The step-by-step guide to PHOTO-OFFSET LITHOGRAPHY

Robert M. Swerdlow

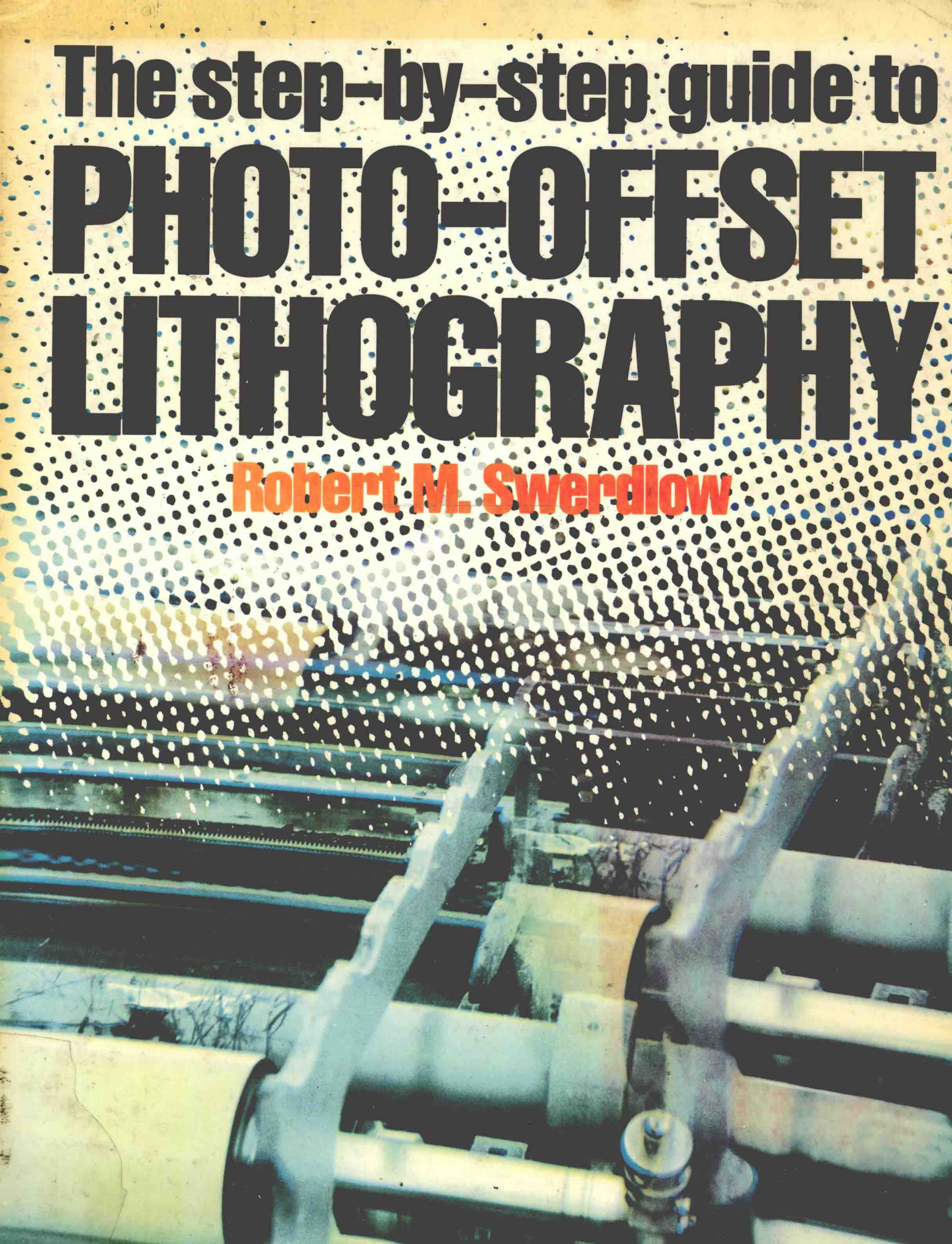

PHOTO-OFFSET LITHOGRAPHY

ROBERT M. SWERDLOW

Department of Technology and Industrial Education
New York University

PRENTICE-HALL, INC., *Englewood Cliffs, New Jersey 07632*

Library of Congress Cataloging in Publication Data

Swerdlow, Robert M. (date)
The step-by-step guide to photo-offset lithography.

