of an electric light; each PAPER TOWER has its own light.

443. The Scale Keys are used to cut out characters not required in both ribbons when using the DOUBLE BOARD for duplicating: For example, in Fig. 89, page 219, the first line of six point "A new process of" ends with the word "of"; to justify this line the operator depresses the right SCALE 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 SCALE KEY to lock the right TOWER. Similarly, the first line of eight point in Fig. 89 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 SCALE 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 SCALE KEY while the hyphen is struck. After striking the hyphen and while the left SCALE KEY is still held down, the operator reads from the left SCALE the justification required for this line, and, with the SCALE 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 SCALE KEY and strike a justifying space, as described above, before beginning the second line of eight point. Thus, by using the SCALE KEYS or the SWITCH, it is quite possible to vary the matter being set simultaneously on both PAPER TOWERS.

444. Duplicating double-justified matter: Fig. 89, page 219, 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). "*If the operator desires to determine the Justifying Keys to be struck to justify a section of a line, at a point where the Scale Key cannot be used, he determines the shortage of this section from the reading of the Em Scale and Unit Indicator, exactly as though he intended to justify the section 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 been rotated by depressing its Key, 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 (see Plate I, 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 I) 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).

445. 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 as SCALE KEYS: 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

* 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 *right* green KEY will still be the SCALE KEY for the *right* JUSTIFYING SCALE and the *left* green KEY the Restoring Key for the *right* counting mechanism.

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 KEYS, 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 SCALE KEY is used both to revolve the SCALE and to lock the other PAPER TOWER while the JUSTIFYING KEYS indicated are struck.

446. The following examples illustrate special uses of the DOUBLE KEYBOARD. It is quite impossible to cover all of these, for almost 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.*"

447. 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. 91, page 226, 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. 91 is set in six point 56J ($7\frac{1}{4}$ set), twenty-two picas measure; the left column 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

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*"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; *the cost of this conversion is the difference between the first cost of the two styles of Keyboards.*

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, depress the left SCALE KEY, 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 lower row is struck, both EM RACKS move to the left and the *right side* of the BOARD is positioned to

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 91
Double justification on the Style DD KEYBOARD, using one perforating mechanism and both counting mechanisms.

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 uses the right SCALE KEY, 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 (¶444): *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.*

448. 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, 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 ¶444.

449. 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 ¶440, 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 BOARD 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 saved. In this work, 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 following on copy and proof of the larger type, 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 eight 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 8 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 8½, since the twelve-point face is twelve set and the eight-point face is eight and one-half set. The zero of this paper scale is, of course, at the left, coinciding with the point on the EM SCALE where the eight-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 eight-point matter on the left PAPER TOWER. In making up, lift out the "deadwood" in the eight-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.

450. For intricate work with two different Matrix Case Arrangements the DOUBLE KEYBOARD may be used with great advantage by using BUTTON CLIPS (Fig. 38, page 120) 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.

451. 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."***

452. 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.*"

453. Wide measure work: The maximum measure for a 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. 92 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

*The MONOTYPE is built on the unit system and, just as the "Pianola," may be applied to the TYPE CASTER, converting it into the standard MONOTYPE Composing Machine and Type Caster (¶353), the SIXTY PICA ATTACHMENT may be applied to any CASTING MACHINE.

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.

FIGURE 92
Wide measure work on the DOUBLE KEYBOARD.

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.

454. Wide measure work with one ribbon illustrates another use of the BOARD with one perforating and two counting mechanisms (¶447). 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) equals eighty-four and one-half KEYBOARD ems and three units (see table for Changing Pica Ems, Plate III, at back of book), that is, twenty-four 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 twenty-four and one-half ems three units, and on the right side of the BOARD for sixty 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 sides 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.

455. 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.

456. Saving Keyboard changes: In offices specializing 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.*"

457. Using figures regardless of the set of the face: Fig. 93 shows that the DOUBLE KEYBOARD removes the last

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 93

"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.

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.

458. "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 (¶277), which causes all characters to be registered as nine units, and arrange the fractions in order on the right KEY-BANK (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 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.

459. 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 re-winds the first, so that it is ready to put on the CASTER when the second ribbon is finished.

460. Box heads: For offices handling tariff and other tabular matter the DOUBLE BOARD has especial 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.

461. 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.

462. "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 point or ten until he sees it in both. With the DOUBLE BOARD a sample page can be set for one composition cost in both sizes. 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.*

463. 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.*"

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CHAPTER XLVII

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."

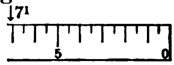
We have known operators to injure their future prospects because, in their anxiety to be "doing stunts," they neglected the fundamental principles, believing that they could learn to set straight matter properly any time. They forgot that the hardest of all learning is "unlearning," and that careless 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."

464. 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 for this character in his stick. It is possible to illustrate but a few of the almost infinite uses to which the MONOTYPE has been put for tabular composition, but the examples selected illustrate basic principles. 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 enable them to meet the requirements of any office.*

465. A great advantage of this graphical method of explaining tabular work is that it affords a ready means for the compositor testing 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 III, at back of book), table of Allowance for Rule and Squeeze (Plate IV), a Justifying Scale (Plate II), and, for determining the number of ems and units in the words of a line, the unit values of the different letters and characters given in Fig. 94, facing page 232. For those who cannot test their work by trying on a KEYBOARD the lines thus analyzed, we will willingly criticize any examples sent us.

466. 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.

467. All these examples are set in eight point (8A series, 8½ set, Arrangement C); the Boldface rules enclosing the specimen matter are not part of the exercise. Refer now to Fig. 95, illustrating the use of justifying spaces and quads. The bottom line (Texas) of the specimen is the one which is illustrated graphically. Immediately below this is given, between arrows extending the width of the specimen, the measure in picas, thus: ←— 5 Picas —→ Next below this, between similar arrows, comes 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), by the aid of the table for Changing Pica Ems (Plate III). Following the measure in ems and units is 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 the left of the seven-em mark on the representation of the EM SCALE and the figures "7^1" beside this arrow (the superior figure is used for units and the full size figure for ems), thus:  In setting the 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: $\overset{46}{\text{Texas}}$ The method of obtaining this total from the table of Unit Values (Fig. 94, facing page 232) will be clear from Fig. 96.

Vermont
Maine
Illinois
Texas

←— 5 Picas —→
←7 Ems 1 Unit of 8½ Set→

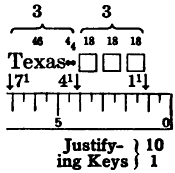
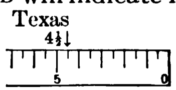
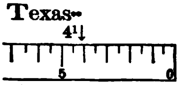


FIGURE 95
Use of justifying spaces and quads.

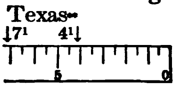
T =	13 units
e =	8 "
x =	9 "
a =	9 "
s =	7 "
	46 units

FIGURE 96
Shows forty-six units in word Texas.

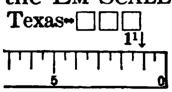
After striking the last letter (s) of the word "Texas" the KEYBOARD will indicate four and one-half ems on the EM SCALE; thus,  The two stars (**) following the word "Texas" indicate justifying spaces, and the width they are counted (4 units each) is shown by the figure four above each, thus $\overset{4\,4}{**}$ After these are put in the line the KEYBOARD will register 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 $=18\times3=3$ 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 registered after striking the second justifying space (indicated thus *),



This difference, three ems, is shown in the example by the figure three above the brace including the word and the two justifying spaces (**), thus: $\overbrace{46\quad 4_4}^{3}$ Texas** Three quads are next inserted in the line; these are represented by the rectangles with the superior figures "¹⁸" above them (the figures "¹⁸" show that each quad is counted as 18 units), thus: $\overset{18}{\square}\overset{18}{\square}\overset{18}{\square}$ The total width of the three quads is three ems, shown by the figure three above the brace including the three rectangles, thus: $\overbrace{18\quad 18\quad 18}^{3}$ □□□ After the last quad is put in the line, the KEYBOARD 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, pointing just to the left of the one-em mark on the EM SCALE and the figures "1¹" beside the arrow, thus:



In setting this line at the KEYBOARD, the operator, after striking the last em quad (□), would press down the JUSTIFYING-SCALE KEY and read the justification indicated by the JUSTIFYING-SCALE POINTER. By reference to the eight and one-half set Scale (Plate II) 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. If the JUSTIFYING-SCALE KEY were depressed at the KEYBOARD, the SCALE would revolve until the POINTER indicated the column, numbered "19" at the bottom (because the line is 19 units short of the measure); 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 II) 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 "$\frac{10}{1}$", 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: $\left.\begin{matrix}\text{Justify-}\\ \text{ing Keys}\end{matrix}\right\}\begin{matrix}10\\1\end{matrix}$ 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.

