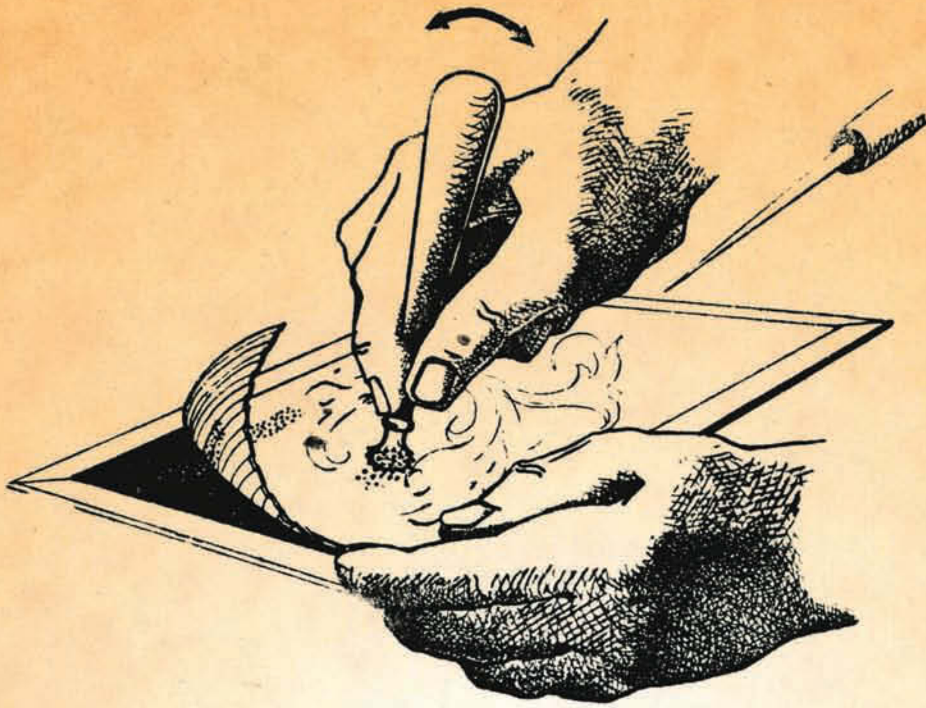


THE

RESTORATION

OF

ENGRAVINGS, DRAWINGS, BOOKS, AND OTHER WORKS ON PAPER

MAX SCHWEIDLER

TRANSLATED, EDITED, AND WITH AN APPENDIX BY

ROY PERKINSON

THE

RESTORATION

OF

ENGRAVINGS, DRAWINGS, BOOKS,

AND OTHER WORKS ON PAPER

This page intentionally left blank

THE RESTORATION OF ENGRAVINGS, DRAWINGS, BOOKS, AND OTHER WORKS ON PAPER

MAX SCHWEIDLER

TRANSLATED, EDITED, AND WITH AN APPENDIX BY
ROY PERKINSON

THE GETTY CONSERVATION INSTITUTE | LOS ANGELES

The Getty Conservation Institute works internationally to advance conservation and to enhance and encourage the preservation and understanding of the visual arts in all of their dimensions—objects, collections, architecture, and sites. The Institute serves the conservation community through scientific research; education and training; field projects; and the dissemination of the results of both its work and the work of others in the field. In all its endeavors, the Institute is committed to addressing unanswered questions and promoting the highest possible standards of conservation practice.

Second printing

Getty Publications
1200 Getty Center Drive, Suite 500
Los Angeles, California 90049-1682
www.getty.edu

Chris Hudson, *Publisher*
Mark Greenberg, *Editor in Chief*

Tevvy Ball, *Editor*
Sheila Berg, *Manuscript Editor*
Catherine Lorenz, *Designer*
Pamela Heath, *Production Coordinator*

Typesetting by Diane Franco
Printed in China

Library of Congress Cataloging-in-Publication Data

Schweidler, Max, b. 1885.
[Instandsetzung von Kupferstichen, Zeichnungen, Büchern usw. English]
The restoration of engravings, drawings, books, and other works on paper / Max Schweidler ; translated, edited, and with an appendix by Roy Perkinson.
p. cm.
Translation of: Instandsetzung von Kupferstichen, Zeichnungen, Büchern usw.
Includes bibliographical references and index.
ISBN-13: 978-0-89236-835-8
1. Prints—Conservation and restoration. 2. Drawing—Conservation and restoration. 3. Books—Conservation and restoration. I. Perkinson, Roy L. II. Title.
NE380.S3513 2005
760.028'8--dc22

2005042449

To my mentors

with great appreciation and gratitude

FRANCIS W. DOLLOFF,

who patiently and generously led me into paper conservation,

and

CHRISTA M. GAEHDE,

who introduced me to Schweidler and much more

This page intentionally left blank

CONTENTS

This page intentionally left blank

FOREWORD

Die Instandsetzung von Kupferstichen, Zeichnungen, Büchern usw. (The Restoration of Engravings, Drawings, Books, etc.), originally published in Germany in 1938 and long out of print, has generally been known to only a few, even in Germany. To those who have heard of him, the work's author, Max Schweidler, has often seemed a shadowy figure. He perhaps gained notoriety because his surname is sometimes used as a verb—as in "this print has been 'Schweidlerized'"—to describe extraordinarily skillful, virtually undetectable repairs of Old Master prints. Roy Perkinson, Head of the Virginia Herrick Deknatel Paper Conservation Laboratory at the Museum of Fine Arts, Boston, first brought Schweidler to our attention in 2003 when he was a scholar at the J. Paul Getty Museum. Roy's involvement with Schweidler's manual has extended over more than three decades. The result is this volume, a wonderfully readable translation of Schweidler's text, accompanied by a thorough introduction, copious notes, and an extensive appendix, which includes eleven remarkable examples of deceptive, "Schweidlerized" repairs and alterations.

Given the tradition of secrecy surrounding the practice of art restoration during Schweidler's era, it is remarkable to have a document so full of revelations of repair techniques, most of which had never been described in earlier manuals, and to discover how extraordinarily effective these repairs can be. Roy compares Schweidler's book to a magician's handbook "in which the author pulls back the curtain and reveals the secrets of his most baffling tricks." And as with magic, knowing how the trick is done helps the viewer to see through the "magic" to the reality. With this knowledge comes awareness.

This book is unique in several ways—as a detailed compendium of restoration procedures, as a remarkably substantive document of restoration knowledge and practices in the early to mid-twentieth century, and as a thought-provoking resource that will likely change how one assesses the condition of works of art on paper. The Getty Conservation Institute has long been committed to publishing seminal texts in the field of conservation to broaden and deepen understanding of the discipline's history, methodologies, and philosophies. This volume will acquaint a much larger audience with the extraordinary techniques advocated by Schweidler; and, perhaps even more important, it will enhance our ability to discern what may have been done to a print or drawing after its original creation. Schweidler's discussions of chemical processes, in particular, will give us more informed knowledge of what a work of art on paper has been subjected to throughout its history. We are pleased that Max Schweidler's book is now available in English, and we are grateful to Roy Perkinson for bringing this important work to our attention and for creating such a rich volume. We appreciate his efforts, which will be of significant benefit to those who care for and admire works of art on paper.

TIMOTHY P. WHALEN
Director
The Getty Conservation Institute

PREFACE

One day in about 1967, after carefully scrutinizing an important print in the Museum of Fine Arts, Boston, the curator of prints muttered, "I think it's been 'Schweidlerized'!" Overhearing this, I wondered what she meant. And who was Schweidler? I had only recently begun my training in paper conservation, and when I learned that it was a repair to which she had reacted, I was fascinated that someone had attained such skill in the treatment of prints that his repairs were extraordinarily difficult to detect. Clearly it could be disagreeable to discover repairs in a print where one had thought none existed. But if the curator found in her collections a print marred by an accidental hole, would she not be pleased to have it repaired as skillfully as that which she had just discovered? After all, wasn't it often said that a goal of conservation treatment is to have the object seem to the viewer as if it had *not* been treated? Was the curator chagrined simply because she had failed previously to detect an important aspect of the condition of the print? Or was there something about the nature or extent of the repair to which she took exception? This was a fine introduction to the philosophical complexities of conservation, complexities that will probably continue as long as there is art that is in need of repair.

Christa Gaehde, widely respected as a conservator of great skill, sensitivity, and experience, introduced me to Max Schweidler's book and to some of his methods of repair. In the 1960s books and manuals on conservation or restoration practices were few, and those that existed did not discuss the kinds of repair techniques practiced by Schweidler. Since that time the field of conservation has developed enormously, with consequent growth in its literature. In the past several years articles have also appeared on the history of conservation—perhaps signaling that the field has attained maturity. I hope that this translation will be seen not only as a useful and interesting addition to the literature in English on conservation but also as an important historical document.

This book consists of four sections: background and commentary on Max Schweidler's manual on paper restoration; a translation of the original German text of the second edition (1950); an appendix, in which there are several instances of what might be described as repairs, alterations, or reconstructions that illustrate some of the practices described by Schweidler. It is my hope that the examples presented in the latter will help the reader to become more adept at detecting what are often referred to as "deceptive" or "extremely skillful" repairs or alterations. The fourth section is a glossary of technical and chemical terms.

Many people helped me to bring this book to publication. I am especially grateful to Rugela Schweidler, who generously made available materials, memories, and knowledge about her late husband, Gert Schweidler, his father, Kurt, and his grandfather, Carl. She kindly opened her home to Olivier Masson (himself a member of an illustrious family of conservators) and made it possible for him to provide me with digital images, photocopies, and invaluable information relating to the Schweidler family, information I could not have obtained by any other means.

I would like to express my gratitude to Marlies Comjean for her help with many aspects of the translation. Her patience and skill in ferreting out the precise meanings of Schweidler's words were exemplary. Similarly, I am indebted to the editorial talents of Faith Smith, for unraveling knotted tenses and phrases and transmuting them into plausible English for an early draft of the manuscript. I also want to thank Christa and Joachim Gaehde for encouragement and for putting up with my numerous questions. August Laube helped me to obtain information on the formidable "copying-ink pencil," the marks of which are apt to cause significant problems during conservation treatment.

Without the generous support of the National Endowment for the Humanities, this project would not have begun. I would like to thank Nancy Yocco and Marc Harnly for facilitating my Getty Scholar appointment, which enabled me to resume work on this project after having had to set it aside for many years. I owe enormous thanks to The J. Paul Getty Trust; my tenure as a Getty Scholar gave me the uninterrupted time and extraordinary archival

resources needed to finish this work. I also recall with great fondness and thanks all the wonderful staff at the Getty Research Institute who were unstinting in their patience and helpfulness.

The administration of the Museum of Fine Arts, Boston, kindly allowed me leave from my ordinary responsibilities. A Kress Publications Fellowship awarded by the Foundation of the American Institute for Conservation provided indispensable funding that made release time from regular employment financially feasible. I am especially grateful to my colleague Annette Manick for superbly managing the paper conservation laboratory in my absence and for thoughtfully protecting me from the inevitable day-to-day issues that would have diluted my ability to focus on Schweidler during my work as a Getty Museum Scholar. Deborah La Camera, with her usual cheerfulness and ebullience, has always been quick to help me. Gail English, whose get-it-done energy is legendary, also helped me in countless ways. Thea Burns and Judith Walsh gave me many thoughtful and constructive comments on the manuscript at an important stage of its development.

In addition, I owe thanks to Clifford S. Ackley, Christiane Andersson, Damon Beale, John Bidwell, Britta Bothe, Craigen Bowen, Peter Bower, Irene Brückle, Marjorie Cohn, Eva Dencker, Anne Driesse, James Druzik, Margaret Holben Ellis, Debra Evans, Richard Field, Cynthia Godlewski, Greg Heins, Kristin Kelly, Penley Knipe, John Krill, Tom Lang, Shelley Langdale, Brigitte Laube, Danielle Laube, Elizabeth Lunning, Alison Luxner, Rhona MacBeth, Timothy Mayhew, T. K. McClintock, Margo McFarland, George S. Norton, Tom Rassieur, Mary Reinsch-Sackett, Sue Reed, Gary Ruuska, Ruth Schmutzler, Kristal Smentek, Martin Sonnabend, Moyna Stanton, Marcia Steele, Stephanie Stepanek, Carol Togneri, Martha Tedeschi, Nancy Turner, Bob Walker, Jeffrey Warda, Stephan Welch, Thomas Wölk, and John Woolf.

Finally, I owe more than words can say to my wife, Jean, whose patience and support throughout this project were boundless.

This page intentionally left blank

EDITOR'S INTRODUCTION

The first edition of Max Schweidler's book, *Die Instandsetzung von Kupferstichen, Zeichnungen, Büchern, usw.*, appeared in 1938. In 1941 he produced another book, *Sammeln und Sichten* (Collecting and Picking ["Picking" in the sense used by those who shop for antiques: rummaging, sorting, selecting, and classifying]), which dealt solely with the ins and outs of collecting prints, their value, those that are desirable to collect, and so on. Only once in the latter book does Schweidler say anything about the care and preservation of prints, and this merely describes a few dos and don'ts of framing. In 1950 he published a revised and enlarged version of his earlier work on restoration, and it is this edition that is presented here. I found no documentation as to whether demand for the first edition was sufficient by itself to justify a second edition, but it is possible that the new edition was motivated by Schweidler's desire (facilitated by his friendship with the publisher, Max Hettler) to clarify his text and increase the number of illustrations. In his introduction to the second edition he acknowledges that he had been asked repeatedly "to restrain [his] somewhat patronizing, urgent and pedantically repetitious presentation" and to provide additional illustrations, which his publisher agreed to do.

When I was first introduced to Schweidler's book by Christa Gaehde, I learned that Schweidler had an elder brother, but both figures were always shrouded in mystery. In some respects, the brothers seemed to occupy a curious "Siamese twin" persona as legendary restorers who could (and would) do anything imaginable to transform a print from some state of disrepair into something that looked perfect—until one looked very closely. One of the pleasures of working on this project has been learning a little more about both men, and also about their relationship (and difficulties) with each other.

In his book Max Schweidler states that he was born in Berlin on April 18, 1885, but I have been unsuccessful in determining the date of his death. Max's elder brother, Carl, was, according to some, the more skilled and experienced restorer.[1] Carl Schweidler was born in 1884 and died in 1962 in Berlin. His son, Kurt, was born in Berlin in 1910 and died in 1981 in Gockhausen, near Zurich, Switzerland. Kurt was also well known as a restorer of prints. Kurt's son, Gerd, was born in 1944. Kurt and Gerd left Berlin in the 1960s, at about the time the Berlin Wall was erected, and settled in Toffen, near Bern, before moving to Gockhausen. Gerd died in 1992 in Gockhausen.[2]

Carl Schweidler's son-in-law gave him a copy of the first edition of Max's book on August 5, 1938, inscribing it to "the other Schweidler—for his edification and instruction"—words that are loaded with irony. (This annotated copy is in the possession of Regula Schweidler, the widow of Gerd Schweidler. The inscription is signed "your son-in-law," leading one to assume that Carl Schweidler must have had a daughter, but whether she or her husband were also involved in restoration is not known. This inscription is written in a style that is different from all the other annotations in the book, which are undoubtedly by Carl, given their level of knowledge and detail about Max's life [see note 5, below] and authoritative observations on the materials and techniques of restoration.) Carl had already prepared a postcard to be mailed to his clients in which he states emphatically that he and the author of the forthcoming book on restoration are not one and the same.[3] According to Regula Schweidler, the publication of the book led to a permanent rupture in relations between Carl and Max. Surely Carl never deigned to purchase a copy of his brother's book, but when his son-in-law gave him one, he not only read it but made a number of annotations as well, many in the form of exclamations about what he regarded as errors or misstatements. Some of the most interesting, amusing, or relevant of these notes have been appended as endnotes to the translation, with the initials "C. S." to identify them as Carl's.[4]

When I first learned of the existence of a copy of Max's first edition with Carl's annotations, I wondered what effect these comments might have on my understanding and assessment of the text. I also wondered why the publication of the book had caused such animosity between the two brothers. Was it simply that Carl was upset that Max had divulged "trade secrets"? From Carl's annotations in the 1938 edition, it is quite clear that he was critical of and disagreed with some of Max's statements. Occasionally he articulated why he disagreed, but usually he merely noted that he was of a different opinion and did not elaborate. Carl was especially angered that his younger brother had overstated his experience in restoration.[5] Rather than the thirty to fifty years of experience claimed in the book, he notes that Max had worked as a restorer for no more than eleven years prior to publication of the book. Carl writes that as of 1927, Max began working as a restorer "at his instigation," although Max was at the same time a dealer in art, engaged in political activities, and worked as a "poet and writer, as his main profession." He also notes that in 1927–28 he had allocated to Max a considerable amount of work from his own commissions but subsequently mentions that he had had to "remove [from a Rembrandt print] the spots that [his] brother messed up."[6] It seems that Carl felt that Max, both by asserting long experience and by publishing techniques that must have been learned from him, had betrayed his trust, for which he could not forgive Max.

If Carl's assessment of the extent of Max's experience is accurate, it is reasonable to suppose that some, if not most, of the techniques and practices described by Max were those of his brother, although it is also possible that Max developed variations of his own, or that in some instances he might have misunderstood the procedures of his more experienced brother.[7] It is unfortunate that Carl's annotations are so brief and that he did not publish his own version of his methods. For our purposes, however, it may be less useful to know whether Carl or Max or both employed a specific technique than it is to understand in what way that restoration procedure might affect the appearance and condition of a print or drawing, and to apply knowledge of such techniques to the examination of works of art. For example, knowing that there is a way to split a print or drawing into two layers (pp. 104–5) can be enormously useful if one happens upon a print that has been delaminated and reassembled (see Dürer, *Adam and Eve,* in the Appendix), but without this knowledge such a print might escape detection.[8]

The dearth before the 1950s of substantive publications dealing with conservation of prints and drawings makes Schweidler's book interesting as a historical document. Among the few scattered publications that existed in earlier centuries,[9] one of the most significant is *Essai sur la restauration des anciennes estampes et des livres rares,* by Alfred Bonnardot, which appeared in 1846 and is mentioned by Schweidler.[10] Bonnardot cites works from the early eighteenth century. Nevertheless, serious, consistent attempts to compile knowledge based on sound scientific principles and to assess the long-term effects of treatments are not found until the twentieth century. The 1930s saw important additions to the scant literature on treatment of works of art on paper. In 1932 the Fogg Art Museum began publication of its Technical Studies in the Fine Arts series, which included several articles on this subject. H. J. Plenderleith published *The Conservation of Prints, Drawings, and Manuscripts* in 1937 (one year before the first edition of Schweidler's book). There are a few other sources in English from this period, but none of the importance of these two.[11]

Readers will hardly have begun *The Restoration* before encountering a tone or manner like that of the stern schoolmaster who rewards infractions of the rules or inept performance with a sharp rap on the knuckles. Schweidler reserves his strongest words, however, for those bumbling entrepreneurs who carry on restoration as a sideline but have neither the skill nor the experience to see that they are causing more harm than good. This has always been the lament of seasoned practitioners who recognize that judgment and experience are precious, hard-earned commodities. Warnings and notices of caution are common throughout the book, as the author tries to reconcile his desire to communicate with the fear that his words will simply give courage to the unskilled and thereby promote damage. Sometimes, however, one may wonder whether a warning is a convenient means of avoiding a complete explanation, or perhaps a technique to avoid confessing his own lack of knowledge. Schweidler cautions against treating stains in colored prints unless the restorer has the necessary expertise, yet he is reticent to explain what constitutes such expertise or how one can attain it. Work on prints colored with gouache is mentioned, but rather than describe the relevant techniques, Schweidler observes only that this requires great skill.

The fear that communication about methods may spawn dangerous amateurs still exists among today's conservators, but the balance has swung away from secrecy toward open communication. In this regard the act of writing his book is evidence that Schweidler is among those who hold a modern commitment to promoting knowledge and information, though he is sometimes cagey. He held the conviction that only through fuller communication could the destruction of art objects in the name of restoration be curtailed. "It is high time that these offenses are discussed openly so that something can be done about them," he writes (p. 36). He describes taking a colored print (albeit one of little value) to a glazier's shop[12] and arranges to watch the proprietor subject it to a treatment that is ultimately disastrous. Schweidler then announces his identity and revels in the chagrin of the merchant. Here we see the crusader and stern schoolmaster, as well as a smug, obnoxious egotist. Those who share his disapproval of those who damage artworks through their incompetence may derive at least a little vicarious pleasure from this story, but his method is certainly heavy-handed. Schweidler professes, however, to use the same yardstick to measure his own performance, and it is this attitude toward the demands of his work that is interesting and even inspiring.

A recurrent image throughout the book is the restorer as physician. Schweidler often refers to pictures as "patients," insists that pictures should "recuperate" after treatment, and indicates that removal of certain problems requires "surgery." Mold stains are regarded as the outward manifestation of a "contagious illness" of the paper. He even refers to the "skin" and "body" or "flesh" of a sheet of paper. This image is related to how he views the meaning of "restoration." "In our field one may not create the new, but brings the old into order" (p. 138). Though these words sound somewhat awkward in English, their meaning is clear. The restorer is the healer, the physician. His goal is that the patient should be good as new, without evidence that he was ever ill.

A laudable goal in medicine, it sounds equally good when applied to restoration. Yet art objects, unlike human beings, do not have inherent powers of recuperation to assist the efforts of the "doctor." Should we try to make the object look just as it did when it left the artist's hand? If not, how much evidence of age or disfigurement can we accept? Should we try to carry a treatment to the extent that no one can easily tell that damage has occurred? Should we reconstruct missing parts to replicate the losses convincingly, or should the viewer be allowed to perceive, however subtly, these deficiencies in the original? These are some of the most perplexing and endlessly fascinating questions that arise in the treatment of art objects. Opinions about goals and techniques for treating artworks vary with time and with regard to the specific object under discussion.[13]

Some of Schweidler's own attitudes toward these issues can be gleaned from his remarks: "A cleaned print should under no circumstances look as if it had been treated. . . . The character, tone and warmth of the print have to be preserved at all costs" (p. 109). Yet elsewhere he observes that if a print loses its vividness in baths, "nothing is to be done but to restore the beautiful and pristine appearance by skillfully retouching" (p. 94). Even if replacing coloring lost as a result of a treatment could be done so well that it makes the print *look* as if it were not treated, the fact is inescapable that some of the original coloring has been lost.

Here we come up against a central problem in conservation. What if achieving a specific goal requires compromises: the stain can be removed, but a color might change, an ink might be diminished in intensity or—even more subtly—the strength or aging properties of the paper might be adversely affected? It seems to me that in the past few decades, there is more willingness on the part of conservators, curators, and collectors to articulate the real compromises and risks of treatments at the same time that the benefits are considered. Surely we would agree that having to make such choices is one of the reasons the field of conservation can be so demanding. One of the major achievements in the field of conservation in the past several decades is that we have begun to realize that certain procedures may result in improvements in the appearance of an artwork but may promote deterioration in the future. The use of the term "conservation" is itself a manifestation of this awareness because it includes the meaning of the older term "restoration"—denoting action taken to ameliorate damage or disfigurement—and also the need to ensure preservation of the object, whether or not there is any attempt to improve its outward appearance. Making informed decisions that skirt disaster, control risks, and ultimately meet the requirements of both preservation and aesthetics is a source of deep satisfaction for everyone involved, conservator and curator alike.

Schweidler often seems to the modern reader to go too far in carrying out a desire to make a treated object look untreated. Should one, as Schweidler suggests, refold a letter after treatment so that it looks as if it had not been treated? Should a book be dried such that the pages are caused to buckle in the way that old books sometime do? If the plate mark on a print no longer seems to stand in relief, should it be re-created with the point of an appropriate tool? Or are these steps going beyond what is required and into a realm where deception is the goal? All conservators take pleasure in being able to carry out a treatment in such a way that the viewer cannot detect it. There is magic in making a whole out of the parts. Schweidler would have been comfortable with the image of the restorer as a magician who is capable of conjuring up the desired appearance. But what about the magician's audience? Will it simply acquiesce to the deception, or will it cry "Fraud"? Or are the effects of such magic likely to compromise another goal, that of long-term preservation?

Even if the question is limited to what is permissible for the sake of visual effect, where does one draw the line between skillful repair and deception? Is the issue of deception inherent in the nature of the repair, or are there other factors that must be considered? Schweidler was aware that a skillful repair had the potential to deceive and professed concern to avoid deceit. In one instance, he cautions that in the repair of stamps any additions have to be minor, or one runs the risk of being considered a forger (p. 199). Elsewhere, in conjunction with doing retouching after adding a margin, he says that even if one carries out the retouching of the front with great care and delicacy, "you are still far from having achieved a deception. The back will betray the added margin" (p. 123). In other words, one cannot be accused of forgery if by merely looking at the back one can easily determine what has been added..

Having been fooled by a deceptive repair—that is, discovering that a print has been "Schweidlerized"—is frustrating, especially if the price paid was that for an object in perfect condition. But if one day an artwork one owns sustains damage through an accident, one would surely want to make the evidence of the damage as invisible as possible, provided that the long-term effects on the object were not adverse. In this hypothetical circumstance, would one insist that the repair be done in such a way as to reveal its presence? Or would one prefer that the repair look virtually perfect and put the burden of honesty about its presence on the written and photographic documentation that ethical conservators now routinely provide? The idea of a self-revealing repair is the basis of the technique called "trateggio," in which the visual characteristics of the retouching are designed specifically to give discrete indications of where portions of a painting have been lost. Depending on the nature of a loss and the artwork itself, however, this approach may be unacceptable.[14]

I still marvel at how good the Museum of Fine Art's (MFA's) impression of the Housebook Master print looks (see Appendix, fig. A.7). And neither I nor, I am sure, the curator would be likely ever to propose that the repairs be removed only because they are deceptive. Deceptive to whom? The visitor to the MFA? This complicates the discussion somewhat, in that one could argue that by not telling the visitor that the art object he or she is viewing is not as perfect as it looks, a museum is being deceitful. To this one might counter that it is a duty of a museum to present its objects so that the viewer is able to perceive them in a way that best conveys what the artist was trying to say and that drawing attention to its flaws is like cluttering the page of a novel with endless footnotes. To push this analogy further, perhaps one could say that the repairs should be like endnotes; they are there to be found as a matter of record but do not stand in the way of the main text.

Perhaps in the end it is not a problem that a repair was done so well as to be almost undetectable but rather that there was no disclosure of this fact. When I first began my training in paper conservation, auction catalogs rarely mentioned *any* condition problems, but they gradually began to introduce phrases such as "skillfully repaired tear at lower left" or "a small loss at right has been beautifully repaired." On balance, a virtually undetectable repair can indeed be a good goal of a conservation treatment, provided that its presence is appropriately documented. Having said this, discussion of the benefits and disadvantages of a theoretical repair has to lead to practical issues. Is it acceptable, for the sake of an excellent repair, to scrape away some of the fibers of the original, as required in Schweidler's method? Or would some other approach (paper pulp, Japanese tissue, etc.) be good enough for this specific artwork? How will the technique and material used be likely to age? And how much is one willing to do to the original solely for the purpose of repairing a defect? At times the forces of the marketplace have required that everything necessary be done to create the illusion that a print was in perfect condition: a tear in the sky of a Rembrandt landscape would be repaired by removing *all* of the sky and splicing in another sheet of paper (see Appendix, pp. 230–31 and note 5). I would hope we never see those days again: respect for the integrity of a work of art is reflected in today's conservation principles and practices by emphasis on preserving as much as possible of the original material of the artwork.

Clearly this book raises many philosophical and practical issues; but to return to the book itself, if one had to identify the most important aspect, surely it would be Schweidler's explication of the subject of structural repair of works on paper. It was this technique for which he and, especially, his brother, Carl (from whom Max probably learned the technique), became best known. I know of no other author before Schweidler who had such an understanding of the technique of chamfered repairs.[15] Schweidler indicates the importance of this topic by introducing the subject with the heading, "Actual Mending or True Restoration" (pp. 109–22). He is obviously fascinated with the magical effect achieved when a damaged sheet of paper once again appears whole. To emphasize the demanding nature of the process of mending, he admonishes the reader that one must practice for many long hours before undertaking repair of an object of value and that one must be in the best of moods before proceeding with the work. His attitude toward the work—his stringent requirements of absolute cleanliness and extreme delicacy in the use of tools—might seem in keeping with a textbook on surgery and will probably find a sympathetic response among paper conservators today.

In describing the process of mending, Schweidler offers a number of observations about paper that are still valid and are an indication of his familiarity with its properties. For example, he distinguishes between the color of paper as seen in reflected light and its color as seen when the sheet is held against the light (p. 110). Two papers may look quite similar under one kind of lighting but may appear radically different under another, and the implications of this difference for the repair of paper cannot be ignored.

The specific method of repair advocated by Schweidler is sometimes referred to as the "chamfered" or "inlay" repair technique, but there seems to be no standard phrase. Schweidler simply uses the word *repair.* The basic process is well known and requires the shaving down of the back of the picture around the edges of the loss or tear. Typically the shaving begins two or three millimeters from the edge of the tear or hole. As one approaches the edge, the paper is shaved down more and more until finally, at the edge itself, the thickness is reduced to scarcely one layer of fibers. After selecting a piece of paper that is as much like the original as possible and cutting it to the required size and shape, the mend is fashioned by shaving down its edges in such a way that wherever the original is thickest, the mend is thinnest, and wherever has been shaved down to only a few fibers, the mend is not thinned at all. In theory, when the mend is pasted into position, the combined thicknesses of the original and the mend will then be perfectly uniform and hence the repair will be unnoticeable, even when the sheet is held against the light.

