MILESTONES
of Machine Typesetting

Cover illustration from an old wood-engraving showing the
Government Printing Office, Washington, D. C., about 1881

This booklet is Linotype-set in Memphis Medium. The numerals for the "Milestones" pages are Gothic No. 40

 Printed in U. S. A. 843.16-F-Z-3X

MILESTONES

THE DEVELOPMENT of machine typesetting represents an interesting phase in the history of the graphic arts. Perhaps it is natural that many of the inventors concerned themselves with attempting to develop machines to set foundry-cast type, while other minds were working on more revolutionary ideas.

These selected milestones in the development of present-day typesetting methods are typical of many others along the highway of progress. Some have stood in places where they have attracted the attention of passersby, while others have been less conspicuous—the labor of those long since forgotten by the unheeding multitudes who speed along the avenues of our fast-moving civilization.

All are significant. Each represents the dreams, the disappointments, the toil of men who contributed to the advantages which we enjoy. None failed. Each became the foundation of another's further thought and development.

And this process continues. There will be no end so long as there are men who think and are dissatisfied with the past. Improvements in machines and methods result from creative thinking done by men who believe that in every walk of life there should be something better.

They are the makers of milestones. To them this booklet is dedicated.

Linotype's *Milestones Room* is an abridged educational exhibit of interest to those with a love for the technical backgrounds of their craft.

It is not a museum, nor does it include more than a selected group of machines that have been recommended by our Linotype historian as being representative of the developments in typesetting machinery that took place during the latter part of the last century. This was a period when a number of significant attempts were made to mechanize manual methods of printing. Some of these are exceptional examples of engineering—all are interesting.

The following pages illustrate and briefly describe the machines shown in Linotype's *Milestones Room*.

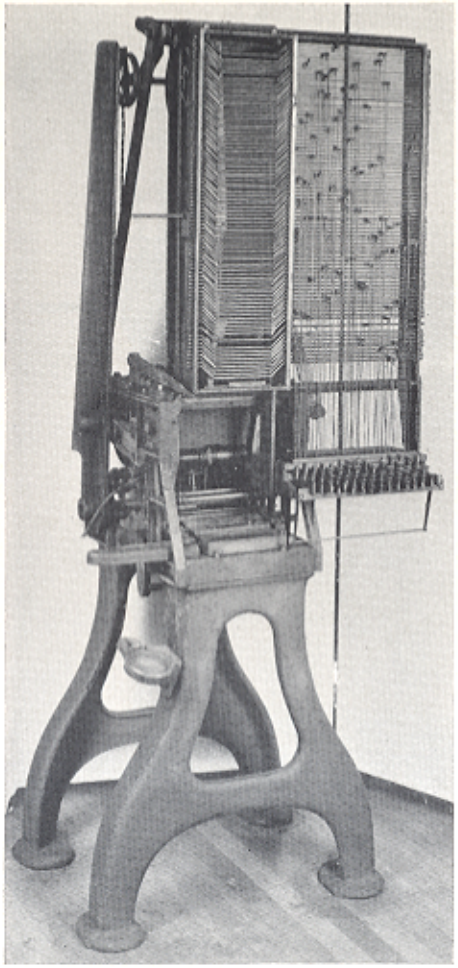
This was the first American typesetting machine to come into common use. It continued in use for many years both in the United States and Great Britain. The type was in three cases, containing in all eighty-four channels, and arranged so that filled cases might be easily substituted for those which became nearly empty. 1872

Depression of keys on a three-section keyboard released type from the channels into a front plate having converging grooves, one for each letter, and having an outlet at its bottom for but one type at a time. The type was assembled in a continuous line and a second operator drew toward him successive portions of the line and justified each to fill the measure by substituting or adding necessary thickness of type spaces. The only part of the machine driven by motor was a small cam which revolved in the raceway to advance the assembled line in order to keep a clear space for the type emerging from the outlet of the front plates.

A separate machine was required for distributing the dead type from galleys into cases for re-use on the composing machine.

1872 · THE EMPIRE COMPOSING MACHINE

(Originally Known as the "Burr" Machine)

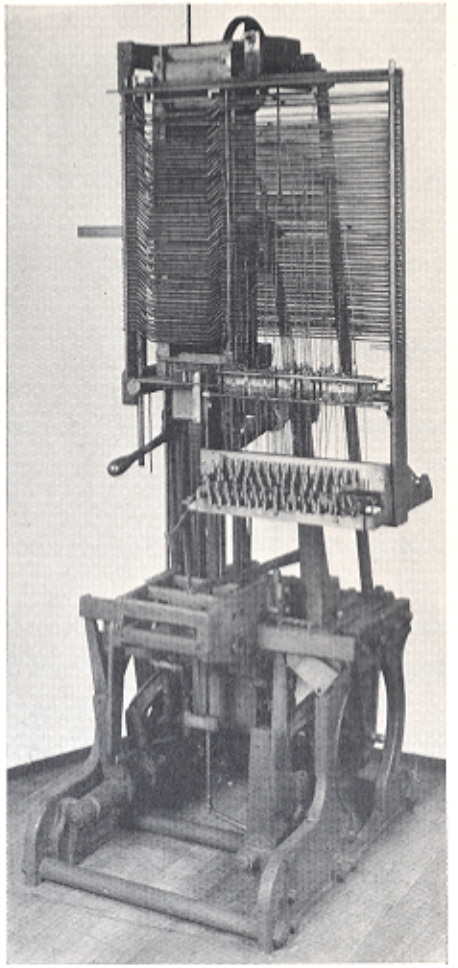


1884 · THE FIRST BAND MACHINE

(O. Mergenthaler, Inventor)

1884 This machine, without metal pot, was equipped with a series of vertical bars, each carrying a full alphabet of type and space characters raised on its surface. The bars descended at the touch of a finger key, each bar being arrested to bring its selected character to a certain level. After the Line-o-type was assembled and justified, a papier-mâché strip was forced against it, thus producing a matrix for one line. The matrix strips were then assembled side by side to form a stereotype matrix and type metal was cast into it to form a printing plate.