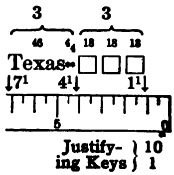
468. In this example, Fig. 95, two justifying spaces were used after the word "Texas" and these two spaces were followed by three em quads. Of course, the principles would be the same if any other number of justifying spaces were used. With two justifying spaces, however, three em quads are necessary; this will be clear from an examination of the eight and one-half set SCALE (Plate II). 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. 95, 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.

469. 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→



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 II, 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 234, 235, and 236.**

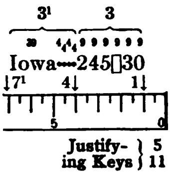
EXERCISE 2

Justifying Spaces Between Columns

Idaho	113	60
Ohio	333	25
Kansas	116	85
Iowa	245	30

⟵ 5 Picas ⟶

⟵7 Ems 1 Unit of 8½ Set⟶



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.

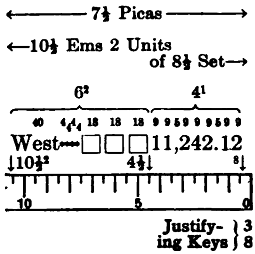
Note: By reference to the Justifying Scale (Plate II) it will be noted that if there are two justifying spaces in the line and the line is two ems (36 units) short, the Pointer will indicate a blank rectangle. In such case it will be necessary to strike a quad before the figures in order to obtain the 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, $7 \times 9 = 63$, $63+5+5=73$ 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.

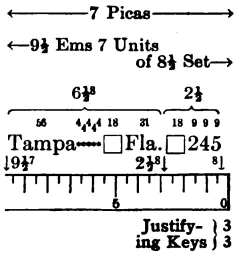
Note: By reference to the Justifying Scale (Plate II) it will be noted that if there are two justifying spaces in the line, and the line is two ems (36 units) short, the Pointer will indicate a blank rectangle. In such cases it will be necessary to strike another quad before obtaining the justification; 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 II) 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.

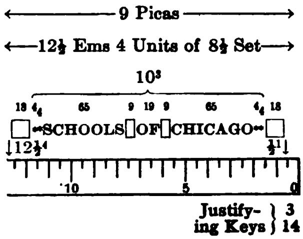
NOTE: Another way to set this exercise is to figure out the space necessary for each state abbreviation and use fixed spaces or leaders to bring the measure that number of ems and units short of zero, or a given mark-off on the EM SCALE, as described in Exercise 25.

* 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, see ¶350.

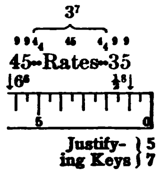
EXERCISE 6

Centering Word Column Between Two Figure Columns with Justifying Spaces

24	Price	33
23	Net	32
16	Tare	14
45	Rates	35

←— 4½ Picas —→

←6 Ems 6 Units of 8½ Set→



Object: To center a word column with one figure column flush to the right and one flush to the left of the measure by the 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.

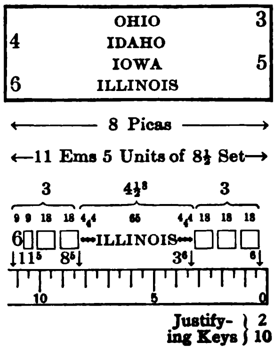
NOTE: In some cases the figure columns on either side of the word to be centered may not be of the same width and it would be necessary to equalize the columns by means of fixed spaces before justifying (see Ex. 7).

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 as the line to be justified, see ¶350.

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.

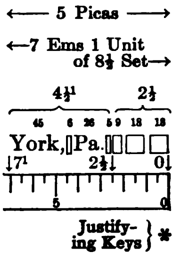
This exercise demonstrates the use of fixed spaces, on one side of a word to be centered, to equalize the space taken up by the figure column on the other side. If the figure column is on the right of the measure, allow an equal number of units of blank space on the left of the measure in addition to 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, see ¶350.

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). 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 V, 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 two fives); when two units short, use an eleven-unit space (or five and six); when three units short, use a twelve-unit space (or two sixes); when four units short, use a thirteen unit space (or six and seven—a justifying space with constant justification will also give four units); when five units short, use a five-unit space; six units, use six; seven units, use seven; eight units, use eight.

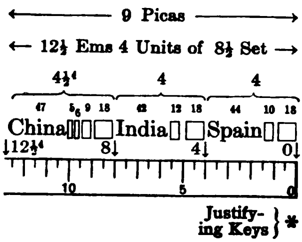
---

* JUSTIFICATION: Do not use the SCALE KEY, 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 use the SCALE KEY, 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.**

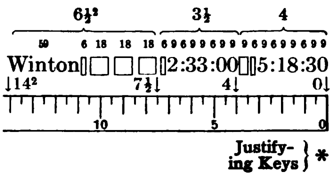
EXERCISE 10

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

← 10 Picas →

← 14 Ems 2 Units of 8½ Set →



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 and a nine-unit space in order to bring the mark-off on the EM SCALE to even ems. 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 use the SCALE KEY, 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.

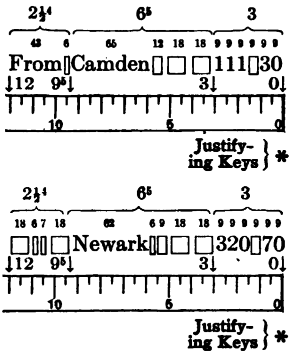
EXERCISE 11

Hanging Indentions and Fixed Spaces Between Columns

From	Camden	111	30
	Newark	320	75
	Bayonne	193	45
	Trenton	285	25

←——— $8\frac{1}{2}$ Picas ———→

←——— 12 Ems of $8\frac{1}{2}$ Set ———→



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.*

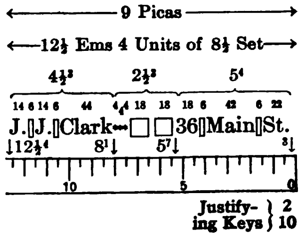
---

* JUSTIFICATION: Do not use the SCALE KEY, 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.

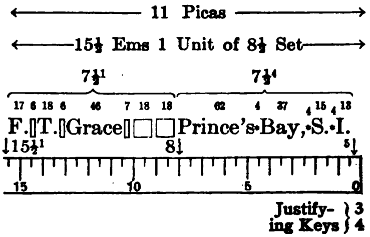
NOTE: In order to estimate the number of ems in the last column, a guide can be obtained by setting up the longest and shortest lines in the column and governing all other lines by these widths.

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, see ¶350.

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.

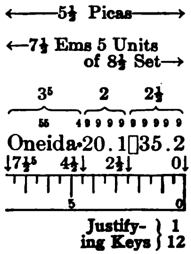
This exercise differs from Ex. 12 in that the last column is lined up on its left at a mark-off on the EM SCALE instead of on its right at zero. Ascertain the width of the last column by setting up the longest line in that column with justifying spaces between the words, and mark the nearest number of 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 use the SCALE KEY 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

Aurora	16.3	17.3
Munco	15.2	16.3
Tusten	33.3	34.2
Oneida	20.1	35.2



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 fixed space that can be registered on the KEYBOARD, and should be used only when the space lef twill not admit of the use of the various-sized fixed spaces.