Theory is one thing; practice, another. Schweidler describes some of the obstacles that might thwart efforts to achieve a satisfactory repair. There may be shiny places along the perimeter of the repair. Buckling of either the original or the mend, or both, may occur. The reflectance, gloss, or texture of a mend may differ from the original. Traces of dirt along a tear may be unnoticeable until after the repair has been completed. Obviously, the patience, dexterity, and attentiveness of a watchmaker are essential for this kind of work.

Also necessary is an enormous supply of papers of every period, color, texture, and condition. Partly because of this daunting requirement, many conservators today tend to rely more on the use of paper pulp when filling losses, or to use Japanese papers to reinforce a tear. Another obstacle, however, is the ethical consideration of whether it is permissible to remove any part of the original at all in order to effect a repair that is virtually unnoticeable. Still another objection might be that it can be difficult, if not impossible, to predict how a specific repair paper is likely to age in comparison with the original. Some years ago, I saw a Meryon print on pale blue-green paper that had a fairly large chamfered repair. The repair was now a cream color and immediately stood out. Surely the person who selected the paper years ago was careful to select a closely matching color before expending the amount of time and care required to effect the repair.

There are other procedures interspersed in the text that are likely to raise some eyebrows. For example, a long section concerns how to create false plate marks and false margins. The description of how to split a banknote may give pause to an agent of the United States Treasury, but the agent's alarm will be matched by the print lover who encounters the suggestion that one could also split a print to use it as a lampshade![16]

The reader who is schooled principally in restoration traditions published in English may discover certain practices or techniques that are unfamiliar, although most are less unsettling than those just mentioned. A few will be mentioned here, but space does not allow complete discussion of their possible harm or benefit. The intent is to let the book stand on its own as a document in the history of conservation and as a source book on what might have been done over the years to prints, drawings, and books. Baths of wine vinegar are often mentioned as a remedy for stains or overall discoloration and as an "antidote" for chlorinated bleach. A solution of aluminum subacetate ("essigsäure Tonerde") is suggested as a means of protecting pastel pictures (when sprayed on the back of the picture) against recurrence of mold growth and as an additive to gelatin sizing applied prior to retouching. Sunlight is suggested for the bleaching of discoloration or stains, and although Schweidler considers the method quite satisfactory, he observes that the lack of constant availability of sunlight is an obvious disadvantage.[17] Use of sunlight and artificial light to reduce stains has recently attracted attention in this country, and therefore Schweidler's reference is interesting (see Keyes 1984:100–104; Van der Reyden 1988:73–106).

Other materials used by Schweidler will be familiar to today's practitioners, though the details or conditions of their use will likely be different. Both hydrogen peroxide and calcium hypochlorite are employed for removal of a variety of stains. A material that is no longer as familiar is so-called bleaching soda.[18] Initially I assumed that this must simply be another common name for calcium hypochlorite, in large part because in directions for using "bleaching soda" (as on p. 55) it is clear that this is a dry material, like a powder. Thus one might assume, as I did, that "bleaching soda" is the same as "bleaching powder," that is, calcium hypochlorite. (The confusion is heightened by Schweidler's occasional use of the word *bleach* as shorthand for *bleaching soda;* e.g., p. 102.) In fact, bleaching soda is a mixture of sodium carbonate and "water glass" (sodium or potassium silicate).[19] Schweidler is certainly quite aware that papers, inks, and other media can be adversely affected, even destroyed by such substances. He frequently cautions about the danger that chemicals present to colored prints. At one point he suggests that it might be a good idea to have a second copy of the print on hand, just in case (p. 75). And although he suggests certain "harmless cleaning agents" (p. 38), he cautions that even a "good, familiar home remedy" can be remarkably powerful (p. 56).

Notable for their absence are references to methods for removing stains caused by pressure-sensitive tapes, synthetic adhesives, and other products of our modern era. Similarly, there is no substantial discussion of the deterioration caused by acidity or ground wood pulp papers and boards, with which we are all too familiar today. In reading this book one might justifiably become a little nostalgic for an age in which many of the materials encountered now had either yet to be invented or were not yet recognized as injurious.

Some of the information presented is useful to keep in mind when examining a work of art on paper. For example, one of the first clues to the presence of a skillful repair is an unexplained buckling of the paper. As Schweidler observes,[20] buckling of a repair can be a problem for the restorer, but as an aid in detecting repairs such buckling can be important evidence. Gentle, overall buckling is, of course, a common and normal feature of any sheet of paper, and on occasion residues of adhesive may cause localized cockling or distortion; however, when the buckling seems more pronounced in certain areas, or if the area of buckling seems to have a discernible contour, close examination is in order. Light from a small, high-intensity lamp directed at a very shallow angle across the surface of the paper—"raking light"—is an invaluable aid for this purpose.[21] Similarly, unexpected change in the surface texture—considered by Schweidler a defect in the repair—may indicate the presence of a mend. It is not unusual for the perimeter of a mend to be smoother than either the surrounding paper or the mending paper. This loss of texture is due to the burnishing caused by pressure of the knife edge used to shave down the paper. Moreover, the texture of the paper selected for the mend may differ subtly from that of the original. Illumination alternately under raking light and reflected light is helpful for discovering these textural differences. Incidentally, Schweidler's description of how to create wire lines in paper where there are none, and, by extension, false watermarks, may be disconcerting, but I should point out that so far only two instances of a false watermark have been found in the collection of the MFA (see Appendix, discussion of Urs Graf and Schongauer). It is possible that this practice may be rather uncommon, given that it involves scraping away paper fibers and that the scraping can be detected with low-power magnification.

Schweidler describes a process for stretching prints in order to flatten them after they have been repaired, to dry them after various aqueous treatments, and to mount them on a support prior to framing. This technique involves, first, attaching narrow strips of paper to all edges on the back of a print. Then, while the print is slightly damp from treatment, these strips are attached to a rigid support, and the print is allowed to dry. As the print dries, it tends both to contract and to stretch somewhat, becoming flatter in the process. It is not surprising, therefore, that the precise dimensions of prints often differ from impression to impression, although some variation in size may also occur because of variations in printing pressure, differences in the moisture content of the paper at the time of printing, and other factors peculiar to the printing process. This stretching procedure may also explain why narrow remnants of paper are sometimes found on the edges of the back of a print.

Schweidler's book is likely to stimulate a variety of reactions, including antiquarian curiosity, fascination, respect, surprise, and, occasionally, astonishment. It deserves consideration as a document that grew out of a period when it was becoming more widely understood that those who attempt to treat problems associated with works of art must accept broader responsibilities than in the past. Conservation, as opposed to the narrower concept of restoration, soon became useful as a term to convey these wider concerns. Schweidler indicates that records of treatments should be kept. He stresses that those who would like to work in this field should first acquire proper training and not regard such work as a mere sideline. Furthermore, he asserts that it is important, through one's work, to save an art object, not just for decades, but for the future. The book is evidence in itself of an important new attitude—that treatment of artworks is too important to practice in secrecy and that open communication is essential.

Furthermore, there are other aspects of his book that are distinctly modern and in accord with current practice. Though it seems sometimes as if he assumes that simply because a material is used in the home, its harmlessness is ensured (e.g., pp. 38, 56), at other times he is aware that some materials may indeed be harmful. He recommends testing inks and other media in advance of treatment to determine their solubility and assess the risks of aqueous treatment (pp. 81, 94, 146). And although one can object today to his having carried out more extensive restoration or reconstruction of a print than necessary in order to achieve the illusion that nothing was done to it, he also stresses that bleaching may not be necessary and that a simple water bath (although usually containing vinegar) may be sufficient to achieve desired results (see the section "Brightening and Cleaning," pp. 51–57).

The second edition was used in this translation because it amplified, clarified, and illustrated topics that were only touched on or were ignored in the first edition. In the initial stages of work, accuracy of translation was the goal, but having done that, it became clear that most readers would find the results much too tedious and stilted. In subsequent stages, the approach has been to try to enhance the readability of the text while not distorting or corrupting the information it contains. Nevertheless, the combination of technical details and Schweidler's pedantic tendencies are hard to ignore. Throughout the time I have worked on this book, I have tried to remember to treat it as a document in its own right, without getting bogged down in passing judgment on specific methods, although from time to time I have added notes either to clarify confusing passages or to provide useful, relevant information not contained in the original. I hope that additional historically interesting works in other languages will eventually be brought to readers of English. In particular, I hope that someone will undertake the task of translating Bonnardot.[22] It would be fascinating to have a closer look at the practice of print restoration in the mid-nineteenth century. There is a growing interest in the history of this field, and there are several articles that would be of interest to those who wish to pursue this further (Clarke 2001:49–55; Donnithorne 1988:16–25; Kosek 1994:41–50; Stevenson 1990:420–24; 1995:111–25; Walsh 2000:383–90).

NOTES

1 I am grateful to Jane MacAusland for having given me a copy of the following obituary which, according to Regula Schweidler, was printed in the *Frankfurter Allgemeine Zeitung*, February 7, 1962. The obituary was written by Erhard Goepel, a well-known art historian.

> Carl Schweidler was born at a time in Berlin where his name was still spelled with a "C." His name had already become a legend in the world of engraving while he was alive—probably because publicity was not important to him. In contrast to his brother who also restored engravings, Carl never wrote a word about his craft. Even in conversation, he never mentioned a word about his small or big trade secrets. Schweidler learned the craft of lithography like Menzel from the ground up in an environment that is reminiscent of Glasbrenner. After he was done with his apprenticeship he became self-employed and invented processes to clean and restore graphics. The peak of his career came in the 1920s when the prices for old graphics at the auctions of the C. G. Boerner auction house in Leipzig tremendously increased and the buyers and collectors were therefore able to pay more for the restorations of the graphics. For decades he was regarded as the best in his field. He liked to work for connoisseurs, who were able to fully appreciate his often complicated and crafty work as well as his sensitivity—among them Gustav Meyer, Hans Boerner, Richard Gutekunst, August Klipstein, Heinrich Eisemann, Eduard Trautscholdt. His success was based on his deep artistic understanding of old graphics. While restoring works by Dürer and Schongauer he was striving to reconstruct the brilliance of the piece of art, and while restoring works by Rembrandt he tried to recapture the richness of the predominant colors. In his unassuming manner, he used to say that the most important thing while in restoring a damaged engraving etching was to find paper of that era that had the same characteristics as the original. His extraordinary talent in drawing would have put him in a place where he could have done remarkable work on heavily damaged sheets—but he knew not to exceed the ethical limits in his work as a restorer. He always had a folder at hand where he kept the leaves that he had refused to restore because too much of the original had been lost.
>
> His fees were based on the amount of work he had done and not on the increased value of the graphic once the yellow or spotty piece of paper had gone through his hands. His extraordinary character, his loyalty, and his ability to remain silent were tested during the war when he did not declare the graphics that he was entrusted with by foreign art dealers as enemy property. He kept the artwork carefully wrapped in his basement in crates, and there it survived the bombings. These graphics were valued at several hundred thousand German marks.
>
> With the huge water containers, the presses, and the shelves filled with very well organized folders of old paper, his work space in his apartment in the Flemingstrasse resembled a laboratory. Sometimes it seemed more like the chamber of an alchemist when sulfur or chlorine vapors would rise. It was facing the commuter train track. Carl Schweidler used to cut the damaged spot of an engraving where a little corner or border was to be added with an Exacto knife and hold it up against the windowpane, so that the bright light would illuminate the watermark and the texture of the paper. Every time a train would go by he would pause because the window would shake and continue his work once the train had passed.
>
> The walls in the living room were decorated with works by Theodore Hosemann, who had also started as a lithographer and whose dry, anecdotal humor Schweidler appreciated as much as his technically perfect paintings. In the evening Carl Schweidler would sit down at his piano, play, and sing songs of Berlin in his high-pitched voice. He would serve his guests a cold beer. To everybody's surprise, the old gymnast would all of a sudden do a somersault or stand on his hands. Even into his old age he had a steady hand. After he had a stroke at age seventy, he accepted engravings only for cleaning. He could not live without doing work. He lived to be seventy-eight years old. His assistant and friend B. Drescher who had emigrated to London and his son Kurt Schweidler, who moved to Bern last year, continue his craft in a virtuoso style.

2 Private correspondence from Regula Schweidler, via Olivier Masson. I understand that Kurt and his son were encouraged, and perhaps aided, to come to Switzerland by Kornfeld and Klipstein, dealers in fine prints. [Private correspondence from Joachim Gaehde.]

3 The postcard says, "Based on a number of inquiries, I would like to draw your attention to the fact that I am not the author of the soon to be published book, *Die Instandsetzung von Kupferstichen, usw*. Carl Schweidler." Carl underlined his own first name and also gives his address as follows: Berlin NW40, Flemingstrasse 11.

4 Because Carl's notes are in the 1938 edition and because there are instances in which the text has changed or is no longer present in the 1950 edition (the one presented here in translation), there is no way to reproduce a few of these notes when there is no corresponding text. On the whole, however, only a few notes had to be omitted. One such note, at the beginning of the book, relates to a statement that was no doubt especially infuriating to Carl. Max says that following service in the military, it was he who introduced his brother (Carl) to the business of restoration, "considering that he was suited [to the profession]." In a marginal note, Carl states, "I cannot say that about 'Uncle Max.'" In the margin at the bottom of this same page, Carl writes, "A person is suited to become a restorer of antique prints when he possesses craftsmanship and a broad knowledge of the artwork that was given over to him in a *trusting* manner." Clearly Carl felt that Max was not such an individual.

5 On page 2 of the copy he had been given of the 1938 edition, Carl wrote a chronological outline of his brother Max's life. The obvious impetus must have been Max's allusion on that page to his "more than thirty years of experience," and this chronology was Carl's demonstration that this claim was false. In the 1950 edition, Max alludes to his experience indirectly, referring sometimes to his "years of experience," and elsewhere (p. 89) says that he had "been using hydrogen peroxide for about thirty years." On another page (p. 204), he says, "My friends have a great advantage: I have revealed to them the experiences of my fifty years of professional life." Carl's brief chronology of Max's life is as follows:

1885
born
1904–6 [age 19–21]
military service
1907–11 [age 22–26]
with Carl ("was also barkeeper at the Café Streng")
1912–14 [age 27–29]
a dealer (presumably in art)
1914–18 [age 23–29]
military service
1919–27 [age 34–40]
dealer, maker of silhouettes, and painter of landscape views
1927–38 [age 42–53]
a restorer "at my [Carl's] instigation," dealer, party member, and poet-writer "as his main profession"

Carl states that he did restoration work for Max from 1919 to 1927 and that it was he, not Max, who was doing restoration work during that period. He also notes that he handed over to Max more than 6,100 marks' worth (more than $19,000 worth, in 2002 U.S. dollars) of "restoration work for which *I* [Carl] was responsible." Perhaps Carl is trying to make clear that it was only through him that Max received commissions for restoration. Perhaps he is also trying to suggest that giving over to Max such remunerative restoration projects was an act of generosity.

6 See translation, note 84.

7 On p. 82, Max states that oxidized lead white should be treated with either citric acid or hydrochloric acid. Carl made an emphatic note in his copy of Max's book that this is wrong, and indeed Carl is correct in saying that dilute hydrogen peroxide is the appropriate material to use.

8 See Walsh 2000:383–90 for an interesting discussion of examples of this practice that she has found in the collection of the National Gallery, Washington, D.C., and on related historical information.

9 For more on earlier manuals and books on treatment of prints, see Stevenson 1995:111–25.

10 Alfred Bonnardot (1808–84) published a limited edition of his book, *Essai sur la restauration des anciennes estampes et des livres rares,* in 1846. A revised edition was published as *Essai sur l'art de restaurer les estampes et les livres* in 1858, and a German translation followed in 1859 (Stevenson 1995:117).

11 Among the few that come most readily to mind are Beaufort 1927; Gunn 1911; Scott 1921, 1923, 1926; and Buck 1918.

12 See glossary.

13 For a fascinating discussion of such opinions as they apply to sculpture, see Podany 1994.

14 One might achieve a "pure" means of repair that in no way could be confused with the original, only to find that the materials employed are aesthetically so alien that the result is self-defeating. See Podany 1994. On the use of "trateggio," see Hoeniger 1999.

15 In a survey of historical approaches to treatment of works on paper, Donnithorne (1988) remarks that there seems to be less documentary information available on the subject of repair than on any other aspect of treatment. Most writers seem to be satisfied with suggesting that repairs of holes should be made by cutting similar paper to fit or, if part of an image were missing, by using an appropriate portion of another print. Overall, "the preferred method of repair was to apply an overall secondary support (backing or lining)" (Donnithorne 1988:19).

16 As astonishing as this is to print lovers today, in some respects this could be viewed as an extension of one of the long-standing functions of prints as decorative objects. Prints have been used, for example, as the basis for a poor man's "reverse glass painting" *(Hinterglasmalerei)*, in which one affixes a print to the reverse of a glass pane in a clock case, thins it down by removing much of the paper fibers so as to see the design, and then finally paints the back with oil paint to provide color, which can be seen from the front side through the glass. My favorite and perhaps the most breathtaking examples of the decorative uses of prints are the "Print Rooms" of eighteenth-century England, in which prints (having had their margins removed) were glued onto the painted walls of a sitting room in a country house, such as at Uppark and Calke Abbey (see National Trust 1995:76; Gore 1991:97; Colvin 1985:55). I am grateful to Curt DiCamillo for directing me to these examples.

17 See pp. 67 and 163 and note 55 in the translated text.

18 See glossary.

19 See glossary.

20 See the section, "Actual Mending or True Restoration," pp. 109–22, below.

21 See, for example, the discussion in the Appendix about the print by Rembrandt, *Landscape with a Cottage and a Large Tree*, and the Raimondi, *Massacre of the Innocents*.

22 Our librarian at the MFA informed me that an English translation was done in 1932 as a thesis (Ann Arbor, Mich.), but this is not available except by requesting photocopies of selected pages.

This page intentionally left blank

THE RESTORATION OF ENGRAVINGS, DRAWINGS, BOOKS, AND OTHER WORKS ON PAPER

Past Mistakes and New Methods in the Removal of Age-related Damage to Cultural Treasures in the Graphic Arts

This page intentionally left blank

DIE INSTANDSETZUNG VON KUPFERSTICHEN, ZEICHNUNGEN, BÜCHERN USW.

Alte Fehler und neue Methoden bei der Beseitigung von Altersschäden an graphischem Kulturgut

von

MAX SCHWEIDLER

Restaurator in Berlin

BUCHBINDER-VERLAG MAX HETTLER, STUTTGART 1950

Fig. 1.
Copy of an engraving depicting a
papermaker (from 1680)

CONTENTS

FOREWORD TO THE FIRST EDITION

It is with special pleasure that I write a few words as a foreword to this unique professional book by my friend Max Schweidler. Over a period of many years I have admired the art of the author, much in the same way as he has quietly admired my work. We both worked, each in his own way, toward the same goal, the protection and conservation of works of great cultural value. Our heavy workloads long prevented us from establishing contact with each other, though we both longed to do so. Finally, Schweidler's intention to put down in a book his extensive knowledge and expertise in the field of copperplate restorations brought us together. I witnessed the creation of his book with special interest since I myself had earlier worked in the same field in which the author has achieved unsurpassed mastery over the course of many decades.

Despairingly, I had read during all these years many articles about restoration work, in professional books and journals, which betrayed the incredible ignorance of their authors and a sad, general lack of knowledge about the subject, and I longed for the moment when, finally, a real expert in the field would find the time to end this incredible nonsense. I knew that nobody was better equipped to do so than Max Schweidler, and consequently I was overjoyed when about two years ago he surprised me with a voluminous manuscript and the request to look it over sometime and to give him my opinion. It was a real pleasure for me to follow Schweidler's statements, and it was helpful to Schweidler when I, as an expert, would ask for more extensive explanations here and there. Mutual visits filled with interesting discussions were very informative for me and brought the work to its completion.

Now that Schweidler is sharing his broad knowledge with the professional world, he will certainly receive widespread appreciation there. But appreciation will also come from the owners and the curators of collections of copper engravings and art prints of all kinds, since his book is exactly what is needed to prevent a great deal of damage.

I would like to point out here — emphatically — what the author himself also mentions in his preface, namely, that this book is not to be considered an entertaining piece of literature but rather is to be studied carefully and attentively if the user wants to be successful in his work.

But not even the thorough study of this book alone will be sufficient to reach the level of expertise in the restoration of copper engraving that can only be attained by firm, unbending willpower and constant practice.

Many years of hard work and numerous disappointments, which, however, never discouraged but rather stimulated him, have brought the author to the indisputable mastery that he to this day strives to continually expand.

Thus I wish Schweidler's book complete success, a success that will first of all benefit the conscientious user and will culminate in the preservation of great cultural treasures.

DR. HUGO IBSCHER[1]
Berlin-Klein-Machnow, July 1938

PREFACE TO THE FIRST EDITION

Anyone who has only a small amount of time available and thinks he might be able to finish my book on the streetcar, or somewhere else in between other activities, is better off leaving my book alone. It will not do him any good. It is not just an entertaining piece of literature, a pleasant chat in more or less beautiful words.

I sat down, and from years of professional experience, I recorded facts that are supposed to be of use to those who have, in the same way as I, set themselves the goal of preserving cultural treasures. What I have written down has to be thought over and studied. The processes have to be clarified. Repetitions in the text cannot be skimmed over as boring; an attempt has to be made to follow each point.

That requires leisure and the most comfortable and quiet corner in the house and peaceful hours. I would especially like to address discerning and ambitious young people who have recognized the weaknesses and mistakes of earlier times.

But the contents of my book should also be of assistance to adults and should provide them with many kinds of insights. The special literature in this field is still so poor, so meager, that I think my statements may be considered a somewhat enriching contribution. Unfortunately, the authors of many treatises, with the exception of Bonnardot[2] in Paris, are not real experts in the field. When a subject to be described and explained is known only by hearsay, then — as one knows — a lot of damage can be done. I certainly do expect that a lot will change in this field after my book has been read in interested circles.

Numerous illustrations will clarify several hints better than the text alone could.

I had to be rather pedantic about the details of my descriptions so that no misunderstandings would occur.

Minutely detailed explanations seemed absolutely necessary to me in order to finally put an end to the vandalism inflicted on precious cultural treasures. Whoever follows my instructions and advice will certainly contribute to the goal of transmitting these treasures in the best possible condition to future generations.

I hope that I have also provided some stimulus for my colleagues. I would be happy if my work could lead to an exchange of ideas and arouse criticism, because both can only lead us closer to the goal.

THE AUTHOR

PREFACE TO THE SECOND EDITION

In the preface to the first edition of this book, I had asked my readers to supply me with additional material about restoration methods that had not been discussed up to then, with the intention of making them available to the readers of future editions. Up to this day — the first edition of my book has now been out of print for several years — from among the numerous letters I have not found one suggestion that could show me and my readers new ways. However, I have been asked several times — maybe not quite rightly so — to restrain my somewhat patronizing, urgent, and pedantically repetitious presentation and to make my book clearer by adding more illustrations.

As far as it seemed possible and useful, I have incorporated these suggestions into the new edition. I thank my friend and publisher Max Hettler, who in spite of major time-related problems agreed to publish this second edition. He also made it possible to satisfy the requests for an increase in picture material by including a number of new illustrations.

In addition to numerous questions about restoration problems, a great many works have been sent to me for evaluation. I was happy to take on this often somewhat problematic special task with the hope that I might be able to give the younger, ambitious and enthusiastic friends of our sparsely populated restoration profession some encouragement.

I would like to thank everyone very much for their interest and the manifold stimulating ideas in their letters.

THE AUTHOR

Spring 1949

SUBJECT REGISTER

VARIOUS THOUGHTS ABOUT RESTORERS, THEIR WORKSHOPS, AND THEIR WORK

Before proceeding to a discussion of various prints and engravings, I would like to raise the question: Does every engraving or print really have to be cleaned when it shows a small spot or a faint water stain? I refuse to treat individual decorative engravings when it is only these problems or a faint yellowing that disturb the alleged aestheticism of their owner. Many collectors, I am certain, will share my point of view.

In many cases I have been able to convert the owners of colored prints to my way of thinking. The treatment of such prints holds absolutely no risk for anyone who has made it his profession for decades. But there are alleged experts who gladly take on any commission and enthusiastically follow the wishes of their clients. That is an absolute disgrace! These experts have very little understanding of the real cultural value of any work entrusted to them for cleaning, and they do not care at all whether they deal with a print by an Old Master or one that is merely decorative. Frequently, the owner himself does not have a proper understanding of the valuable prints that he might have inherited. What other explanation could there be for the frequently indiscriminate distribution of engravings from a big inheritance? Often, a complete set will be divided among three or four families and thus be separated. If the new owners, the heirs, were a little more sensitive to the real value of these works or sought professional advice, valuable sets would not be broken and scattered in all directions. It has even happened that a pair of engravings that truly belong together have been separated. If these prints had been kept together or the heirs had made some kind of special arrangement, a much bigger sum would have fallen into their laps upon the sale of the prints as a pair.

If the owner of such valuable engravings gets together with a glazier[3] who is just as ignorant of the prints, real disaster will strike. It is hard to believe that such vandalism of great cultural treasures is still possible in the twentieth century.

While they are still in trade school, young people should gain an understanding of these treasures. The basic values, the fundamentals, should not be hidden from them. A glazier does not only put in windows; he likes to find other sources of income. Often in a small glass shop, run by a glazier, you see pictures and frames. If you go into such a shop, you often find portfolios filled with engravings, even individual pictures specially displayed.

And that raises the question of whether the glazier knows anything about engravings or various kinds of prints. I think that only in the rarest instances does the owner of such a shop have any general understanding of graphics. A small shop certainly would not carry any important works, but the customer might be under the impression that he is entering a picture shop.

Young people in specialized trade schools should be taught the technique of engraving. A young person who devotes himself fully to his trade will gladly accept such instruction. And then valuable cultural treasures will no longer be subjected to vandalism.

And if I may now indulge in a brief backward glance to reveal earlier crimes, it will become obvious how these experts—I am referring to our dear friends in the glass trade—have unwittingly destroyed precious cultural treasures because of carelessness or lack of knowledge. I especially salute these friends.

How often it has happened that those pictures have had to be restored again. Since I especially salute these friends, it is only proper that I deal with them specially too. Time must be made for this, particularly since some open accounting ought to be done. An accounting that is seriously overdue!

What have these friends not done in the area of bleaching! In particular, I mention bleaching because the process could not in most cases be called cleaning. I cannot enumerate all the crimes one by one since this would require too long a paragraph. But let us look at some random cases. Some workshops have revealed their offenses to future generations by putting their seal—a stamp with the name of the workshop—on the back of the print. Valuable old engravings as well as fine color prints from the eighteenth century were entrusted to these masters. And how did they treat them? They cut off the margins if small mildew stains or water stains happened to disturb them. Dark spots on the print were made lighter with opaque white paint; water stains and small stains were smeared over as well; and finally the print was mounted with alum paste![4] And if the margin had actually been spared for once, a mat was pasted on with heavy alum paste! Was there nobody around who noticed? Nobody who would sue? Was there not a soul in the shops who had the smallest inkling of the treasures involved? Almost all of Europe was blessed with this kind of expert, and unfortunately, there are still many of them busily at work today!

Often, I have been able to admire such experts abroad, but, unfortunately, I have also witnessed many things in Germany which can only cause a real expert to shake his head in sorrow. When valuable pictures—now ruined—still smell of chlorine, when white residues of chlorine bleach make the pictures look milky white, when several kinds of opaque colors are applied even today, then there is little evidence of the high cultural standing of a nation. I have to ask once again: Where are the trade schools? Is there nobody who can teach the young people? Does no understanding of such treasures exist?

Nobody should be allowed to clean valuable engravings without at least a minimum of previous experience! Once an engraving has been made lily white by means of the dangerous bath of chlorine bleach, it has not only lost its intimate charm, but print and paper have been considerably endangered.

A dark corner in an untidy workshop cannot possibly be the right work space. The cleaning process can take a lot of time and should, therefore, never be undertaken after a day's work. Often, the owners of color prints are themselves to blame because they assert that an expert would be too expensive. Frequently, the owner agrees to the treatment of a print by an amateur and is even happy with the seemingly successful result. You can hear remarks like, "The print is completely white again, as if newly printed!" In 1934 an art dealer told me, "A new client just bought four sporting prints that were very well preserved, for fifteen hundred marks [somewhat less than $5,000]."[5] When asked, "Can you also frame them?" the art dealer said. "Of course I can do the framing." "Well, then I would like the margins cut off so that these engravings will match my other prints!" And that happened in 1934! There are a few good frame shops in Berlin and other major cities that you can trust implicitly. These establishments will refuse to undertake the repair of engravings, even minor and less valuable ones, and will refer them to a skilled expert.

I will now very briefly mention bookbinders, who treat papers—I cannot spare these friends altogether either, for I am particularly annoyed with the enormous importance they assign to alum paste. What other "crimes" these friends have committed will be evident to everyone after a glance through my book. Why the constant use of alum paste, which is such an impediment to restoration? After all, every work should be treated according to its own needs. And how many members of this noble trade have come to me after it was too late? Is it not possible to prepare a starch paste specially for art prints? No, the ready-made paste is easier.[6] The paste pot is filled to the rim and the paste must be used. Wrong, dead wrong, and dangerous! Even if you tell me that all museums and libraries abroad and at home work in this way! It cannot be assumed that everything that happens at these places is right, unless a responsible restorer is conscientiously minding his duties. Since I would like to make a final clean sweep, my remarks should be of concern to anyone who uses too much alum paste in his work.

The objection that a small amount of alum protects the starch paste, prevents it from spoiling, and makes it usable at all times can only be considered valid for mass productions that are exposed to air a great deal. But when working with art prints—unfortunately, often the basic knowledge for a proper recognition is lacking—please boil the starch paste from scratch! Have you not perhaps noticed on occasion that alum paste has destroyed valuable prints?