This machine, with metal pot, was the first to produce a Line-o-type automatically, through the action of finger keys. Vertical bars containing an alphabet of female characters descended at the touch of a finger key, were brought to a common alignment and metal forced through a mold into the depressed characters in the bars, thus forming raised type on the front edge of the slug in the mold. The slug was ejected through trimming knives into a galley and the vertical bars were lifted to their original position, ready for the next line. **1885**



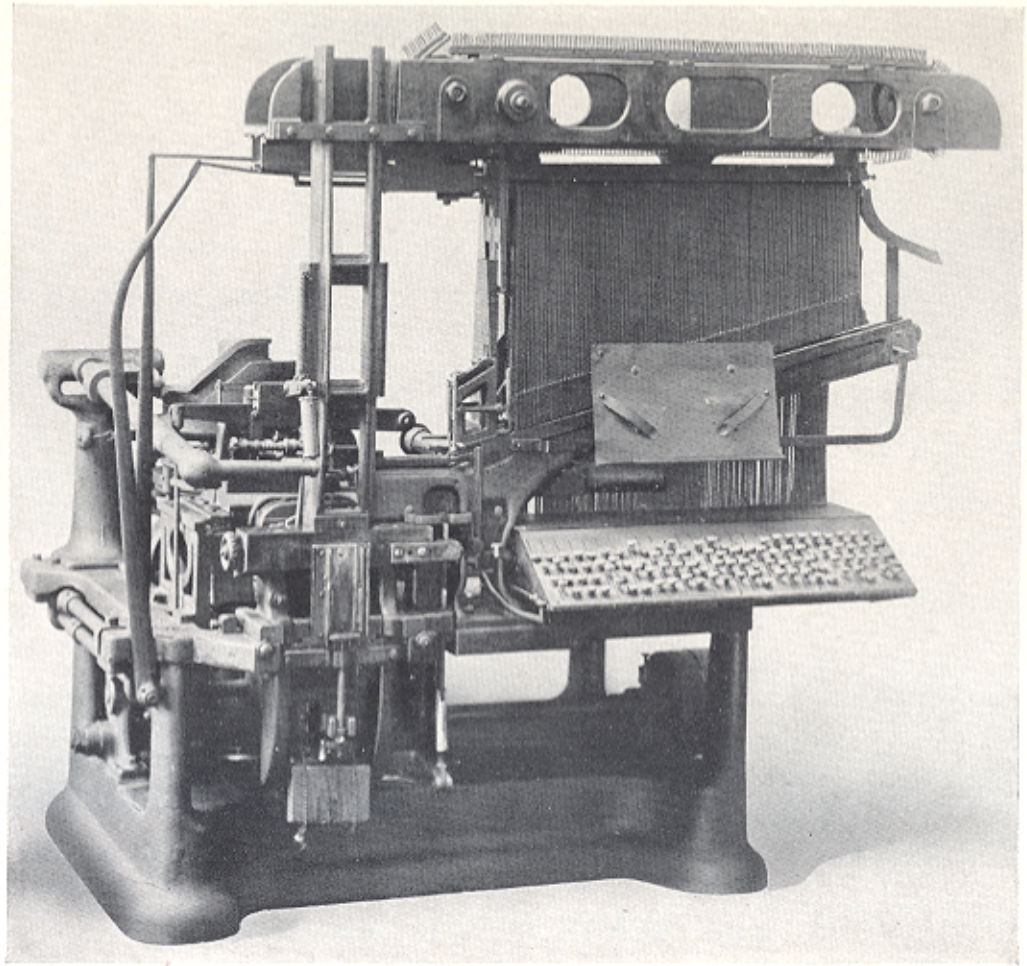
1885 · THE SECOND BAND MACHINE

(O. Mergenthaler, Inventor)