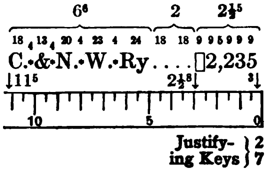
EXERCISE 15

Justifying Spaces and Leaders in Making Alignments

C., B. & Q. Ry....	1,118
Union Pacific.....	2,227
D. & R. G. Ry....	3,669
C. & N. W. Ry....	2,235

←——— 8 Picas ———→

←—11 Ems 5 Units of 8½ Set—→



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 II) 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.

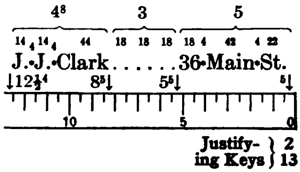
EXERCISE 16

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.	

←——— 9 Picas ———→

←— $12\frac{1}{2}$ Ems 4 Units of $8\frac{1}{2}$ Set —→



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.

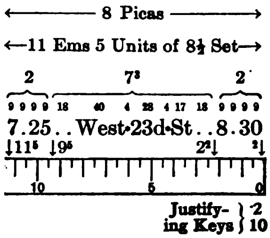
NOTE: In order to estimate the number of ems in the last column, a guide can be obtained by setting up the longest and shortest lines in the column (before starting the "take") and governing the width of all other lines by these guide lines.

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.

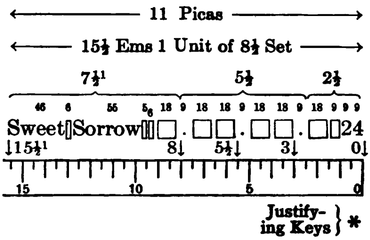
The use of leaders on either side of the word column necessitates the use of justifying spaces between the words of this column to justify the line. Use nine and eighteen-unit leaders only. Set up the first figure column flush to the left of the measure. Estimate the width of the word column and the number of em and en leaders required on either side of this word column. (Note that the sum of these three plus the width of the two 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 II) 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.*

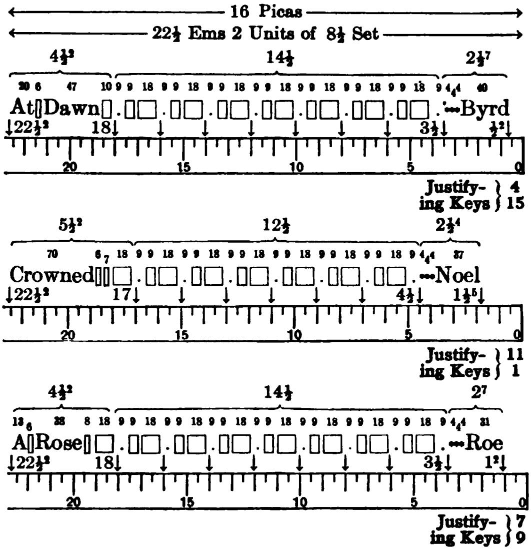
---

* JUSTIFICATION: Do not use the SCALE KEY, 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 II) 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

← 8½ Picas →

← 12 Ems of 8½ Set →

8½ 3½

30 6 47 8 8 18 18 18 9 9 9 9 9 9 9

Lye▯Brush........▯421▯30

↓12 3½↓ 0↓

Justifying Keys } *

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 use the SCALE KEY, 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

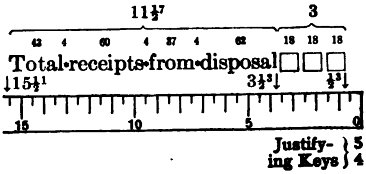
Hanging Indention

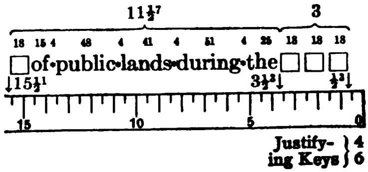
Object: The use of hanging indention and figure column, with justifying spaces and eight and ten-unit leaders.

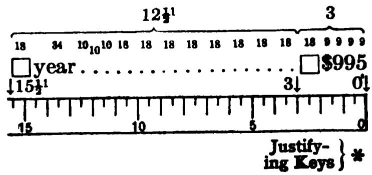
Number of claims filed in May	1,334
Total receipts from disposal of public lands during the year	$995

← 11 Picas →

← 15½ Ems 1 Unit of 8½ Set →







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 use the SCALE KEY, 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 IV).

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: If a table or other form which is to be made up with brass rules is composed of columns which average not more than five picas in width, it is customary to make no allowance for squeeze. The brass rule, especially after it has been in use for some time and has become dirty, is thicker than its rated point size and this extra thickness has the same effect as allowing squeeze.

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 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 IV).

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

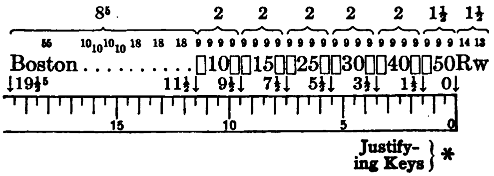
Chicago..........	11	16	26	30	40	50
Cleveland†.......	15	20	25	30	35	40
Pittsburg........	9	14	24	29	39	49
Boston...........	10	15	25	30	40	50

† 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 III), 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 IV). 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 IV); 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 use the Scale Key, 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

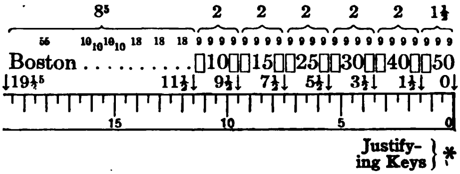
Chicago..........	11	16	26	30	40	50
Cleveland........	15	20	25	30	35	40
Pittsburg........	9	14	24	29	39	49
Boston..........	10	15	25	30	40	50

← 15 Picas with Rules (2 point) →

Actual CASTER and KEYBOARD Measure

← 14 Picas →

← 19½ Ems 5 Units of 8½ Set →



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 of 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 III); 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 258.

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* JUSTIFICATION: Do not use the SCALE KEY, 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

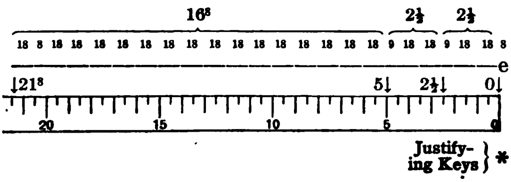
Annawan.......................Ill.	270	300
Barberton..................Ohio	120	140
Clinton.....................Iowa	310	340
Dubuque...................Iowa	310	340
East Burlington................Ill.	270	300
La Trobe.......................Pa.	175	195

←—15½ Picas—→

←—21½ Ems 7 Units of 8½ Set—→

Actual KEYBOARD Measure

←—21 Ems 8 Units of 8½ Set—→



Object: To use Monotype rule instead of 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 III, and Allowance for Rule and Squeeze, Plate IV.) 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 258.

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.

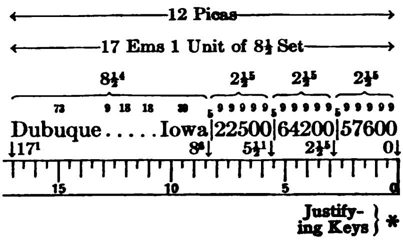
NOTE: When a MONOTYPE horizontal rule line is set, the shoulder above and below the rule should be noted when allowing for white space when the table is made up.

---

* JUSTIFICATION: Do not use the SCALE KEY, 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 instead of 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 III, and Allowance for Rule and Squeeze, Plate IV.) 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 either side of the rule.

Note: When Monotype rule is used instead of brass rule, allowance for squeeze is, of course, made as usual.

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* Justification: Do not use the Scale Key, 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.