Includes index.
1. Photolithography—Handbooks, manuals, etc.
I. Title.
TR940.S95 686.2'325 82-404
ISBN 0-13-846584-3 AACR2

The Step-by-Step Guide to Photo-Offset Lithography
Robert M. Swerdlow

Editorial/production supervision and
interior design by *Rosalie Herion*
Page layout by *Diane Heckler-Koromhas*
Cover design by *Zimmerman/Foyster Design*
Cover photo courtesy *Robert Ternaven, Algen Press Corp.*
Manufacturing buyer: *Ed O'Dougherty*

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Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

ISBN 0-13-846584-3

PRENTICE-HALL INTERNATIONAL, INC., *London*
PRENTICE-HALL OF AUSTRALIA PTY. LIMITED, *Sydney*
PRENTICE-HALL CANADA, INC., *Toronto*
PRENTICE-HALL OF INDIA PRIVATE LIMITED, *New Delhi*
PRENTICE-HALL OF JAPAN, INC., *Tokyo*
PRENTICE-HALL OF SOUTHEAST ASIA PTE. LTD., *Singapore*
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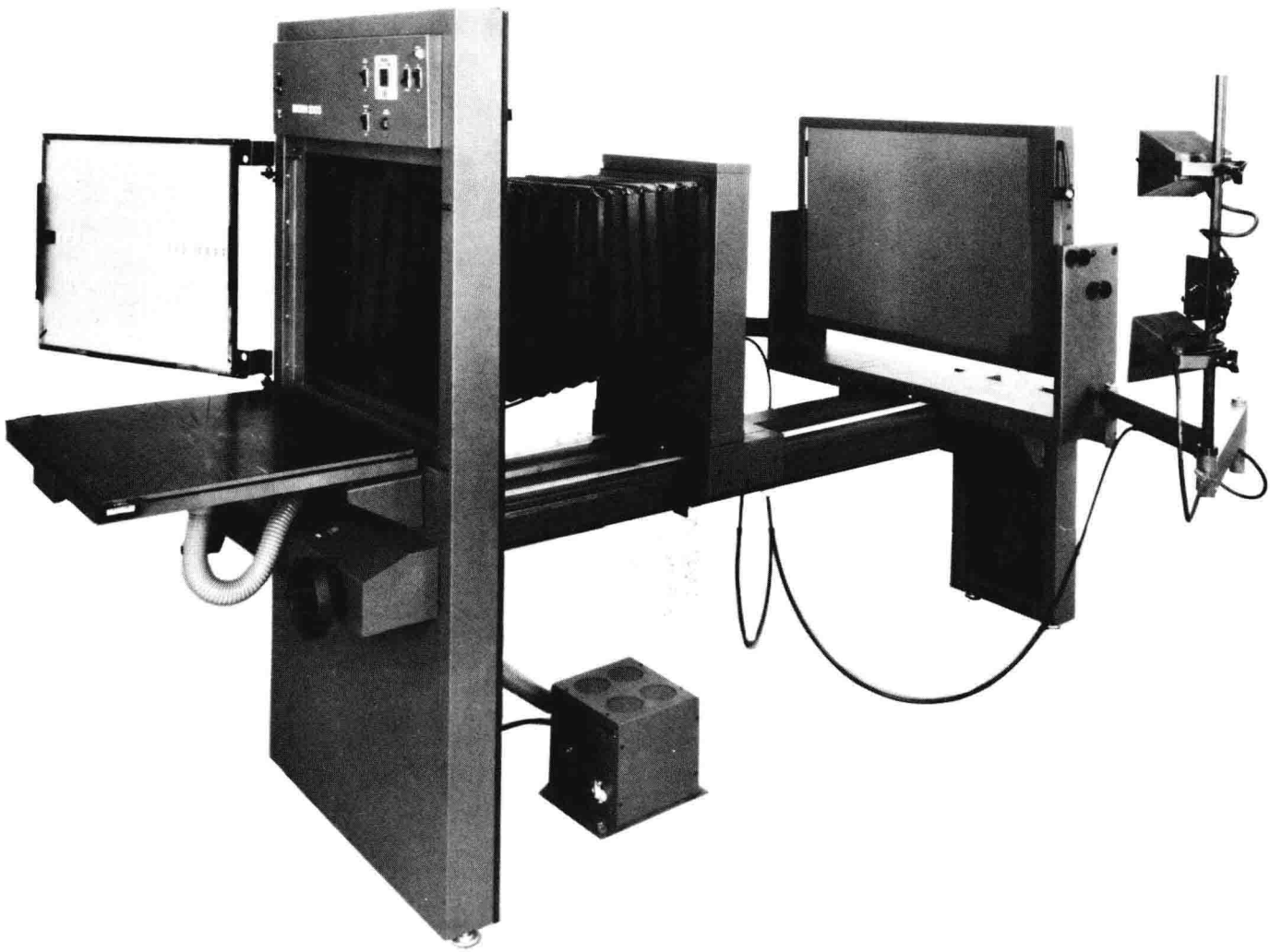