1886

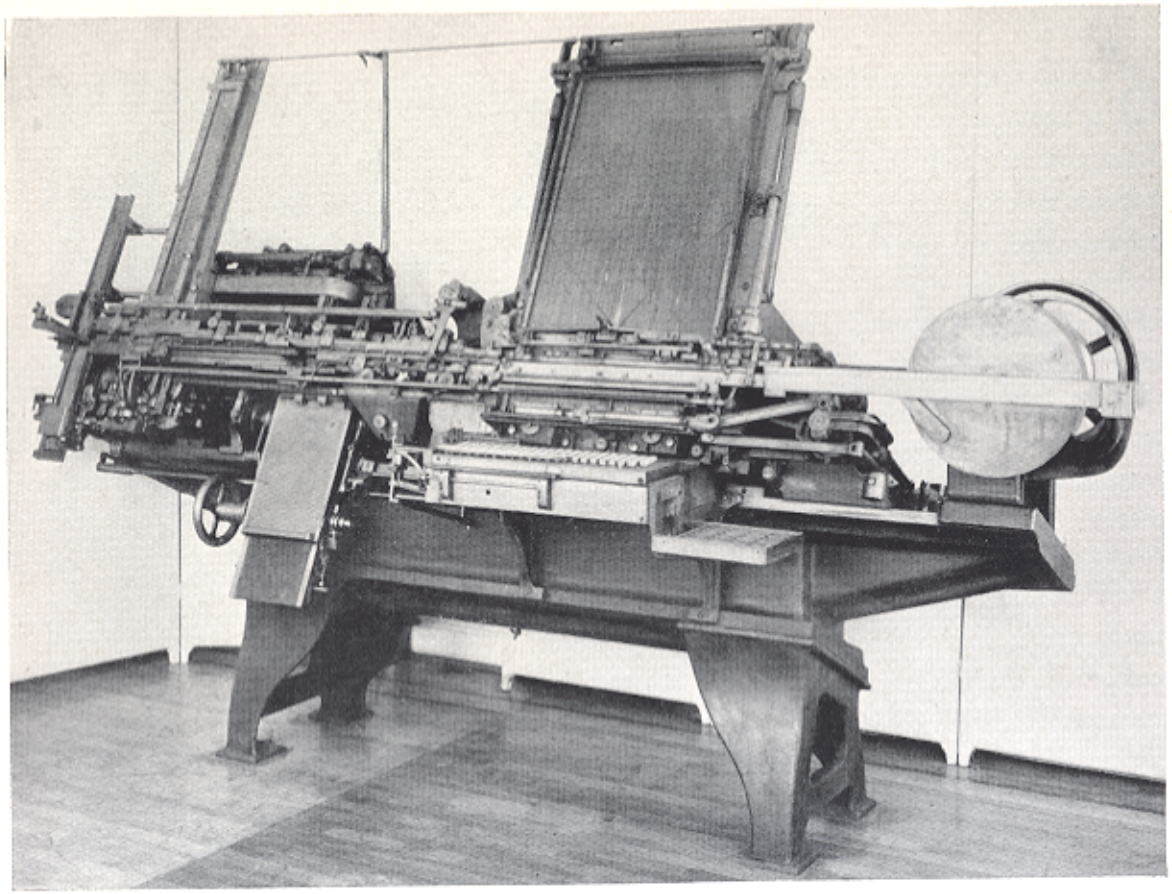
The first commercial line-casting machine using small circulating matrices, each containing one character. The matrices, stored in vertical tubes, were released in the proper order by finger keys, delivered to an inclined chute along which they were carried laterally and successively by an air blast to form a composed line. This line was transferred to the face of a slotted mold, justified by wedge spacers and a slug produced by forcing metal through the mold into the depressed characters of the matrices. The matrices were then lifted to the top of the machine and returned through a distributor to the vertical tubes.

The first commercial operation of this machine was in the office of the New York *Tribune* in July, 1886.



1886 · THE BLOWER LINOTYPE

(O. Mergenthaler, Inventor)



1887 · PAIGE COMPOSITOR WITH JUSTIFIER

THE "MARK TWAIN" MACHINE

(James W. Paige, Inventor; and Chas. R. North, Co-Inventor of the Justifier)

1887 This machine set, justified and distributed foundry type specially nicked for that purpose. Composition was accomplished by the operation of the keyboard of 109 keys arranged to permit whole words to be conveniently assembled at one stroke of the keys. Distribution of dead-matter, with leads and rules removed, proceeded simultaneously.

Justification was mathematical, as distinguished from the wedge system, thus requiring very complicated calculating mechanisms. Every movement on the machine was positively controlled by cam action and, though the various mechanisms required a total of about 18,000 parts, less than one-fourth horse-power was necessary for their combined operation.

The machine was proven capable of a much greater output of composition than was possible by any other then known means; nevertheless, its complications were such that it was found impossible to train the necessary mechanics to a degree of skill to make it a commercial possibility.

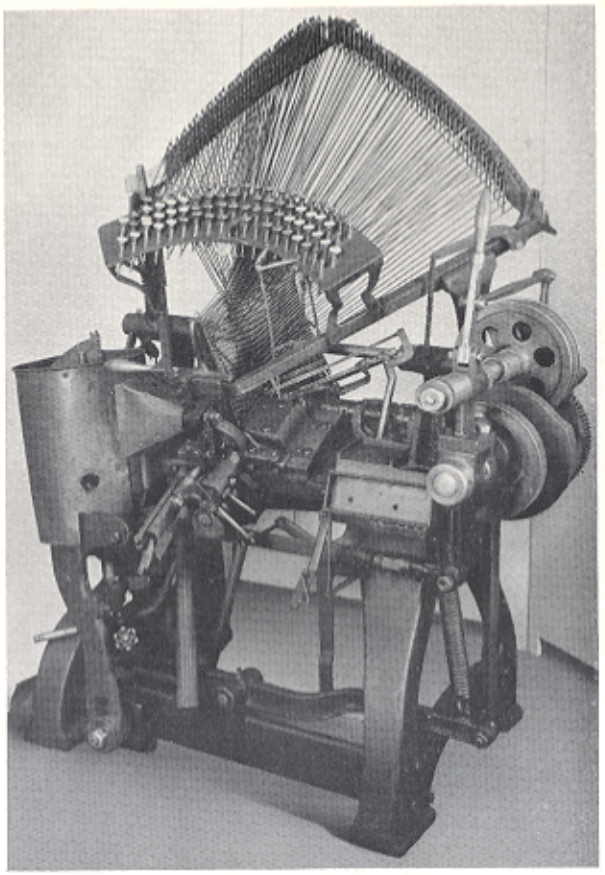
Mark Twain invested and lost a substantial fortune in this machine. The mechanism shown in "The Adventures of Mark Twain," was devised in Hollywood without the photographs of the Paige Compositor which had been provided.