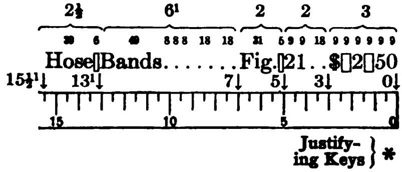
EXERCISE 26

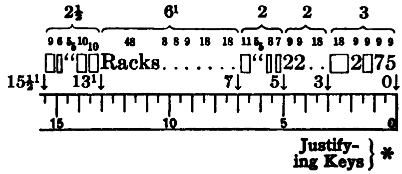
Simple Ditto Work

Hose Bands.......	Fig.	21..	$ 2	50
" Racks.......	"	22..	2	75
" Nozzles.....	"	33..	5	50
" Spools......	"	14..	1	00

← 11 Picas →

← 15½ Ems 1 Unit of 8½ Set →





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 use the SCALE KEY, 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.

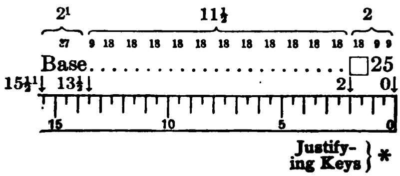
EXERCISE 27

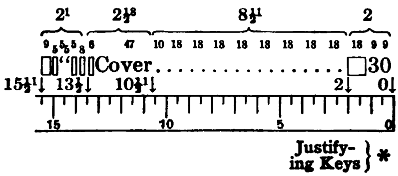
Intricate Ditto Work

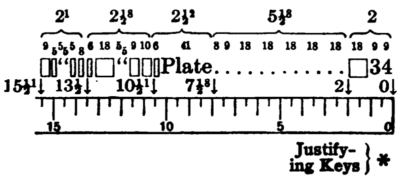
Water......................	16
“ Tank................	19
“ “ Feed...........	18
“ “ “ Valve.....	21
Base.......................	25
“ Cover..................	30
“ “ Plate............	34
“ “ “ Screw......	37

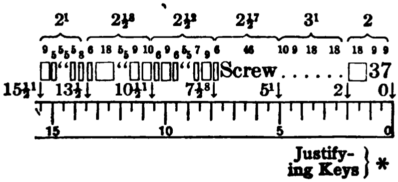
← 11 Picas →

← 15½ Ems 1 Unit of 8½ Set →









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 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 use the SCALE KEY, but strike any 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

8ʃ	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⎭	8ʃ

1	2	3	4	5	6	7	8	9
⎫	⎪	⎬	⎭	⎩	⎧	\	ʃ	⎨

Object: To show the different combinations of the nine pieces making up a set of right and left piece braces for enclosing (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.

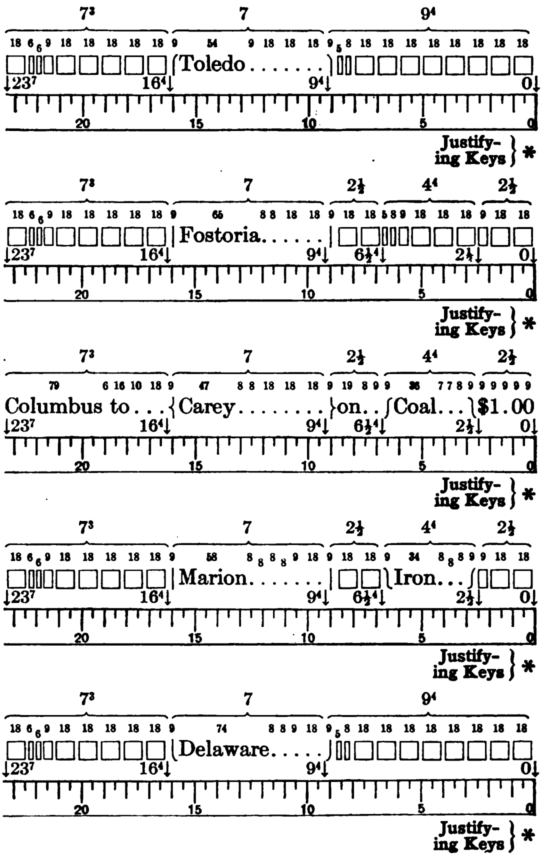
EXERCISE 29

Braces in Combination

Columbus to . . .	Toledo . . . . Fostoria. . . . . . Carey . . . . Marion. . . . . . . Delaware.	on. .	Coal. . . Iron. . .	$1.00

←16½ Picas→

←23 Ems 7 Units of 8½ Set→



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* Justification: Do not use the Scale Key, 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, quading 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 "ʃ 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 avoid having to cut leads, and it is absolutely essential that 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.

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* JUSTIFICATION: Do not use the SCALE KEY, 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

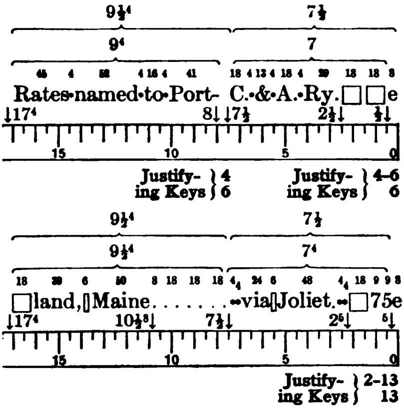
Discount allowed on "Alpha" Oil shipments in bulk.....	Any line	13
Rates named to Portland, Maine.......	C. & A. Ry. via Joliet.	75

← 12½ Picas with Rule (2 point) →

← 17½ Ems 3 Units of 8½ Set →

Actual KEYBOARD Measure

← 17 Ems 4 Units of 8½ Set →



Object: Use of double justification on three column matter and characters used as "deadwood" for allowance for rules.

The allowance for two rules (2 point) is eight units (see Allowance for Rule and Squeeze, Plate IV). 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, obtain the reading of the JUSTIFYING SCALE in the usual manner by using the SCALE KEY, 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 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 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

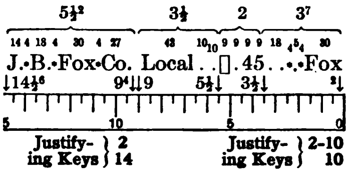
W. J. Dunn.	....	1.29	. .Dunn
Slater & Co.	Local . .	.29	. Slatco
E. E. Ewing.	....	3.36	. . Ewe
J. B. Fox Co.	Local . .	.45	. . . Fox

← 11 Picas with Rule (2 point) →

Actual Caster and Keyboard Measure

← $10\frac{1}{2}$ Picas →

← $14\frac{1}{2}$ Ems 6 Units of $8\frac{1}{2}$ Set →



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 either side, then the word, 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 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 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

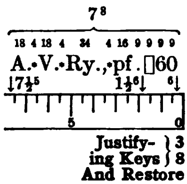
Double Justification in Twin-column Matter

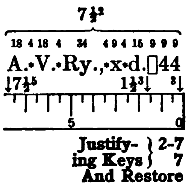
N. Y. C., pf...110	N. Y. C., com.113
B. & M., 1st pf 40	B. & M. 2d pf. 44
So. Pacific... 36	So. Pacific pf. 75
A. V. Ry., pf. 60	A. V. Ry., x d. 44

←——11½ Picas with Rule and Leads——→

←——Caster Measure 11 Picas——→

Keyboard Measure
←——5½ Picas——→
←—7½ Ems 5 Units
of 8½ Set—→





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 must be turned to the rear in order that the Em-rack Pointer may be restored by the lower 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 by the use of the green Justifying-scale Key.