It is often impossible to separate a print that has been mounted to an underlying layer with alum paste without damaging it. Alum paste is not water soluble. Therefore, a number of manipulations have to be employed so as not to damage the valuable print.[7] If the separation is successful and the print must be restored, it will be resistant to water. The slippery part of the paste can be removed, but the alum itself is very hard to get out.

And even if one insists on using deep window mats that cause old prints to appear to be swallowed as into the "depths of the sea," one should not apply paste to two-thirds of the margins of the prints as well. It is a bit more work, but a little guard[8] can be put around the print and brushed with starch paste, and a good deed will have been done.

And one more thing! If one worked more wet on wet, many a disappointment could be avoided.[9]

I would like to take this opportunity to give a message to the mounting artists.[10] It is not part of the preservation or embellishment of a valuable print to prick it with a needle in order to put on a face mat or a window mat. The print is only placed on the cardboard for reasons of ease, I do not want to say "laziness," and the area to be cut out is then marked by puncturing the print with a needle, instead of making a tracing of the print and then treating the copy with needle pricks to one's heart's content. This involves about five minutes of extra work, and the print will have not have been ruined.

Only a little while ago an "artist" produced a mat for a small oval print. The value of the print: 1,500 marks [somewhat less than $5,000].[11] It so happened that I was called to give an opinion on the picture and found out at that time that the so-called artist had put more than twenty needle pricks in the stippled margin. If the master had just taken ten minutes to trace the oval print and had then put the copy on the cardboard and put the needle pricks into the cardboard or the copy—a hundred of them, for all I care—the print would not have lost any of its value.

It is high time that these offenses are discussed openly so that something can be done about them. I only mention a few cases here, but the attentive reader will find in my later descriptions many that could also be included. It is my intention to make my colleagues aware of the high degree of conscientious and clean work that is necessary for each restoration. Whoever is willing to rise above his station should be conspicuous not for "inexpensive" but for "good" work. Again and again, one should remember the old adage: "First think, then begin!"

A cheerful room with a water supply is a must. If you only occasionally clean a small print, the bathroom or even the kitchen will do. The tray that receives the prints has to be positioned in such a way that the water can flow over a spout into a drain [in a sink]. The tray should be custom-made by a plumber. Zinc is best for this. A tray measuring about 60 × 75 cm will probably be sufficient. The bottom of the tray has to be completely flat, and it should have a raised rim, about 5 cm high, so that it can hold enough water. A 150 cm rubber hose is required for the incoming water and for rinsing off the prints.[12] A second tray would be appropriate if you have to work with chemicals occasionally. The first tray would then be used for rinsing and the second for receiving the rinsed prints. The 150 cm hose is long enough so that the second tray can be put next to the first one. A bucket should be placed under the spout of the second tray if its water outlet cannot be connected to the drain.

A wooden pole can be used for hanging and manipulating the prints [see fig. 17]. (I bought an old jalousie[13] that had been used in the entrance door of a store. The painted bars are slightly rounded.) The rounded edges on the four corners of the wooden pole and the small indentation in the middle are important. If you put a sheet of paper over wooden poles with sharp edges, it is guaranteed to break during rinsing! So do pay attention to that! The size of the poles is optional, depending on the size of the tray. The poles will have to be beveled a little on one side so that they can be inserted in the slot of a hanger which is fastened to the wall [see figs. 3, 10].

The hanger consists of two separate pieces of wood, 7 and 10 cm wide respectively and about 3 to 4 cm thick. The two pieces are arranged in such a way that the 7 cm wide piece is put on top. The lower, 10 cm piece supports the pole when it is put in the hanger, and the upper piece provides resistance. The clearance between both pieces of wood, therefore, has to be just enough to allow the insertion of the pole (see fig. 2).

The poles mentioned above are absolutely necessary for all kinds of different sheets. For prints on especially thick papers, however, even these poles would not be sufficient. To prevent these papers from breaking or folding, one must construct the following: a cardboard tube, from 60 to 75 cm long and with a diameter of 6 to 8 cm has to be made smooth with sandpaper or emery paper. Its two open ends are covered by cardboard lids into which a circular opening has been cut. These openings

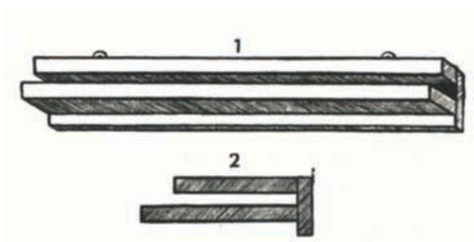


Fig. 2.
(a) Hanger; (b) cross section

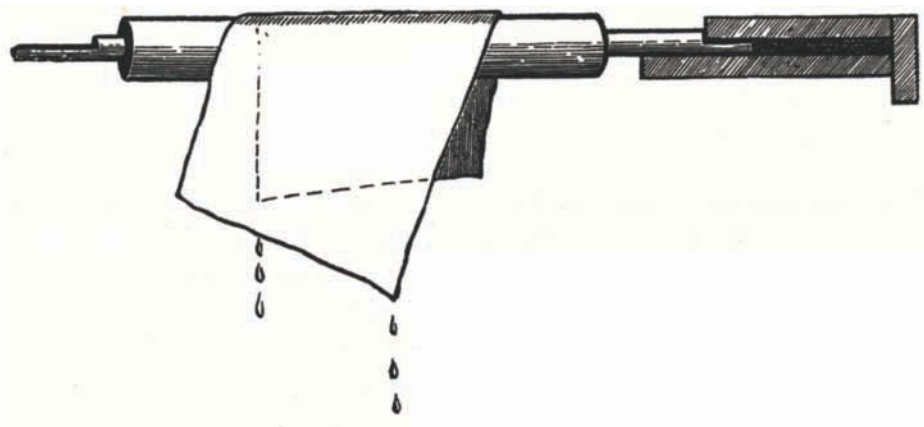


Fig. 3.
Tube pole fastened to the hanger

should only be large enough to allow a broom handle to be pushed through easily. The handle will then be glued tightly to the cardboard lids so that no water can penetrate. After gluing, the tube should be well oiled all the way through to the handle, and after several days it should be covered with a layer of shellac or oil paint. The handle is cut flat at the ends so that the tube pole can be inserted in the hanger. The tube ensures that even thick, completely wet papers will not break. I always recommend the use of tube poles for the beginner because they eliminate any small mistakes that might occur during the rinsing process.

The inventory also includes a pail and old, absorbent cleaning cloths. A table with a flat top should be covered with an oilcloth. This oilcloth should be fastened on the sides with several thumbtacks so that it cannot move or slide. Oilcloth can also be used to support a brittle sheet so that it does not get damaged when it is put on a pole for rinsing.

Additional equipment includes wood-pulp cardboard on which damp papers can be deposited, straw cardboard as a substitute for a small press, and several old, absorbent and nonabsorbent, yet well-preserved copperplate printing papers on which to deposit damaged engravings. These sheets are often needed and therefore should always be on hand. It is also advisable to acquire glass or enamel trays for smaller prints.

Harmless cleaning agents that should always be on hand are plain or cooking vinegar,[14] liquid ammonia,[15] carbon tetrachloride,[16] spirit of wine,[17] citric acid[18] (in powder form) and bleaching soda.[19]

With the help of these simple cleaning agents, remarkable results can be achieved. Several flat bristle brushes and a round brush are also necessary. The different kinds of brushes can be seen in later illustrations. A large grit-free sponge[20] is also recommended if you want to be fully prepared.

THE HISTORY OF PAPER

Quality paper, that is, paper made only from the very best materials, is found in the works and prints produced in the period roughly between 1400 and 1600. Paper, of course, has a much longer history than that. To give our youth a very condensed idea, I would like to talk about it briefly.

The first writing paper was manufactured in Egypt from papyrus plants. Let us listen to Dr. Hugo Ibscher, who saved many precious papyri from ancient Egyptian, Greek, Roman, and Arab times, and whose advice and support was sought after by all foreign papyrus collectors:

> The papyrus that has given today's paper its name was an excellent writing material in the ancient cultures from the third millennium before Christ to about A.D. 1000, and its quality equaled that of our best handmade paper. Made from the papyrus reed, a marsh plant which grew wild in ancient Egypt but was later cultivated on a large scale for better usage, it was one of the most important articles of trade for the country of the pharaohs. The manufacture of papyrus was very simple. The stem of the plant, as thick as an arm at the lower end, was freed from its bark, and the core was then divided into manageable pieces that were cut lengthwise into thin strips. These strips were put together vertically so that the edges overlapped slightly, and then a second layer was laid down horizontally in the same manner. Both layers were bound together by hammering and pressing, and after drying, the sheet was rubbed slightly with pumice and smoothed with shells or stones. Then it was ready for use. If bigger surfaces were required, the single sheets were pasted together, overlapping only a little, thus forming the papyrus roll which was the book form in antiquity. Up to the second century A.D. the book roll was predominant but was then replaced by the codex, our present-day book. The ancient peoples used incredible amounts of writing material for writings of all kinds, much in the same way as the world's people do today. But while our writings of today are subject to rapid decay, the conserving, dry desert soil of Egypt has faithfully preserved the papyri for us; they are still giving us today, after five thousand years, a vivid picture of the life and pursuits of the peoples of the ancient cultures.[21]

Painting and writing on animal skins in ancient Egypt fell into disuse because papyri were more flexible and could be carried rolled up and because leather was heavy and hard to handle.

Animal skins (from donkeys, goats, lambs) became accepted only when essential improvements in their processing were achieved at Pergamon. From that time on, the leather was called "parchment." Parchment was often used for writing and drawing but was not able to fully replace papyrus. Only true paper, introduced by the Arabs, perhaps brought from the Far East via various routes, slowly replaced papyrus at the beginning of the ninth century. By then the process of making paper had been adopted on a large scale in Egypt. Since the Egyptians were great merchants and thought in a businesslike manner, most countries were supplied by them with this new material—paper. Gradually, the whole civilized world adopted the paper-making process and was able to go its own way, no longer dependent on Egypt. Only through the introduction of paper did it become possible to manufacture books—written and illustrated by hand. Printing with movable or fixed type might have been possible on papyrus, but it was not suitable for copperplate engravings.

PAPER MANUFACTURE

Earlier papermaking was very primitive compared to today's state of the art. The early paper manufacturers were small papermaking businesses which employed the help of members of the family. Rags from the best materials, hemp and flax, were sorted carefully according to texture and by tumbling[22] or beating were freed of all kinds of loose impurities, dust, metal, and especially small iron particles. Of the many kinds of fabrics, very heavily dyed rags (blue and brown) were removed first since the bleaching process was not yet very advanced.

Raw materials were used only rarely for papermaking in Europe, even though hemp and flax cultivation flourished until the end of the eighteenth century. Heavily worn pieces of clothing that could not be used for any other purpose—tools for certain trades, such as ropes, nets, and similar objects—were used for paper. In China and Japan rags were only used rarely for the manufacture of paper. Of course, those papers are, therefore, much more durable since all their components were processed new. In spite of the above shortcomings, excellent paper was produced in Italy and Spain because the earlier paper manufacturers were careful in examining their materials.

After tumbling the rags and examining them for dampness[23] and color, the early paper manufacturers shredded the rags by tearing them. The heaviest dirt and various stains were removed with an ash solution. The solution not only took out spots and colors but also made the material pliable. The rags were ground to a pulp in mortars. This traditional method of beating had one advantage compared to later methods: the fibers of the fabric were not torn as much and were not cut into as many pieces; instead

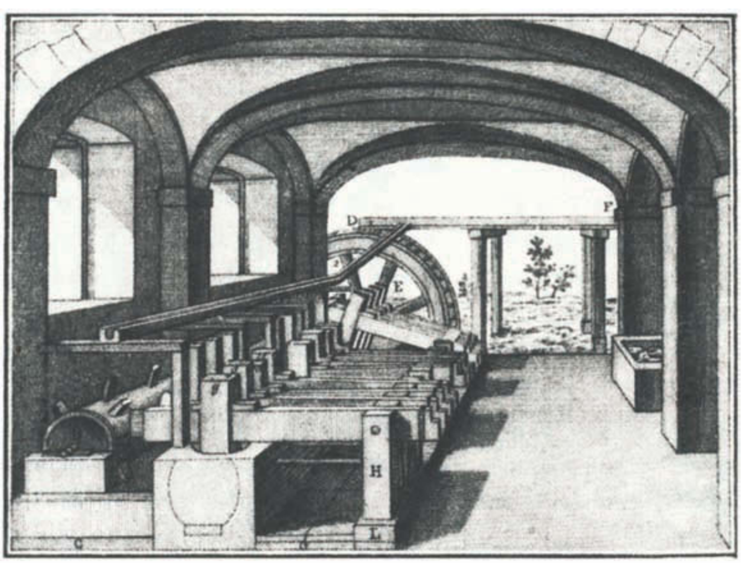


Fig. 4.
An eighteenth-century paper mill

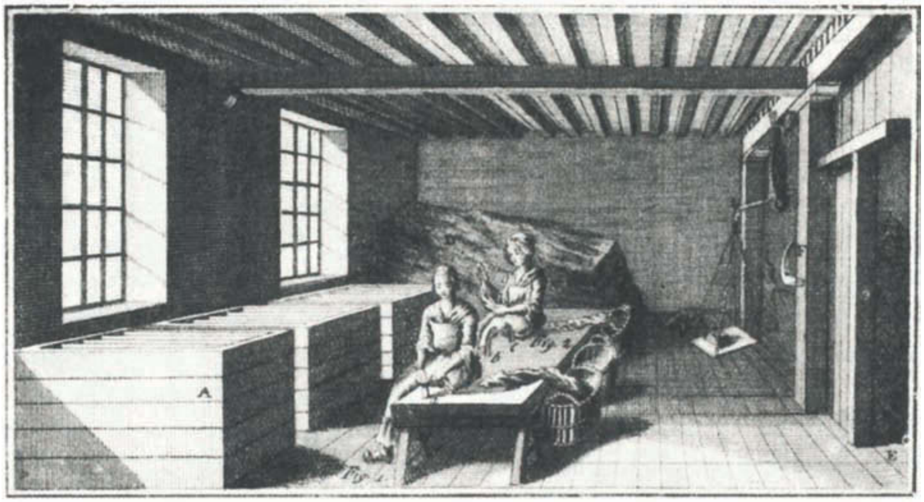


Fig. 5.
Sorting and examining the rags

the fibers were crushed completely flat, and yet they formed a uniform mass. The matting of the fibers that were pressed together in this way proved useful in the subsequent processing of the paper. If you try to tear such paper in order to use small pieces for restoration purposes, you have to use a little more strength than with newer papers. The pulp in the mortar was poured into a vat, mixed a little more with water, and was then ready for forming into paper. Paper was sized with plant and animal products after it had dried completely, although after 1800 the sizing was mixed in with the pulp itself.

Now, for forming the paper. The vat man, the person performing this process, used a device called a mold, which consisted of two rectangular frames, one on top of the other. The lower frame was covered with a porous fabric, whereas the upper one was completely open. Both frames were put together and dipped horizontally into the vat of pulp, which had been stirred vigorously beforehand. The vat man moved the mold back and forth, lifted it horizontally out of the vat, and shook the pulp in the mold so that it was evenly distributed while allowing the excess water to drain off through the woven fabric. During this process, a diligent vat man would remove small particles of impurities from the pulp.

After the pulp was distributed evenly across the surface of the mold, it was couched. "Couching" is the technical term for putting the pulp onto a piece of felt. To do this, the vat man took off the upper frame (the "deckle"), turned the lower one over, and put it quick as lightning onto a piece of felt.[24] A new piece of felt was then put on top, and the dipping of the mold was resumed to make the next sheet. When about two hundred sheets were assembled, they were put under a hand press, together with the felts, to further squeeze out the water. A second pressing without felts followed. The sheets were then hung over strings. Drying outside during a heavy frost was preferred by manufacturers because the frost would turn the papers lighter in

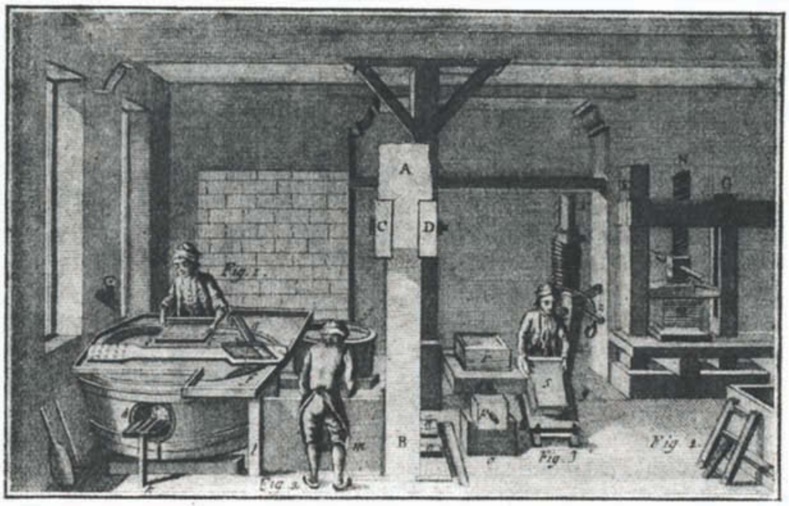


Fig. 6.
Dipping the mold to form paper (mid-eighteenth century)

color; that is, they became whiter. The gradual drying outside resulted in much greater cohesion and compacting of the paper fibers than would have been the case with faster drying in the heat. Forming a sheet of paper looks so much like child's play that it does not seem to require much skill. I tried it for a short while, and the master only smiled watching me. The vat man has to attain the absolute sureness necessary to get exactly the right amount of pulp for one sheet. Two hundred sheets from the same batch must not have different weights once they are dry. Years of experience are necessary to get the weight of a single sheet right every time.

The completed sheets of paper are sorted; the best ones are taken out and used for single prints. In the fourteenth and especially in the fifteenth century, papermaking had already become more of a factory process because the demand had increased enormously after the invention of the printing press. Still, artisans' workshops continued to make paper on a small scale, and anyone who has engrossed himself in the study of papers for many years can identify where a specific paper was manufactured. Water-powered mills took over beating the rags. As a water-driven gear turned, wooden blocks in the machinery ground up the different kinds of fabric. In Holland paper manufacturing had advanced considerably toward the end of the seventeenth century, since it was here that so-called washing potcher[25] was put to use. The rags were cut simultaneously with sharp and dull knives, which, incidentally, tore the fibers too much. In a second beater, the Hollander, the cut rags were turned to pulp.

The porous fabric of the earlier molds was only used by very small papermaking shops and was soon replaced altogether by a sievelike wire screen. In this mold copper wire was stretched in layers lengthwise and across; the wire pattern cannot be easily recognized by looking through the paper. A little later the wire was stretched evenly; that is, the wires ran in one direction, parallel and close to each other, and were supported

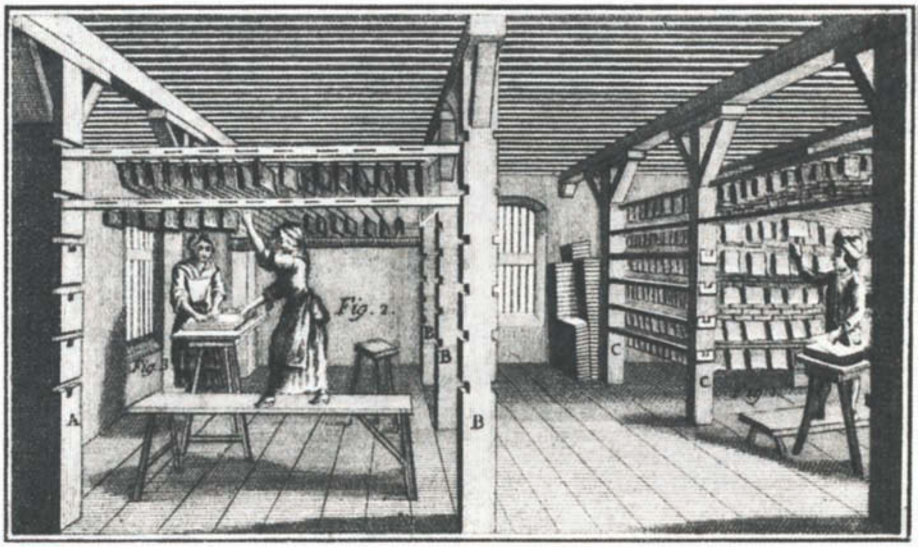


Fig. 7.
Drying of the formed sheet

by other wires at right angles, 1 to 3 cm apart.[26] The watermark was the manufacturer's signature and consisted of wire shaped by hand and fastened to the wider cross-wires with a fine wire or thread.

The marks left by the wires give the paper a ribbed appearance and are clearly visible when you look through it. In the space between the wire lines, the paper is darker, since there is a thicker layer of paper. When I talk in this book about "wire lines," I am talking about the fainter lines.[27]

Of course, cotton rags and linen rags were processed together but only at a much later date. Paper made from pure cotton is softer to the touch, more clothlike, and was used later mainly for blotting paper. If you tear that kind of paper, you find soft, fluffy fibers at the edges of the tear.

Handmade papers up to the end of the eighteenth century show a yellowish tinge. There had been no bleaching of papers in the earlier centuries since even boiling-hot lye did not lighten the color of the rags much. Only when chlorine was used for bleaching did everything change. The bleaching engine[28] completely cleaned all dirt, oil, and color from the rags. The paper pulp now had a milky white appearance, whereas before it had been light or, often, dark yellow. The chlorine activity was completely neutralized by various acids and repeated rinsing of the rags with clear water in the bleaching machine. From this time on, the sizing process changed. There was no longer any surface sizing; instead, sizing occurred—as already mentioned—in the pulp itself. Rosin sizing with a dash of alum was mixed into the pulp.

The earlier sizing methods were more durable than the later rosin sizing. The earlier papers have retained their sizing up to this day, whereas papers with alum rosin sizing lost a lot of their strength when they were exposed to air and light. Outline engravings from those days, which were made for hand coloring, were printed on nonabsorbent paper because the color would otherwise have

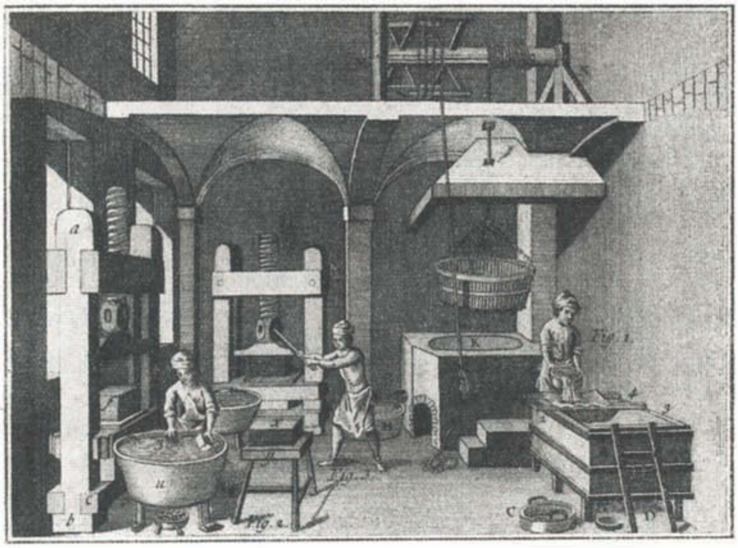


Fig. 8.
Sizing paper

seeped through. Yet often one can observe that these colored sheets take up water when they are put into water for several hours. Neither water stains nor, especially, foxing, however, should appear on these sheets if the paper has been sufficiently protected against water by the rosin sizing and a weak alum solution. Why is it that colored etchings prior to the end of the eighteenth century are not susceptible to water damage? Because the papers that were sized with animal glue received a surface sizing. Paper production by machine, a French invention, has been known to us since around 1800.[29]

Because of the great demand for paper, lower-quality components were used. Much later, about the middle of the nineteenth century, wood fiber and cotton were processed together, and with that the manufacture of high-quality paper steadily declined.

The raw materials for today's newsprint are obtained from pine trees after the bark has been stripped off and the logs have been shipped in wagons to the paper mill. Even today, papers are manufactured that seem handmade to a nonprofessional but have nothing to do with handmade processes. The edges of the paper are torn by hand before the sheet is fully dry; therefore, it may appear handmade. But the edges are abrupt and rough rather than wavy, thicker, and rounded as with the handmade papers. Today, individual paper mills still manufacture handmade papers. These papers are of a much finer quality than the machine-made ones.

It has been my intention to present the introduction and development of paper in general terms so that our young friends can gain at least a minimum knowledge of the history of paper.

HOW TO OBTAIN OLD PAPER

If you want to become a professional restorer, it is absolutely necessary to look for old papers early. You cannot refuse any papers, not even newer ones, because in the course of time you will encounter sheets that need to be treated, from many periods. The larger your supply, the easier the search for the appropriate paper.

A visit to the used-book shop and a dealer in graphic arts can prove very worthwhile. Just ask for old books that are not complete, damaged single prints, and so on. The main thing is that certain parts of a sheet, say, half the margin, are still in good condition or, in the case of book pages, that greater parts of the margin are still there. Do not assume that three or four pages from a volume are enough. No, a book of one hundred pages—if it is an incunabulum (an early printing)—consists of different kinds of papers. Some papers may be thin and cloudy when you look through; different wire lines will be strong and clear, or wavy and indistinct. Other sheets may be firmer to the touch, the texture may vary, and so on. Impurities in the paper as well as on the surface have to be observed (tiny hairs, particles, little brown spots) and should be considered an asset to your paper collection. Do not reject yellowed or foxed paper, so that you can still treat pictures requiring mending but not cleaning. It is also recommended that you pick up such papers in large and small sizes for your first cleaning attempts. The sheets may even have blemishes, including writing in ink, so that you have material that is suited for cleaning and light washing.

When looking over papers from the eighteenth and nineteenth centuries, you will find many kinds that do not show any wire lines and are quite varied in their feel and absorbency. In such cases you are dealing with English or possibly French papers. Do not reject any paper, no matter how recent it is! Your paper supply has to be constantly replenished!

Almost every paper has a watermark even if you cannot discover it immediately. If you can identify papers by their watermarks, you have already made considerable progress in the recognition of papers from different periods. And that is extremely important! It enables you to distinguish old prints from new prints, a very interesting pursuit. Over the course of the years, perhaps a million watermarks have been identified, often very similar to one another. I only name a few of this great number: stars, crosses, symbols, towers, coats of arms, castles, houses, swords, letters, anchors, animals, flowers, pitchers, heads, hands, papermakers' and farmers' tools, crowns, names, and dates.

Another important point is the storage of the paper supply. Diseased papers—foxed and decaying ones—should never be mixed with well-preserved papers (see the discussion of diseases of paper on pp. 162-63). Similar papers, that is, papers of matching age and color, are kept in folders with flaps or in boxes. If you are to obtain very early papers, it is an excellent idea to ask the seller about the age of the individual book pages, because he can give the approximate date of the production of the work—the year of publication is often given at the beginning or the end. Single prints give the year of publication in the publishing address.

It would also be quite appropriate to look for prints at this time so that the different techniques can be distinguished from one another. ("Important Printmaking Techniques," pp. 171–95) contains a number of hints on this subject.)

HANDLING DAMP PAPER

It seems obvious—at least I assume it is—that everyone will have to practice often and diligently before attempts are made on a good engraving. In any event, practicing should be done daily in order to attain a degree of confidence in the treatment of damp papers.

After the sheet has been dry cleaned—I discuss the cleaning procedure later—it is put into a cold bath without any support.[30] The sheet then has to be taken out of the bath and put over a pole (see "Studio Room and Equipment," p. 37). How is this done? You will say, "This is a simple matter." No, my dear friends, it is not simple. On the contrary, it is a complicated matter! The sheet has to be held with both hands, and the hands have to go far over the sheet, as can be seen in the illustration. And why? The damp state of the sheet will immediately seem very disagreeable when you hold it in your hands. The paper might be very fragile; the plate mark, which is created by the copper engraving plate and is somewhat indented in the paper, may be weak or separated. A tear, too, could create difficulties. These are the small and big problems during the first moment.

Eight fingers on top and the thumb underneath! Under no circumstances should the sheet be touched only with the fingertips. No, the sheet has to be supported by at least two joints of each finger. The fingertips alone would do damage; they would dig into the soft paper and could cause holes or severe breaking. If the thin plate margin is close to the edge of the paper, you have to go far into the center of the paper with your fingers, even—if possible—into the picture itself! Why? The paper is stronger in the printed part because the black color was prepared with oil (carbon black and linseed oil) and is therefore more durable in this place when the sheet is taken out of the tray. If there is a large tear in the sheet, you have to coax it out by lifting the print from the opposite edge. If the edge with the tear were to be lifted first,

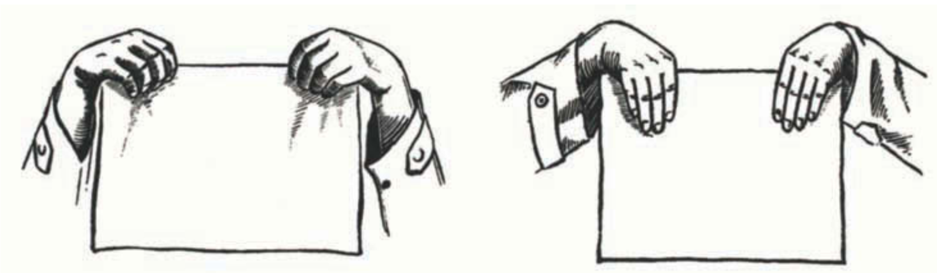


Fig. 9.
Taking damp sheets out of the tray:
left: Wrong, the fingertips can damage the print!
right: Right, only the surface of the fingers touches the print!

the tear would certainly increase. But if you have already gained a little expertise, so that your attempts are fun, and if you enjoy your work, the sheet can also easily be removed from the torn edge. Any kind of work that is undertaken cheerfully always succeeds. So what remains to be done? Practice, practice, and practice again! When you practice, it is essential not to get nervous; the calmer, the better. I do not want to say that you should become lazy—not at all—only that you should think while working and take your time in doing so. When for practice you take on severely torn engravings on very soft paper, you absolutely have to have one or two supports on hand.