1888

The product of this machine differed little from that of the Linotype of about that time; the most noticeable difference being the absence of ribs from one side of the slug. Two-letter matrices punched in rather long copper bars, each with a hook at its upper end, hung vertically on slanting wires down which they were allowed to slide by gravity when escapements were operated by rods, each from a separate key of the keyboard.

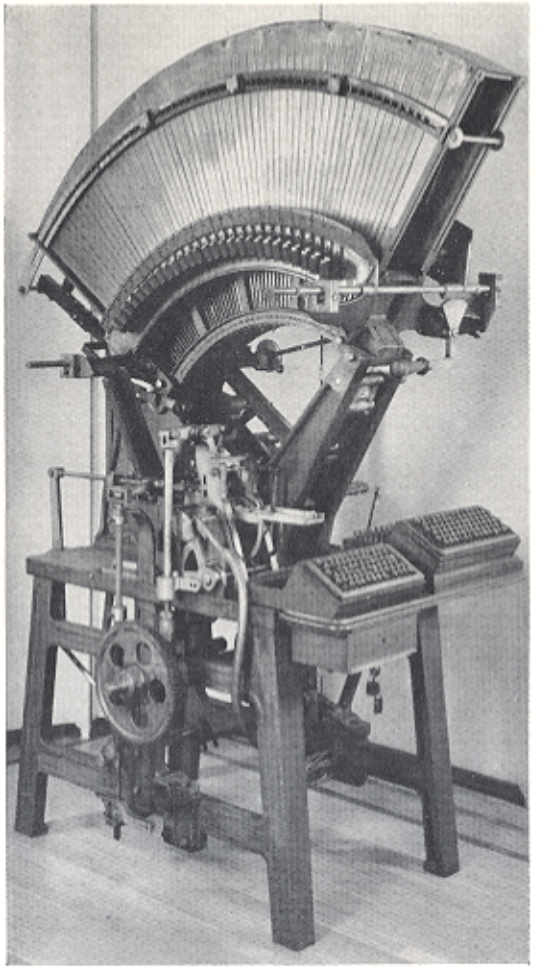
Matrices, with double-wedge rotary space discs between words, were assembled in a channel facing the mold cavity. Justification was accomplished by rotation of the center wedges of the space discs, two sets of space discs being used in order to keep the matrix bars parallel.

Composition was not continuous. After the cast and unlocking of the matrices, the top of the machine automatically tilted back allowing the matrix bars to slide back to their original locations at the rear of their escapements. After this action, the top was returned to its normal position, ready for composition of the next line.



1888 · ROGERS TYPOGRAPH

(John R. Rogers, Inventor)



1891 · MATRIX MAKING MACHINE

(H. Lee and E. LeBrun, Inventors)

1891 The method employed in this machine for the production of an equivalent of a Linotype slug appears, by present standards, to be somewhat indirect and slow. It required the combination into one machine of electromagnetic devices, controlled by a keyboard, for releasing specially formed type and type bars. These were assembled with double-wedge justifying spaces, the assembled type and spaces being held together by air blast. The line was justified and locked before and during impression into a blank to produce a matrix which was then carried and properly held against the face of a mold into which metal was cast to form a slug for printing.

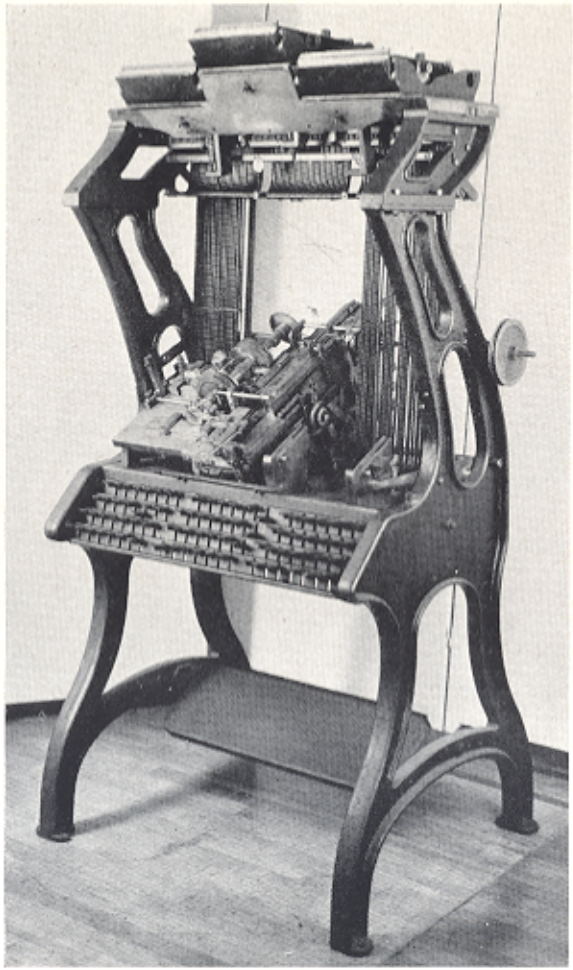
To the mechanisms for performance of those functions, there were added mechanisms for packing the slugs onto a galley. Others were provided for supplying a new matrix blank for each new line, and for disposal of matrices after the cast was made, and still others for returning all parts to their normal positions ready for the next line of composition.