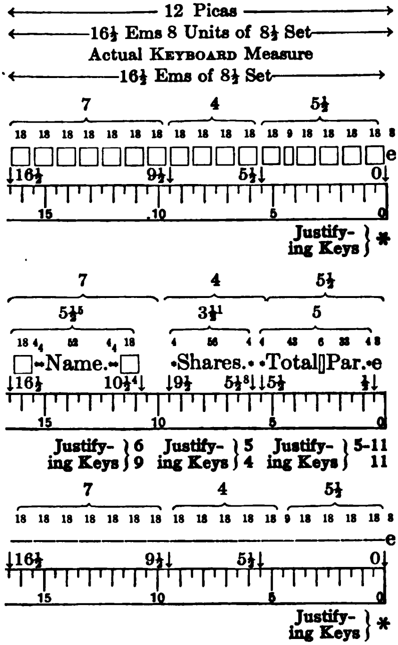
Note: This table could be set by adjusting the Keyboard to the full measure and ascertaining the justification for the first column by turning the Justifying Scale by hand. The above described method is, however, much better, as the green Justifying-scale Key is used to revolve the Justifying Scale for 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



The rule allowance for this table is eight units (4 points equals 8 units of 8½ set; see Allowance for Rule and Squeeze, Plate IV). Subtracting this from the total width of the completed table (16½ ems 8 units) set the KEYBOARD at sixteen and one-half ems. Ascertain the width of the second and third columns by the width of the longest words in the headings or figures in the columns. The remainder will be the measure for the first column. The measure for the first column is seven ems, the second four ems and the third five and one-half ems. Beginning at zero mark off 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 for that column, as otherwise the columns could not be split and brass rules inserted by the hand compositor 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 either 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, get the justification by means of the green JUSTIFYING-SCALE KEY, 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.

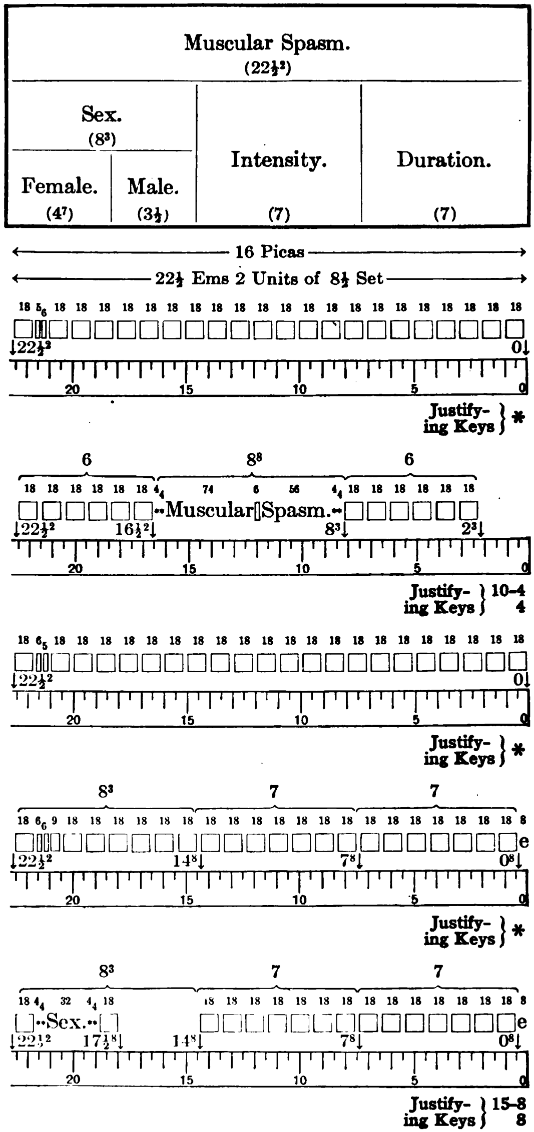
NOTE: When setting double justification on the style D KEYBOARD, the PISTON-BLOCK-VALVE HANDLE 29KC17 must be turned to the left so that the KEYBOARD is restored by pressing the green RESTORING KEY and not by the lower row of JUSTIFYING KEYS. Otherwise, the EM-RACK POINTER would be restored to the beginning of the measure when each column is single justified.

---

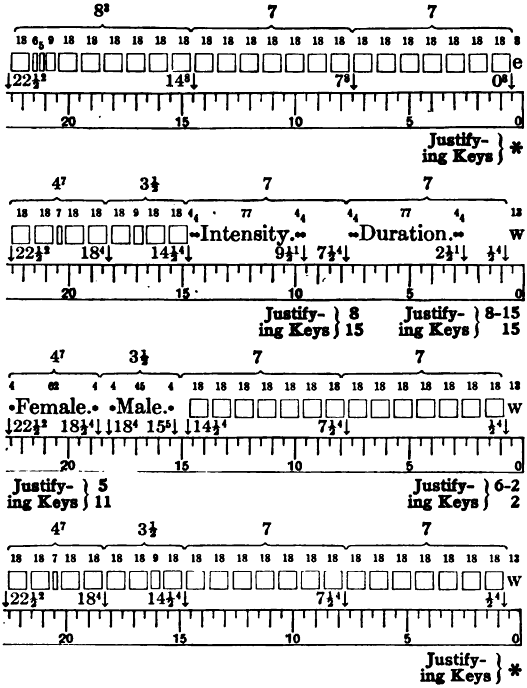
* JUSTIFICATION: Do not use the SCALE KEY, but strike any KEY in the lower row and the KEY above it in the upper row at the same time, to trip the galley and restore. It is not necessary to strike a KEY in the upper row first, since the line is full and contains no justifying spaces.

EXERCISE 34

Intricate Box Headings



Object: Use of double justification in centering words in box headings over single columns, double columns, and the full measure combined.



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 III). 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 brass rules inserted unless the line was rejustified.

NOTE: When setting double justification on the style D KEYBOARD, the PISTON-BLOCK-VALVE HANDLE 29KC17 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.

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* JUSTIFICATION: Do not use the SCALE KEY, but strike any 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

Vegà.	42	46
Berlin.	47	52
Omega.	59	63
Acme.	45	50

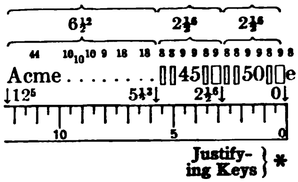
←——— **9 Picas with Rules** ———→

←—**12½ Ems 4 Units of 8½ Set**—→

Actual KEYBOARD Measure

←—**12 Ems 5 Units of 8½ Set**—→

4 Picas 8 Points 2 Picas 2 Picas



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.*

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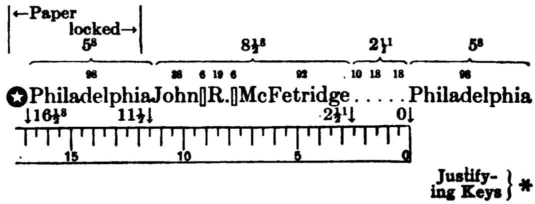
* JUSTIFICATION: Do not use the SCALE KEY, but strike any JUSTIFYING KEY in the lower row to trip the galley and restore. Two KEYS are not required, since the line is full and contains no justifying spaces.

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

←12 Picas→
←16½ Ems 8 Units 8½ Set→



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 low 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 use the SCALE KEY, 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.

Glossary

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 that operate the punching and counting mechanisms when the VALVES 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 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 (Chap. XIV).

Alignment. ¶284. The relative position of a character on its body; see LINING GAGE.

Allowance for Rule. ¶185, page 258, and Plate IV. 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 brass rule inserted, its total width will be the measure required.

Allowance for Squeeze. ¶161, page 258, and Plate IV. 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.

Bell. Plate I. The sound of the BELL notifies the operator when the line is within four ems of being complete. On the DD KEYBOARD (which see) SIGNAL LIGHTS are used instead of 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 (¶375).

Button. See KEY.

Button Clip. See KEYBUTTON CLIP.

Cap. ¶307. 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.

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 18-point attachment is applied) and in any width up to forty-two picas (60 picas if the wide measure attachment 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 Attachment, 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 CASTER (which see).

Casting Machine Stop Motion. See STOP MOTION.

Cellular Matrix. See MATRIX.

Centering Pin. ¶13 and Fig. 4. 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 accurately locate the MATRIX, 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 sidebearing).

Change Box. ¶327 and Fig. 70. 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. Chap. XVIII and Plate III. Converting the measure given in picas into ems and units of the set of the face to be composed.

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. 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.

Composition Matrix. See MATRIX.

Composition Matrix Holder. ¶354 and Fig. 74. A HOLDER which takes one COMPOSITION MATRIX at a time for casting sorts. It is used with either regular COMPOSITION MATRICES or the MATRICES supplied for sorts casting, for sizes twelve point and smaller, by our MATRIX Library (which see).