the STEP-BY-STEP GUIDE to PHOTO-OFFSET LITHOGRAPHY

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Preface

The Step-by-Step Guide to Photo-Offset Lithography is designed to serve as a basic resource for both the beginning student and the practicing professional in the field of photo-offset lithography. The new student will be aided by the step-by-step approach to learning. The practicing professional will find that he or she is introduced to new equipment and new ways of accomplishing old tasks. Both students and professionals will benefit from the large number of illustrations and the helpful tables and charts that are provided.

This book covers all aspects of the photo-offset reproduction process from planning through printing. Emphasis has been placed throughout on practical information presented through a "hands-on" approach. This information is supplemented by theoretical and "nice-to-know" material. Paper and ink requirements for offset lithography are also discussed as are postpress finishing and binding procedures.

The design of this book is unique in that the reader is provided with complete step-by-step procedures for accomplishing the various activities associated with photo-offset lithography. This structuring enables the reader to complete the step-by-step activities even when no instructor is around to help. No prior technical knowledge is assumed; all the material needed for full comprehension of the text is included in the easy to understand step-by-step presentations. Over 700 line and halftone illustrations, some of which are in full color, complement the clearly written text.

Students, artists, designers, editors, compositors, camera operators, strippers, platemakers, press operators, printing buyers, and salespeople will find this book to be a valuable resource. In fact, anyone who is involved in putting together any kind of publication (e.g., newsletter, brochure, catalog) should benefit from a review of its contents.

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to the many people and companies who assisted in the preparation of this book. Thanks are due to Barbara Lach for her help in typing much of the correspondence that was required; to the companies and organizations that supplied illustrations for inclusion in the text; to New York University for providing the time and encouragement that was needed; and to the staff at Prentice-Hall, especially Hank Kennedy, John Duhring, and Rosalie Herion, who turned an idea into a finished book.

Special thanks are reserved for my very special family: to Russ and Dave, who provided the soothing background music whenever things got to be too hectic; to Winston, who helped to keep me on my toes; to Mom and Dad; to Barney and Roz; and to Judith, who always found the right words whenever the well ran dry.

ROBERT M. SWERDLOW

the STEP-BY-STEP GUIDE to PHOTO-OFFSET LITHOGRAPHY

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Photo-Offset Lithography

The graphic arts industry in the United States consists of almost 50,000 companies that employ well over a million people. Graphic arts ranks among the largest of our manufacturing industries. The industry has grown rapidly in the past, and government projections call for continued growth in the years ahead (Fig. 1-1).