A development of the original or "Burr Machine" and with an automatic justifier invented in 1894 by Frank McClintock, this embodied the first employment of wedges to temporarily justify a line of individual type. 1894

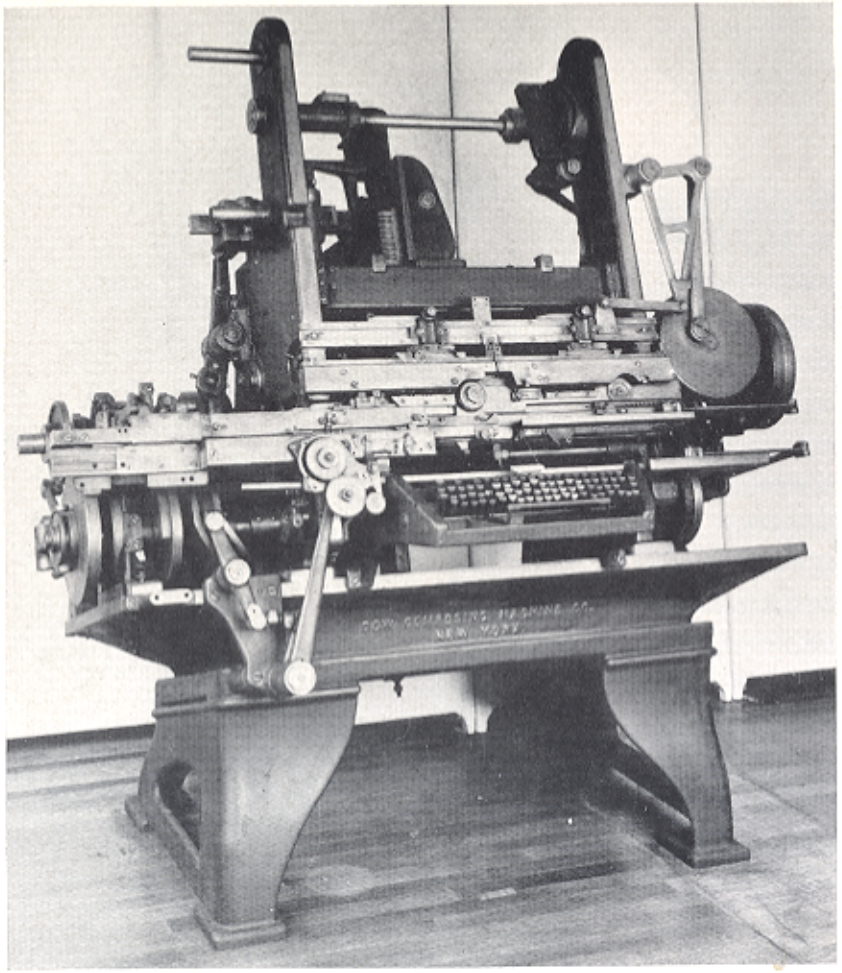
During the assembling of a line, temporary steel wedge-shaped spaces about two inches long were inserted between the words and, upon completion of the line the wedges were driven home to expand the line to the proper measure. The distance that the thick end of each wedge projected from the type-body determined the proper thickness of space to be supplied in place of each wedge as the wedges were automatically and successively withdrawn and permanent spaces inserted.

After each separate insertion of a permanent space, the remaining wedges were given a further push to compensate for any discrepancy between the thickness of the space just inserted and the indication by the wedge just withdrawn.

Because only six thicknesses of spaces were used, it is obvious that exact justification was seldom possible.



1894 · THE EMPIRE
COMPOSING MACHINE
WITH
McCLINTOCK JUSTIFIER



1896 · DOW COMPOSING MACHINE

(Alexander Dow, Inventor)

1896 This machine set and justified, but did not distribute foundry type. An entirely separate machine was used for distribution of specially nicked type.

The typesetter magazine was divided into two parts with vertical channels in which the type lay with their faces toward the operator and with their set dimensions vertical, whereas in the Paige machine the type lay with their set dimensions horizontal.

The type, released by keys on the power-driven keyboard, was ejected into a raceway and then was pushed down into a vertically-held assembling stick which, when the line was complete, made a half turn, thereby allowing the line to be ejected onto a runway for justification.

During composition temporary brass spaces were set between words. The justifier automatically selected whatever combination of ten available spaces would exactly justify the line and inserted them in place of the temporary brass spaces.