Composition Mold. See 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 AIR COMPRESSOR.

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.

Convertible Caster. See TYPE CASTER [Convertible].

Copy Holder. ¶415. A frame carried at the side of the KEYBOARD having two rubber 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.

Corrector. ¶351. 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. Chap. XI. 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. 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 it is also cast the jet which is sheared from the foot of the type and returned to the METAL 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 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).

D Keyboard. Frontispiece. The KEYBOARD with one counting and one perforating mechanism.

DD Keyboard. Fig. 88 and Chap. XLVI. 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. ¶351. 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 259. Characters set by the KEYBOARD operator, of the proper width, to be replaced by rules, initial letters, side heads, cuts, etc.

Display Matrix. See SORTS MATRIX.

Display Type. ¶355. 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.

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. Chap. XXV and ¶444 to 448 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.

Double Matrix. Chap. XXXIV, ¶322, and Fig. 47. 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.

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. ¶403. Oxide of lead and dirt that must be removed from metal in the POT of the CASTING MACHINE and also from the type melted to be cast into pigs. See FLUX.

Duplicating. ¶437, 441, and Fig. 89. 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.

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.)

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 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 I. A rack on the KEYBOARD driven by the PINION on the SHAFT of the UNIT WHEEL and, therefore, moving in unison with it. Its POINTER 4KB3 measures on the EM SCALE 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 4KB3. ¶98 and Plate I. 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 6KB2. ¶177, Plate I, and Plate VI (Fig. 7). 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 VI (Figs. 7 and 8).

Em-rack-stop Adjusting Screw a8KB1. ¶178, Plate 1, and Plate VI (Fig. 8). 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 9KB1. ¶99 and Plate I. A strip of celluloid graduated into 120 equal parts, each of which represents a half em; thus, the SCALE indicates any measure up to, and including, sixty ems of the set being composed. (The latest KEYBOARDS are equipped to indicate any measure up to 65 ems inclusive and the EM SCALE on these is, therefore, graduated into 130 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 37).

Em Scale, Double. See DOUBLE EM SCALE.

Em Scale, Paper. See PAPER EM SCALE.

En Quad. Fig. 8. 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. Chap. XXII. 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 I. When constant justification (which see) is used, the justifying space becomes a fixed four-unit space.

Flux. ¶403. A compound put into molten type metal in the MELTING FURNACE to clean the metal and bring the dross to the top.

Font. Chaps. XXXI, XXXV, and XXXVI. A full font consists of the COMPOSITION MATRICES for one point size of a face, including caps, lower case, and small caps of Roman with figures, and caps and lower case of Italic with figures, 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, about eighty characters, depending upon whether ligatures are supplied.

Foreign Languages. ¶276. 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, Fig. 55); 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, German, Italian, Portuguese, Swedish, Norwegian, Bohemian, Polish, Hungarian, and Greek.

Full Font. See FONT.

Galley Mechanism. Chap. XVII. 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. ¶430. 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. ¶413. A WHEEL on the COLUMN SCREW supporting the KEYBOARD. By turning this HAND WHEEL the KEYBOARD can be either raised or lowered.

Hand Wheel. ¶367. 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. 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 measures less than .8868" for a COMPOSITION MOLD or .8668" for a SORTS MOLD (for use with SORTS MATRICES) the MOLD should be restored to height.

Interspacing. See LETTER SPACING.

Irregular Spacing. Chap. XXIX. Using larger size justification 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 METAL POT when the CROSS BLOCK (which see) moves to the right.

Justification. Chap. X 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 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 I) 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, Chap. XIII, Fig. 20, and Plate II. 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 I) on a vertical axis and may be revolved, to determine the JUSTIFYING KEYS required, either by hand or by depressing the SCALE KEY (which see) when the EM-RACK POINTER (which see) is within four ems of zero on the EM SCALE, in which case the JUSTIFYING-SCALE POINTER (which see) indicates on the SCALE the JUSTIFYING KEYS to strike to justify the line. 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 containing 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 Pointer 14KB1. ¶103 and Plate I. 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 KEY is depressed to revolve the SCALE, 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 six-unit fixed spaces.

Justifying-space Bar. ¶86. A flat BAR at the bottom of each KEYBANK, except the tabular KEYBANK (Fig. 36) where it is above the fourth row of KEYS from the bottom. These BARS occupy the width of five KEYS so that they 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 I.

Justifying-space Punch. ¶125. The PUNCH ("S" on the PUNCH-GUIDE PLATE, Fig. 22) 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 V) 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, 357, 358, and Fig. 77. 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.

Justifying-wedge Gage 46S1. ¶358 and Fig. 77. 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.

Kern. ¶62 and 300. 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. 30. A LEVER carrying a celluloid BUTTON. There are 242 of these for characters and spaces, thirty JUSTIFYING KEYS (which see), one RESTORING KEY (which see), one SCALE KEY (which see), and two JUSTIFYING-SPACE BARS (which see). 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 to 259 inclusive, Fig. 31, and Plate VI (Figs. 1, 2, and 3). 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 seven alphabet arrangement, the KEYBANK may be changed or the KEYS may be capped (see KEYBUTTON CLIP).

Keybar. ¶250, 260, 261, and Figs. 30 and 32. 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 they engage 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 FRAME carries 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. ¶260, Fig. 32, and Plate VI (Figs. 4, 5, and 6). 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 Chap. I. A machine similar to a typewriter in that the characters for all alphabets (except SMALL CAPS with a 7 alphabet arrangement) 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 (Chap. XLVI and Fig. 88) 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. ¶308 and Plate V. The arrangement of the characters on the KEYBANKS (which see). The arrangement of the characters for each alphabet (5, 6, or 7, as required) is identical, except for the SMALL CAPS when a seven alphabet arrangement is used. 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. ¶329 to 332 inclusive, 341, and Figs. 71 and 72. 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. ¶267 and Fig. 38. 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. ¶268. 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. ¶429. 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.

Leaders. Chap. XXIV. 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 used in combination with the eighteen-unit leader in leadering out, to prevent overheating the MOLD if many leaders are used in a line. The eighteen-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 283. 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 and the cost of leads. 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.

Letter Spacing. Chap. XXVI. 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 is the same as hair spacing by hand except that, to save time, the MONOTYPE 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 a23KB1. ¶36 and Plate I. 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. ¶284 and Fig. 41. 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 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. ¶284 and Fig. 41. 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 carried the CENTERING-PIN BUSHING) to position the face on its body.

Lining Up. ¶284 and 285. 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. ¶287. A few abnormally tall faces (6 point No. 56J) 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. For composition; a piece of hardened bronze .2" square and 5/16" 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, 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 and SORTS MATRIX.

Matrix Case. ¶17 and Fig. 7. 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 Figs. 4 and 6) 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.

Matrix Case Arrangement. ¶17 and 25, Chaps. XXXI, XXXV, XXXVI, and XXXVII, also Figs. 49 to 69 inclusive. The location of the 225 MATRICES (characters and spaces) in the MATRIX CASE. The arrangement depends upon the number of alphabets (5, 6, or 7) 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 Chaps. XXXV and XXXVI.

Matrix Library. ¶363, 364, and 365. A plan whereby, for a nominal sum, MONOTYPE users may lease MATRICES, for casting type to be set by hand from the case, of all faces shown in our Specimen Book. These MATRICES cannot be used for composition but they exactly duplicate the faces cast from COMPOSITION MATRICES which the MONOTYPE user buys to cast type in automatically justified lines. "Buy what you want when you want it."—Fill your cases with type cast from MATRICES obtained from the Library; when the demand for a face warrants setting this on the KEYBOARD, instead of by hand from the case, buy the COMPOSITION MATRICES for this face.

Matrix Line. See STANDARD MATRIX LINE.

Matrix Markings. ¶360, 368, and Fig. 75. 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. ¶298. 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. Chaps. XVIII, XIX, XX, and XXI. 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 III). 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 IV) is used.