First, a healthy paper from your supply is put into the tray as a support, and on top of that the badly damaged sheet.[31] When the sheet is ready to be taken out, it is distributed on the support in such a way that the patient can be lifted out together with the support. Both parts will then be hung temporarily over the tube pole in order to drain. After that,

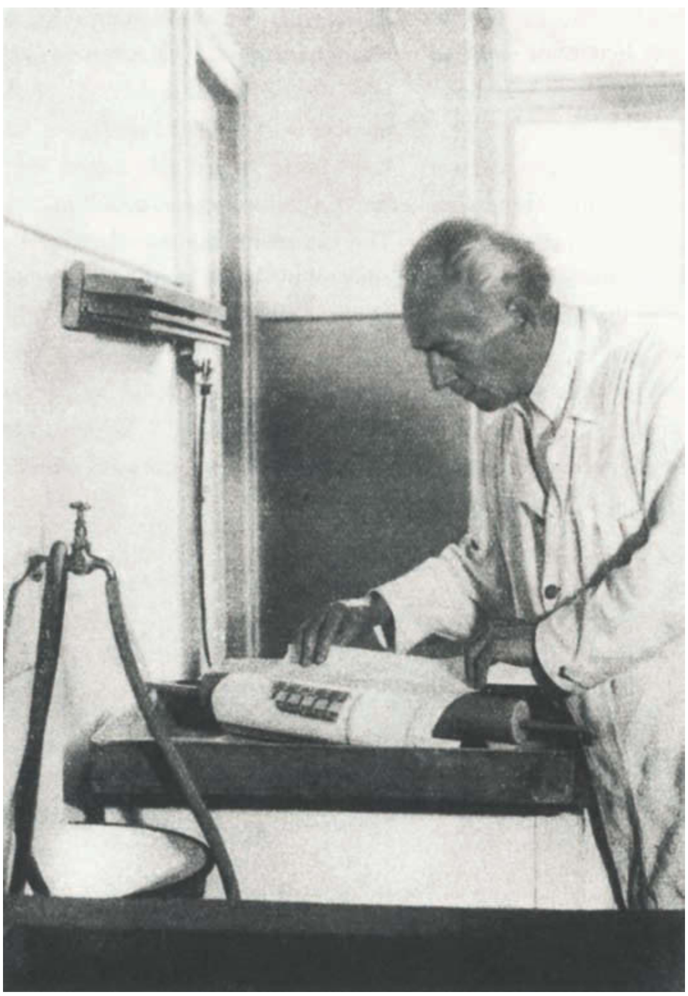


Fig. 10.
Taking a sheet out of the tray

both parts are carried to the table with the help of the pole and are put down nimbly, without accident. The sheet and the support lie on the table or the drawing board, the sheet with the printed side facing upward, the support underneath. What do you do when you want to see the reverse side? You take a second support, put it into the bath, take it out of the tray, and place it skillfully, without the pole, onto the sheet. The sheet is now enclosed by the two supports. If you want to see the reverse, you have to hang all three parts over a tube pole, lift the pole up, and return the parts to the table in such a way that the second support now rests on the table. The first support is lifted off carefully, and the sheet has been turned over.

It would have been possible to turn the sheet over without the second support; however, because of the missing support, the sheet could not have been lifted off the table. If the work had been started without thought, the sheet would have had to stay on the table until it was fully dry, which would have been especially unfortunate if, to make matters worse, the table had not been covered with an oilcloth. Not every move can be described here; you have to think for yourself. Papers are much too diverse and can bring all kinds of surprises. I can only repeat: Practice, practice, and practice again. Great sureness has to become second nature.

If a young man is employed in a frame shop, by a glazier or bookbinder, by an art dealer, in a fine arts print shop, or any other place where he has to work with paper, the technical paragraphs can give him many details and hints that he can use all his life. Adults, too, could certainly benefit from familiarizing themselves with the above-mentioned methods of treatment. How much damage has been done by older teachers in the treatment of works of art! I see it as my task to show young people the correct methods for the restoration of prints and books. The vandalism that has destroyed many cultural treasures should become a thing of the past. Today, altogether different methods should be employed, and the restoration itself should be considered culturally valuable.[32] Whoever works toward this end is a friend of mine!

This section deals with the slight brightening and cleaning of prints. I am very interested in keeping the means as simple as possible, yet achieving good results. This should and must be our main task.

If the sheet to be treated is a black-and-white print that is heavily covered with soot or has become unsightly with dust, the soot or dust can be removed with soft bread or, often better, with a soft eraser. When erasing, do not treat the whole sheet in large streaks but only clean as much at one time as there is room between your thumb and extended index finger (fig. 11).[33] Care has to be taken, of course, that the table is smooth and completely dry. If you try to clean large areas, the sheet will be creased, broken, or demolished. If a soft eraser is not sufficient to remove the loose dirt, try one that is slightly firmer. Erasers come in different degrees of hardness, but never use a very hard one! Such an eraser should not even be found in a studio! Using a hard eraser could easily lead to scratches, abrasions, or thin spots. If the paper is very soft, only a soft eraser should be used. When small areas of dirt are left, the remaining traces can be removed in another way described later.

When both sides of the sheet have been cleaned off somewhat—be very careful in the printed area itself, or do not touch it at all—care has to be taken that the copying-ink pencil markings are completely removed from the reverse side.[34] In all cases this writing has to be removed by a dry method, but the paper should not be made thin by erasing. Copying ink that is not removed while dry can cause many problems in the water bath. Its color will start to run, and, even worse, in absorbent paper it will sink in and appear on the front of the print. If this is not taken into consideration and the copying-ink pencil marks are not removed carefully, the whole sheet will have to be treated with chemicals, whereas otherwise a water bath alone would have brightened it sufficiently. Therefore, always pay attention to those dangerous copying-ink pencil markings! The copying-ink pencil should be employed just as sparingly in a print shop as in a bookbindery! Copying-ink pencils in the office of such a business should be specially marked, wrapped in tinfoil, for example, so that they are definitely conspicuous. And now the water bath! The tray needs to hold just

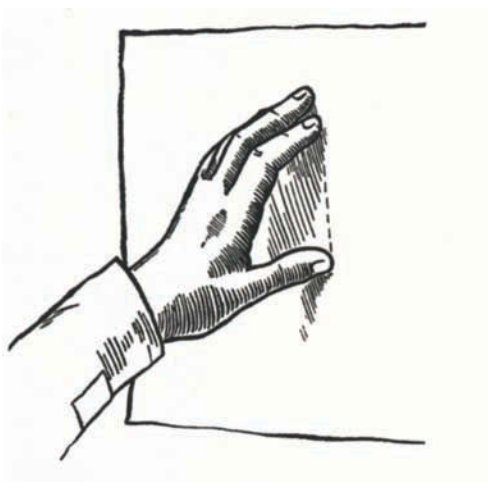


Fig. 11.
Cleaning with an eraser. The area to be treated with an eraser should be no larger than the span between your thumb and index finger.

enough water to cover the engravings or sheets and have them floating lightly. The bath has to be well acidified with table vinegar (it has to have a slight taste of vinegar),[35] and a larger, worthless print[36] on firm paper has to be put in first as a support for damaged sheets or sheets with broken plate marks. This print is immersed so that it lies on the bottom of the tray. Now, the engraving which has been cleaned of the loose dirt—once again, look for the copying-ink markings!—is placed in the tray and immersed. It is best to immerse the print beginning at one end. I consider it best to start this bath at night so that the engraving can bathe in peace.

When you visit your patient the next morning, you will find that the acidified bath has been beneficial. The slight water stains have disappeared altogether, and the heavy yellowing has decreased considerably. The brown color of the water proves the strength of the bath. The discolored water is drained completely by lifting the tray up a little on one side and putting a small wooden block under it. The sheet remaining in the tray is rinsed carefully with a hose. The little patient receives a bath of cold, clean water so that the vinegar smell disappears completely. A two-hour bath is sufficient. After that, the print is put on the tube pole with the help of the support sheet. The tube pole is appropriate so that no breaks occur, since in this case the engraving has to be placed on the pole together with the strong support.

To take the engraving out of the tray without having the tube pole roll off, the pole is put across the sides of the tray in such a way that one end rests with the

Fig. 12.
Etching, English School, 1807,
J. Gillray fecit. The dirt was removed by washing with a dilute soda solution.

flattened side on the edge of the tray. If you have an assistant, let him hold the pole. Next, both sheet and support are pulled out of the water and only placed far enough over the pole that about one-third or one quarter lies on it. When the tube pole is lifted, the two ends of the print can be distributed by turning the pole so that they hang down equally.

When the sheets are lifted out with the help of a pole, care has to be taken that they are not pulled; that is, no tension may be created between the portion in the tray and the portion that has been hung over the pole. The tube has to be turned a little bit or the pole has to be lifted high enough so that the part that is still in the water can be removed. If you proceed this way, you will certainly not have any disastrous experiences.

The tube pole with the sheet is now moved to the hanger and once again rinsed carefully. Since parts of the print might come off, a small sieve should be placed under the spout [of the tray]. This little auxiliary device has saved me a lot of trouble.

At this point, I would like to talk a bit about floating off small parts of prints. In earlier times, at the end of the eighteenth century, there was a great demand for illustrations, and large numbers of engravings were needed. The printers had plenty of work! A lot was going on! At times, the work was done hastily. The papers were prepared and placed conveniently in such a way that the printer could always take the damp papers from a big pile. When the printer placed a piece of paper under the intaglio printing press in order to produce a print and noticed in the process that the paper

Fig. 13.
The same print during washing.

Fig. 14.
Japanese picture scroll, watercolor, early eighteenth century. Brightened halfway by treatment with weak chlorine.

had a thin spot or maybe even a hole, he would tear a small piece off another sheet and use it to cover the blemish in the paper, often without any adhesive. If you have a good eye for something like this, you will be able to recognize these places, since the patches were applied fast and carelessly. The copperplate only pressed the patch on, and the slight oil content of the color held it in place. If, however, such a print lies in water for several hours, perhaps even in hot water, a sieve at the spout is a wonderful help since it will capture the fugitive.

After this little chat, back to the damp sheet. The time has been well used; the sheet has drained off a little bit. It has to be placed on cardboard to speed up the drying process. This simple process of bathing has had good results because the slight water stain has disappeared—as was seen in the bath—and the yellowing, too, has been reduced considerably. The sheet should retain a slight trace of yellow because it looks more attractive when dry. It is just this lovely warmth emanating from the print that is proof of a reasonable method of treatment. And this is the way it always should be!

At times, a water stain is still visible even after a twelve-hour bath. Still, that often does not matter. The water stain may disappear when the print is dry; it may only be visible when the print is held against the light; or it may be so hard to see that it does not disturb anyone.

If the water stain or other stains are still clearly visible, somewhat stronger methods have to be employed. Another attempt at removing them has to be made, and the water stain and the blemishes have to be treated locally. A small casserole dish or pan is filled with boiling water, and a generous shot of vinegar is added. A small round paintbrush with hog's hair bristles is dipped into the solution, and the water stain and other disturbing spots are brushed; this is done until success is visible. It is best to treat both the front and the reverse so that the process is a little more effective. To treat the reverse of a heavily damaged paper, a second sheet has to be employed which is given a quick bath and put over a pole to drain off quickly. When it is still half damp, this second support is placed over the print. The print lies between two sheets. All three parts are lifted up, and the sheet is moved back to the table in such a way that the second support lies on the oilcloth. The first support is removed and hung over a pole. The reverse can be treated easily now. This method was previously described, yet it is always worthwhile to mention it again.

If the water stain has still not disappeared in spite of the hot vinegar water, powdered citric acid should be sprinkled on the water stain and the other blemishes. This can be accomplished with a small, flat piece of wood or a small spoon. The effort has to be repeated several times. Finally, the damaged areas can be treated with pure ammonia solution.[37] This treatment will certainly be successful, and print and paper will not be affected by it. This last point should and must be our goal with every job!

After all these treatments, the sheet has to be rinsed well. A water bath of many hours follows. The last traces of dirt that resisted the eraser have to be removed. This work is done on the damp print. The sheets are placed into a completely fresh bath and stay there for several hours so that the dirt can dissolve a little. The sheet is hung over a pole to drain off quickly and is then placed on the oilcloth-covered table. A flat bristle brush is dipped into a pot of boiling water, and the surface dirt is brushed off very carefully, only enough so that the paper does not get damaged. Of course, small fibers will be raised up, but that is not dangerous, since only a very thin layer of the paper is affected in a harmless way. If this treatment of a damp print has been practiced often on worthless sheets, nothing needs to be feared when it is tried on good prints. The lighter the movement of the wrist and hand, the better the results. A heavy hand might do a lot of damage.

If the dirt is heavily ingrained and it becomes necessary to exert great force in order to remove it, another method has to be employed. Put one heaping teaspoon of bleaching soda[38] into a small, one-pint casserole dish, and pour boiling water over it. A strong soda solution should only be used for the removal of oil paints![39] Since the printing ink in the engraving also consists of oil paint, you have to proceed very cautiously when it is necessary to use soda. You cannot touch the printing; you have to be careful with the title (legend) and should only try the soda solution "miles away" from any

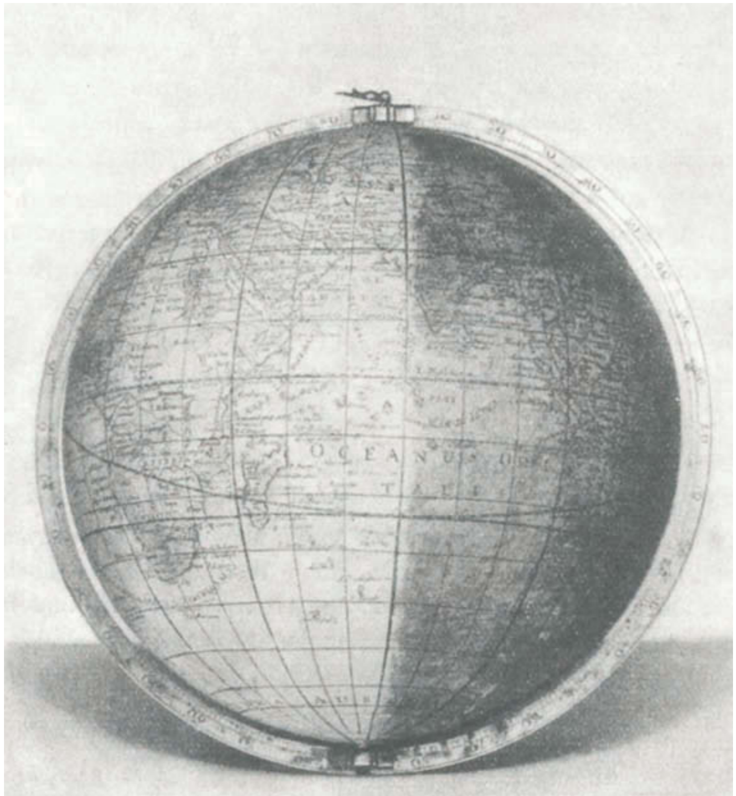


Fig. 15.
Globe, ca. 1800. Brightened with dilute soda solution.

print. I already mentioned this in the section "Paper Manufacture." There are prints in which the color is a little more resistant. Use common prints to find out about this. I advise you to practice directly on the appropriate object so that you become familiar with the enormous danger of the addition of soda.[40] You can put a little more soda, maybe two heaping teaspoons, into the hot water and try this solution on a damp copper engraving. You will then comprehend the power of a good, familiar home remedy.

I have to mention these dangers so that this work is not undertaken lightly.

And if a reader thinks that his first attempt with soda has been a success, please believe me: A kind fate was on the reader's side during his first attempt. A second treatment might not quite meet with his approval.[41]

For removing the dirt from a damp print, take a wide, flat bristle brush. It is advisable to take a somewhat worn brush with slightly shorter bristles on the sides and somewhat longer bristles in the center. When you have gained sufficient experience, you can certainly try many other methods. For instance, what good is a clean margin when the print still is dirty and margin and picture, therefore, show a considerable contrast? In time, practice and experience will allow you to use the soda solution even on the printed part. But I do not exaggerate when I say, "It is absolutely necessary to practice a thousand times beforehand." It is also possible that someone is unable to acquire the necessary skills because he does not have the intuition and general adaptability. Therefore: Practice, practice, and practice again!

For very thin papers and prints you should not use a large bristle brush but rather a short and flat hair brush. The soda process should be used only when the top surface is soiled and no dirt is visible on the reverse. Otherwise, rings of dirt might be drawn from the back through the paper, like a water stain, and could never be removed damp or with an eraser. This is where the "surgeon" can show his skill. When this kind of dirt ring is very disturbing but does not affect any nobler parts, the blemish can be cut out with a knife. This kind of work can only be done when one is secure in the saddle. For the time being, hands off! A margin that has been treated with a soda solution has to be dabbed well afterward with a half-damp sponge, so that the soda solution does not run across the print when the sheet is lifted up.

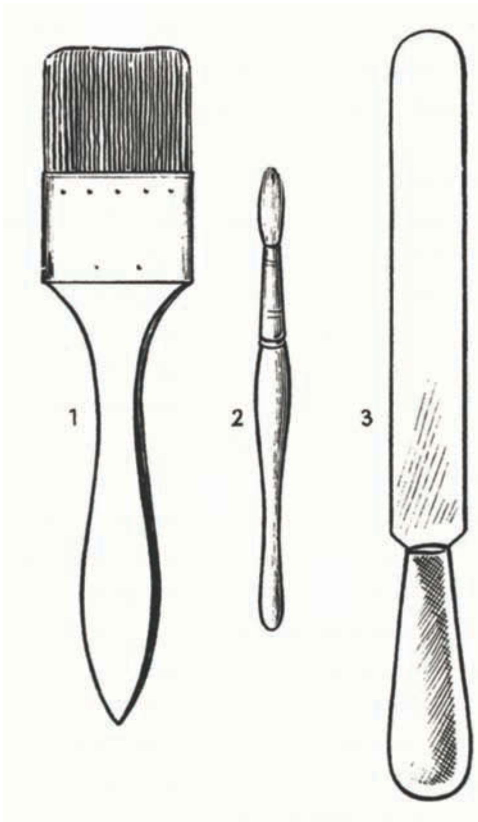


Fig. 16.
(1) Flat bristle brush; (2) paste brush, round bristle brush; (3) flat knife for cutting prints off the stretching boards

REMOVING PRINTS FROM BACKINGS

If the prints that are supposed to be treated are mounted on cardboard or other supports, they can be cleaned with an eraser only if they do not lift up or buckle anywhere.

The mounted sheet is placed in a cold bath and left to its fate overnight. It is always advisable to prepare the bath at night so that no attempts to separate the sheet are made from pure curiosity. This kind of curiosity often carries a severe punishment.

The print is put into the bath with the printed side facing down. In the morning it is checked; the water is drained carefully, and a small corner is lifted up to see whether it is possible to separate it easily. If the corner is still sticking very tightly, the sheet is left in water for another twenty-four hours. During this time, no further attempts at separation should be made. After this bath, the water is drained, and if the sheet still has not separated from its support, boiling water is poured on the cardboard in such quantities that the sheet swims in it. Let the boiling water take its effect for several minutes and then try the separation. If the print has come off by itself in the hot bath and is swimming in the water, that is perfect. But if the print is still very tightly attached to its support, you have no choice but to remove the support by force. Put the engraving face down on the oilcloth, with the support facing upward, and attempt to pull the support off piece by piece. When one corner of the support has been removed without damaging the back of the print, you can continue as follows: with one hand, press down on the part of the print that has been uncovered, and carefully follow the other hand, which is pulling off the support. If the front of the print were put on top, you would try to pull it off. Then it certainly would be damaged. This little hint should always be observed.

After the forced removal of the support, the sheet is put back into the tray and is left in water for several hours. The water is then drained, and just enough hot water is poured on the bottom of the tray to lightly wash around the engraving. I emphasize: Pour the hot water on the bottom of the tray so that the paper of the engraving cannot be damaged! If water were poured on a very soft paper with a certain amount of force (for instance, if it were poured from a spout), the paper could be harmed easily and a hole could appear. Always remember this!

The hot water only serves the purpose of making the layer of glue more pliable. A sheet that is only glued is not difficult to take off. Even if the glue does not dissolve completely over twelve hours, it will certainly not prove stubborn. A hot bath will make the glue disappear, and the reverse side will not have to be treated specially. But what can be done if a sheet, which is difficult to remove, is not mounted with glue but was firmly attached by a bookbinder with the notorious alum paste?

It would be more than deplorable to treat a valuable print in such a way. The paste has to be removed mechanically, since the hot water would not have any effect. Take a worn flat bristle brush, drain a little bit of water off, and start working with the brush. Of course, the washing has to be done very carefully and skillfully. Do not treat the whole back side at once, but wash it piece by piece. This is done best by starting in the upper left-hand corner and going to the right. Touch the first spot that is freed from paste with the fingers of the left hand, and keep on working until all the paste is removed. While the sheet is in the tray, most of the paste is removed mechanically with the brush; then the sheet is put face down on the clean oilcloth. Keep a container of hot water handy, and proceed with the brush in the same way as before. The very last traces of paste must be removed. If any paste is left in spots, these parts will buckle considerably when the paper dries. Therefore, you have no choice but to get rid of the paste completely.

After this procedure, the sheet is put back into the tray once again, and a copious amount of hot water is poured on top. The repeated treatment with hot water[42] in this case only serves the purpose of forcefully attacking the alum paste one more time. The slippery part of the paste will have been removed, but the alum itself will not have been taken care of properly. This alum penetrates the paper deeply and renders it waterproof. All these procedures sound a bit brutal but cannot harm the paper of the print if it has been treated expertly. If the print had been pasted on because of severe tears and has to be mounted again, it still would not do any harm to pursue to a successful conclusion the efforts for the removal of the alum paste. The tears will have to be closed up skillfully later on, and the edges especially will have to be freed from tears. A prerequisite for this is, however, that the sheet has been freed previously of all harmful paste.

In earlier times—the fifteenth to eighteenth century—flour paste was used very often for mounting prints. If you have an idea that the mounting might be from this period, do not use hot water. Rather, leave the sheet in cold water for forty-eight hours; do not pay any attention to it, and continue to work with it then on the oilcloth. It is not a mistake to leave the sheet in water for a longer time even if the assumption about the adhesive turns out to be wrong. If the support is separated relatively fast, flour paste will always leave a striated pattern.[43] If you run a knife over a small area, you can scrape together some paste that is easily recognizable as whitish or brownish flour paste. If the described indications do not apply, you are dealing with a later mounting method and the bonding agent may be glue, dextrin, or starch. The last traces of the flour paste are scraped off carefully with a blunt knife. The sheet is then washed thoroughly with a bristle brush. In this case, hot water would make the paste harder and the separation more difficult.

And something else should be taken into consideration: Starch paste is mixed cold and then boiled; it goes through a heating process, just as glue. Flour paste, as wallpaper hangers used it in earlier days, was mixed cold and made ready for use by adding cold water. If hot water were used to thin out the flour paste, lumps would appear. It is, therefore, obvious: Paste that was mixed and thinned out cold should never be treated with hot water. Cold paste—cold water;

hot paste—hot water!

Prints that are stretched over a wooden strainer are often not simple to treat. Wood and paper have quite different properties of expansion and contraction. In the past, a few, but unfortunately not all, bookbinders or framers stretched a thick sheet of paper over a strainer before mounting an engraving. In this case, removal is not difficult. If one is skillful, even without using moisture one can loosen a corner; that is, the paper support can be separated from the strainer. If it happens that the front side of the strainer is located right at this point, the incision may be difficult.[44] Cut a little into the wood underneath the support and try to create some space between the paper support and the strainer. Just a small corner will suffice.

This space is very important because the sheet is later put into water to be loosened and is left there for twenty-four to forty-eight hours in order to become separated from the strainer. The strainer is lying on top, the sheet face down. If the sheet does not separate from the strainer after the water has been drained, the strainer, like a tray, will trap the water. To prevent this water from forcing its way out, a corner of the support should have been loosened from the strainer so that the water can drain. If you have taken this small trouble, you will be a lot happier in the morning. This procedure of loosening a corner dry cannot be used in all cases; you have to find different methods. It is easy enough to say that the sheet has to be separated at all costs. If you are dealing with very hard sheets,[45] that is, engravings which have been printed on Whatman papers, the separation would not be very difficult, since such papers cannot easily be stretched or deformed. In this case, too, the sheet is put into the tray with the strainer on top, and clear water is poured in gradually. The strainer has to be weighted beforehand so that the sheet does not float. You have to allow the sheet to be in the bath for forty-eight hours if you expect any success. The water is then drained, and you can check to see whether the treatment has been effective. If this is not the case, boiling water must be used to assist the process.

If you are dealing with colored sporting prints, a much more time-consuming process must be used. To avoid the formation of water stains, the back of the print has to be dampened again with a flat bristle brush. The edges on the front are also brushed with water. This process needs to be repeated every thirty minutes. The print can also be put into the tray vertically, maybe at a slight angle, with just enough water added so that the margin, up to the printed part, is underwater. Never forget to dampen the back, though, since water stains can form very easily. The margin is left in water for about one to two hours, and then an attempt is made to separate it further with hot water on the oilcloth. Again, on the front only the margin is dampened, whereas the entire back is moistened. If the margin previously soaked in water is brushed with very hot water, small areas will begin to swell, like blisters. Try to reach these areas with a very flat knife so that the separation can be undertaken gradually. It is also advisable to pour boiling water on the margin from the front and to start the attempts on the oilcloth only after that. If you want to succeed, you have to try a variety of ways. For the separation of very absorbent papers from strainers, I recommend a local procedure. However, the back may not be dampened too much, since the engraving could easily break along the inner edge of the strainer.

If the separation is supposed to take place in the tray, a somewhat larger glass pane has to be put down first. The purpose of the glass pane will be discussed again later, but it is also there to prevent the strainer, which is only held together by glue, from falling apart when the sheet is lifted from the tray. To weight the sheet, one small board is put across the strainer and one lengthwise, and full bottles are placed on the boards. The sheet can be observed easily through the space. The tray is carefully filled with water, and you may even risk a slight spurt onto the back of the sheet so that no air bubbles can form. I would recommend another lengthy cold water bath. After the glue has softened, the tray is emptied slowly and the weights are taken off. Gradually remove small amounts of water inside the strainer by lifting the glass pane. Now carry the glass pane with the strainer to the table, and the print, held at a slight angle, should be seen through the glass pane. You will notice that a lot of bubbles have formed in the margins, an indication that further separation will be easy. The glass pane is carefully placed back on the oilcloth, and the separation is attempted with warm water. (Never use hot water since the glass might crack!) This small task can also be done in the tray. Now the separation should be successful. Do not move or lift the frame by force because this will certainly tear the sheet. If the strainer and the sheet still cannot be separated, drain the water slowly from the tray, bring the sheet to the table—with the glass pane underneath it—and wait for a while until the print has somewhat dried off in the middle. This drying can be accelerated by frequently applying blotting paper to the center of the print. When the print is halfway dry, the sheet can be lifted up slightly with the frame but without the glass pane. Watch the front of the print while doing this, to see whether the whole margin is coming loose. If only a few places come loose, let the print carefully slide back onto the glass pane and turn it over with the glass pane. You can risk this since the dampness has for the most part been removed from the sheet, and the sheet can hardly break at the inner edge of the strainer. Turning the print would have been very dangerous while it was damp, for it certainly would have broken along the inside edges of the wooden strainer because the absorbed moisture would have made the paper too heavy. The sheet is now lying on top, and you can try to lift the margin with a flat knife. After separating the sheet from the strainer, place it in the tray so that the last traces of paste can dissolve a little more and the small water stains, which have formed as a result of the local treatment with water, will disappear. Old prints from around 1500, and so on, which were colored to the outer edge of the paper and have been mounted on thick supports, are loosened this way: The back of the sheet is rubbed carefully with a sponge that is not too wet. This work is done on a glass pane. Since these prints were attached with flour paste, if they were mounted at about the same time as they were colored, they can—as you already know—only be removed cold. The slightly dampened back is then covered with a starch paste that has not been cooked too thick, or else with a rye flour paste prepared cold, so that the layer of paste is 5 to 10 mm thick. Do not go all the way to the outer edge of the sheet with this paste, since it could easily damage the coloring. This damp, thick layer of paste must now be allowed to loosen the support slowly, which can take twenty-four to forty-eight hours, depending on the kind of support and adhesive used. Cover the sheet with a box lid, leaving only a small air space so that the air does not dry out the paste on top.

The described methods of separation can, of course, only be used by an expert who has studied papers, with all their strengths and weaknesses, for a long time.