Although graphic arts is considered to be an industry in and of itself, it is actually made up of several different industries. Included are the publishing, printing, binding, and packaging industries as well as the related industries that supply the paper, ink, chemicals, and equipment used in the various printing processes.

INTRODUCTION TO THE MAJOR PRINTING PROCESSES

Four major processes are used by the graphic arts industry to print its products. These processes are relief printing, gravure printing, screen-process printing, and lithographic printing.

FIG. 1-1 Printing, publishing, and allied industries, 1978–1980 (receipts in millions of current dollars). (Courtesy *U.S. Industrial Outlook 1980.*)

INDUSTRY	*1978*[1]	*PERCENT CHANGE 1978-77*[1]	*1979*[1]	*PERCENT CHANGE 1979-78*[1]	*1980*[2]	*PERCENT CHANGE 1980-79*[2]
Printing, publishing and allied industries, total	56,186	+13	62,451	+11	68,677	+10
Newspapers	14,500	+12	16,125	+11	17,750	+10
Periodicals	7,292	+20	8,240	+13	9,229	+12
Book publishing	5,495	+13	6,040	+10	6,675	+11
Book printing	1,920	+13	2,100	+ 9	2,325	+11
Commercial printing	16,500	+12	18,200	+10	19,700	+ 8
Manifold business forms	3,259	+13	3,846	+18	4,308	+12
Other printing and publishing[3]	7,220	+11	7,900	+ 9	8,690	+10

1 Estimates by Industry and Trade Administration (BDBD).

2 Forecast.

3 Includes the following industries: 2741, miscellaneous publishing; 2753, engraving and plate printing, 2771, greeting card publishing; 2782, blankbooks and looseleaf binders, 2789, bookbinding and related work; 2791, typesetting; 2793, photoengraving; 2794, electrotyping and stereotyping; 2795, lithographic platemaking services.

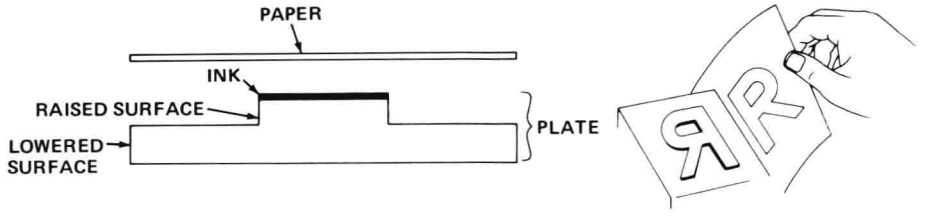


FIG. 1-2

How Relief or Letterpress Printing Works

Printing from a raised surface is termed *relief printing*. It is also called *letterpress* printing. Until recently, relief or letterpress was the most important of the printing processes used in the United States.

The relief or letterpress process is easy to understand (Fig. 1-2). Ink is applied to the raised surface of a printing plate. When paper is pressed against this surface, the ink transfers to the paper. Note that the image on the plate is "wrong-reading" or a mirror image of what is to be printed. Printing reverses this image to form a "right-reading" image on the paper.

Hand- and machine-set type and photoengravings are the original plates used in the relief process. Duplicate plates made from original plates can also be used. Stereotypes and electrotypes are duplicate relief plates that are produced in either flat or curved form. In addition, flexible rubber plates are sometimes used to print by a relief technique called *flexography*.

Hand-set type is assembled in a composing stick to create words and sentences (Fig. 1-3). Each piece of type consists of a raised character on a wood or metal body (Fig. 1-4). All the characters needed to form words and sentences are stored in special shallow drawers called *job cases* (Fig. 1-5).

