LINOTYPE
INSTRUCTION BOOK

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LINOTYPE INSTRUCTION BOOK

A Detailed Description of the
Mechanism and Operation of the Linotype
with Instructions for Its Erection,
Maintenance, and Care

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TRADE LINOTYPE MARK

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Printed in U. S. A.
Composed entirely on the Linotype in
Old Style No. 7 and Caslon Old Face

This Book Is Full of Troubles So That Troubles May Never Occur

AN ANCIENT philosopher said: "My life has been full of troubles, most of which never happened." So that the troubles enumerated in this book may never happen under careful operation and maintenance, every possible source of trouble has been explained. Cause, effect and remedy are given in full detail. To the casual reader this may create the impression that the operation of the Linotype is attended by many difficulties. We mention, therefore, at this point that in all parts of the world Linotypes are in successful operation under widely varied conditions, some of the machines having been erected, operated and maintained by persons utterly without previous training on the Linotype.

It should also be stated that Linotype machinists vary in their practices as to certain adjustments, methods of lubrication, cleaning and the like. The practice given in this book is recommended by the factory engineers. It is generally agreed that standardized methods among machinists and operators should be sought. This book is offered as a means to that end.

MERGENTHALER LINOTYPE COMPANY

Preface

IN THE course of human events, the time has arrived when there should be available to those interested in the Linotype, a book explaining its mechanism and describing its range with further detail and illustration than has thus far been attempted.

Perhaps because of the fact that I am one of the oldest living inventors associated with the Mergenthaler Linotype Company, this connection covering a quarter of a century, it has fallen to my lot to write this book.

It is my intention that the volume shall be mainly one of perspective illustrations, which can be read by any one at a glance. In these the particular point or part to be described is shaded heavily, while the surrounding parts are left light. The text is largely an explanation of these illustrations.

Pictures are called "the universal language," and I have intended to use many illustrations and diagrams, so as to give, if possible, the student of the Linotype a clear understanding of its mechanism.

The Linotype machine is compact, and the levers and cams which give the different motions to its mechanism are so concealed within that it is difficult to see or understand their action when observing the machine while actually doing its work.

It is hoped, by illustrating each separate part, the motion of the moving parts, and the reason for such movements, that the mechanism can be more clearly understood; and also that by the use of these illustrations it will be possible to identify parts more surely when supplies are ordered by the customer.

The Linotype Company receives many letters asking for instructions on various points concerning the machine. These letters come principally from operator-machinists in small towns or villages, where skilled mechanics on the Linotype are not easily obtained.

A large number of these illustrations will be printed in addition to those which are bound in the book, and when writing to our customers who are seeking instruction, by enclosing one of the illustrations with notes thereon, it is believed that very much clearer information may be imparted.

The reader will find a number of repetitions throughout the book. This is intentional. Some of the parts in the Linotype machine perform more than one function and it is often necessary in describing one of these functions to repeat the description with reference to another. There are

also certain directions and warnings to the operator and machinist so important that they cannot be repeated too often.

It has also been found advisable to make a brief summary of long descriptions. In describing the different models which have many parts that are like other models this repetition of description becomes necessary.

Much time and thought have been put into this work and the proofs have been carefully read, but it is always possible in a book of this size that errors will creep in. The Company will be very appreciative if their attention is called to any such errors, which may be corrected in a later edition.

The proof of this book has been read by Mr. E. A. Sytz, Assistant Works Manager of the Mergenthaler Linotype Company. Mr. Sytz has been connected with the Company for more than thirty years, having worked with Mr. Mergenthaler in Baltimore in the early days. He has made many valuable suggestions and criticisms.

Mr. R. M. Bedell, who was for many years foreman of the assembling department in the Factory, afterward master mechanic, and is now connected with the Executive Offices of the Company, also assisted with the proofs and has made many suggestions. The technical knowledge born of the long experience of these gentlemen has been of great value in preparing this work.