Melting Furnace. ¶401 and 402. Used for remelting type, cleaning it and casting it into pigs for the CASTING MACHINE.

Metal Pot. ¶14 and 400. 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 POT is heated by two GAS BURNERS beneath it (kerosene or gasoline may be substituted if necessary). The POT holds about fifty pounds of metal.

Micrometer. ¶359. An instrument used for measuring the point and set sizes 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-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. ¶272. 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. ¶13 and 14, Chap. XLI, and Fig. 11. Into this metal is forced, from the METAL 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 BLOCK to right, in operating position, carries the PIN that forms the nick in the type body), 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 METAL POT. MOLDS are of two kinds, composition and sorts. The 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 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.

Mold Blade. ¶27 and 29. This forms the rear side of the opening in the 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. ¶359. 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. ¶358 and Fig. 77. 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 Caster.

Normal Wedge. ¶27 to 31 inclusive, 124, 357, 358, and Figs. 10 and 77. 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 NORMAL WEDGE 47S is used; this is positioned by hand instead of automatically.

Normal-wedge Gage 47S1. ¶358 and Fig. 77. 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 b14B. ¶28 and 358. 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 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. Chap. XXXIII and ¶318. Figures whose set size (width) is half of their point size; thus, six-point nut-body figures are three points wide.

Opening-up Faces. Chap. VI. 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. ¶331. 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 and 337. The WHEELS that feed the paper at both the KEYBOARD and the CASTING MACHINE. Their teeth engage the marginal perforation 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 Ribbon. ¶2, Fig. 2, Chap. II, and Plate I. 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 absolutely control 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 Plate VI (Figs. 11, 12, and 13).

Paper Tower. ¶105, 439, and Plate I. 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.

Pica. ¶40, 54, 139, 159, and 160. 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.

Pica Ems to Ems of Any Set, Table for Changing. ¶160 and Plate III.

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. 33. 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 224, and Plate I. 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. The thickness of a type-body measured "columnwise." This is measured in points.

Pointways. ¶37, 40, and Fig. 16. 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 METAL 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. It may be operated by hand at any time.

Punch Bars. ¶92, 147, 252, 262, 264, and Fig. 33. 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. Chap. XVI. 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 character, or space, cast. For the position of the PUNCHES, see Fig. 22. 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. ¶439 to 445 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 I), 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 JUSTIFYING-SCALE KEYS, the left green KEY locking the right TOWER and the right green KEY the left TOWER.

Quad. See EM QUAD.

Quadding Out. ¶432 and Fig. 87. Striking several quads in succession to fill out a line, as the last line of a paragraph, or in tabular work.

Release-plate Link. ¶337 and Plate VI (Fig. 10). A link on the KEYBOARD that is pulled forward and upward, as shown in Plate VI (Fig. 10), 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.

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 VALVE HANDLE 29KC17 (Plate I).

Restoring Key. ¶104, 105, 207, and 445. *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 when the VALVE HANDLE 29KC17 (Plate I), 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 I. 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 this 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 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. The UNIT-WHEEL POSITIONER (which see) may be used by those who have not the knack of holding the WHEEL; experienced operators do not require the POSITIONER; they find it quicker and easier to work directly with the WHEEL.

Ribbon. See PAPER RIBBON.

Ribbon Ticket. See KEYBOARD RIBBON TICKET.

Rock Shaft. ¶251 and Fig. 30. 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.

Rules, Allowance for. See ALLOWANCE FOR RULE.

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 when the SCALE KEY is depressed) 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. ¶122. The left green KEY at the bottom of the KEYBOARD; used to revolve the JUSTIFYING SCALE, to determine the JUSTIFYING KEYS to strike, provided the line is not more than seventy-one units short. For justifying before four ems, as in double justification or special work (¶242 and 243), the SCALE is rotated by hand.

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 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, page 27.

Set Size. ¶38 and 47 to 52 inclusive. 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.

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. Chap. X. Using the same size justifying spaces throughout the line, as in straight matter. At end of line, after the BELL rings and the operator has struck the last character KEY for this line, he depresses the SCALE KEY (which see) 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. ¶349. 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.

Slur. ¶93 and 429. 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. ¶286 and Fig. 42. Boxes used for storing type made in quantities and from which the type cases are filled. The best form are made of galvanized iron of the proper sizes to fill a blank type case.

Sorts Matrix. ¶355 and Fig. 75. A flat MATRIX used for casting type for the cases in sizes from fourteen to thirty-six point.

Sorts Matrix Holder. ¶356 and Fig. 76. 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 points. By changing 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.

Sorts Mold. See MOLD.

Space. ¶191, 192 and 373 to 376 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 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 I).

Space Punch. See JUSTIFYING-SPACE PUNCH.

Space-punch Key. See JUSTIFYING-SPACE-PUNCH KEY.

Space Transfer Wedge. ¶128 and 357. 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 (Chaps. XXVI to XXIX 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 Attachment. ¶367 and 368. All TYPE CASTERS and all COMPOSING MACHINES with the Display Attachment, for casting type fourteen points and larger, are equipped with this Speed Regulating Attachment. By shifting three LEVERS this Attachment gives eighteen speeds through gearing and the nineteenth speed direct with all gears cut out.

Spool. Fig. 2, ¶77, and Plate VI (Fig. 9). The paper is wound on this as it is perforated on the KEYBOARD and unwound from it as the ribbon passes through the CASTING MACHINE. The 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.

Squeeze, Allowance for. See ALLOWANCE FOR SQUEEZE.

Standard Matrix Line. Chap. XXXII. 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.

Stopbars. ¶262 to 266 inclusive, Figs. 33 and 34, and Plates I and VI. 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 (Chap. XXXVI) 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 Plate VI (Figs. 17 and 18). 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.

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.

Switch. ¶440 and Fig. 90. 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).

Tabular Keybank. ¶254 to 258 inclusive, 296, and Fig. 36. A KEYBANK (which see) for the left side of the KEYBOARD having a special arrangement of KEYS especially suited to tabular work.

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 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 .0185″ 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.

Trip the Galley. ¶148 to 155 inclusive 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. This disc, which revolves about a vertical axis, has three separate cam surfaces that give the following motion: (*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.

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 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 [Convertible]. ¶353 and Fig. 73. The type-casting mechanism of the STANDARD MONOTYPE COMPOSING MACHINE and TYPE CASTER; used for casting type and high and low spaces and quads, to be set by hand, of any size from five to thirty-six point inclusive. It is called "convertible" because, by applying the additional units, the TYPE CASTER may be converted into the STANDARD MONOTYPE for casting type in automatically justified lines.

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. ¶281 and 287. 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 .105" (.10+.005"=.105"). NOTE: A few abnormally tall faces are cast on a type line .005" lower than this.

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 Transfer Wedge. ¶127, 137, 143, and 144. 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. ¶277. A set of STOPBARS (which see) that causes the KEYBOARD to register all characters as nine units (½ 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 I) 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 277. 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. In 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.

Unit. ¶44, 55, 68, and 69. One-eighteenth the width of the basic 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 25KB1. ¶96, 99, 100, and Plate I. 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 b26KB1. ¶90 and Plate I. 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; this STOP corresponds to the unit width of the character struck.

Unit-rack Stops 31KB1. ¶91,252, 262, 263, 264, Fig. 33, and Plate I. 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. The MATRICES carried in the same COMB (Fig. 6) 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 Wheel a35KB1. ¶87 to 105 inclusive and Plate I. 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 ($162 \div 18 = 9$). 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 for these parts refer to Plate I. **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 b26KB1; 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 25KB1 is provided. When a graduation of 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 36KB1. 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 I. 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.

Unit-wheel Positioner a48KB1. Footnote on page 85 and Plate I. An attachment which can be applied to any KEYBOARD to save holding the WHEEL with the left hand in setting it to the required measure in starting a new section of a line of double-justified matter. It consists of a small PINION which meshes with the teeth of the UNIT WHEEL when pushed to the rear by its KNURLED HEAD and, when thus in gear with the WHEEL, the KNURLED HEAD is used both to prevent the WHEEL from rotating and to set it as desired. When this HEAD is released the POSITIONER is pushed forward by its SPRING so that its PINION no longer engages the UNIT WHEEL. Very few experienced operators use the POSITIONER, they find it quicker to grasp the WHEEL.