If a print is attached to parchment, only the cold separation method should be used. A hot separation would cause the parchment to buckle, and the print might be damaged. Only a longer stay in

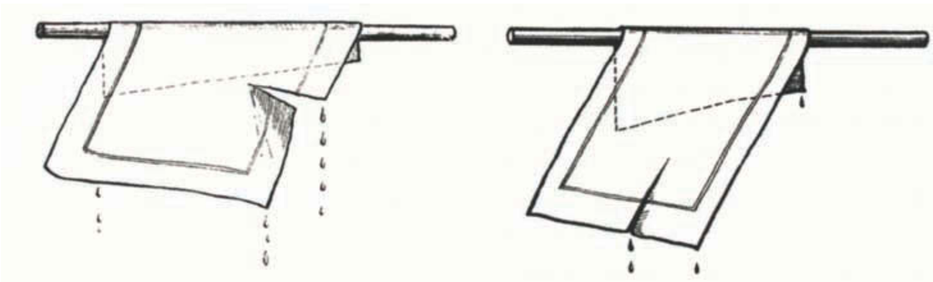


Fig. 17.
Wrong!
Engraving with a tear, incorrectly placed across the pole; the tear will increase because of the wetness and softness of the paper.

Right!
Engraving with a tear, correctly placed across the pole to drain—without increasing the damage.

The sheet can best be observed if a stool is put upside down on the table so that the glass pane can be placed on the legs. When small dark spots appear on the front of the print, the paste has done its work. Remove the layer of paste very carefully from just these places so that the additional moisture cannot do any harm.

After thirty-six to forty-eight hours, maybe even sooner, the layer of paste has to be removed in any case, and the separation is tried mechanically. This will certainly bring the desired results. The traces of paste will have to be scraped off the back very carefully, maybe even washed off with a flat brush if the coloring permits such treatment.

a cold bath can bring the desired results.

Separating prints or drawings that have been mounted to the inner cover of a book, while preserving the old binding, can be a very tedious affair. Moreover, if these drawings or prints are colored, and therefore cannot be dampened, the separation must be done mechanically. Such prints often have not been attached directly to the cover but are glued to two or three sheets of paper. If there is also a layer of parchment—the prints have often been added much later—the mechanical separation is not quite as dangerous. It has to be performed with a flat, sharp knife; that is, the wood has to be laid bare. Also, always remember that the layers should not be damaged during this mechanical work, since there might be valuable parts in between. When such a procedure of separation does become necessary, it requires the utmost patience. If you have already made a little headway, that is, if one side or corner has been lifted up 3 to 5 cm, including small wood splinters, you can continue working in another manner with the help of a paintbrush. Dip the brush in lukewarm water and very carefully brush the back of the part that has been lifted up at the place where it is still attached. Wait a while for the water to have an effect and cautiously try to lift the loosened part. Of course, you have to be aware that the dampened part is very fragile and that you should be happy to advance 1 to 2 cm an hour. When beginning this separation, you should let the paper dry somewhat in this spot but only just enough to be still a little clammy. (A lot of thinking is necessary in all this work so that no damage will be done. The individual supporting layers often are not attached uniformly; there are places that have not been pasted or others where the paste did not adhere.) When all but one of the supporting layers have been removed, cover this remaining layer of paper with paste, allow it to become loose, and remove it from the back of the print.

WHEN MAY ONE WORK WITH CHLORINE?

(General Observations on the Treatment of Prints and Books with Chlorine)

You hear quite often that the use of chlorine is very harmful to books and prints.[46] I fully agree with this opinion, and it is more than deplorable that so-called time-tested remedies, which were still recommended in 1929, unfortunately, are being used over and over again. Among various other inferior recommendations, such a procedure advising the use of chlorine has even been printed in a treatise. A Dr. X, a pure theorist, is the author of this book, and he tries to introduce his work to practicing restorers by referring to the "assistance of top experts and curators of state museums."[47] Verbatim you read there: "Chlorinated lime can be sprinkled dry on the back of the wet sheets of paper; after using it, however, there will be white lime spots on the print which look like mold and can only be removed by hydrochloric or nitric acids, which dissolve lime easily, and by rinsing with water."[48] On the cover of the book you can also read: "Revised according to the most recent state of the art by Dr. . . . [Hans Böhm]." And that was in 1929![49]

If a person who has no firsthand experience with the various methods of treatment for engravings and books and, just because paper is patient, starts writing away, based on hearsay, it is high time that an expert with long-standing practical experience puts an end to such nonsense. This shall be done right here! I would almost like to ask my dear friends the glaziers and bookbinders to forgive me for being so harsh on them! Unfortunately, though, there is no other way. However, I have to say to this Dr. X: "What do you think a color print would look like if your recipes were to be used?"

You, dear doctor, though to seemingly disclose valuable advice, have done just the opposite. And when one reads on the title page the lovely words: "Complete guide to the maintenance, cleaning and restoration, etc.," one wishes that you had used your clever pen for another kind of purpose. More than a hundred years ago, chlorinated lime was already in use for "bleaching" paper. However, also over a hundred years ago, sprinkling dry chlorinated lime on wet papers was stigmatized as a great danger to papers. Dissolved chlorinated lime, as I recommend it for use, has never harmed any papers.[50]

Hands off dry chlorinated lime! My long experience—not science overheard!—gives me the right to say: This is the way to do it! Whoever still thinks that he has to use the "time-tested good remedy" is doing harm, and I hope that his clients will hold him accountable.

Preparation of Chlorine[51]

Carefully pour 500 g of chlorinated lime into an earthenware pot with a spout. Such a pot is perfect, since the spout is very useful when the chlorine water is poured out later. Add about 2 liters of boiling water to the chlorinated lime, and close the pot with a lid. After five minutes the chlorine mixture should be stirred well with a ladle or spoon, and this stirring should be repeated three times within the next two hours. If you mix the chlorinated lime at night and proceed as prescribed, it is advisable to leave the mixture until the next morning. The foam and the chlorine particles that have not been dissolved are now skimmed off with a skimming ladle or a spoon. Wait a while until the chlorine water has calmed down again after the foam has been skimmed off, then pour the chlorine water through a linen bag into another container with a spout. When pouring out the chlorine water, make sure that the sediment of the chlorinated lime does not get into the linen bag. Next, a supply of well-cleaned, dark bottles is filled—not quite up to the neck, with the help of a funnel, which is also covered with a linen cloth—and tightly corked. Store the bottles in the dark. If you are very intent on saving, you can pour boiling water over the chlorine sediment in the pot again and proceed as described. After that, the sediment is discarded. The second solution is labeled "Chlorine water, highly diluted." The first solution is labeled "Extract."

The chlorine water is now ready for use.

Pour very carefully when you use the chlorine from the bottles, so that the paper does not get "hurt" in the treatment if inadvertently any chlorine sediment has passed through. At first, it is advisable to use the extract for practicing since the effect could easily be too severe.

ANTIDOTES FOR CHLORINE[52]

Each paper that has been treated with chlorine water needs a very special bath after the first baths (see pp. 70–71). The paper has to be "detoxified." The long previous baths modified the effect of the chlorine, but there is still a trace of chlorine left in the paper, which has to be removed.

Table vinegar, for instance, is a potent antidote for chlorine.[53] If you want to use it, first drain the water completely from the tray until there is no more foam left. The spout is closed tightly, and a whole bottle of wine vinegar[54] is poured in. Thrift has no place here, since you are dealing with valuable prints. Let the vinegar take its effect for a few minutes. After a short time, with the vinegar still in the tray, let cold water run in slowly until the papers are just covered with water.

This antidote requires three to four hours to remove the small remnants of chlorine. The papers will no longer smell like chlorine when they are dry. The pure wine vinegar will also remove any lime residue, in case some of it might have passed through into the extract when the chlorine was filtered. Diluted hydrochloric acid is used only when absolutely necessary, such as when the chalky residue from the chlorine is so strongly evident that it must be removed.

Sodium hyposulfate (in small crystals), as photographers use it, also is an excellent antidote. One should obtain this sodium hyposulfate in any case, since it is at the moment somewhat less expensive than wine vinegar.

Take 1,000 g of the supply, pour boiling water over the crystals in a 2-liter earthenware dish, stir thoroughly, and let the solution cool. Pour the solution through a funnel and a linen bag into two clean bottles. Under no circumstances should the dirty residue of hyposulfate come into contact with the paper.

TREATING BLACK-AND-WHITE PRINTS WITH CHLORINE WATER

A severely yellowed sheet of paper with unsightly mold stains, which has become a little lighter through a simple water bath, shall now be treated to improve its appearance.

The paper can be treated in different ways. The most natural and most beautiful method is exposing the paper to the sun for many hours.[55] The advantages of the sun's rays are well known. However, if you want to use this lightening method, you have to have a lot of sun and time. Such a treatment can last for days and weeks. To reinforce the effect of the beneficial rays of the sun, the paper has to be put into a bath previously lightly acidified with vinegar. After the bath is completed, the paper is put on cardboard and exposed to the sun. When the paper starts to dry, it has to be sprinkled with a weak vinegar solution from a watering can. This procedure can take weeks, as already mentioned. But will you always have the time and leisure to do this?[56] Will the sun shine that long?[57] You could and should try this once with an engraving in black ink to see how truly powerful the effect of the sun is.

If only one area is to be cleaned (local treatment), a lot of patience is necessary. Put the thoroughly dampened paper on oilcloth but never on cardboard—a mistake that is often made, unfortunately. Dry cardboard will absorb the cleaning agent, creating pronounced rings on the back of the print instead of letting the weak chlorine water run evenly over the paper. However, if the paper is severely damaged, you certainly want to use a well-saturated support for it. This wet support will allow the slow spreading of the chlorine water, since only the dry and absorbent support creates hard rings on the back.

To dab the print locally, take one part extract and two parts water. An eggcup will be big enough to hold this solution. For dabbing, use a thin white *estompe*[58] or pieces of cardboard cut as small as desired. Very unsightly but only occasional mold stains or offensive water stains should be dabbed with this solution. The paper is dampened in order to (1) prevent it from being damaged at the treated spots and (2) allow the chlorine water to mix gradually with the moisture present in the paper.

If you started to work right away with the strong extract, the effect would be very noticeable and the treated areas would stand out sharply against the surrounding. This is avoided by using weak chlorine water. After the spots have been treated several times in this way, a moist sponge is squeezed out over them so that the water and chlorine solution can combine again and a slow blending in of the chlorine water is assured. If the chlorine water is too weak, the mold stain has to be locally dabbed with a stronger solution and only in its center. The stronger solution then combines with the weaker one, and the weaker solution in turn with the surrounding dampness. Dabbing frequently with a wet sponge is advisable in any case. If you have removed the stains on the front, the paper should be treated to a lengthy cold bath. After about two

Fig. 18.
Coat of Arms with Skull, German School, Dürer, 1503, engraving. Stained by modern ink; completely cleaned through a water and chlorine treatment.

hours, take the paper out of the tray and place it wet, with the back facing upward, on the oilcloth which has been cleaned in advance. The spots might still be faintly visible on the front, but they will completely disappear once the paper is dry or will just be faintly noticeable without being distracting. The back is treated in the same manner as the front. When you are able to clean a spot locally in such a way that the surroundings of a mold stain or water stain are not affected or lightened as well, you will have been quite successful.

If an engraving is still very brown in spite of the preceding treatment with the vinegar solution or if it still shows unsightly spots, it has to be lightened as described above. During this treatment, the areas surrounding the spots are, of course, also treated since the yellowing is too severe. You start at first in the same way: localized dabbing of the front, bath, localized treatment of the back. After you treat the back, the paper is left lying there; it does not get another bath for the time being. The back of the paper is brushed with a weak chlorine water

Fig. 19.
The same sheet after cleaning

solution. A wide flat bristle brush is dipped into the weak solution, and the solution applied with a full brush. Do not rub the brush into the paper but move the wet brush back and forth over the paper like a painter painting a floor. As soon as the paper becomes light enough and its shade matches the locally cleaned areas, the front can be treated. For this, the paper is carefully turned over and only the margins are covered with a weak solution. Often, you do not have to cover the printed part with the solution because it already has been affected from the back. However, if dark spots appear on the front, especially in the lighter parts of the print, a careful lightening with chlorine water has to be attempted. In the meantime, the appearance of the margin has improved and its color again corresponds to the pretreated areas. You have thus been extremely cautious when treating the paper with weak chlorine water. If the localized pretreatment had been omitted and the whole sheet treated at once, the paper would have been exposed to a longer treatment with chlorine water and would have been

Fig. 20.
Jan Cornelis Sylvius, Dutch School, Rembrandt, ca. 1645, etching. Nearly destroyed by fire, the picture was fully restored by treating it with chlorine and mending it.

weakened unnecessarily. Even though the chlorine water will never damage the paper and the print if it is used as previously described, it seems unnecessary to me to treat the entire paper in such a way. I would like to advise you once more, strongly: Always treat the stains locally first and then proceed to lighten the whole sheet, and the latter only if it is absolutely necessary.

After the treatment, rinse the paper well on both sides and let it recover in a cold bath. After about one hour, the bath should be renewed and the old water, which contains slight traces of chlorine, should be drained off. The second bath (the etching remains in the tray after the first bath has been drained) will be very good for the paper. After another two hours, empty the tray completely, carefully rinse off with the hose any foam that might have formed, close the spout with a cork, and pour a small amount of chlorine antidote into the tray. Slowly pour in some water, just enough to have the solution taste a little like the antidote and to cover the paper well. If the solution is too weak, add a little more antidote to

Fig. 21.
The same etching after treatment.

make it stronger. Allow this bath to work for two to three hours, then drain it and replace it with fresh water. The paper remains in this water bath for four to five hours and is then placed over a pole.

Never use a pure chlorine bath, since print and paper could be damaged by it.

If larger brown stains appear during the treatment with chlorine water, a chemical process has taken place.[59] These dark spots can be removed instantly by applying a weak hydrochloric acid solution (5 to 10 percent) with a small round bristle brush or by sprinkling pulverized citric acid on the spots. Another dabbing with weak chlorine water then causes these spots to disappear completely.

THE CLEANING OF COLORED PRINTS

This section deals with old colored woodcuts as well as engravings and lithographs.

It is surprising how hard it is to avoid unintentional loss of color from prints in the course of treatment. But my task, which is to preserve the colors on paper, is even more difficult. Early woodcuts were colored for good reasons. First of all, the less well modeled garments of individuals would be made more expressive in order to give greater emphasis to the figures themselves. A second reason was to create a colorful book by portraying the religious images in imitation of Egyptian picture sheets.[60] The main purpose, however, lay in covering up drawing errors by means of rich color. The early wood-cutters were not yet very experienced, so that common carpenters performed this kind of work. The woodblock was given to the cabinetmaker, whose task it was to cut out the area around the drawing precisely. The drawing itself remained, in relief. Of course, it was possible for the carpenter to miss a few folds in the garments because he was not yet a master in this art. Looking at woodcuts from the second half of the fifteenth century, you can see that the carpenters worked rather awkwardly. And the artist who created the design often was not the right man for this kind of work either.

Coloring became less frequent after the example set by Albrecht Dürer. Dürer learned the art of woodcutting from his master, Wohlgemut. If Dürer was not able to cut every woodblock himself, the work was at least done under his supervision. The appearance of woodcuts improved, images were executed more artistically, more attention was paid to details, and the garments pleased the viewer even without color. After Dürer's time, if any woodcuts were colored, it was probably for the reasons mentioned in the preceding paragraph.

The coloring consisted mainly of four hues—blue, yellow, red, and brown. Later, black was added. Because in earlier times paper was prepared for coloring with a gum or albumen solution, there is a distinct danger of complete removal of the old color even during a simple water treatment. If the colored sheet were placed in water, the colors could float away because, as already mentioned, the background was covered by a water-soluble coating. Gum or honey solutions were used as binding agents for colors in earlier times.

A chlorine treatment can be used only if the greatest possible precautions are taken. And only a local treatment may be applied. Especially disfiguring stains can often be removed using a dry method with a razor—for instance, wax stains, the kind that are frequently found in prayer books. Subsequent treatment with carbon tetrachloride will often bring good results. For a treatment with chemicals, the sheet first has to be dampened from the back, and care has to be taken that the water does not run onto the color. Foxing or water stains immediately absorb water. Because of the absorption, the spots can then also be treated more easily. Local treatment with chlorine has to be repeated often if the stains are stubborn. After each chlorine application, an antidote is used, and this process is continued until the goal has been reached. Do not treat stains in the color itself if you do not have the necessary expertise. When the stains have been removed to the extent that they are not very visible anymore, the sheet should be dampened frequently from the back with clear water so that the effect of the chlorine is gradually lessened. After the treatment with chlorine water, the paper, if it is not very absorbent, can also be placed on a water surface. Water will be absorbed at the places that have been treated with chlorine, since the paper has been made softer in those places.

If the sheet is floated on water, with the treated surface facing upward, care has to be taken that no waves are created by moving the tray. These waves could run over the color and damage it. Therefore, utmost caution! After the treatment the individual spots are sized with a gelatin solution.

Why does foxing only appear localized on a sheet? I think because the paper is more susceptible to it in these places. How often do we not see in an old book only one or two sheets out of a hundred covered with a few individual foxed marks? The reason for this cannot be that the book lay open. On the contrary, a brief, dry airing would always be of advantage to the book. It has to be assumed, therefore, that these places did not receive any sizing when the paper was prepared or that other defects existed in the material.

Colored engravings from the eighteenth century do not show foxing, water stains, and overall browning as often as prints from the nineteenth century. When I specify colored prints from the end of the eighteenth century to the beginning of the nineteenth century, I am thinking above all of the beautifully colored Swiss prints.[61] With what kind of endless patience and exquisite colors these great artists worked! You can literally smell the fragrance; you can sense the love and great care in their prints. I do not think that I exaggerate when I maintain that no other country in the world was blessed with such great masters in the art of coloring as Switzerland. As a matter of principle, I also refuse to treat Swiss prints when a spot does not impair the impression as a whole. Often a slight browning makes the paper especially attractive. And this little bit of browning should now be removed? Never, hands off! One has to have some idea of coloring if one wants to talk about it. If a sheet has been treated anyway and the color has been slightly affected, it should be left to another hand to touch up the exquisite colors! It is not easy to find the right way to return the softness and originality to the sheet. The collectors and dealers of Swiss prints know coloring; they all know that no one can match the original. And it is entirely impossible to fool these experts.

I lingered a little longer over the Swiss prints so that anyone who wishes or has an inclination to treat such sheets will think over carefully whether he can finish this work successfully.

I do not exaggerate when I say that it is often harder to treat a colored Swiss print than a French aquatint print. For this kind of treatment I cannot simply say, This is how it is done; or, Take the following. That is impossible! Empathy is of the utmost importance here.

And, unfortunately, how often we find these wonderful Swiss prints in a deplorable condition! The dear framer frequently did not understand the great art of his compatriots; he just did the framing! No thought was given; he just put on a frame. Instead of cardboard as a support, highly resinous boards were used so that the grain of the wood is often visible in dark brown on the front of the sheet. And many framers did not put any special barrier behind the sheets. The green wood was simply placed on the print, pinned down, and that was the extent of it. This is how the exquisite prints of the Swiss artists were treated at the time.

To save such a print, of course, in most cases you have to use chemicals, even though it breaks your heart. Special precautions have to be taken for this treatment, since different hues can be easily changed or disappear through a chemical reaction. You should examine the print carefully, therefore, before beginning the work, study its fineness and detail in coloring, and note its special characteristics. In addition, details of the clouds should be copied and a small color sample made. I would like to point out especially that the shades of red have to be determined so that you can find the right hue again later.

If two or more prints need cleaning at the same time, the color sample may be unnecessary but never the drawing. Only one print should be treated from beginning to end so that there is always a sample at hand. If the print has a black borderline, it will have to be removed while the sheet is wet. This kind of work is done in the tray so that the water can immediately distribute the colors when the lines are washed off. A quick washing would only cause the remaining color to run later and to spread over the rest of the paper. Only a faint trace of the line should remain. If, after lying in water for twenty-four hours, the sheet becomes a little more absorbent, the task is no longer quite as difficult. Great progress has been made if the sheet is willing to absorb water.

In this case, the chlorine solution treatment is applied from the front. The area surrounding the main colors is brushed liberally with the chlorine solution, and, of course, the sky area has to be treated too. The delicate reddish tinge will no doubt disappear, but that cannot be helped. It will be possible to reconstruct everything by following the copy and the notes. When I say that the area surrounding the colors is brushed liberally with the chlorine solution, I mean that care has to be taken so that the solution does not run into the colors. It is advisable to have a damp sponge at hand to dab off any excess chlorine solution in case it should spread. No liquid should be allowed to stand on the paper.

The back must be treated a little more forcefully since the effects of the grain of the resinous board will be most visible here. Yet here, too, one should be very careful not to let the chlorine water work too long on those places that correspond to the principal areas of color on the front. As soon as the back becomes considerably lighter—small remaining traces can be ignored—the sheet is rinsed thoroughly on both sides. After the baths, the sheet is dried. Next, the sheet is prepared for further treatment so that the missing shades and the borderline can be restored. This procedure is described in the section that deals with the preparation of paper (see pp. 102-3).

Before applying the tints with a brush, when the color solution is well settled, you should mix in a small amount of ox gall, which is available in pharmacies. This addition is only necessary when the paper, after having been prepared, does not take up any color. You can also pour pure sugar into the color solution to make the blue watercolor for the sky run better. The sugar water ensures a good and even distribution of the color. Of course, a sponge is also very useful for achieving soft forms after the color has been applied with a brush. The border can be renewed with black drawing ink and a drawing pen.

This kind of treatment applies to prints with particular colors that are soluble in chlorine water. These colors are generally known as transparent watercolors. The majority of the Swiss prints are decorated with colors of this type, and only a fraction at the beginning of the nineteenth century were painted with opaque colors. These opaque colors were either supplied from the factory already mixed with white or combined with white by the painter. In earlier times really outstanding colors were mixed and used in the artist's studio or workshop, but, unfortunately, their composition is often unknown to us. It would be beside the point to give more detailed information about this. The colors combined with white are called gouache, tempera, or distemper. Whoever knows how to use these colors expertly can certainly achieve good results. The question arises, however: Should such prints be treated with chemicals? At first, one might think that it would be quite impossible to remove stains without repainting. And yet such a treatment can be accomplished with relative ease, although it may not be the simplest task in the world.

It goes without saying that such a method requires great skill and the ability to work fast. A print painted with opaque colors in earlier times can even be completely immersed in water and left floating, without any harm to the color. The earlier colors were carefully mixed and can easily withstand such a treatment. Of course, it is not advisable to try this out in all cases; there might be times when it does not work. At least I have to give this little advance warning so that disappointment may be prevented. If such a print is to be treated, it might be useful to have a second copy at hand.

Prints painted with opaque colors often do not have any white paper visible in the margin. The margin is covered with a yellowish green or brown color, and any writing has been added by hand. A thick black borderline frames the picture. Thus, the print has been completely painted over. The sheets often are glued to a strong backing, which makes them even harder to treat.

When the colors have been affected by superficial dirt or when dust has begun to form in wavy patterns, the sheet should first be treated with a soft eraser. After erasing, try a localized razor treatment at a spot which is quite conspicuous but is located somewhat on the side. This razor treatment can be very useful on occasion. The less that water is used, the better! If the spot is too deep, it has to be dabbed locally with a chlorine extract. In this case, the sheet is not moistened. Small water stains are not treated for the time being because they might disappear in the later water bath. When the extract has done its work, the sheet is placed into a bath. The sheet is immersed, that is, pulled into the water so that the colors are not touched by your fingers. The colors will, of course, become soft in the bath, and if they are touched a little too roughly by your fingers, they will invariably come off. The sheet therefore has to be treated with great care! The bath will take a good hour so that the paper can get well saturated. Before taking out the wet sheet and putting it on the table, you must pull a support under the sheet so that the colors are not touched by your fingers. The black border especially may not be touched, or there will be headaches. Those borders on prints that have been painted with opaque colors have to be regarded as the greatest "enemies," for they can cause a lot of trouble.

You will discover that the small water stains have partially disappeared and light areas have been left behind in the locally treated spots. At this point a chlorine water treatment can be applied with a soft flat bristle brush, up to the delicate borderline.

You should avoid—I have to emphasize this once again—going into the area of principal coloring, for stains are not very disturbing there, whereas they show clearly in the sky. The flat bristle brush has to be thoroughly saturated with chlorine water and applied lightly when the sky is to be painted. Do not rub back and forth with it as that will dissolve the colors. There should be no color adhering to the paintbrush at all if the job has been done properly.

Before the sheet is transferred to the tray, all chlorine water has to be removed to prevent damage. The sheet is dabbed with blotting paper. Do not rinse it but carefully slide it into the water again. After an hour, the bath is renewed. After emptying the tray completely, pour a generous amount of table vinegar around the sheet. The remaining baths follow as has been previously explained.

If you have a good eye and have acquired a certain amount of skill through frequent practice, this job should not give you too much of a headache. All other colored engravings and prints, regardless of their origin, are treated like good Swiss prints.

Sporting prints—when you are dealing with later ones, after 1820—occasionally show a certain gloss. This gloss, especially in the shading of individual horses, is supposed to heighten the pictorial effect. Does this gloss disappear when the sheet has been through a bath of several hours? No! You will be amazed at this answer, because I had the opposite view of paint applied to old woodcuts. No base coat was applied to the later prints because nonabsorbent papers were used, whereas in earlier centuries softer papers were used more often. For this reason a water bath does not pose any major threat to prints after 1820 inasmuch as the gloss that has been applied on top has mixed with the colors and, therefore, cannot swim off immediately. Still, I do not think that these prints should stay in water for several hours. Often, the gloss is also caused by the colors themselves if they have been thickened copiously with eggwhite, gum, or honey. Chlorine water should not spread to especially shiny places; the chemical treatment therefore has to be applied very carefully. The sheets cannot lie on top of each other in the tray, only next to each other so that the gloss will not be damaged by contact.

When, for instance, several prints with glossy areas are to be treated which are not too valuable, I advise you to proceed as follows: Slip one sheet carefully into the water, and place the other one on top. The second sheet will, without doubt, curl, because the sizing of the paper does not yield immediately. To prevent the sheet from curling into a roll, however, several bars are put crosswise or lengthwise on the rim of the tray. The sheet will slowly relax and become entirely straight again. You will also have to be careful that fingers of water do not advance over the surface of this sheet, so that waves or moving water will not touch the shiny areas. However, if this happens, the whole sheet should be submerged quickly, taken out, and put on cardboard. Colored prints with shiny coatings or opaque colors should never be hung over a bar to drip dry, since the colors can run easily. Of course, valuable prints should only be treated this way after you have gained great expertise.

THE CHEMICAL TREATMENT OF COLOR PRINTS

Chemical treatment of color prints can be covered only briefly here. Always make sure that these prints are worked on very carefully. Not all color prints can be treated alike; above all, the colors have to be examined first. It is hard to write down general rules for this examination, and even an hourlong chat would create more confusion than enlightenment. One thing I would like to mention in advance: English color prints can endure a little more, since their colors are stronger. German [prints], too, are durable. Italian and certain Dutch color prints are hardier by their nature. French and Swiss [prints] have to be treated with great care. Aquatint prints have especially delicate colors; treatment with even the weakest chlorine water solution can cause them to disappear.

For the reasons just given, the reader will find it understandable that I only reluctantly offer advice on the treatment of color prints. With regard to the last-mentioned French and Swiss color prints, I can only give you this well-meaning advice: Hands off! Whoever heeds this advice avoids a lot of damage. English color prints are, as already mentioned, somewhat stronger, especially stippled engravings. Mezzotint prints generally represent a hard nut to crack. The marvelous liquidity and especially fine shading of the colors have to be preserved at all costs. Do not try to remove the warm tonality unless it is too brown and darkens the lighter tints too much.

You know about the dispute of the paintings experts: "Lighten the picture here, leave the varnish there." For oil paintings, this is a matter of dispute and taste. And what about mezzotint prints? An experienced restorer of engravings can perform a 5 percent or a localized lightening, but a restorer of paintings can never do that. The lightening of mezzotints may not be visible from the front or the back. An experienced professional will be able to perform such lightening without any risk to the prints. Restorers of engravings are thus better off in this instance than their colleagues in the other field.

I advise you to lighten color prints only if they are seriously impaired. How often I have refused to treat prints because their owner only wanted to have them lightened out of a mere whim. No professional will be so ruthless as to remove the golden warmth from a valuable print solely because of profits offered.

Let me now talk about the cleaning of color prints. A color print is examined and pretreated in the same way as monochrome prints. Can the color print be put into a water bath? Not all of them; stippled color prints can be put into water, whereas mezzotint prints can only be put on top of a water surface. Both kinds should be treated with the lightest means known. If disturbing stains are found in fine and delicate parts, especially in the reddish areas, you have to work extremely carefully! Do not go beyond the spot under any circumstances! The surrounding color will certainly suffer if you use a stronger remedy.

A weak solution will have to be used to bring success. And you cannot get tired of repeating the same procedure ten to twenty times. Parts printed in blue, even in French aquatint etchings, are a little easier to treat because this color shows more resistance. Since the sheets also have to be treated from the reverse, I advise you to treat that side first. After soaking in water, the sheets have to be dried lightly with blotting paper so that the absorbed water will not combine too much with the chlorine water. After that, the treatment with light chlorine water can begin.

I expressly advise you once again to stay away from treatment of French prints if they are aquatints. This warning has to be given so that valuable prints will not be ruined.