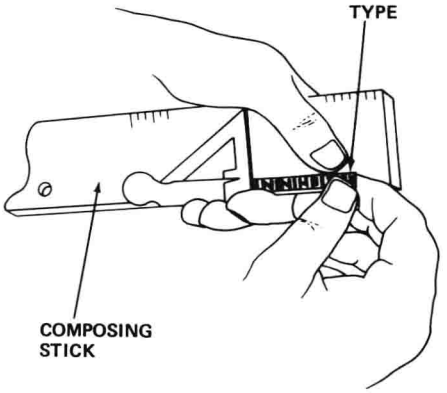


FIG. 1-3

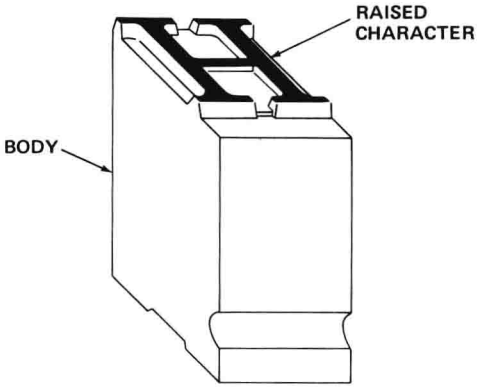


FIG. 1-4

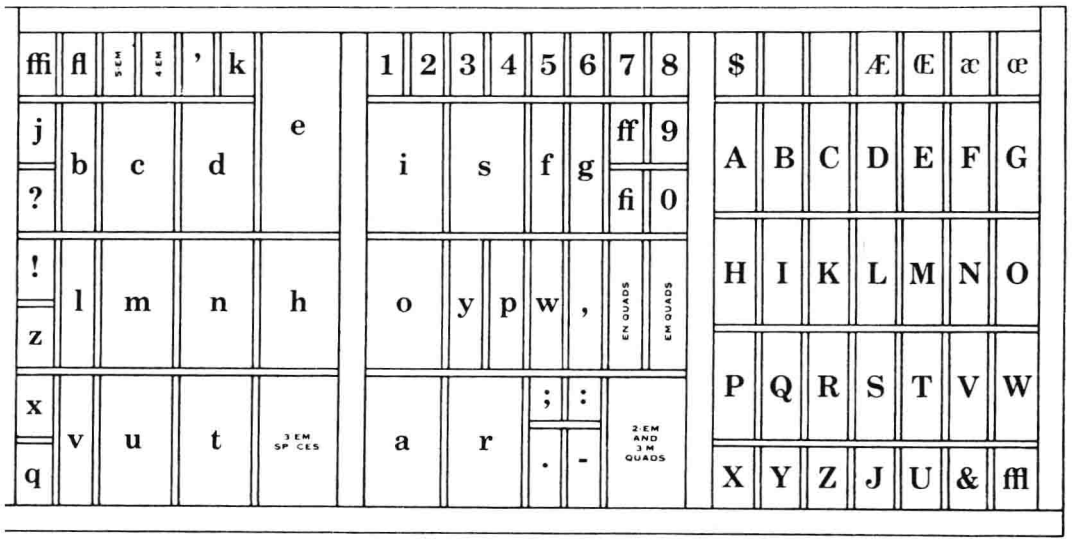


FIG. 1-5 Layout of the California job case.

Machine-set type is generated by typesetting machines that store matrices (molds) of letters, numbers, and punctuation marks (Fig. 1-6). A machine operator depresses the keys that send selected matrices to a casting area where they are filled with molten metal. After the metal solidifies, a type slug containing the desired words and sentences is delivered to the front of the machine (Fig. 1-7). Matrices are then automatically returned to their storage area and may be reused over and over again.

Photoengravings are relief plates that can print drawings and photographs as well as words and sentences (Fig. 1-8). The plates are prepared using both photographic and etching techniques. A photographic negative containing the desired copy is placed in tight contact with a metal or plastic plate that has been coated with a light-sensitive emulsion. The plate is exposed to light through the negative and then processed. Processing removes the emulsion from the unexposed areas of the plate only. The exposed emulsion remains on the plate and serves as a resist during etching. The unprotected areas, however, are lowered or eaten away by the etching solution (Fig. 1-9).