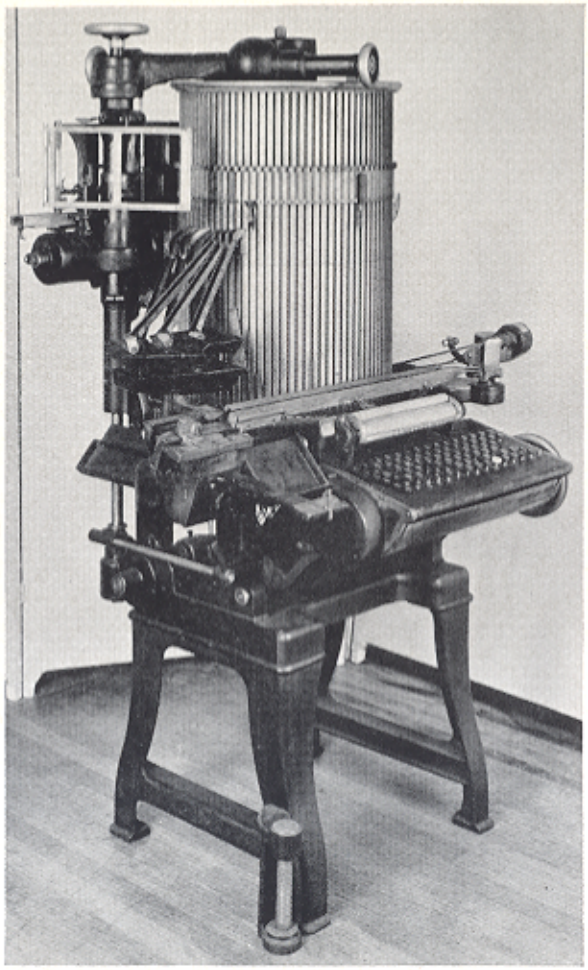
All movements were positively controlled, mostly by cams. Although this machine was an outstanding piece of mechanism, it was little used commercially.

1898

This was the final and improved form of the Thorne machine of about 1880. It set and distributed specially nicked foundry type but was not equipped with an automatic justifier. It consisted essentially of two cylinders of equal diameters on the same vertical axis. In each cylinder, and extending vertically for its whole height, were ninety channels. On the side of each channel in the lower cylinder were rails to correspond with the various combinations of nicks on the type distributed to and stored therein. From this cylinder, which was stationary, the operator at the keyboard released the types which were automatically assembled by the machine. Justification was hand-work by the operator; or, in order to increase output it could be done by a second person.

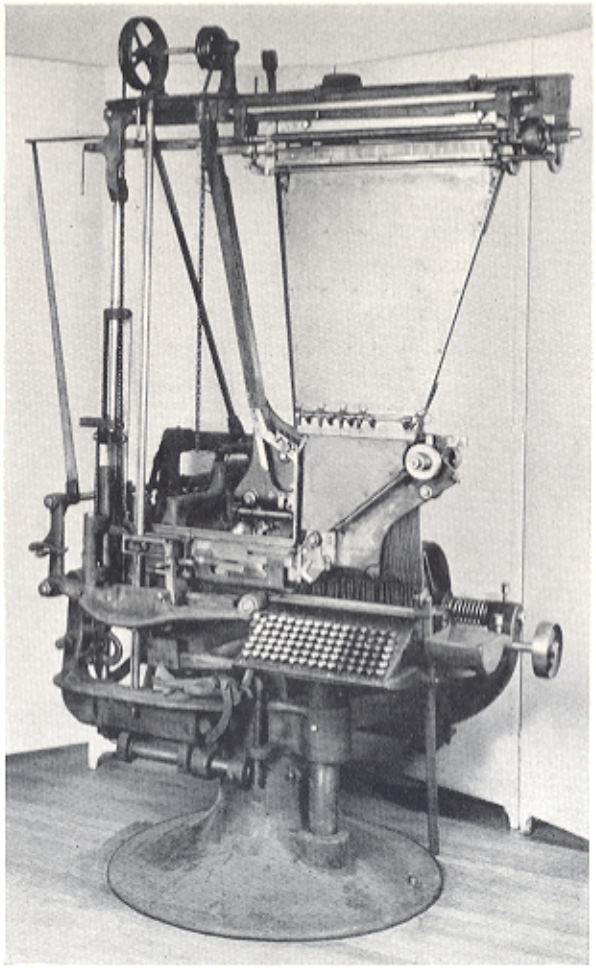
The upper cylinder, which was a mechanism for keeping the channels loaded with dead type for distribution into the lower cylinder, had no rails in its channels. This cylinder had a step-by-step rotation, stopping for a short period with its channels in register with those of the lower cylinder in order to allow the type to drop into their proper channels, ready for use.

Although each machine was equipped to accommodate but one point-size of type, many of these machines were in successful operation both in the United States and England.



1898 · "UNITYPE" or SIMPLEX ONE-MAN TYPESETTER

(J. Thorne, Inventor)



1898 · MERGENTHALER ROUND BASE LINOTYPE

(O. Mergenthaler, Inventor)

1898 Simplification was the main object of this variation from that which had at that time already been adopted as the general Linotype design, as evidenced in the popular Model 1 Linotype. Although simpler construction might well have been attained by adoption of this machine, experience proved the necessity for a machine possessing the possibilities of further development to adapt it to the everchanging requirements of the printing industry, and this machine was not so designed.