Very early in the history of the Linotype it became necessary to designate the different parts of the machine so that the names of these parts could be used in the manufacture of the machine and by our customers in ordering supplies. As there are many parts in the Linotype machine, it was necessary to have a system for naming these parts. The system adopted at first, and which has been in use ever since, is that commonly used by manufacturers of machines having many different parts. The first word designates the main part of the machine to which the part belongs, and the names follow in order so as to designate beyond the possibility of a doubt each part. It thus happens that the smaller the part the longer the name. A small bracket on the machine has the following name: "vise jaw left-hand adjusting rod locking pin lift bracket." While this name is very long and clumsy it does actually describe and locate the bracket so that it is impossible to make any mistake. In addition to the name, each part has a number. The number of the "vise jaw left-hand adjusting rod locking pin lift bracket" is E-1311. It is manifest that these long names cannot be used in ordinary practice. The keyboard keybar is commonly called the keyrod or keyreed. In this book the shorter and more common names are used in the descriptions. This is made necessary by the fact that the regular names are so long and difficult to keep in mind.

As a general rule the part numbers are not used. This is because the part numbers have been subject to change during the many years since

the Linotype was placed on the market. The proper names and part numbers can be obtained from the catalogues issued by the Company which are revised and brought up to date from time to time, *and these catalogues must be used in ordering parts.*

In general, it has been the desire of the author to use the most simple language so that those who are not familiar with the mechanism of the Linotype can understand it so far as language can communicate it. It is probable that in some cases the use of technical language would be more exact and scientific. Algebraic formulæ are the most scientific and exact ways of expressing facts, but such formulæ are of no use to one who has not studied algebra. Every one will understand that the same fact may be expressed in different language by different persons. It is hoped that the language used is so simple that it can be easily understood.

J. R. R.

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Foreword

UNDOUBTEDLY the invention of separate movable type, capable of being assembled, used as a "form" to print from, distributed and reassembled into other "forms," is the one invention which has made the greatest contribution to human progress. The art of printing is rightly called "the art preservative of all arts." Wendell Phillips, in his lecture on the "Lost Arts," shows that the ancients possessed much useful knowledge which was lost to the world because the only method of handing it down to succeeding generations was by word of mouth, or in very costly manuscripts, few in number. Since the art of printing came into use each succeeding generation has made marked progress, because the knowledge of arts and sciences has been handed down on the printed page to posterity. In point of importance and in amount of capital involved, the printing art now stands sixth in the United States.

From the time of Gutenberg, for nearly four hundred years, no improvement was made over his method of assembling and distributing movable type. In the assemblage each letter was picked up singly from its cell in the compositor's "case," placed in a "stick," assembled into a "form," and after the form had been used for printing, either directly from the type or by the making of electrotypes or stereotypes, the types were one at a time thrown back into the cell of the "case" by the fingers of the operator.

During this time vast improvement was made in the means for taking impressions from the "form" of type. In the original press used by Gutenberg and his immediate successors the platen was brought down upon the type by means of a screw, operated by the arm of the printer. The ink was smeared upon the form by what were called "inkballs," which were merely a means of daubing the ink upon the type, and these "inkballs" were also operated by the hand of the printer. Five hundred sheets in ten hours with these original means would be considered a good day's work for two men, and such a record was seldom achieved. During the eighteenth century a good deal of improvement was made, but the press was still manipulated entirely by hand. The ink-roller took the place of the "inkball." In the beginning of the nineteenth century rapid progress was made. Lord Stanhope changed the material of the press from wood to iron and power began to be applied to the presses. From this time the presses became more and more automatic, consequently more rapid and accurate in their work. The invention of stereotyping and electrotyping

was followed by the use of the cylinder press and the web press, printing from rolls of paper, so that by 1880 there were presses capable of turning out twenty thousand copies of an eight-page newspaper in an hour, which was considered a wonderful thing. The "perfecting press" made the manufacture of books and pamphlets very much cheaper, so that the cost of a library was very greatly reduced. During all this progress of the printing press, however, the types were assembled, distributed into the cases, and recomposed in exactly the same way as had been done by Gutenberg four hundred years before.