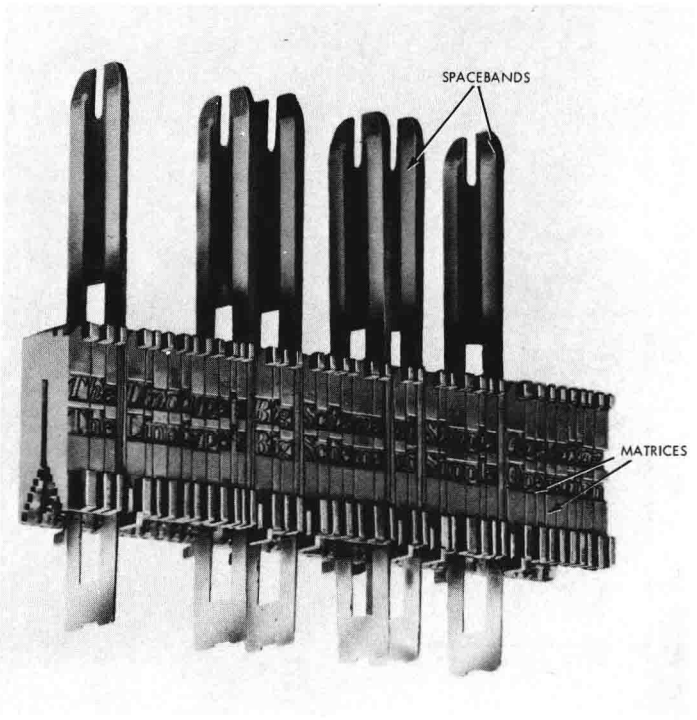
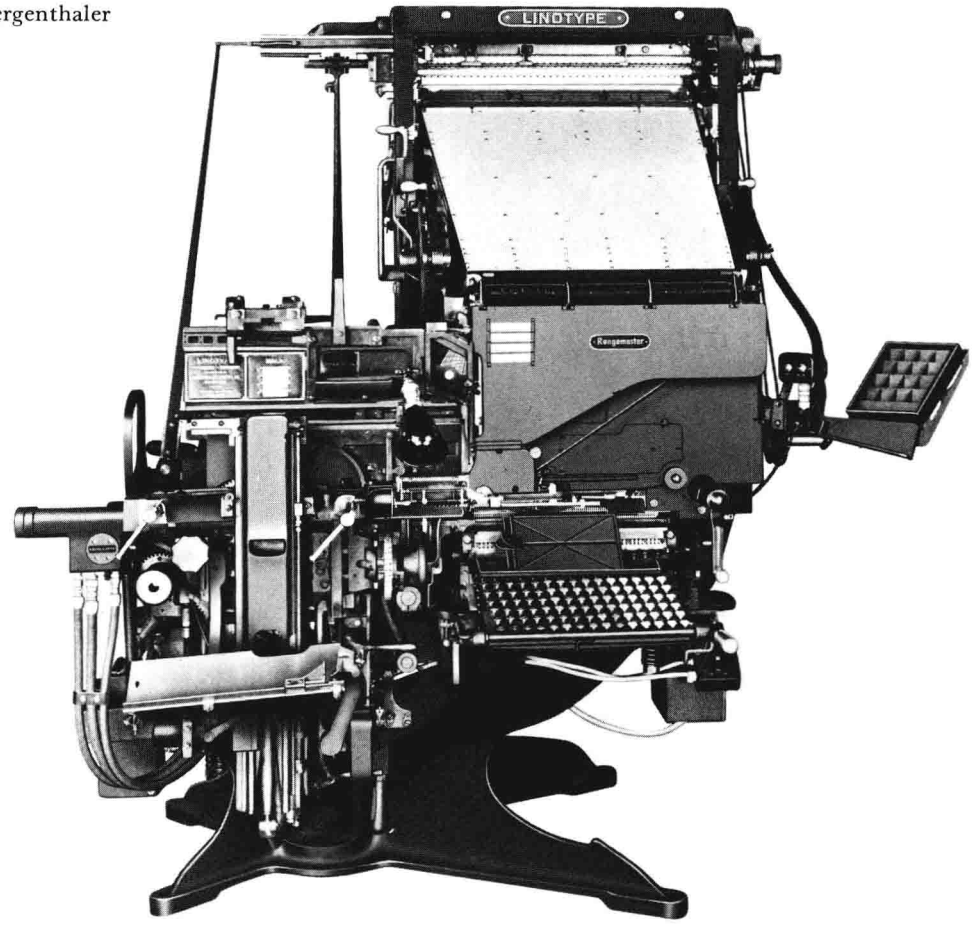