Valve-bank Plunger 41KC12. ¶251 and Fig. 30. 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. 30. That part of the KEY mechanism of the KEYBOARD that connects the ROCK SHAFT (which see) with its VALVE-BANK PLUNGER (which see).

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 I) below the left end of the UNIT-WHEEL STANDARD.

Varying the Type Line. ¶282, 369, and 370. 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 points and larger) this is accomplished by changing the ABUTMENT in the SORTS MATRIX HOLDER (which see).

Water-cooled Molds. ¶405. 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 on the CASTING MACHINE are thoroughly water-cooled.

Wedge, Justifying. See JUSTIFYING WEDGES.

Wedge, Normal, See NORMAL WEDGE.

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.

PAPER SPOOL X15KC

PAPER-SPOOL SHAFT X16KC

PAPER RIBBON . . . .

PAPER FEED WHEEL (also a13KC2) a13KC1

JUSTIFYING-SCALE SPINDLE head 20KB2

PAPER TOWER punch guide index plate 18KC30

JUSTIFYING SCALE 10KB1

UNIT-RACK-STOP BAR case 32KB3

JUSTIFYING-SCALE POINTER 14KB1

JUSTIFYING-SCALE POINTER rack 14KB3

PAPER TOWER housing punch lock knob 18KC11

PISTON BLOCK valve handle 29KC17

UNIT INDICATOR 25KB1

UNIT-WHEEL DRIVING CYLINDER (left) 36KB1

UNIT-WHEEL POSITIONER a48KB1

EM-RACK-STOP-RACK ADJUSTING SCREW head a8KB2

EM-RACK SLIDE 5KB1

EM-RACK STOP X6KB

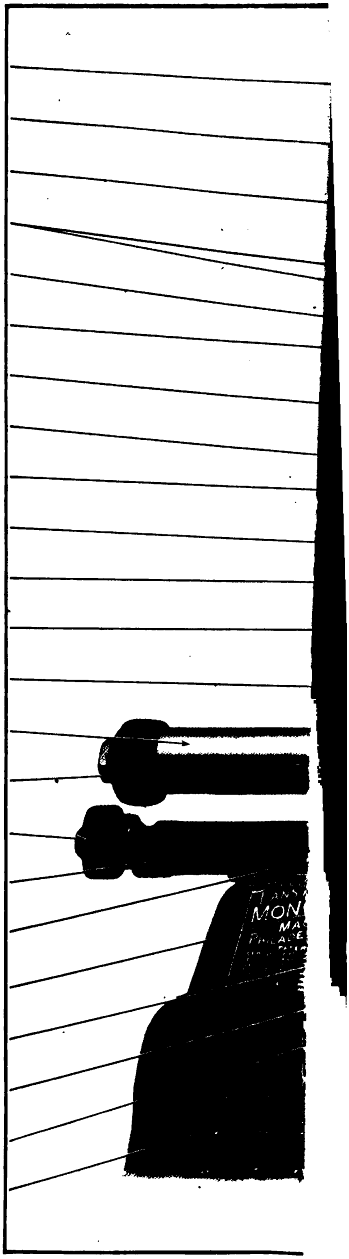
UNIT WHEEL shaft a35KB2

VALVE RETURNING ROCK SHAFT operating arm rod head 14KA7

UNIT RACK b26KB1

SPACE CUT OUT operating rod head 16KA5

KEYBANK button (137) 7KA6



3 11	3 11	3 10	3 9
3 13	3 12	3 11	3 11
3 14	3 14	3 13	3 12
4 1	4 1	3 15	3 14
4 4	4 3	4 2	4 1
4 6	4 5	4 4	4 3
4 9	4 8	4 7	4 6
4 12	4 11	4 10	4 9
5 1	4 15	4 14	4 12
5 5	5 4	5 3	5 2
5 11	5 9	5 8	5 7
6 2	6 1	5 14	5 13
6 10	6 9	6 7	6 5
7 6	7 4	7 2	6 15
8 5	8 3	7 15	7 13
9 9	9 7	9 4	9 2
11 9	11 5	11 2	10 14
14 13	14 8	14 4	13 15
45	44	43	42

G	H	I	J	K	L	M	N	O	
. 109-237	, 108-236	▌ 23	l 98	i 86	] 9	[8	' 2	| 3	5 Unit
- 64-192	j 96	f 93	I 137	*l* 161	: 193	*;* 194	▌ 12	6 unit & justifying spaces. See Note.	6 Unit
' 30	‘ 29	r 82	s 91	t 83	J 147	*v* 232	° 1-25	*z* 229	7 Unit
? 32	I 42	z 101	c 103	e 81	z 152	s 142	† 5-227-99	*?* 160	8 Unit
1 196	*0* 205	. 113-241	9 76	7 74	5 72	3 70	1 68	0 77	9 Unit
2 197	*$* 195	– 21	$ 67	8 75	6 73	4 71	2 69	■ 111-239	9 Unit
x 102	J 52	g 94	o 87	a 90	P 139	F 144	L 149	T 134	9 Unit
v 104	y 84	p 88	u 85	n 106	Q 130	B 156	O 138	E 132	10 Unit
q 79	k 97	b 105	h 95	d 92	V 155	Y 135	G 145	R 133	10 Unit
ff 184	■ 128	Z 57	■ 121	ff 56	X 153	U 136	K 148	N 157	11 Unit
æ 19	L 54	P 44	F 49	¶ 7	M 158	*Z* 185	*Q* 163	*G* 178	12 Unit
T 39	O 43	E 37	A 46	w 80	*P* 172	*T* 167	*R* 166	*B* 189	13 Unit
œ 20	Y 40	U 41	G 50	R 38	Œ 120	Æ 119	W 131	*V* 188	14 Unit
D 48	N 62	K 53	H 51	m 107	*&* 183	℔ 34	*X* 186	*U* 169	15 Unit
M 191	— 22	.. 114-242	M 63	W 36	*%* 129	*Œ* 116-13	*Æ* 115-14	■ 112-240	18 Unit

Note: Both the Justifying-space Bars and Key 24 produce Matrix Case position 2-O. The Space Bars also bring up the Justifying-space Punch and consequently produce Justifying spaces. Key 24 produces 6 unit spaces because it does not bring up the Justifying-space Punch.

ase.

WXYZ&ÆŒ

YZ&ÆŒ

fiflffffiffl

WXYZ&ÆŒ

iflffffiffl

0 £ ℔ ; : ! ? ‘ ’ .

890

The red numbers in the squares with the characters indicate the Keys that produce these characters.

See Keyboard Arrangement at left.

mbers in the same square with a character
erent Keys that will produce this character;
ill be produced by either Key 151 or Key 16.

al characters: Thus, Key 16 might be capped with any desired character of same
be substituted, without affecting the justification, when the matter is corrected.

PLATE V—Keyboard and Matrix Case Arrangement C (Book)

FIGURE 16

Rotate the Scale, as shown, until it engages the Pins on its Pinion. Make sure it is fully seated; test this by striking the Space Bar ten times and noting that the Pointer indicates the tenth space on the Scale.

To Change Stop Bar Cases

For certain work it is sometimes necessary to change the values of the Unit Rows, as, for example, setting typewriter faces where all characters are on a nine-unit body. To do this requires that the Stop Bar Case be changed.

FIGURE 17

Pull the Plunger to the left to release the Case, swing the top of the Case to the front and lift it out.

FIGURE 18

Holding down the Unit-rack Stops with the thumb of the left hand, slide the new Case down into its guides as far as it will go. Then pull the Plunger to the left and swing the top of the Case back into position. (See Fig. 17.) *Never force the Case.* If it does not swing easily it has not been put in properly.