The desirability of means for mechanically composing and distributing the single type was recognized many years ago, and beginning in the early part of the nineteenth century many patents were obtained for machines for this purpose. Fortunes were expended in experimenting and several machines were placed on the market, but, after a limited time, all disappeared.

An early English machine was provided with finger keys by means of which the type was assembled in a continuous line, which was separated and divided into short lengths or lines which were "justified" by hand. After being used the type was transferred to an elevated part of the machine where a second keyboard was used to effect the distribution of the type into the magazines from which it had been delivered, the operator being guided by the proof or print before him. Several of these machines were built and used for a time.

Of all the machines constructed, the most notable and unfortunate was the so-called Paige Compositor—beautiful in conception, design and execution, and operated successfully to compose, justify and distribute the type. Years of time and vast amounts of money were spent in its development. Its principal promoter was "Mark Twain" (Samuel L. Clemens), who lost his fortune and large amounts contributed by friends. It is known that the various American companies expended unsuccessfully upwards of twenty million dollars in composing machines of one kind and another.

In the early seventies of the nineteenth century, the typewriter came into use. A few stenographers and official reporters in Washington, recognizing the great advantage of the typewriter for their own work over manuscript, conceived the idea that a machine similar to the typewriter could be made which would, on the touch of a key, do the work of the arm and fingers of the compositor. Their idea was to have this machine impress steel type successively into a strip of papier maché, or similar material, to be subsequently used as a matrix from which to cast the stereotype plate.

These men organized a small company which experimented along the lines above indicated, and at the same time another independent company engaged in experimenting along the same general lines.

Not daunted by the failure of others, certain of the stenographers and a few of their friends undertook developments which finally resulted in the production of the Linotype. The members of the original syndicate were: Moore, Clephane, Devine, McEwen, Warburton and Murphy. All but Moore and Warburton were identified with Congressional reporting. None of the number is now alive.

Operations were begun by the building of rotary machines, controlled by finger keys to indent the characters in long papier-maché strips which were cut into the proper length and justified by bending or lapping the paper between words. These strips were secured in parallel lines to a backing sheet and constituted a matrix for column or page, the printing form or plate being cast in type metal thereon after the manner of ordinary stereotype plates.

Moore conceived the idea of casting from the matrices separate slugs or bars, each bearing the characters to print complete lines; in other words, he was the originator of what is now known as the "linotype" or slug. These slugs were produced in a slotted mold or frame filled by hand, the slugs being planed or dressed to height on back, and the frame then separated to release them.

While the development of these slugs was a great advance in the art, the method of producing them was impracticable and failed to come into use.

Ottmar Mergenthaler, then a workman in the shops of Hahl and Company, in Baltimore, where certain of the experimental machines were built, was employed by the above named gentlemen and their associates to continue experimental work. He produced a rotary indenting machine which was not adopted. Later a machine was built with long vertical parallel bars, each bearing a complete alphabet of metal type or dies, and a fingerboard by which the selected letters for a line, one on each bar, could be brought into alignment and impressed in papier-maché, thus producing one after another justified matrix lines; the papier-maché matrices thus produced being transferred to a second machine from which the slugs or linotypes were cast, one at a time, line after line.

The next advance was the production of a machine similar to the above, except that the long bars, each having similar characters, were replaced by bars containing female characters or matrices for an entire alphabet. This machine also included a melting pot for type metal and a mold. After the matrix bars were longitudinally adjusted to bring the selected characters in line, they were presented to and closed the face of the mold slot which was then filled from the back with molten metal expelled from the pot into the mold, much as in the present Linotype machines.

This was the first machine in which the linotypes were cast against metal matrices, temporarily assembled in line. While this machine was

practical, it was slow in action, and to secure the necessary speed Mergenthaler developed a machine in which small metal matrices, bearing individual characters, were stored in a magazine from which they were released one at a time by finger keys, and assembled in line with expansible wedge spaces, and the composed line transferred to the face of the mold with which the matrices co-operated to form the type characters on the front of the slug or linotype cast in the mold, after which the matrices were elevated to the top of the machine and returned by a distributing mechanism to the magazines.