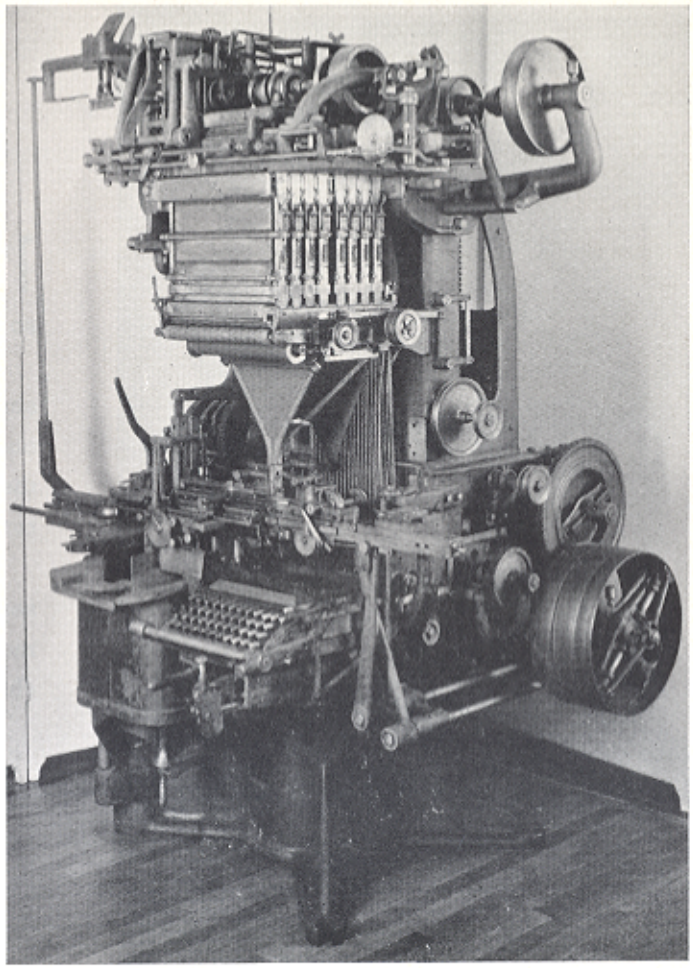
In appearance, the most noticeable variations from the standard Linotype design were: the vertical magazine; the substitution of one chain-operated vertical elevator in place of both the first and second elevators of the standard design; the long chute down which the spacebands dropped; the absence of a vise frame and of a mold-wheel capable of accommodating a plurality of molds; and of other mechanisms including the power-driven keyboard.

1901

The product of this machine was a line of logotypes, all but the final one of which in each line, had cast thereon at its outer end a justifying space, and the final one had cast on its inner end a "correcting" space for exact justification of the line.

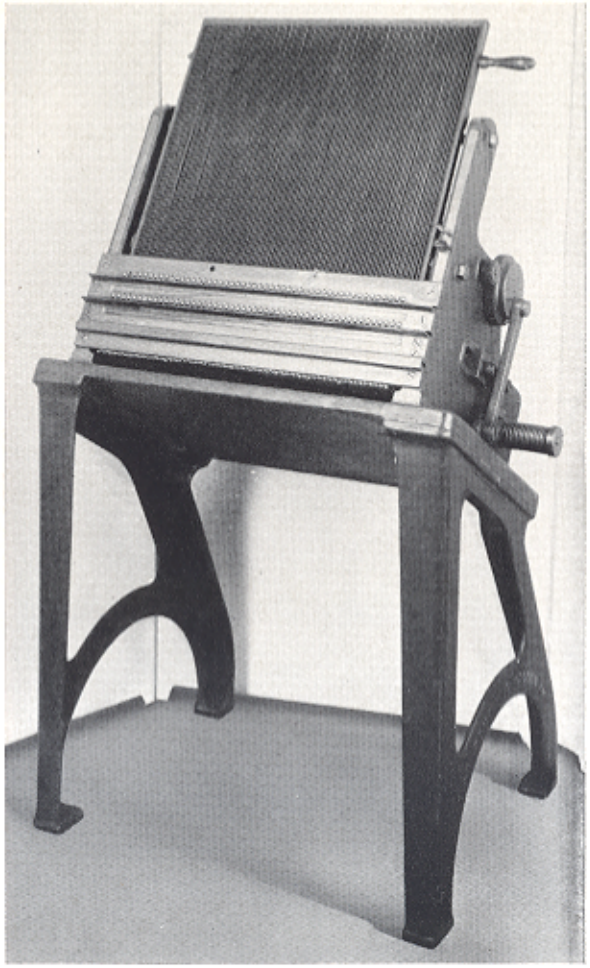
The matrices were quite different from Linotype matrices, though serving the same purpose, having both font notches and teeth for distribution. Assembling, justification and distribution were also different from Linotype.

The magazine was divided into eight sections and might contain as many as four fonts or any other combination of matrices of the same point size. Normally, the four forward sections contained the lower-case and the four rear contained the upper-case matrices. The method of distribution required that Font No. 1 be contained in sections 1 and 5, Font No. 2 in sections 2 and 6, Font No. 3 in sections 3 and 7, Font No. 4 in sections 4 and 8. For distribution, the matrices, after being separated into four fonts or groups, dropped into a series of carriers, each having four rows of pockets and each holding one matrix. These carriers transported the matrices step by step over the magazine sections and under feelers containing tooth combinations serving to release the various matrices to drop into their correct channels.



1901 · LOGOTYPE CASTING AND COMPOSING MACHINE

(O. Mergenthaler and E. Lawrenz, Inventors)



1904 · DOW TYPESETTING MACHINE

(Alexander Dow, Inventor)

1904 This machine did not set type. Its function was merely to aid the compositor by providing him with a continuous supply of type arranged so as to be more readily selectable and removable than from the ordinary type cases.