I was not eager to speak about the treatment of color prints here as so much harm can still be done because of lack of knowledge and expertise, but I had to do it to prevent recipes from being used that are doomed to fail from the outset. Our aim is to preserve the colors and not to touch them up with a paintbrush. How often we see such ruined prints, which are not really color prints anymore. This kind of work should not be allowed to continue. And how often I have seen such dabblers at work. To give one flagrant example: I asked a glazier, "Do you clean color prints, too?" His answer was, "But of course." I said, "I would like to be present, because I am interested in your craft." At first, my presence was unwelcome, but when offered double the money, he agreed. It was about seven o'clock at night. I assumed he would ask me to come back at a certain time the following day. Far from it! The brave master announced, "We can start the work right away." The untidy workshop did not look too enticing. He took out a dusty pane of glass and started to put a rim of putty around it to create a cheap substitute for a zinc tray. (I strongly discourage you from imitating anything like this.) He took my color print and put it face down on the dirty pane. He poured the well-settled chlorine water on the reverse of the sheet. It must have been a doubly strong solution in which he left the print soaking for more than an hour. During this time, we talked forthrightly about framing. Off and on he gave but a cursory glance at my poor color print. Since only the back could be seen, the print remained in the chlorine bath until the foxing no longer was noticeable. He poured the chlorine water back into the bottle and left the print in the homemade tray. From a watering can he poured water into the tray and renewed this bath twice within the next hour. After that, he took the familiar antidote to remove the chlorine smell altogether. This bath took five minutes. A new bath of approximately the same duration followed. He placed my print on a piece of cardboard, and the cleaning process was completed, or so he said. It is probably unnecessary to dwell on the kind of applause and the enthusiastic praise that the destruction of my color print elicited from me. (Since it was only a part of a color print, the pain was not too severe.)

After the cleaning was accomplished, I introduced myself to the master. I was not unknown to him. A long discussion ensued, and the dear old gentleman may not have slept too well that night. I have to discuss this kind of treatment to justify my complaints about some dear friends in the glazier trade.

Color prints can only be cleaned in

steps. The more progress you make in cleaning black-and-white prints, the easier the transition to color prints. Practice—frequent trials—leads to the treatment of an occasional color print of insignificant value. There are prints today that can be bought for very little money. A heavily damaged, cut sheet or a part of a print can always be found and is enough to practice on.

Yet these attempts should be made with color prints only after you have gathered enough experience with black-and-white engravings. And that would give the author inner peace!

THE CLEANING OF DRAWINGS

The chemical treatment of any drawing requires, first of all, a thorough examination of the drawing materials used. A water bath cannot do any harm to a simple pencil drawing. But if other drawing materials have been used, a water bath can do a lot of damage. Pencil drawings can also be treated with chemicals. They are not damaged if the treatment is done professionally. For this, it is absolutely indispensable to find out whether you are really dealing with pencil drawings, since other materials similar to pencil may, in rare instances, be able to withstand a water bath but never a chemical treatment. Before I discuss examining the drawing material any further, I would like to discuss briefly the pencil.

The filling of the pencil used today consists of graphite and clay. Its home is England, where at the beginning of the sixteenth century large stores of graphite were discovered. In England the pencil was first manufactured and used in the form of small round rods or slim square strips that were covered with paper or set in metal holders. The pencil as we know it today, except for minor changes, was introduced to and used in Germany at the end of the eighteenth century. Yet not all our artists used the new drawing tool; several remained faithful to the old implements they were accustomed to. These were used especially when particularly fine and delicate lines had to be drawn. This is the reason we find drawings executed with the old materials well into the early Biedermeier period.[62] The old substances used for creating fine strokes up to then consisted of lead, silver, and often even tin. A piece of metal was shaped and cut several times at the drawing end so that—according to wish and desire—two, three, and four parallel lines could be drawn. A metal piece with a particularly fine edge could create incredibly delicate lines when guided by the hand of a master. Moreover, if the artist used paper specially prepared with chalk, really outstanding works could be executed.[63]

After these general observations, I have to confirm that pencil drawings from the seventeenth century exist. And works that show the characteristics of this time should not be regarded as later works or as forgeries.[64]

Before starting the chemical treatment of a pencil drawing, you should check to see whether the drawing can withstand the treatment. Using a sharpened matchstick that has been dipped in chlorine water, apply a small drop to an unimportant part of the drawing. If this part of the drawing can withstand the chlorine, that is, if it does not disappear, repeat the same test in another place but on a somewhat bigger area. If here, too, the drawing does not become affected or does not completely disappear but the background is lightened by the chlorine water, you can start cleaning the entire drawing. If the drawing gives way in the area treated with the chlorine water and the line disappears, the chemical treatment of the entire drawing has to be abandoned, and you can be assured that even a water bath would most likely harm the drawing. In such a case, it is best to clean any stains locally as far as the drawing permits, or to try to lessen the spots with the help of a sharp knife.

To clean a pencil drawing completely, it should be put first in a water bath of the kind previously mentioned. Severe stains are then treated by wetting with a few drops of ammonia solution after the sheet has dried off a little. After this, the stained places are worked on from the reverse with chlorine water. The procedure, by the way, is the same as for the cleaning of engravings. The only difference in the cleaning is that in treating the front with chlorine water, you cannot rub with a bristle brush because there is a danger that the drawing might be obliterated. Instead, the chlorine water has to be sprinkled on the drawing. This cleaning procedure only applies to pure pencil drawings without any coloring.

Drawings heightened with white—that is, drawings in which the white has been applied as liquid, not dry—often show a dark instead of a white color in the heightened places. Sometimes the white has even turned black. The change in the white coloring is caused by the effect of light and air. The white lead has oxidized. Oxygen has turned the color dark.[65] Oxidation is a combustion process. These black spots can usually be removed very quickly. Just drip some citric acid solution or a 10 to 20 percent hydrochloric acid solution over the spot.[66] Very stubborn spots can be sprinkled additionally with chlorine water. In spite of this treatment, though, such drawings will turn black again after a few years if they are exposed to light and air after the cleaning process.[67]

Chalk drawings should never be placed in water, not even on the surface of water. Colors that have been applied dry can float off easily, especially those dramatic white highlights. Also, I would never recommend the use of fixatives on chalk drawings or pastels in which the paper has become foxed or severely darkened by age. The darkening is caused by light, and the paper has lost some of its sizing in the process. When the sizing is lost, the paper becomes softer and is more susceptible to outside influences. The fixing process can easily cause stains, even if the fixing agent is sprayed with compressed carbon dioxide. If anyone dares to take on the chemical cleaning of a chalk drawing, he should have years of experience. Instead, I would advise you to desist from such a cleaning, since unpleasant surprises can happen even if you proceed with extreme caution.

To reduce the intensity of foxing and to make it harmless for some time, I would recommend that you expose chalk drawings and pastels to chlorine vapors. This procedure can be undertaken in a room with very little air movement. Chlorinated lime is boiled in a container (see "Preparation of Chlorine," pp. 64-65), and the vapors are used to treat the reverse of the sheet. Build an appropriate frame and put the drawing on it, the front facing upward. It is a good idea to put a net of strings under the drawing so that the paper is evenly exposed to the vapors. The distance from the vapor-producing container to the paper has to be such that the vapors do not hit the sheet instantly and cause drops to form. It is also appropriate, but not absolutely necessary, to use a box without bottom or top so that the vapors do not become ineffective because of a draft. It is not absolutely necessary to repeat this procedure. After the treatment, the sheet should be exposed to fresh, dry air so that the chlorine smell evaporates. Occasionally, foxing becomes more noticeable and pronounced through the vapor treatment. Do not worry about this. After a short time it will fade again. Since loose prints buckle during the vapor bath and again after drying, I recommend that before treatment the dry prints be stretched over a pane of glass. The side with the illustration, of course, is facing the glass pane. If they have severe foxing, the sheets can be strengthened with a light solution of aluminum subacetate[68] combined with gelatin after the vaporizing and drying process. This mixture, however, has to be applied very moderately or else the foxing will strike through. It might be appropriate to mist this mixture with a spray nozzle.

Pen-and-ink drawings should only be cleaned with chemicals if the colors have a carbon or silver oxide base. These inklike colors can withstand any chemical. As with the pencil drawings, it is necessary to experiment on a small scale first and then to start the work or to leave it alone. All further treatments are the same as for pencil drawings.

THE CLEANING OF BOOKS

The cleaning of books can be very simple when a skilled bookbinder has removed the binding. However, the matter is more complicated when the pages must be cleaned inside the book, as is often the case.

It goes without saying that in the first instance the pages are numbered. If about one hundred pages out of a total of two hundred are to be cleaned, all pages are soaked. An acidified water bath precedes the cleaning. After a twenty-four-hour bath some success should be noticeable. If water stains are still visible, the sheets will have to be placed into a bath containing a generous amount of citric acid. The water must have an acid taste. The pages are soaked for three to four hours. The citric acid bath is followed by two more baths, which remove the acid altogether. Take one sheet out as a sample, put it on blotting paper to accelerate the drying process, and make sure that the water stains have disappeared. If a chlorine water treatment is necessary, the stains should only be dabbed locally. Always proceed this way. Under no circumstances should all the pages be subjected to a chlorine water bath.

A thousand voices may sound against this and maintain that they have always put their sheets into a chlorine bath and no harm has ever come of it, but I still insist on my opinion, which is based on decades of experience.

I look at such a treatment as barbaric. Even if older people cannot be convinced, I ask the young under no circumstances to engage in such maltreatment.

After all, I consider it my task to preserve cultural treasures to the best of my ability, not to vandalize them.

I am not an enemy of chlorine but a friend!

Just think: If the pages still show unsightly stains after the acid baths, how strong the chlorine water must be to remove these, too!

But what happens so often when the desired effect has not been achieved? Someone's fingers itch because the stains have not disappeared in spite of the strong chlorine solution. Stronger and stronger agents are used, and the paper is ruined. This should not be! Hands off!

Book pages receive the same kind of chlorine treatment as single prints. If there is enough room in the laboratory, ten to twenty sheets can be treated one after another. The damp pages are put on a wet support, and the stains are treated locally with a weak chlorine solution. If the solution is too weak, it can be concentrated. Refer to the section on the cleaning of engravings for this. Especially conspicuous stains should be treated with hydrochloric acid, 10 percent at the most; use chlorine and sorrel salt[69] for ink, but do not add any other agents. The cleaning is sufficient if the stains become lighter. These three agents prevent the stains from spreading. The remaining color of the stain does not do any harm. The main point is that the evil has been eradicated.

The local treatment of stains inside a bound book requires great patience.

Strong stains near the gutter margins are not removed because their treatment would require bleaching several times and in such quantity that the book could be damaged. Any expert on books is justified when he refuses cleaning procedures that might be successful on the treated spot but could harm the integrity of other parts. This has to be emphasized here, once and for all!

More conveniently located stains or water stains are treated as follows: I recommend that the areas around very stubborn stains, which probably have to be subjected to a lengthy treatment, be saturated from both sides with a moderately strong gelatin solution. This strengthening agent should not run into the paper suddenly but should gradually pass over into the dry paper. To avoid the formation of new water stains when doing this, the area around the stain should be moistened lightly with a sponge that has been squeezed almost dry. To start the treatment, place a colorfast piece of oiled paper[70] under the page and a slightly moistened, absorbent piece of paper on top. When a second page is treated, the preceding one has to be protected in the same way so that it does not come into contact with any chlorine later on.

When the sizing solution has dried, the chlorine water treatment can begin. The surrounding areas are once again moistened with a sponge that has been squeezed out well, and the affected areas are dabbed as in the case of the copper engravings. First use a weak solution, then a stronger one! After the cleaning process—several pages of the book can be treated at once—the treated areas are dabbed with clear water. This is followed by the antidote, undiluted if possible, and clear water then moderates the effect of the antidote.

Light water stains have to be removed in advance with vinegar water. After the last localized water bath, several layers of blotting paper are put between the pages and left there to dry. During the drying process, the book should be placed upright and spread open so that the pages that have not been treated will not be affected. I would like to mention here that the pads have to be changed after the localized chlorine water treatment as soon as the countermeasures start.

If, in spite of all precautions, new water stains have formed after the complete drying of the book, these have to be removed by careful dispersion with a firmly squeezed-out sponge. You can also try to remove new water stains by strengthening the affected areas with a gelatin solution.

If you have used a lot of water, the pages will probably slightly expand out of their binding. Since the expanded paper cannot be cut—the type area has to be taken into consideration—it seems advisable to slightly moisten the remaining pages also.

The special character of the book pages has to be restored. Please refer to the section "Actual Mending or True Restoration" (pp. 109–22) for further details on this process.

It is often quite difficult to take a book out of its binding without damaging the binding. However, an experienced bookbinder, who knows all the secrets of binding as well as various binding agents, will have hardly any problems or will be able to overcome them easily.

Above all, the owner of such a book will have to trust the expert even when he considers the removal of the pages necessary but cannot guarantee that the binding will remain unharmed. After all, it is the main goal of any expert to preserve the binding, since the cleaned pages are most attractive in their complete old setting.

I know some capable bookbinders who are especially proud of performing their work while preserving the character of an old book.

Of course, even among bookbinders and restorers there are dabblers to whom valuable works should not be entrusted.

No special advice can be given for the separation of an entire book, since every binding is different. After preserving the binding, continue with the separation of the book, layer by layer. Water should be used as sparingly as possible because any absorbed water can cause severe stains that are often very difficult to remove. To avoid the formation of water stains, I would suggest that after separation the volume be placed under a heavy press so that only the back protrudes a little. The volume could also be put between strong boards and pressed with iron or wood clamps. Working lightly with cold or at the most lukewarm water, do not brush it over the entire back but leave 1 to 2 cm at both ends of the back free so that the water cannot seep into the sides of the book. Trained book specialists do not need to be reminded that the moistening of the book has to be done very skillfully. I would, however, like to avoid having inexperienced people perform this kind of work, believing they can blame my pronouncements.

If the book can be divided into three or more sections while dry, I recommend that the sewing threads in each section be cut. After this, place the sections into water as follows: Find the middle of the section, then submerge one-half, page by page; treat the other half the same way. When submerged in the acid bath, each section will look like an open book. After softening the paste with an hourlong bath, the pages can be lifted up one by one. The soaked paste is removed with cold or warm water, depending on its composition.

Cleaning Severely Damaged Books

From many circles, including the bookbinding trade here and abroad, I have received inquiries and samples, with the request to comment on one kind of treatment or another. I was not able to follow up each request the way I would have liked—although a short reply was always given. I would therefore like to answer here in a little more detail the questions that have been put to me.

First, without great effort, it is hardly possible to restore moldy books that are excessively covered with fungi or bacteria, the way they are sometimes found today, and hope to be able to use them again. When books have been left to deteriorate so badly that the pages start to crumble when they are turned, we can no longer speak of a satisfactory restoration.

Many readers of the first edition of my book thought that there must be a procedure that could remedy such damage. There has been talk of hot air, with or without chlorine vapors, of airtight incubators, and so on, without any thought given to the fact that heat might make the damage even worse. Light and heat combine with the enemies of the paper and can completely destroy a cultural treasure. When paper is so fragile that even turning a page becomes dangerous, there is hardly any way to save it, especially if the pages have print on both sides. If there is a special reason for risking an attempt at restoration, I suggest the following: Remove the pages from the binding as best you can, the somewhat sturdier ones first. A colorless, strong sheet of paper is cut in such a way that each piece is a little bigger than a book page. This paper is saturated with a strong solution of chlorinated lime, and the fragile page is placed on top. Sprinkling liquid chlorinated lime on the page would harm it; therefore, a second piece of paper saturated with chlorinated lime is placed on top, enclosing the book page between the two papers. Enough solution of chlorinated lime is dribbled onto the paper so that it begins to float. The book page should be left alone for about fifteen minutes. It would be perfectly all right to perform this task in a larger tray in which several pieces can lie next to each other. After the fifteen minutes have passed, lift the upper sheet carefully, make sure that the book page does not adhere to it, and examine the page. If the cleaning has been somewhat successful, leave it at that. The book page with its support is now placed in a pure water bath, but the sheet is not rinsed because it could tear in the process. Renew the clear water bath very frequently before applying an antidote. When taking the page out of the water bath and in the course of the various other baths, use the supporting sheet. The further baths have already been discussed.

I would like to emphasize again that only a person with the necessary expertise should attempt this kind of cleaning. As with all tasks, only the person who really applies himself will be successful. All the procedures require the utmost concentration. A good frame of mind, a cheerful working space, undisturbed working conditions, and excellent daylight are the first prerequisites for the solution of such difficult problems.

If some stains remain quite conspicuous and require a second cleaning, I recommend that the pages be sized a little more thoroughly when dry. After drying, the cleaning process is the same as mentioned before. Although this procedure is very time-consuming, it can preserve for several years many books that would simply decay otherwise.

Second, why would mending paper, which completely matched the original, buckle once it dried, despite having been applied in complete accordance with the instructions? I have answered this question many times, either in writing or orally, so that in more than a hundred cases much better restoration work could be performed. Before blaming the paste alone, I first look at the preparations. Has all preliminary work been performed satisfactorily? Has all preparatory shaving been done in such a way that guarantees success?[71]

The shaving at a tear or corner may be done only as forcefully or lightly as the paper permits. When the shaving down begins, it cannot be done so deeply that when the paper is held against the light a transparent area will be seen from the starting point to the edge of the tear or corner, as I have been told has happened in many instances. This should never happen! Many think that in being shaved to fit the original, the mend would require hardly any shaving because the shaving of the original would be enough. Of course, this is completely wrong. The preliminary shaving of both parts is done in such a way that it makes the original only slightly thinner—hardly perceptibly so—but never so much that the mend merely has to be shaved a little bit. The way in which both parts must join together is such that you must use your intuition as a guide in the shaving. Certainly, when shaving the front, you may touch only the thin inner edge of the tear, never the entire width of the mend. Also, if you shave the back of the original extremely thin for the full width of the patch, the paste—which often may not be prepared correctly—will become evident from the front as an area of transparency. If the shaving is done well enough so that little shaving is left to do after the mend is attached, the problem of a good restoration will have been solved in the best way. This requires patience and the kind of intuition that can only be acquired over the course of many years.

This method is the best, but satisfactory results can also be obtained when more shaving is done on both sides. The main points are doing the shaving in accordance with intuition and inserting the mend in a methodical manner.

But let us look at paste one more time. Paste, as I mentioned in the beginning of this section, is a foreign body.[72] Since we cannot work without it, we have to try to limit its power. As I mentioned before, the preparation of the paste is often to blame if the mend starts to buckle or become noticeable in other ways. Most restorers—I have been able to observe them often—do not know how to prepare paste properly. They may start out correctly by stirring the paste cold. Then they pour on boiling water, stir the paste well, and—that is the end of it. If you prepare paste this way, you should not be surprised when the restoration becomes problematic later on.

During the preparation of the paste, it is most important that the kettle not be immediately taken off the heat after the boiling water has been added. For restoration purposes the later swelling of the paste has to be prevented at all costs. And this is done by adding small amounts of water while stirring constantly. Paste only swells when it is boiled repeatedly.[73] It is amazing how much boiling water has to be added to make the paste usable for restoration purposes. Paste that is prepared according to the first method can be used for bookbinding work but never for restoring. When especially thin papers have to be mended, the paste is diluted even more. Each mending procedure requires a special preparation of paste. It is better to make fresh paste more often than to try to renew old paste by adding water.

Newly restored sheets should not be placed under a press immediately—that, too, can cause harm—but should be weighted with books or cardboard. Take the double moisture of the mended area—which can become noticeable after drying—into consideration. Rubbing with a bone folder[74] should not be done too forcefully either, to avoid damaging the edges of the mended area on the front of the paper. When the sheet is almost dry, light pressure from the press cannot do any harm.

HYDROGEN PEROXIDE

Next to weak chlorine water, hydrogen peroxide is an excellent cleaning agent. I mention it in second place because it has only become a household remedy over the past fifty years. Although it was used for all kinds of purposes almost ninety years ago, for a long time it was much too expensive for extended use.

I have been using hydrogen peroxide for "only" about thirty years. During that time, I have had only good results with it, probably mainly because I had gained sufficient experience in the treatment of color prints and also with the use of chlorine water. Practicing with weak chlorine water, sometimes even using chlorine extract combined with hydrochloric acid, is absolutely essential. Using chlorine and hydrogen in the right amounts can bring excellent results. When chlorine water is used, cleaning should be done with the window open; hydrogen peroxide, being odorless, may be used in weak solutions even in a closed room. At the most a 5 to 10 percent solution can be used. Never use a stronger solution! Oxygen, the real cleaning agent in hydrogen peroxide, can burn the paper severely and make it very brittle.

A dark bottle should be filled only halfway with the 10 percent solution. If it were filled all the way and not kept in proper storage, the tightly fitted cork would fly out of the bottle with a loud pop. Hydrogen peroxide has to be stored in a cool, dark place.

I have experimented with stronger solutions and advise against them because it is very hard to determine the limits of usefulness.

And now a piece of personal advice, which is designed to protect the technician. Since oxygen is highly caustic, do not wipe your eyes with moist hands while working. Small burns on your fingers, whitish spots, are not harmful unless you have cuts. I mention these minor dangers so that you do not handle hydrogen peroxide carelessly.

Hydrogen peroxide, which is commonly sold in drugstores and pharmacies for household use, is at the most 3 percent and is too weak for the lightening of sheets. Order a 10 percent solution, maybe 200 g, and pour half of it immediately into a dark bottle that is then filled with an equal quantity of distilled water. This is now a 5 percent solution, whereas the first one is 10 percent.

The 5 percent solution can be used to remove light browning and foxing. I would like to mention, however, that each sheet has to be subjected to the same preparations as were made for the chlorine water treatment—namely, baths, a light local treatment with citric acid, and so on—because often even the weaker processes bring success.

When the sheet is half dry, not moist as in the case of the chlorine water treatment, lightening with hydrogen peroxide can be started. Brush the sheet from the back with a saturated flat bristle brush, let it dry a little, and repeat the procedure until the desired result is attained.

This kind of treatment does not affect the paper or the print, but the cleaning process is somewhat slower.

The 10 percent solution is needed only when severe foxing refuses to disappear. Here, too, you will have to try to create a harmonious transition to the surrounding area so that the paper in the vicinity of the foxing does not stand out as considerably lighter. If the localized treatment is not sufficient, give the sheet a shorter water bath and treat any unsightly stains with chlorine water.

When severely yellowed book pages have to be treated in the binding, I recommend the use of dilute chlorine water. Cleaning the pages with hydrogen peroxide for many hours would cause water stains, and frequent dabbing would wear away the paper.

A full bath of two to three hours in a 5 percent solution cannot harm the book pages. When stronger solutions are used, the danger exists that paper might become brittle if it contains cotton or mechanical wood pulp.

Before treating color prints with hydrogen peroxide, you should practice on monochrome sheets until you have reached a certain expertise in lightening them. Hydrogen peroxide, even in a weak solution, affects colors when it is allowed to work for hours. There are a number of colors that cannot withstand extended treatment with hydrogen peroxide. It is impossible to list these colors because individual combinations as well as their oil content vary, and later prints, those after 1820, have to be given special consideration.

For localized treatment of unsightly stains that have to be removed from robust colors such as blue, brown, or bistre, I prefer weak chlorine water. The treatment is performed on moist paper. A gradual transition to the surrounding area can be achieved more easily with dilute chlorine water than with hydrogen peroxide.

After the treatment with weak chlorine water and an antidote, I recommend a slight lightening of the sheet, done from the reverse, with 5 percent hydrogen peroxide.

For practicing, I recommend that you apply a 10 percent solution to papers from different epochs so that in each instance you learn the effect of the oxygen contained in the hydrogen peroxide.

After treating the papers with hydrogen peroxide, especially after a complete cleaning, you place the sheets into pure water baths. The clear water must be renewed within four hours. Many of you will not be aware of the fact that the cleaning power of hydrogen peroxide does not dissipate very fast. If you pour into an eggcup a small quantity of hydrogen peroxide and let it stand unprotected, the hydrogen peroxide is still usable after thirty hours. Chlorine water, on the other hand, cannot be used anymore. Hydrogen peroxide, therefore, should never be regarded as a harmless cleaning agent.

I do not want to present specific poisons to you, even though I have to say that there are quite "useful" poisons. But the use of poisons often does more harm than the stain itself. Therefore, I only recommend the use of chlorine extract combined with citric acid or 10 to 25 percent hydrochloric acid.[75] The sheets have to be well moistened even if the stains are receiving only localized treatment.

Writing in ink can be removed with the above-mentioned remedies. If some remnants of the writing are still visible, sorrel salt can help. For this purpose boiling water is poured on half a teaspoon of sorrel salt, creating a solution that fills an eggcup halfway.

Fresh grease spots are removed with carbon tetrachloride. Blotting paper is placed under the grease spot, and the spot is rubbed from the front with a swab. Sometimes repeated dabbing is enough. Do not limit the dabbing to the spot but spread the remedy on the surrounding area also.

If stubborn stains do not yield to repeated treatments, lightly moisten these spots with pure water. Since the print and the paper have to be protected by all means, it is advisable to repeat the chlorine extract treatment three to four times and to put the sheet into a bath with an antidote after each attempt. Never try to remove unsightly stains all at once. I strongly recommend that you let the sheet dry after each cleaning procedure and examine it to determine whether further treatment is necessary. If the stain is still faintly visible, the surrounding can be colored lightly to achieve a harmonious impression.

Unfortunately, there is no set rule for treating flyspecks, which often cannot be completely removed. At times a bath is sufficient, however. While the sheet is in the bath, try to remove the flyspecks by rubbing with a round bristle brush. If the flyspeck is in a heavily printed area, the bristle brush can be very efficient. Chlorine extract and hydrochloric acid can considerably modify such stains if they are dabbed on frequently.

In stubborn cases flyspecks have to be removed surgically, because the surrounding area has to be protected. The cut-out places are repaired in the same way as wormholes.

Superficial burns in the paper, which are not too dark brown or too brittle, are treated with pure chlorine water.

Stubborn oil stains can often be modified, occasionally completely removed, if they are located in the unprinted part of the paper. A wide casserole dish or enamel frying pan, half-filled with water, is put over a small gas flame. Into the pan pour two to three tablespoons of bleaching soda and let it dissolve. The print that is about to be treated has been moistened and placed between two nonabsorbent, colorless sheets. One sheet covers the front up to the oil stains to protect the print from soda vapors.[76] The lower sheet supports the entire print. Shape the print with the support into a wide roll, and place this roll vertically or at an angle into the dish. For the removal of oil stains, it is best if they are reduced gradually. Therefore, never try to diminish or remove an oil stain by direct treatment in boiling soda water.[77] Leave the print in the dish for up to five minutes while the soda solution is boiling. Remove the print after this period of time, open it a little, and check whether the oil stains have started to absorb water. If they have, the stains have lost their oil content. The print is placed into a water bath so that the soda is removed. The paper has been subjected to a lot during this treatment, but it has not been weakened so much that it dissolves.

The surface of the soda water always has to be at least 3 cm away from the printed part; otherwise, the picture will be adversely affected. It has to be taken into consideration that the more the paper has been moistened before the treatment, the harder it is for the soda solution to spread or soak into the paper. In other words, the more moist a paper is, the less harm can be done by the soda solution. At the place where the effect of the soda solution leaves off, a brown ring is formed, which stems from the yellowing of the paper.[78] Most of the time this ring can be removed by means of a simple water bath, but if it does not disappear, it has to be treated with weak chlorine water. The chlorine water treatment also takes the color out of the stain, so that two things are accomplished at the same time. If the stains are still visible, sprinkle a little hydrochloric acid on them.

Once you have gained a certain expertise in the treatment of old oil stains, you will be able to recognize ahead of time whether a case is severe or not. It is better for the paper if you do not try beforehand to remove the stains by chlorine water, because that would only affect the area around the stains. It would be a futile undertaking, and the paper would be affected twice.

I have to repeat once again: This method can only be used on those parts of the paper that are free of print. Also, the paper has to have a certain amount of strength; it cannot be too fragile. Under no circumstances should any of the Old Masters be subjected to the soda method.

THE REMOVAL OF SPIRIT VARNISH

Varnished and mounted prints are immediately treated with spirit of wine, if possible with 96 percent spirit. The latter is more effective than the common methylated spirits.[79]

After removing the dust with a moist sponge, put the mounted sheet in a bath of pure spirit of wine. The tray has to be rubbed dry before use. The sheet does not have to be submerged in the bath, but you cannot have too little spirit of wine either. In order to have the spirit of wine take effect, the tray should be rocked frequently back and forth. Through rocking the tray, you inundate the varnish, which runs off the sheet. After about twenty minutes, the spirit of wine is drained off and the spirit bath renewed. To prevent the spirit of wine from evaporating too quickly, cover the tray with cardboard or a drawing board. Shortly before taking the sheet out, rock the tray back and forth a few more times and move a flat bristle brush across the whole sheet. Make sure that the spirit of wine has no color when the bath is drained. If it shows color, the bath has to be repeated. Only when the spirit of wine is clear can you be sure that the varnish has been removed completely. The mounted engraving has been freed from its varnish and is put upright to dry completely, in such a way that it does not touch any objects painted in oil. If you observe several whitish areas after the sheet has dried completely, the spirit treatment will have to be repeated.

Usually, it is the presence of sizing that causes the sheet to appear slightly shiny or spotted when held at an angle against the light. Because the sheet is mounted but has to be separated, it should stay in water for about twenty-four hours. Since the sizing is paste, it will be advantageous if the bath softens the sizing a little. Do not attempt to separate the sheet cold after the bath but attack it immediately with sword and fire. Pour boiling water on the print—of course, not from a great height, so that the impact of the water pressure cannot harm the paper. I mentioned this danger before. The next task is the removal of the sizing. The hardened layer of paste, the sizing, has to be covered with boiling water. When the water has cooled off somewhat, the tray is emptied completely; the sheet remains in the tray, and boiling water is poured over it again and again. After repeating this three to four times, take a somewhat worn flat bristle brush and carefully move it across the sheet, to loosen the remnants of paste. These hot treatments have to be repeated frequently; do not assume that one or two baths will be sufficient.

The support will have become loose in the meantime. The sheet is turned over, the support is removed, and the glue is washed off. After the sheet is placed on a piece of oilcloth, any glue remnants are removed; the sheet is rinsed well from both sides and placed into a recovery bath. After several hours it is hung over a pole to dry.