This was the first automatic continuously acting Linotype machine, in which the speed was due to the fact that one line of matrices could be composed while the second was being used at the mold and a third being distributed. This machine was modified, improved and simplified from time to time, and finally became the first commercial Linotype which was placed on the market and installed in 1886 in the offices of the *New York Tribune,* the *Chicago News,* and the *Louisville Courier-Journal.*

The justification of the lines was one of the most difficult problems. Three inventors, J. D. Schuckers of Philadelphia, Mergenthaler, and the author of this book, were experimenting in this field at one time, but a patent on the double-wedge spaceband was finally awarded to Schuckers as the first inventor. The Linotype machine of the present day represents the contribution of various inventors other than Mergenthaler.

There are now more than 49,000 Linotypes in use, setting about forty-seven languages, and the machine has been developed so that it covers the entire range of type composition.

But the mechanical development of a machine is only one side of a great business; the establishment of a factory, the organization of the business, securing the confidence of customers, overcoming prejudice and skepticism when a new art is developed, require an ability of a different sort, but no less important than that of the inventor.

The Linotype Company was very fortunate in securing early in its history the services of Mr. Philip T. Dodge, of Washington, as president and general manager. Mr. Dodge was a young patent attorney of Washington, and had prepared and solicited the patents on the Linotype from a very early period. He took hold of the business as president and general manager in November, 1891. The task before him was herculean. The Mergenthaler Printing Company and the National Typographic Company had expended upward of two million dollars and had exhausted their capital. There was no ownership of real estate. The tool equipment was limited and imperfect, and the factory consisted of a small leased building. The machine at that time was far from perfect and worked in a more or less unsatisfactory fashion. He had the opposition of those who feared that their trade would be ruined, and of those who were skeptical in view of the vast sums that had been lost in the typesetting machine business.

He had to recreate not only the machine but the tools, factory and organization to build it. Even the stockholders, who had held on hitherto with great persistence and patience, were almost at the point of despair.

In October, 1891, a new company, the Mergenthaler Linotype Company of New Jersey, was formed and succeeded to the holdings of the older companies. The new company was provided with a cash capital of only $374,000, and it was with this limited capital that Mr. Dodge was required to reestablish and carry on the business. The first dividend was not paid until August, 1894.

During the past twenty years the Linotype business has grown enormously, many new models have been produced, and the scope and range of the machine has been increased beyond the wildest dreams of the original syndicate. New models have been designed covering display work, advertising, in which faces of different sizes and styles are combined, tabular work, mathematical work and many languages in which characters in great number are used. This mechanical development has also been directed by Mr. Dodge, who has an inventive turn of mind and who has taken out many patents, and by suggestion and direction has controlled the development of the machine, as well as the business of the great corporation which the Linotype Company has now become.

The success of the Linotype Company is due fully as much to the business foresight and energy of Mr. Dodge as to the genius of Mergenthaler and others in the development of the mechanical side of the machine.

The Linotype is often spoken of as a "typesetting machine." Strictly speaking, this term is properly applied only to machines which set and distribute foundry type, such as the Thorne, Empire and others.

The Linotype makes its type in the form of a slug or solid line of type, having printing characters upon its upper edge. These slugs, when assembled together, make up a "form," which can be used for printing direct or from which an electrotype or stereotype can be made. After the form has been used the slugs are melted and run into pigs or put into the crucible direct and used over and over again indefinitely. The term "distribution" in hand composition and in the type setting machine, such as the Thorne, means the process of restoring to the cells of the case, or to the magazines, the separate, individual foundry type. In the Linotype machine the term "distribution" refers only to the process of restoring a line of matrices to their original places in the magazines, the distribution of the "form" being made by remelting the slugs as aforesaid.