FIG. 1-7 (Courtesy Mergenthaler Linotype Co.)

FIG. 1-6 (Courtesy Mergenthaler Linotype Co.)



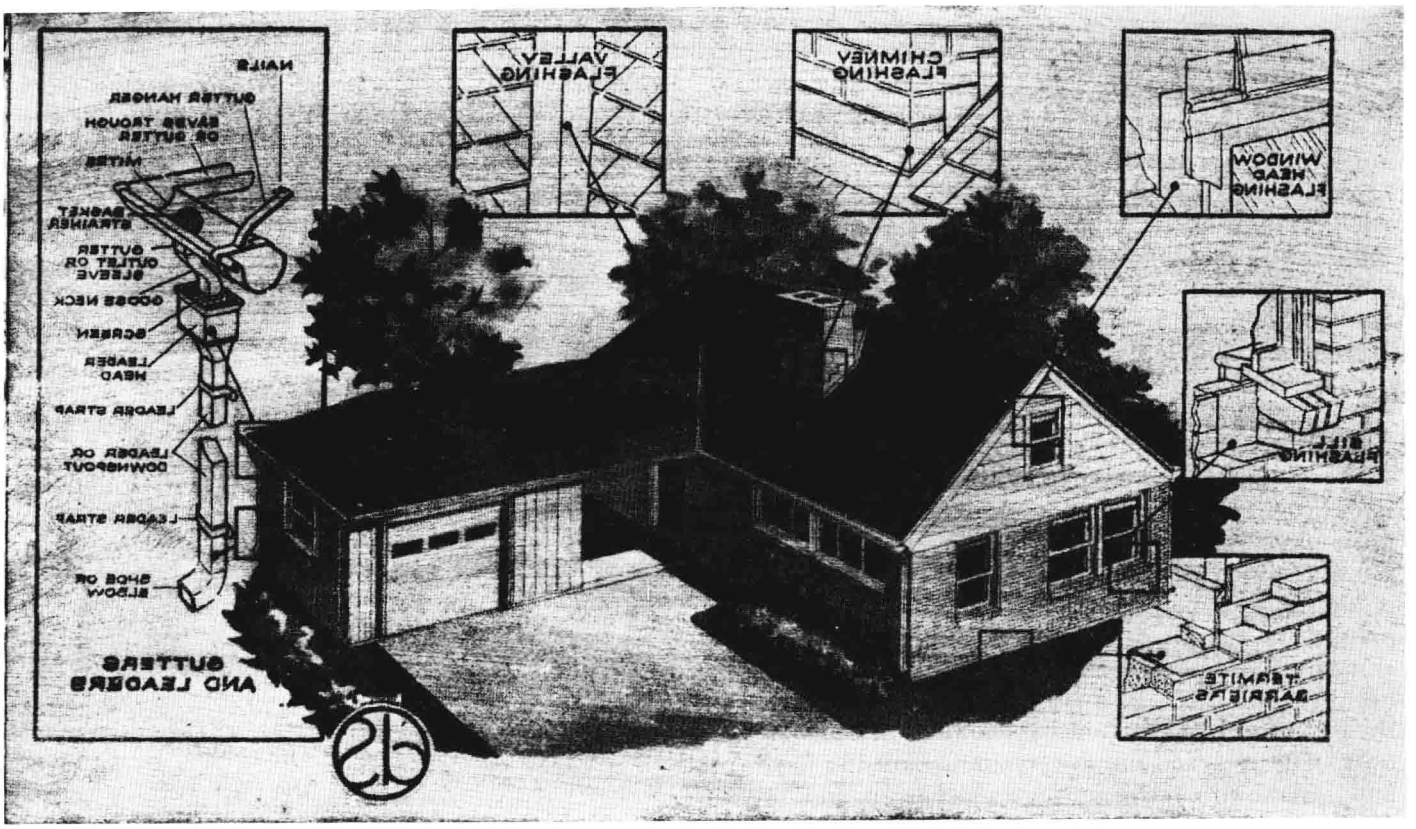
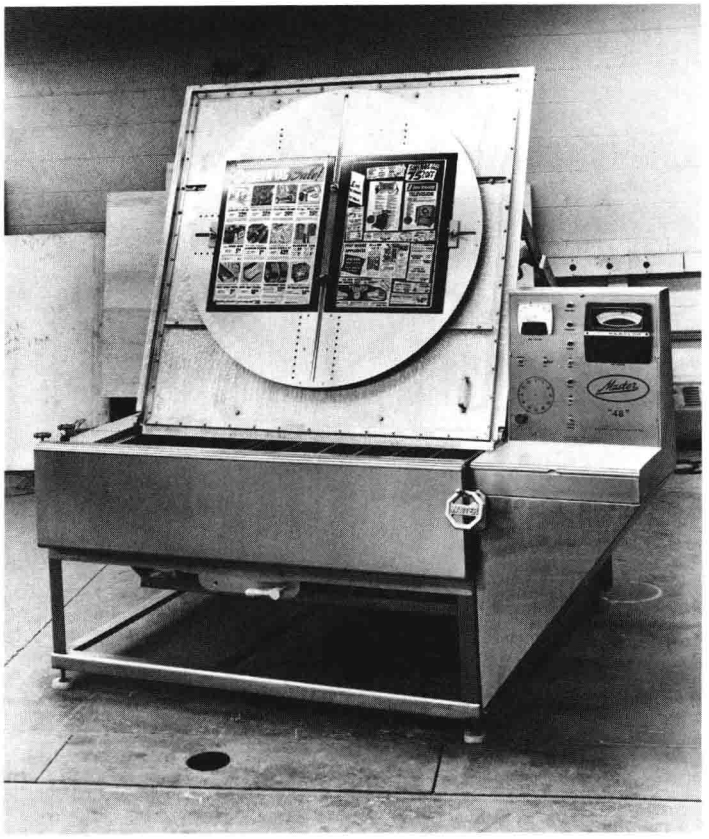


FIG. 1-8

FIG. 1-9 Powderless photoengraving etching machine. (Courtesy Master Sales & Service Corp.)



Three types of presses are used to print from relief plates—platen, cylinder, and rotary. Photographs of each type are shown in Fig. 1-10, 1-11, and 1-12. Operating principles of the platen, cylinder, and rotary presses are also provided here.

How Gravure or Intaglio Printing Works

Printing from a lowered surface is called *gravure printing*. Intaglio (pronounced *in-tal-yo*) is another name for this process. Gravure techniques are most appropriate when printing extremely long runs on relatively low-quality paper. Many newspaper supplements, magazines, and mail-order catalogs are gravure printed. Paper money, postage stamps, and much of our fabric is also printed by the gravure process.

In the gravure process, printing is done from a lowered plate surface (Fig. 1-13). The desired image is etched or cut into the plate, forming cavities or depressions. Inking is accomplished by coating the entire plate with ink and then wiping its surface clean. The ink remains in the lowered cavities only. When paper is pressed against the plate, it picks up the ink from the depressions and image transfer (printing) is completed. Like relief, gravure printing plates must contain "wrong-reading" images in order to print "right-reading" ones on the paper.

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