Examine the sheet after it has dried, and you will probably find some remnants of paste. These remnants—which often appear only in the dark areas because the heavily printed colors hold the paste better—will have to be treated locally with chlorine water. Vital parts and beautifully colored parts especially should not come into contact with chlorine water. In these instances the remnants have to be left on the sheet because it requires great skill to remove them completely. The print can lose some of its vividness because of the frequent pouring of water. There is nothing to be done but to restore the beautiful and pristine appearance by skillfully retouching.

Varnished engravings are rare. In all my years of work, I have treated at the most one hundred fifty to two hundred sheets.

Occasionally a client will ask apprehensively, "Do you have to use water? Will the print not suffer from this kind of treatment? I do not want the wonderful mellowness of the mezzotint to disappear."

To that I can only answer, "Yes, you are right, the danger is there. But your print has already been varnished and has lost its mellowness, so the water treatment cannot do any more harm." Occasionally, the same question is asked about prints that are not varnished: "Does the print absolutely have to be put into water?" My answer is, "Yes, obviously. After all, the print is mounted. Mounting can only be done when the sheet is completely saturated from the reverse! If you wanted to cover a sheet with paste without moistening it beforehand from the back, the paste would have to be packed on really thick. Naturally, by its gloss the paste will be visible on the front when the paper is soft, and the paper will have lost its charm. The most magnificent mezzotints were printed on soft paper. If nonexperts have allegedly done no harm to the print, it cannot possibly suffer in a water bath under expert care."

When you are dealing with precious mezzotints, the sheets can be separated dry in certain instances. But such a separation requires a lot of time. I myself own a small collection of color prints and know that every collector would like to have untouched prints in his collection. However, whether precious mellowness will be lost during the treatment of varnished prints is a question that does not have to be raised at all, because the owner never saw the print before it was varnished. If the owner of a varnished print were aware of the fact that this sheet had to be sized with a heavy layer of paste before being varnished, he would consider this question superfluous.

Could there have been a compelling reason for treating a print this way? I think so. During the course of my work, I have found that most color prints are not first-class impressions. Before I start treating them, I select one place that seems to be suitable for testing to see whether the print has any special charm. If I find out that the print loses some of its vividness in the especially colorful parts or rich tones, I have to conclude that the sizing and varnishing were done to liven up the colors. One certainly does not have to varnish a print to make the printing look livelier. A conscientious retouching artist can easily improve the appearance of a print by adding minor details. A varnished picture might not always be recognizable as such had the "master varnisher" worked with greater care.

I would like to mention, in closing, that varnish can be successfully removed. In only a small percentage of the prints from which I removed the varnish was it noticeable that they had been varnished at all. In those cases the sizing would not disappear entirely.

I have to point this out for the protection of anyone who might want to purchase varnished prints. In spite of many successes, no restorer can guarantee work performed on varnished prints.

STARCH PASTE

Hoffmann's rice starch, packed in a box with the brand name Kätzchen, is the best and, therefore, most highly recommended adhesive. Different kinds of preparations are selected for different kinds of work. Although the starch goes far, to be economical you should mix and prepare only enough for two to three days. Prepared with clear water without any additives, the paste will certainly keep four to five days if it is boiled until it is somewhat thick. If stored in a cool place, it might even keep a week. What more can be expected? Never add alum to paste that is used for restoration work or for mounting valuable papers.

Bring a small kettle of water to a boil. In the meantime (the water should boil for at least fifteen minutes)[80] dissolve two teaspoons of starch in cold water in a small casserole dish. A little water is sufficient; the starch immediately absorbs the water, disperses into particles, and is mixed thoroughly with a spoon. Pour enough boiling water on the starch to make a somewhat thick mixture. Bring the paste once more to a boil over a gas flame, stirring constantly; after that, it is finished and can be put aside.

When the paste is cold, it has to be thick enough not to pour out instantly when the dish is turned upside down. Is the paste ready for use now? One hopes so. Trying it on worthless sheets will show whether the paste has been prepared too thick or too thin. If the mended area starts to buckle or if the mend becomes loose after having been pressed down, it is not always certain that the paste is to blame. The areas that were covered with the paste might have been too moist or, if the place is buckling, too dry.

A soupy kind of paste that is used for mounting China paper has to be mixed in the same way, only more boiling water has to be added. When cooled, this kind of paste immediately pours out. Before applying the prepared paste, it is advisable to press it through a linen bag. It is best to put as much paste in the bag as you can use in a day.

For mounting on stronger supports, boil the paste a little thicker than for pure restoration work. To separate the supports of earlier color prints, mix the paste as usual, only it should be neither thick nor soupy when cold.

Cold paste should never be diluted. There is a possibility that lumps will form. The adhesive strength, too, will suffer. The preparation of paste is simple, but using it properly requires a lot of experience. I wish that success will be denied to no one who has acquired enough experience. If restorations go well, then for the most part one must thank the starch paste.

The paste has to be stored well so that it does not get contaminated by dust; it is best to put cardboard over the dish or to place a carton over it.

For working with paste, I recommend the use of cardboard. For taking up paste, small, clean pieces of cardboard are used so that the water content of the paste can be absorbed. Ten or twenty pieces are cut from a big piece of cardboard; they are stored carefully and protected from dust. For a minor mending job, a small amount of paste is put on a piece of cardboard with a teaspoon and is distributed with a small round bristle brush.

As an alternative to rice or cornstarch, I recommend pure white potato starch which you can make yourself.

STRENGTHENING SEVERELY DAMAGED PRINTS

It is a widely held opinion that paper will lose its sizing even after a very short water bath. This is not true. The sizing of paper is not lost that quickly. Papers from earlier times were often sized so heavily that they hardly absorb any water at all. Papers that were manufactured from good materials and received heavy sizing, therefore, hardly ever show water stains, foxing, or browning.[81] Papers from later periods, especially those manufactured from cotton, are more susceptible to external influences. When ordering papers, graphic artists and printers distinguished between soft, absorbent papers with little sizing and hard, nonabsorbent papers with heavy sizing. The first kind were especially suited to mezzotints and aquatints, whereas the latter were more frequently used for heavily colored, contour prints. Only in rare instances would color prints be sized after leaving the press. The skill of the painters in the eighteenth century had already reached such a high level that they worked successfully even on soft paper. It is possible that papers from about 1750 on will lose some of their already weaker sizing,[82] especially when they are treated with chemical baths. It is therefore advisable to examine the texture of the paper before any treatment. An untreated print from the same period makes it easier to decide whether the entire treated sheet requires sizing. You certainly have to be careful not to destroy the special character of soft paper through inept and unnecessary sizing. Therefore, if you encounter heavily sized sheets that make rattling noises when handled, you can invariably assume an inexpert after-treatment. Heavy sizing after a treatment is necessitated by highly caustic agents used during the cleaning process. To revive colors that were destroyed, the incompetent restorer—lacking technical skill and the ability to adapt—sizes the paper too heavily so that watercolors can then be applied.

Even an expert will now and then apply a weak sizing. He will not do it to restore the colors—heavily damaged areas of colors do not occur when the treatment is done properly—but to preserve the character of the paper. If the entire sheet has to be sized, perhaps existing tears, breaks, folds, and worn places will receive a special sizing applied locally with a bristle brush.

Another reason for an expert to size the whole sheet can be the fact that larger mended areas, in spite of a good match between the print and the mending paper, need to be lightly sized because they are rough and more susceptible to dust. If a strong sizing is applied later, it spoils the engraver's work as well as the restorer's.

How to dissolve the sizing agent—white gelatin—has been discussed in detail in a previous section.[83] Such a gelatin solution can be diluted as needed. The solution is used for sizing a dry sheet and is brushed on with a flat bristle brush.

TINTING, COLOR PREPARATION

Prints are tinted while they are moist. Tinting should never be done dry because the sheets can develop streaks and there is a danger that the tints might be too strong. The print is not put into the water but just on top, so that it can absorb a light tint more easily. The reverse will absorb the water and distribute it over the entire sheet. The sheet is put over a pole to drain. Initially, the tinting is done from the back on an oilcloth. The prepared, warm tint is mixed with a dilute gelatin mixture and generously applied overall with a flat bristle brush. The front is colored in the margins but in the printed area only if really necessary. The tint has to be subtle enough so that it does not appear to be a real coloring. For instance, if the book pages have been treated individually, a tint has to be chosen that matches the color of the untreated pages. It is advisable to tint the sheets two to three times to match them gradually. Never try to attain a dark tone in one attempt. I can tell you from experience that such shortcuts do not work and that the result is usually catastrophic.

If a great quantity of sheets is to be treated, you can have special equipment built for tinting. But this is not a necessity. A sheetmetal worker can make a tray with an arched bottom, similar to a butcher's tray but with vertical sides and turned-down edges. Two feet, or braces, hold and support it. The colored water is poured in hot, and the sheets are pulled through with some kind of tool. The colored water definitely has to be stirred several times. Two small alcohol burners can be employed to keep the colored water, mixed with the gelatin solution, warm at all times. Or the colored water can be poured back into a big pot and heated over a gas flame.

Licorice water, coffee, chicory, and several kinds of tea are suitable for tinting. Prepare an extract of each of these and let it settle for a while. When you are ready for tinting, pour the extract through a linen bag into a big pot in which it can be heated. Three to four sheets of gelatin dissolved in boiling water will be enough for 3 to 4 liters of color extract. The tinting itself has to be preceded by several experiments. Find a similar paper among your paper stock and experiment with it. I would like to mention specifically that the sheets should never be tinted in such a way that they appear greenish or grayish once they are dry. On the whole, the color should not be especially noticeable but should merely improve the harmonious impression of the sheet.

If you know how to clean a sheet or how to treat it well in other ways, you will not need the dyeing process at all, as can be gathered from my previous remarks on bleaching.

EXAMINING AND PREPARING THE PAPER

That water can be heated in a paper bag is well known. Take paper with a good amount of sizing—it has to have a certain firmness—pull the sides of a small sheet up a little, maybe 5 cm on all sides, pour a little cold water into this container, and hold it over a small gas flame. After a few minutes the water will have reached the desired temperature. This is only a little, fun experiment. The paper cannot catch fire because the container is filled with water and the temperature necessary for igniting the paper is never reached.

Old papers are occasionally so strong, firm, and impervious to moisture that the wonderful preservation and freshness of these old books does not cease to amaze us. Provided they have been kept properly, not too many old books will exhibit foxing, water stains, or browning. The earlier, high-quality paper production not only has preserved invaluable treasures up to the present, but will preserve them even for future generations. The paper manufacturers of earlier centuries created perfection through the use of good materials. In later times, as already mentioned, manufacturers were less particular about the processes and use of ingredients involved because of sharply increased demand. And, apart from a few exceptions, I do not even want to mention the present.

It is understandable that the large volume and relatively low price make it impossible to use higher-quality materials. However, if we want to preserve valuable works for the future, we have to take the greatest pains in the manufacture of paper!

And how is the paper that is needed for mending prepared or made ready so that it becomes like, or at least similar to, the paper to which it is to be added?

Please, take this paper preparation seriously and follow my instructions exactly.

The mending process, true restoration, requires utmost attention. If it fails, you have only read my instructions superficially. You cannot repeat the procedure several times as may be possible with a painting. The work has to be an instant success for each sheet, or you will do great damage.

The explanations about the use of paper and the notes in the section "Actual Mending or True Restoration" (pp. 109-22) should be read carefully!

If the original paper, the print, is from the fifteenth century, you will find—as already mentioned—that the paper does not absorb water easily. The sheet, therefore, must have been sized specially and consists of only the best materials. If you find sheets from this period that readily absorb water, the papers or prints have probably experienced some less than expert treatment. There is also the possibility that earlier prints have been sized more than one hundred years ago with a sizing solution to restore a certain firmness. What do you do then? You have to look at the print to see whether the treatment was a radical one. The treatment with chlorinated lime, sprinkled on dry, was already known more than one hundred years ago.

The lovely tone of the print, the softness, would have been lost with this barbaric type of treatment.

I would like to point out here that it is sometimes impossible to restore a sheet that has been treated by a layman and has been heavily patched and retouched.[84] A restorer of paintings can go a millimeter beyond the tear if there is no other way. A restorer of paper simply cannot do this!

I am digressing slightly from my topic, but that has to happen occasionally. I want to and have to mention all procedures. And since everything is interconnected and the subject is difficult, I want to make sure that the reader completely understands my ideas and practical advice. And I have to insist that the reader follow me closely.

Let us assume that the sheet was not treated previously but was torn by an inexperienced hand, as often happens. In this case, the paper will not be absorbent. Since it has not been cleaned yet either, the best possible match has to be selected from the paper supply, and the following points have to be considered carefully:

1. The paper should not be absorbent.
2. The color should be a very good match.
3. The texture of the paper should be the same.
4. The wire lines should match the original when seen against the light—fine, coarse, or indistinct.[85]

If these four basic prerequisites are met, the paper will be suitable for the restoration.

Soft—that is, absorbent—papers or prints are considerably more difficult to treat because the matching repair paper has to be examined more thoroughly. Except for point 1, the above points also have to be taken into consideration carefully. Even if the mending paper is soft and points 2, 3, and 4 seem to correspond, in many instances the paper still may not be usable. It is not absolutely necessary to test the expansivity of hard mending papers when they are used for minor repairs; they are strong and barely absorbent.

Soft papers especially have to be tested for their expansivity. The illustration (fig. 22) will clarify my explanations.[86] The print side is put on a sheet of glass while dry. The mending paper is put on the reverse of the print in the direction of the wire lines, and small marks are made with a soft pencil, extending onto both the mending paper and the original paper. Later, after an examination of the paper, these pencil marks are

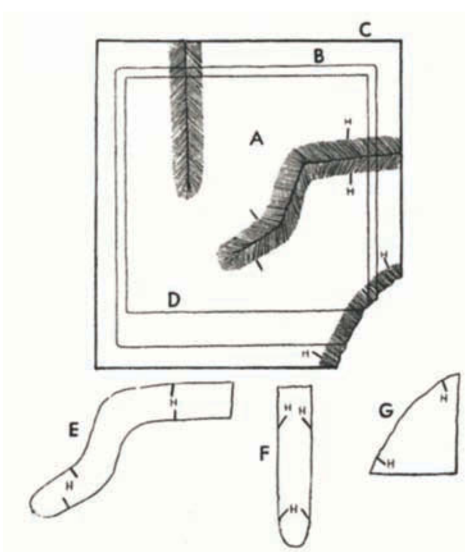


Fig. 22.
(a) Copper engraving (reverse side); (b) plate mark; (c) edge of sheet; (d) image size; (e–g) reverse of the mends, top view; (h) registration marks

carefully removed with a soft eraser.

After this has been done, the print and the mending paper are placed in a clean, cold bath and left to soak and be saturated with water. Both parts are then taken out and put on clean, white blotting paper, which will quickly absorb any surplus water. The mending papers are examined while moist by placing the parts on the pencil marks. If the registration marks match perfectly at this point, the repair paper is suitable. A tenth of a millimeter is important! Negligence and carelessness—thinking, "Oh, never mind, it will come out all right"—invariably produce disappointments. Later, while still moist, the pieces of mending paper are put together with the original paper with the help of starch paste—that is, the mends are implanted.[87] If you do not pay close attention to the expansivity and go ahead with the restoration, this place will immediately stand out after drying. The pasted area will buckle and develop slight puckering[88] on the sides, so that the purpose of doing a good job will not have been fulfilled.[89]

When working, test two or three mending papers at once. If you find out later that one or the other cannot be used, you will not have to repeat the test.[90]

Very hard, nonabsorbent sheets can also be made soft or semisoft. The procedure is simple. The tray is filled with just enough water so that the paper, which always has to be plain—without print—for this treatment, can be submerged. Bleaching soda is dissolved in the water at a ratio of 1 to 10, that is, 100 g of bleaching soda to 1 liter of water. Stir the soda into the water with a paintbrush or your hand, and place the sheet into the solution. You can also pour a small quantity of boiling water over the prescribed amount of bleach to dissolve it faster. The bath takes approximately twelve hours. After this time, the soda solution is drained off, the sheet is rinsed, very hot water is poured on it, and it stays in the bath for a short time longer. The sheet is draped over a pole to dry. If the treatment has not been successful, that is, if the paper is not yet absorbent, the process has to be repeated by pouring a boiling soda solution over the sheet. After the solution has cooled and the sheet has been rinsed, the paper is placed in a cold bath. As I said before, use only paper without printing for this procedure! Printed papers are damaged in ninety out of one hundred cases. The print starts to bleed, and the paper turns a dirty gray. Also, never hang the sheet on a painted pole immediately after the soda bath; the paint on the pole could come off.

An enamel pan, which is put on a flame, can be used for small strips of paper. First, pour boiling water into the pan; add soda and put a somewhat bigger piece of paper in, to protect the strips of paper so that the rising bubbles of boiling water cannot cause any holes. A small gas flame will create hardly any damage.

It is also not difficult to prepare soft or absorbent papers in such a way that they can be colored.

If you tried to make the paper dense and impervious to ink with heavy sizing, the paper would become as hard as a bone, would crack easily, and could break completely when rolled. However, you want to preserve the flexibility and shape of the paper.

To accomplish this, proceed as follows: Soak a sheet of white gelatin for ten minutes in cold water. Put the softened gelatin into a small dish that holds about half a liter and pour boiling water over it. Before the solution cools off completely, add two to three tablespoons of aluminum subacetate, stir well, and—the magic potion is complete. If the solution is not strong enough, add another tablespoon of aluminum subacetate. Never pour the aluminum subacetate into hot water, or the liquid in combination with the gelatin will turn cloudy.

If this agent is to be used for coloring purposes, I advise you to proceed as follows: As in most processes, work wet on wet. The sheet should be well moistened from the back and only lightly blotted dry. It is then turned over, and the solution is applied with a flat bristle brush to the areas that are to be colored. On large sheets it is not absolutely necessary[91] to saturate the entire margin with the liquid, only to go a little beyond the print so that the color can be washed off easily in case a brushstroke is misapplied. Be very careful when wiping off the color. Never wipe toward the margin with the sponge but always toward the print. The margin that is not saturated has to be covered with a nonabsorbent piece of paper so that the color does not get smudged onto it.

SPLITTING PAPER[92]

This is not a difficult procedure either, but it requires more patience. A sheet of paper—printed or blank, heavy or thin—can be split in such a way that you end up with two sheets the size of the original sheet. Both sheets then have half the thickness. This is not magic but a simple manipulation.

Two uncolored pieces of wrapping paper, not too strong, on each edge about 5 cm larger than the sheet or print that is to be split, are placed into a cold bath so that they can expand a little. The paper that is to be split—it can be hard or soft—is also placed in a bath. All three parts are left in the water for at least one hour because they may be of different composition. They are then taken out of the bath, drip dried briefly, and the parts placed on cardboard or blotting paper for quicker absorption of surplus moisture.

While this minor, undemanding treatment is taking place, you can be melting the best carpenter's glue,[93] which has no particles or other impurities. The glue has to run readily off the paintbrush because you have to brush the very hot, liquid glue onto one side of the sheet that is to be split. (Make sure that the sheet is moist but not really wet.) After that, a sheet of wrapping paper is put on the glue-covered side, projecting over all four sides. The second side of the print is also brushed and is covered with the second sheet of wrapping paper. The two sheets of wrapping paper have now hermetically sealed the entire sheet. Since all three parts have been treated while damp and are still moist, creases and bubbles have to be removed so that all parts look smooth and tight. They are now weighted with light pressure, and the parts are allowed to dry a little bit, between absorbent pieces of cardboard. After one to two hours, the pressure is increased by the use of heavy books so that the papers dry out completely and become firmly attached to one another.

After this, the left, top and bottom edges of the wrapping paper are cut just up to the sheet in the middle. The tightly enclosed sheet is visible through the wrapping paper so that there is no danger of cutting into the sheet when the wrapping paper is being trimmed. The paper has now been cut from two sides, and you can try to split the sheet at the point where the two cutting lines intersect. Use a sharp penknife to cut into the corner of the sheet in such a way that there is a little corner of the split print on each of the cover papers, left and right. As soon as you can grasp the two corners with your fingertips, continue pulling evenly and carefully from both sides, top and bottom. If the sheet starts to tear, turn it slightly, or change the pressure of your fingertips to continue safely. Sometimes a small penknife will help.

After the sheet is split, both parts are placed into a cold bath and soaked for an hour. Usually, this is long enough for the separated sheet to float off the support sheet. Remove the cold water and pour very hot water over the sheets so that the final traces of glue will be dissolved completely. Take the sheets out together with the support sheets.

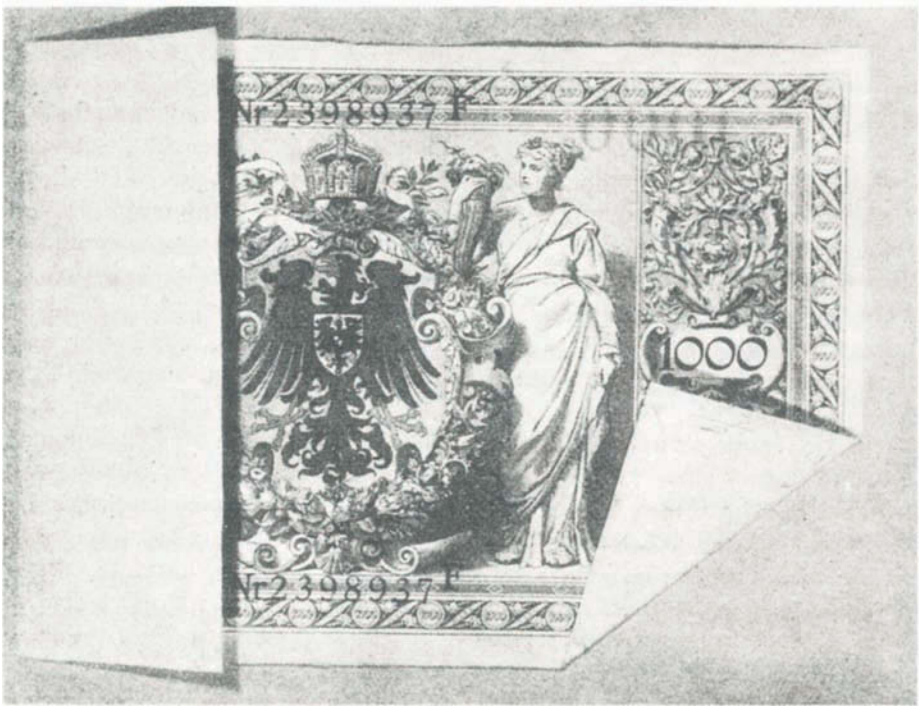


Fig. 23.
A thousand-mark note, split front from back

Yet a second attempt at splitting can now be made.[94] After placing the sheet between two pieces of cardboard, to dry better, take it out to dry completely and now try to split it.

Occasionally you will be more successful if the sheet is not dried out completely—like a board. As usual, you will have to experiment with a sample first. Once you are secure enough and have experimented sufficiently with cover paper and glue, the separation of the papers is easy.

A sheet is usually split when there are drawings on both sides[95] or when a print is supposed to be used for a lampshade but is not transparent enough because the paper is too thick.[96]

It is also necessary to split the paper when copper engravings or lithographs have text printed on the reverse and are to be mounted. The print would clearly bleed through as soon as any glue was applied and would render the front unsightly.

It should also be mentioned that paper for mending should never be split because the unsplit side of each sheet will have become somewhat harder through the application of the glue.

Only paper that is free of small lumps or pieces of metal is suitable for splitting. (These pieces fall out and leave small holes.) Each piece of paper that is to be split has to be examined first. Any irregularities will show up as dark spots when the paper is held up to light.

GENERAL REMARKS ABOUT PAPER

Paper, as you know, consists of various plant materials, which are processed into pulp, then scooped onto a paper mold and formed into a uniform mass. Paper is created by fusing (felting) the fibrous materials together, pressing lightly, drying outside and subsequent sizing. Paper has become a commodity and an item that is used as a matter of course by everyone. But the restorer and the bookbinder working with paper know it a little more intimately because they often have to work for days on one piece of paper and are able to appreciate its qualities, good or bad.

The expert lives with paper and does not consider it a dead material but feels closely connected to it. He knows that paper has an upper and lower surface (skin) that holds the flesh, or interior, of the paper. The upper surface is the side that clearly shows the wire lines.[97] All the early printers printed their engravings on the upper surface. The Swiss color artists for the most part worked on papers with pronounced wire lines, rarely on smooth, wove papers. The upper surface has to be looked at closely because it shows the character of the paper. Therefore, one should never damage the upper surface in the course of a restoration.

When shaving a piece of paper, one can make several small discoveries about the flesh of the paper. One has to be especially careful when shaving book papers from the fifteenth or sixteenth century, since they do not yet have any cotton mixed in. The flesh is hard and proves very unyielding. If such paper is shaved to powder, it often becomes obvious that primitive tools were used, and probably the rags were not as finely processed as one could wish in spite of sufficient care. Unfortunately, the reason for poor processing is often also insufficient carefulness. Consequently, iron particles, small deposits of sand, and clumps of all kinds are occasionally found in the paper.

These impurities generally do not harm the paper, yet one has to be careful when shaving it because there will be brown spots here and there from iron particles, which appear as discolorations on both sides of the paper. Of course, iron particles have to be removed by going into the healthy flesh, whereas other little clumps should remain, if possible. If all irregularities were removed at the places where the restoration is to be carried out and the mending therefore were done on smooth paper, the repair would become obtrusive. The harmless little clumps that have not damaged the paper over many centuries have to be preserved at all costs, otherwise the paper would lose an important part of its character. These clumps often originate from the sizing and are therefore part of the paper. If a big job is supposed to be performed on unprinted paper, these impurities have to be taken into consideration when choosing from the paper stock.

I would like to discuss very briefly the expansivity of paper. Mending papers sometimes expand more or less than the original once the work is in progress.

This occurs even if they look very much like the original and are from almost the same period. In such instances, the mending paper has to be brought to the same state of expansion. If a large mending job is to be done on unprinted paper or if a broad strip of paper is to be inserted, and so on, the mend first has to be examined for color and wire lines. If the wider wire lines B (see fig. 24) are a

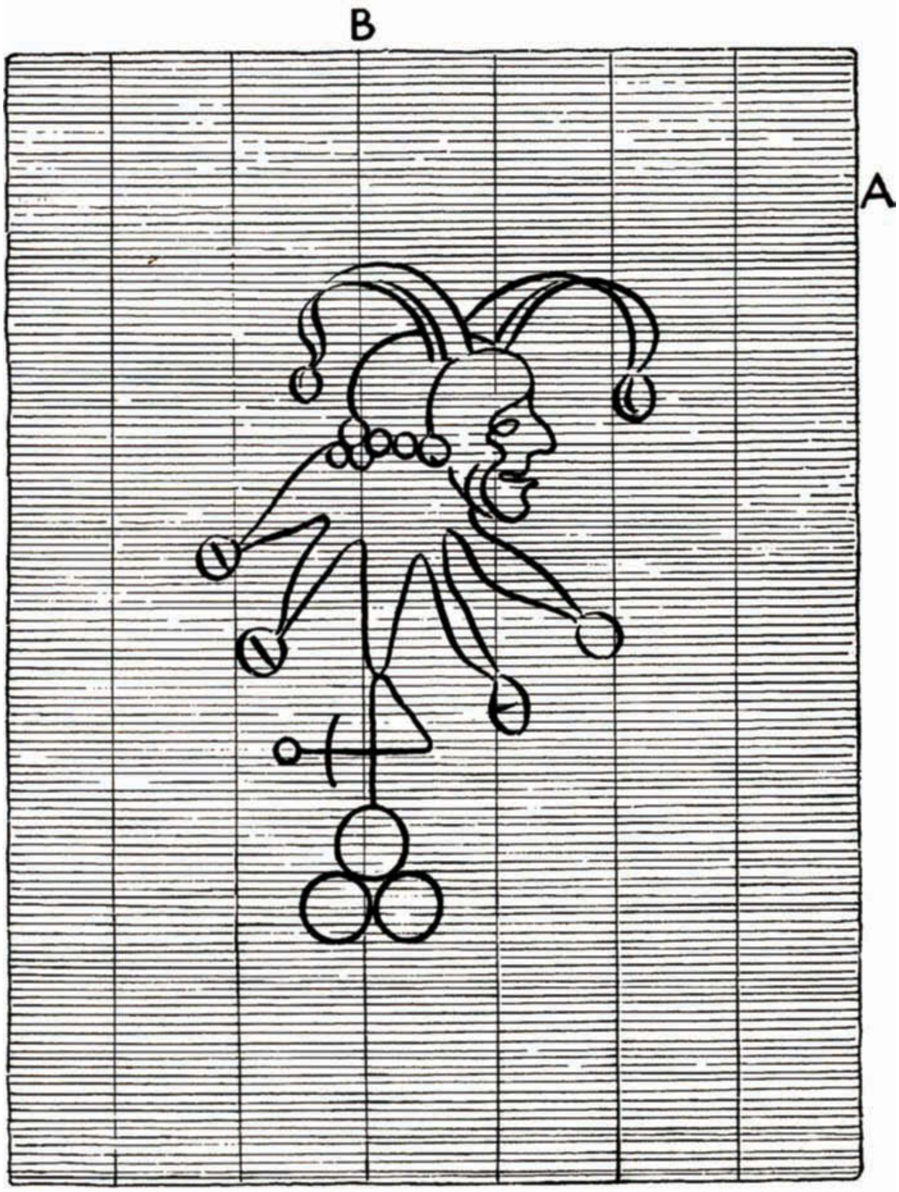


Fig. 24.
A sheet of white paper (looking through the sheet) with watermark, horizontal and vertical wire lines. (A) wire lines are not always distinctly visible; (B) wire lines are always visible.

little more closely spaced in the mend and correspond to those of the moist original paper only when both are wet, the mending paper has to be stretched in order for it to equal the original when both are dry.