The type was arranged in channels of the magazine and lay with the nicks similarly disposed and the faces forward. It was ejected by the mechanism, one by one, into channels on a table and held sufficiently loosely to be readily removed by the compositor and yet not removable by vibration or jar. As soon as any type was removed it was automatically replaced by another from the channel above it.

The type was ejected onto shelves at two levels in order to provide alternate separation, thereby allowing more room between type on the shelf for easier removal by hand. Under each shelf was a long strip on which was stamped the same character as on the type lying immediately above it.

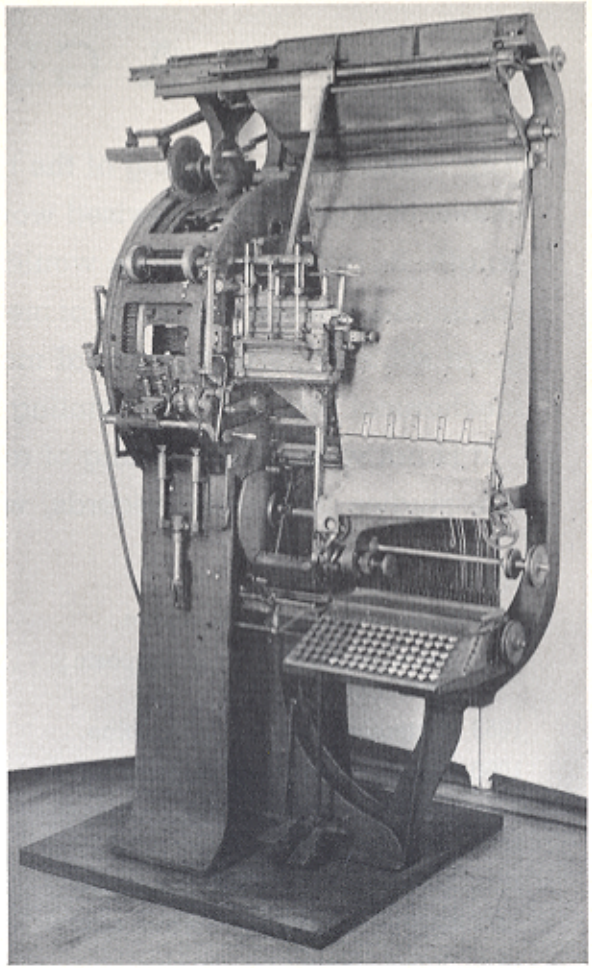
This machine was the development of a line-casting machine invented about 1900. It employed special matrices, sections or segments of a ring of uniform thickness. Each matrix had on its outer convex surface, a plurality of dies for the same letter or sign in several faces, or even in several point sizes. On its inside concave edge were six teeth which not only held it to supports during composition, casting and transfer, but served also for distribution. The assembled line of matrices and spacers, of wedge design, was delivered onto either of two grooved supporting cylinders rotatively mounted on a large ring-shaped frame. This revolved on a horizontal axis to carry the cylinders to and through the positions of casting and transfer, and returned them to the assembling position. The grooved cylinders could be rotated to bring any desired line of the several type faces on the matrices into casting position.

1911

The metal pot with its mechanism was inside, but not attached to, the large ring-shaped frame. An adjustable mold was moved horizontally to the left in order to locate it between the pot mouthpiece and the composed line on the grooved cylinder.

After the slug was cast, the mold was moved to the right and outside the ring-shaped frame to the ejecting position. During this movement the slug passed knives which trimmed its base and both edges of its face.

The keyboard, magazine and assembling mechanism resembled those of the Linotype, but a grooved roller was substituted for the assembling elevator. The distributor was somewhat like two of the earlier Mergenthaler distributors, set side by side. The machine was never used commercially.



1911 · POLYTYPE

(F. C. Lucke d'Aix, Inventor)

A GLANCE BACKWARD

Any comprehensive listing of the typesetting machines that have been devised would be of great length. Its only significance would be that of the continuing interest and effort of men of vision and great skills to perfect practical machines for the mechanical production of printing types.

It is not without the feeling of amazement that one studies the patent records, where so many hopes were halted, either temporarily or permanently. Still other inventions became laboratory models; not a few saw limited usage; a number stood the test of dependable production; a few have survived.

These highlights include some of those names that are either familiar or are now forgotten in the long list of milestones of typesetting machines.

CIRCA

1822 Church composing machine

1840 Young and Delcambra composing machine

1859 Hattersley composing machine

1860 Felt composing and distributing machine

1869 Thorne machine (early)

1870 Kastenbein composing machine

1872 Empire composing machine (early)

1872 Fraser composing machine

1872 Westcott casting and composing machine

1872 Hooker composing machine

CIRCA

1880 Wicks composing machine

1884 Mergenthaler band machine

1886 Mergenthaler Linotype

1887 Paige Compositor

1888 Rogers Typograph

1890 Pulsometer composing machine

1892 Monoline

1893 Graphotype

1893 Calendoli type-bar machine

1895 Compositype type-bar machine

1896 Dow composing machine

CIRCA

1897 Electrotypograph composing and casting machine

1898 Unitype or Simplex one-man typesetter

1898 McGrath casting and line-justifying machine

1902 Dykotype

1902 Castotype casting, composing and line-justifying machine

1908 Bhisotype casting and distributing machine

1909 Unitype-bar machine

1909 Oddur machine

1911 Polytype

MERGENTHALER LINOTYPE COMPANY

29 RYERSON STREET · BROOKLYN 5, NEW YORK