I strongly recommend that you do not stretch the original, since the print can become distorted. The original paper definitely has to keep its size.

If you own two proofs of a copperplate with a complete plate mark and if the prints are not too valuable, I suggest the following test for one of the engravings. (This test can also be done on a single sheet, but the dimensions of the plate have to be precisely determined beforehand.)

Put the print into water for three to four hours. During this time, the paper expands fully in all directions. A longer bath, for example, twenty-four hours, would not cause the sheet to expand another millimeter. Put the sheet on cardboard in order to dry it completely. When measuring the plate mark after this, you will often find that it has changed considerably. As a second experiment, if you were to stretch the sheet, perhaps in a moister state than usual, its expansion would be even greater.[98] Now, if the printer had moistened the papers from monochrome prints slightly differently from one another, half dry to moist, the drier proof would be a little smaller in comparison with the moister one. For this reason, it is easily possible for two seemingly identical proofs to show very slight deviations. The more often a paper is stretched, the bigger it gets. Of course, there is a limit to this extensibility. Such tests must be done frequently with the mending paper in order to execute a restoration. If the mending paper does not have conspicuous wire lines, it should be moistened thoroughly and immediately placed between blotting paper and under a press. The paper cannot shrink under the press. When it is taken out later, the paper will shrink to a negligible degree as soon as the press is released. Repeat this process three to four times; success is inevitable. When you undertake this procedure, I recommend that you leave a piece of the same paper of the same size untreated or trace its original dimensions. You will then be able to see the actual changes after each trial.

Papers with distinct wire lines cannot be put under the press but have to be stretched while they are very damp; otherwise, the upper surface will become glossy. The stretching process has to be repeated two or three times to make the paper soft.

The frequent pressing and stretching may weaken the mending paper somewhat, but its texture will be retained fairly well.

ACTUAL MENDING OR TRUE RESTORATION

The preparatory treatment of a tear or other damage requires absolute neatness, utmost personal cleanliness, and clean tools and an immaculate workplace. The glass pane on which the work is done has to be cleaned several times a day. The floor has to be washed daily after all dust has first been thoroughly removed with a vacuum cleaner. Good results are obtained only when the above conditions are met. Whoever is not used to cleanliness or does not value clean hands should and must refrain from restoration work!

To state it openly and clearly for once, a restoration is not a subordinate but, on the contrary, a technically demanding and even artistic work. Each kind of work deserves its reward, and every customer, therefore, should understand that any restoration costs more or less money depending on its extent. As a rule, a restorer should and will not work for nothing because the restoration of artworks is his profession and he has to be compensated for his expenses. Every owner of a work of art should be aware of this when at some point he makes his way to a restorer to preserve his art treasures.

When the owner decides to go ahead with the restoration, he can expect the restorer to undertake the work with great joy, I might even say with dedication. A sympathetic understanding of the art object has to be a prerequisite for the restorer. I know from experience that a collector only reluctantly parts with a work of art he has come to love. And there are the anxious questions: Will it get into the right hands? Is the restorer really an expert? Will no damage be done? These doubts are dispelled easily as soon as the owner meets the restorer and learns to value his advice and work.[99] A friendly relationship of mutual trust will develop which will make it easier to work together.

A cleaned print should under no circumstances look as if it had been treated after all the particularly troubling spots have been removed and only the insignificant ones remain. The character, tone, and warmth of the print have to be preserved at all costs. Once this work has been completed successfully, unsightly holes or tears have to be eliminated. I mentioned how important extremely accurate work is for the preliminary treatment; it is even more vital for the actual repair. This process requires not only patience, love, and empathy but also the best, the very best, of moods. No print should be restored unless all these prerequisites are fully met.

Once the restoration is complete and the print is ready to go back to its owner, it is a good idea to let it rest for a while with the restorer. The print should definitely have this rest period—we can call it recuperation time. Just as in the case of a seriously ill patient, there should be an extended period of observation after the cure. If work on a print has been finished for several weeks, this rest under expert monitoring will contribute to the complete cure of all symptoms.

Some people will think that you hold the print back for the obvious reason: to increase the cost of the restoration.

Completely wrong!

The necessary and careful observation and the interest of the restorer in his work justify his saying to the owner, especially in the case of an artistic restoration, "You will have to wait!"

The work should not only please the owner; far more important is that the restorer is satisfied. It often happens that the owner finds words of praise for a work, whereas the restorer feels quite differently.

At any rate, the success of a large project depends on ample experience. I say this beforehand. If a restorer undertakes a large restoration job based on my explanation, he must ask himself: Will I be able to meet the requirements? Thus, he will be saved from many a bitter disappointment, according to the old saying, "No man is born a master of his craft." It certainly is not presumptuous to use this proverb in connection with the restoring profession.

A Tear in the Page

A tear has to be closed. The mending paper you have chosen matches the original in color, texture, softness, even when held against the light. What happens now? Now you examine the tear:

1. Is any part of the print missing?
2. Does the tear have dirty edges?
3. Does the tear have edges that can be put together again?
4. Has the tear been treated before?
5. Has old alum paste hardened at the edge of the tear?
6. Has anyone applied watercolor in a disagreeably obvious way to the surroundings of the tear?

I will answer these questions as if these types of damage actually existed.

1. If the tear is open and you suppose that something has been cut out and a gap exists when the tear is put together, place the sheet into a water bath first, since it is easier to find out how much is missing of the print after the paper has been expanded while damp. Often nothing is missing, and the sheet was only distorted.

2. Are the edges dirty? Every tear has dirty edges. They have to be completely removed with a restoring knife. The dirt has to be removed entirely from the front; otherwise, the restoration will not be successful. A black or gray line will remain.

3. Can the edges of the tear be put together again? New tears, if they remain clean, can often be restored invisibly by applying starch paste to the overlapping edges. Unfortunately, many new tears get dirty through touching, because the owners of prints frequently try to put the tears together to find out whether they close properly. If the tears are dirty, they must be shaved down.

4. Has the tear been treated before? The back of an old tear, treated by a skilled restorer, will have thin places that become thinner toward the edge of the tear. Be careful that these places do not get damaged any further during a wet treatment.

5. Has old alum paste hardened along the edge of the tear? Horny [translucent and hard] places, which appear very light when you look through the

paper, are due to paste. If a hot bath does not make these horny places disappear, there is only one other way—"a surgical procedure." The part is cut out with a knife, close to the outer horny rim. This little operation has to be performed if the restoration is to be satisfactory.

6. Has anyone applied watercolor around the tear in a disagreeably obvious way? The surroundings of the tear are hard to clean if watercolor has been smeared on. The adjacent areas have to be protected at all costs. Try to remove the watercolor by washing it with a short flat camel's hair brush. You need a weak soda solution for this. The work should be done on a damp sheet. I suggest that you first make an attempt at cleaning with clear, hot water. A surgical procedure is recommended only if you can do a first-rate repair and are also a little bit of a master in drawing.[100] If you do not meet these two prerequisites, hands off the operation!

In answering the above questions, I only want to give a few, tentative hints to explain how important it is to think carefully at the beginning of each task and not to start any restoration without thought.

Before I come to the actual mending process, allow me a few more remarks.

It is a bad habit to work with paper pulp.[101] There are people who pulverize paper, saturate it with paste, and then mend tears and holes with it. The powder is produced by rubbing paper with sandpaper or emery paper to a fine dust or by forming a ball of paper and scraping it with a file. If you want to fill a tear with paper pulp, you have to apply it thinly at least 5 mm wide to the reverse of the tear so that the paper pulp is held in place. If the thick layer of pulp is lightly scraped off after it has dried, so that the transition to the original paper becomes less noticeable, the pulp will still be visible as a mending job. You cannot implant any of the paper wire lines because the pulp is too hard. The same is true for the mending of wormholes. The thin outside walls of such holes cannot support the paper pulp, and here, too, a lot has to be applied to the back side.

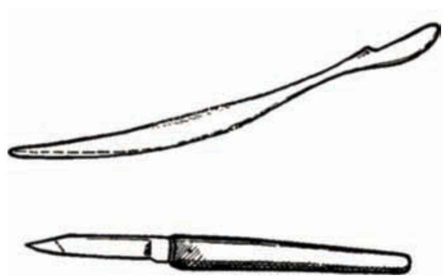


Fig. 25.
(a) Bone folder (worn toothbrush). Has to be ground off to the dotted line. (Use sandpaper to create a smooth, flat surface.) (b) Erasing-shaving knife. Has to be ground off to the dotted line also so that one can work with the short paring edge.

It is natural for the back side of a print not to be immaculately clean because, in spite of the most exacting cleanliness, it will have been handled a lot. Special attention has to be given to this kind of dirt, which is hardly visible. The sheet is treated once again from the reverse. The dirt is removed from the area around the tear or hole with a semihard eraser. The eraser particles are removed with a clean brush. Be careful not to create thin spots when erasing. If the dirt is still somewhat visible and the semihard eraser has not been able to remove it sufficiently, without pressing down too hard, the sheet has to be treated further, while damp, with a soft bristle brush. Most important, the area immediately around the tear has to be perfectly clean. As soon as this task is completed, the sheet is rinsed and put between two pieces of blotting paper in order to dry completely.

When the sheet is dry, the area around the tear has to be treated once again with a semihard eraser, even though it may seem to be clean.

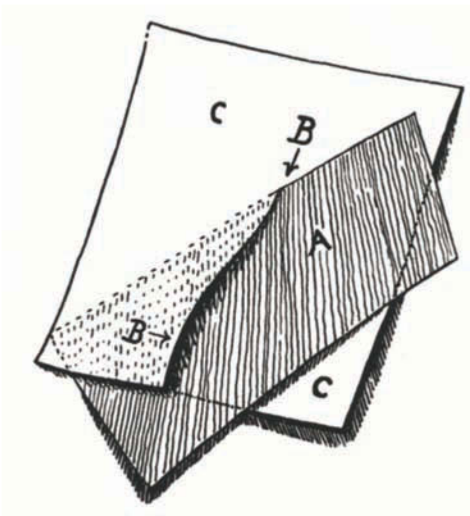


Fig. 26.
(a) Grease-proof paper covers one-half of the tear; (b) tear; (c) reverse of the original.

A repair with less thorough preparations can be done as an exercise, at best, but never on a valuable print. Try it with a dirty reverse; do not use the eraser on the surrounding area or just use it superficially, and you will find a gray border around the patch. I highly recommend such experiments on worthless prints.

The preparations are complete. The best-suited mending paper is selected from the paper supply. I already pointed out how this is done in the section "Examining and Preparing the Paper," pages 100-103. The mending paper matches that of the original perfectly. Now it must be pure delight to close the tear! Of course, the mending paper has to undergo the same cleaning process so that here, too, no dirt rings will be created. To protect the clean mending paper from dust, it is put between two clean sheets of blotting paper. After the tear and the mending paper are cleaned, the sheet is put upside down and the shaving begins. A piece of flawless grease-proof or writing paper is put between the tear in such a way that part of the original is covered (fig. 26). The uncovered side of the tear is then shaved down extremely thin. Depending on the size of the tear, the shaving is started about 4 to 10 mm from the tear. At the outset, the shaving is done extremely lightly, then progressively more forcefully until the edge of the tear only has the strength of tissue paper. The shaving follows the shape of a wedge. Of course, the edge of the tear has to be shaved very skillfully so that no holes or small tears are created. The more carefully this work is performed, the more successful the overall result!

In addition, something has to be said about hard paper. If the original paper is hard and if tears, holes, and corners are difficult to shave; the print has to be soaked first, and the shaving has to be done while the paper is semimoist. The hard part of the paper—the surface or skin—will absorb water, although this may not be immediately obvious. Soft paper, as you know, absorbs instantly and changes because of the water absorption; hard paper does not to seem to undergo any changes. However, the areas that have been mended should be shaved only while dry.

When one edge of the tear has been

shaved down, the other has to be treated the same way. The sheet has to be turned to a more convenient position. After the second edge is finished, the sheet is held against a window to see if the wedgelike transition is perfectly uniform. I would like to emphasize that the transition from the shaved area to the tear has to be made with the preservation of the paper in mind.[102]

Next, the mending paper is taken out from its hiding place between the two pieces of blotting paper and placed on the tear in such a way that the wire lines match perfectly when the paper is held against the light. The shape of the tear is carefully scratched into the mending paper with the point of a knife. The mending paper can be marked on the worktable, but especially when larger and wider tears are dealt with, it is often advisable to perform this work on a clean window pane.

The mend is separated from the rest of the paper along the scratched lines by peeling it away starting at the top. Turn the scratch mark toward you so that it can be followed exactly when the mend is torn out. The mend should never be cleanly cut out with a knife because the cut would be too even. For the same reason, the scratching should not be done too forcefully. The fine fibers or fuzz that is created when the paper is torn is important and should not be removed in either smooth or wire-lined papers. The fuzz has to be preserved for the melding of the two parts.

The mend for the tear has now been separated neatly and fits exactly over the shaved part of the tear.

The mend also has two sides, one which will be the back of the tear and the other which is supposed to be implanted into the paper. The side to be implanted has to be shaved to a thickness that is opposite that of the tear. That is, where the tear has been shaved thin, the mend has to keep its original thickness. The edges or sides of the mend are not shaved as extremely thin as the edges of the tear, but enough is taken away from the edges of the mend so that it, too, will have a slightly wedgelike shape. The center of the mend on the implant side is shaved

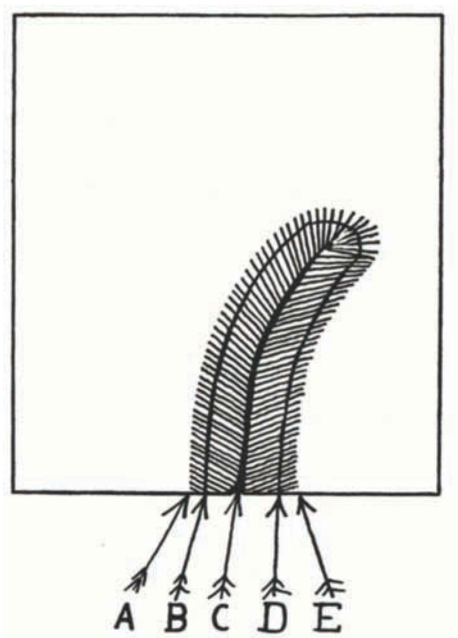


Fig. 27.
(a–e) Shaved area of repair. (c) The tear itself. (b–d) Area to which paste is applied. (a, b, d, e) Paste-free areas.

lightly so that no uncleanliness will be noticeable later.

When both sides are well prepared, the mend is placed on the tear in such a way that all the shaved areas are covered. Pencil marks are now made so that the mend can be applied in exactly the right spot later on (see fig. 22). If you do not make any marks, you can be almost certain that in larger tears, holes, or thin places the shaved areas will not be covered completely, and the result will be less than perfect.

Place the two parts—print and mending paper—in dust-free water to saturate. Have clean blotting paper ready for these papers after their stay in the water so that any excess moisture can be absorbed faster.

Place the parts on cardboard to apply the paste. Apply starch paste very thinly to the tear. But be careful when doing this job, which is not easy on your first attempts, and watch that the thin areas of the tear do not fold over and touch the print. Since the mend, too, receives a thin layer of paste, it is important to make sure that the paste does not cover the shaved areas completely—that is, the mending paper can be totally covered with paste, but not the original paper (see fig. 27). If paste is thickly applied to both parts, the excess will flow out when the papers are pressed together and spread over the area surrounding the tear. This will cause a needless mess. After the paste has been applied, the print should be transferred to another small piece of cardboard. This is extremely important! If this is not done, the small amount of excess paste, which is left on the cardboard when the tear is pasted, could damage the print. Now it is time to take the pasted mending paper and lightly press it down with blotting paper and the heel of your hand. Turn the print over and make sure that the tear is well aligned from the front, too. If the wire lines of the print do not match where the tear has been closed, one side of the tear has to be lifted. When this is done, one-half of the tear—with the mending paper—should be pressed down firmly with the left finger, and the other half of the tear—without the mending paper—should be lifted with the right hand. The tear is now open again. Carefully pull to the left the side of the tear that has been lifted, and try to close the tear exactly. The printed lines of the image should be matched perfectly. This little procedure can be performed only if you have made sure ahead of time that the tear closed while damp and that the dislocation or distortion is only due to the application of the patch and a gentle pressure of the hand.

In all restorations careful attention has to be paid to the following: When the damp back side of the sheet has been prepared to the extent that the mend can be implanted to close the damaged part, thinly cover the area to be repaired with paste from the reverse. But apply paste to the mend only where it will be covered by the original paper. Apply no paste to that part of the mend that is visible from the front—because some of the original is missing—and must be retouched later. If you do not think of this, the blotting paper can get stuck when pressed against the mend and can damage the sheet when the blotting paper is lifted.

The space between the two edges of the tear—in which printing is missing—will appear as a white gap after the mend has been inserted. In this case, too, you have to make sure that the printed lines are arranged in such a way that in spite of the gap a good continuation of the lines is possible when the paper is later retouched. When the edges of the tear are properly positioned, press them firmly with the aid of blotting paper, from the front with your fingertips or the ball of the thumb. After this, the paper is left to rest.

As soon as the sheet starts to dry,

lightly dampen the back once again but not the mend. This ensures a relatively even distribution of moisture. Take into consideration, though, that the patch contains more than double the moisture of the other parts of the sheet because of its damp pretreatment and the application of paste. Uneven moisture content can cause the sheet to buckle.

If the sheet does not buckle when it is dried further, place it between blotting papers and weight it down with cardboard or books. However, if buckling occurs, it must be removed by moistening the buckling areas. Now the sheet can be left unattended.

Let me once more briefly go over the main points of this little restoration procedure.

Be exceedingly careful when applying the paste. Too much is always harmful, too little is no good either; the golden mean is the best. Do not damage the sheet when pressing on it. Watch the drying procedure carefully and remove the buckling before weighing down the sheet. And the most important prerequisite for success: Never forget to be perfectly clean while doing the shaving and mending.

If a larger hole in the engraving has to be mended, even closer attention has to be paid to the wire lines. The wire lines in the mending paper and in the original paper should never clash with each other.

If a corner is missing, a few more things have to be taken into consideration. If three of the corners still have the original, deckled edges—in other words, if the sheet is still its original size—the corner that is to be restored has to be shaped accordingly. (Better and simpler would be to obtain a suitable deckled edge from the paper stock.) Shape the corner of a piece of well-matched mending paper with a knife. Create the irregular edges of a deckle by cutting or scratching into the paper, remove the excess paper, and try to achieve a soft transition with sandpaper. Use the three corners and deckled edges of the original as a model. I would like to mention that the outer edge of the mend must receive

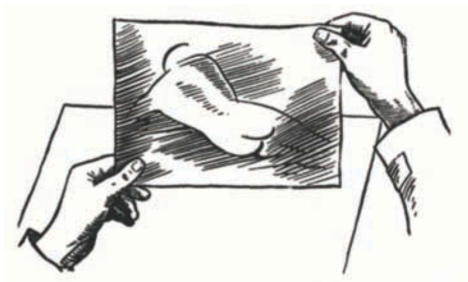


Fig. 28.
A print, ready for stretching, being laid onto the stretching support

its final shape after the mending process has been completed, never before.

Not all engravings and prints should be treated chemically before the mending process. Do not remove the beautiful, warm tone of a completely torn page of a book, because it must again harmonize with the adjacent pages. However, if such a page has been treated chemically, out of ignorance, a great deal of skill is required to match the hue of the sheet to the other pages.[103] You only burden yourself with additional work when you treat a page chemically before mending it.

If a corner is missing from a book page and the page does not require a deckled edge, be careful to insert the new page properly. The corners or sides of an old book often have an appealing warmth. To avoid later retouching, always try to find corners that match well. Be careful that the new corner is not lighter than the rest when the book is closed. Remember also that old books can be worn and dirty at the corners from frequent handling. This kind of smudging has to be duplicated to make the new corner match. It often happens that the following or previous layers are wrinkled or brittle. Consider all cases individually and try to incorporate these signs of aging into the restored page so that it can harmoniously blend with the other parts. This is also important for individually restored engravings within a set.

Be especially careful to give the treated book page—after it has been made smooth for the restoration procedure—the character of the neighboring pages. If the pages of the book buckle a little, you cannot put the restored page into the book dry. The page has to be moistened a bit and inserted half damp into the book. The book should be weighted when the page is almost dry. The page will now take on the desired shape.

An old book has its history; when you open it, the pages do not lie as evenly as in a modern book. Sometimes, at the center of the book, there is buckling, which becomes increasingly weak until it finally disappears toward the front and back. These signs of age occasionally appear as sharp ridges. When such a book has to be treated in its entirety, the really dangerous-looking ridges may be removed but never the book's general wavy character.

The buckling will disappear in the water bath, and it has to be restored for the book. Separate an old, incomplete work that has ridges like this, and place three to four sheets of the cleaned book between pages of the incomplete volume. Moisten the cleaned pages and place them in consecutive order into the old work, so that the first pages of the cleaned book take on a slightly wavelike character, the middle ones a stronger one, and the last ones a weaker one again.

When treated this way, a book does not show any traces of the restoration when it leaves the restorer's workshop. The character of the book is preserved. Not all eventualities that might occur during a restoration can be described in such a way that you can say afterward, "But that was covered in the instructions, word for word." You have to put all your thought and intuition into the process. And if you have just started a process that demands your undivided attention, you should not be interrupted. It is not worth it to start a job shortly before the end of the workday. And it is also completely wrong to start a big job when you know that you will be disturbed several times during the day. The timing of a big restoration or retouching job has to be well planned.

Let me resume the discussion of the tear that you have mended. The paper has dried well during this little chat and should not show any buckling. This would not happen anyway because the paper matches very well in all details. Examine the mend and make sure that

- the edges are firmly attached;
- there is no buckling anyplace;
- the surroundings of the mend are not shiny; and
- no gray line indicates an insufficiently cleaned edge along the tear.

Remove the pencil marks or lines with the aid of a soft eraser. Turn the paper over and look at the mended tear from the front. The lines fit together well. No retouching is necessary because the print was not damaged when it was shaved. You have worked strictly according to my instructions.

If things do not go right—if the tear and the mend do not adhere, if the printed lines are uneven, if a gray line runs along the tear, if the paper appears rather wrinkled, if shiny places appear around the tear—I say that my instructions on the restoration of tears have not been read carefully enough and that, moreover, poor work has been performed.

It is not easy to rectify these mistakes. The entire process has to be repeated, and the danger exists that the page will be damaged further when the paste is washed off a previously shaved tear. Repeating the process makes a successful outcome almost impossible.

Before making the mended area thinner, you have to clean the front of the tear. Since you have to go into the image with a knife, you have to work very carefully. In the white paper you can see, first, whether the tear has been properly closed and whether there are only slight ridges along the edges of the tear. These are disturbing and have to be removed with the utmost care. When shaving off the ridges, avoid creating small indentations or furrows. A skilled hand will guide the knife lightly to create a good transition to the surrounding.

After shaving the front, you should have made the tear completely invisible. This work is done on a glass pane. If a streak or a gray line appears in spite of almost imperceptible shaving of the raised areas, the preparations have not been done satisfactorily. You would magnify the mistake greatly if you were to cover the line with a thin, even though well-matched, piece of paper on the front. A tear should never be closed [i.e., mended] from the front if you want to deliver excellent work! Every kind of restoration is conspicuous when done from the front, although it is hardly visible when done from the back. If the tear has been treated professionally, you only have to shave off the small elevations, a task that is child's play.

Placing a mend over the paper on the front really leaves you with two larger tears to take care of. It is impossible to treat this kind of wide mend in such a way that the restoration is invisible afterward. It is better in the case of a gray line to treat the tear all over again and to pay utmost attention to cleanliness, because a gray line can only be due to dirt.

Now I come to the shaving of the mended tear.

If you want to thin down the paper and do not own a box for shaving,[104] a clean window pane will do.

Holding the paper up to the window, you can see that the mended tear is still quite thick.[105] That is natural since both parts have not yet been shaved fine. It is time to start the second shaving, that is, the thinning. At first, shave away only enough from the mend so that it is visible as a slightly dark area. A complete scraping of the mend—that is, rendering it totally one with the surrounding area so that the mend is no longer visible when you look through the paper—should be done only if there are no wire lines in either part, the print or the mending paper. For implanting wire lines, the dark appearance has to remain.

When working on the sheet, take it with your left hand, put it with the printed side facing down on the pane, and shave it down carefully with the knife, centimeter by centimeter.[106] This shaving is done just as though you

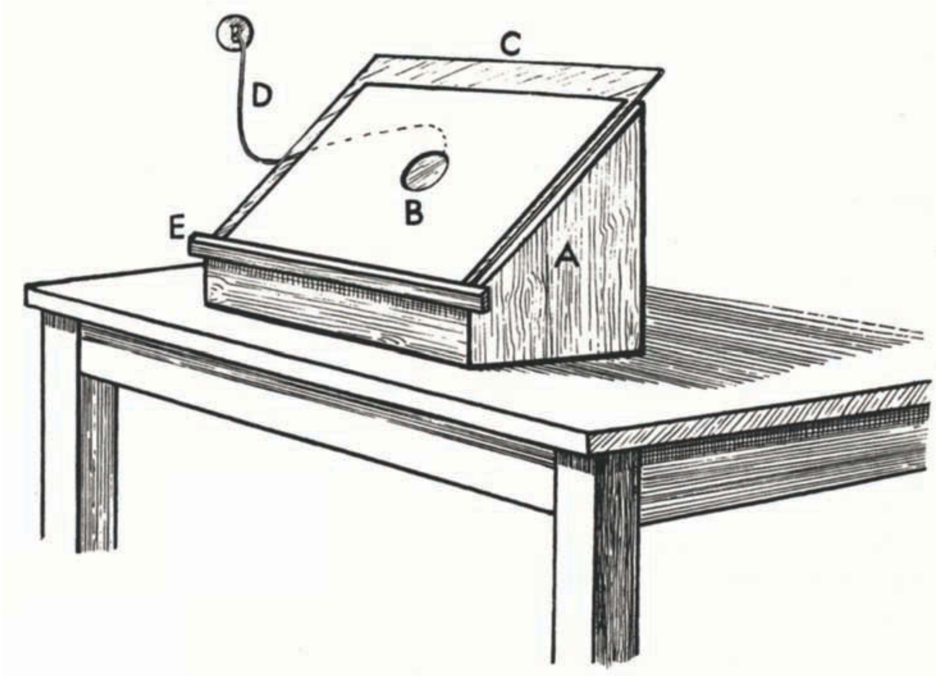


Fig. 29.
Shaving box. (a) Wood; (b) cardboard cover with circular window for shaving; (c) glass pane; (d) light cord; (e) support for the glass pane (wooden ledge)

wanted to erase a spot of dirt.

On pages 111–15, I discussed shaving the original paper and patches of mending paper for tears, holes, and edges. For that kind of shaving, the knife was used in only one direction. Here, on the other hand, when the mend is shaved to thin it down, the knife is moved in two directions—back and forth.

The mend is shaved carefully and skillfully, and no thin spots should be created during this process. An extremely sharp knife is moved lightly across the patch.

Before the wire lines are implanted, the mend is examined thoroughly once again. The small ridges at the sides of the mend still need to be shaved off. Since this kind of work cannot be done at the window, the paper is put back on the glass pane and the sides are shaved completely smooth. If wire lines are to be implanted into the mend, only these lines are shaved out of the paper. Otherwise, the mend should have the same thickness as the original print. I repeat once again: The general shaving of the mend is carried out to such an extent that, except for the shaving of the wire lines, no other scraping of the surroundings is necessary.

Implanting the Wire Lines[107]

Magic or other secret means are not involved. How often I hear, "The tear is not visible at all; one wire line just continues into the next. How do you do it?" When I explain that it is really only the little knife that does it all, almost nobody wants to believe me, and yet it is the truth!

Before I explain the implantation of the wire lines, I have a few other things on my mind.

Success does not come overnight. Wire lines are difficult. You need more than just skill and patience; a certain amount of intuition is necessary. A repair will immediately be obvious if the wire lines are not implanted skillfully. Simply scraping out light lines is no great achievement. The blending of the surrounding wire lines with the implanted ones has to be performed in such a way that it is not noticeable. That does not seem difficult at first glance. You think that it cannot take long to scrape out a few lines. But once you try it yourself, you gain respect for those wire lines. Each one has to run into the other evenly, and the transition from the mend to the original paper has to be harmonious.

Above all, you should not be physically or mentally exhausted before starting this kind of work. You need a steady hand that is loose at the joint. It is impossible to perform a good job with a heavy hand. The knife has to be like a toy in your hand.

The tool for this kind of work is the previously mentioned restoring knife. Try the implantation of wire lines first on a sample sheet at the window or at the shaving box.

As in all exercises, the first attempts betray an unskilled hand. Even later, after minor successes, there are still relapses, which should not discourage you. The wire lines are not supposed to be dug in but are to be lightly shaved in. The knife has to be held so skillfully and deftly that at first it is hardly perceptible that the paper is being abraded faintly in the form of lines. And yet a uniformly flowing groove has to be perceptible. Start with the knife at the left side of the mend and begin to implant the artificial wire line parallel to the original one, working toward the right. The indentation, which at first is extremely shallow and hardly perceptible, is then reinforced in the opposite direction. If you only scraped from left to right, the shaving would be one-sided. It would immediately be noticeable when the sheet was moved into another position. The tiny fibers that become raised are shaved off from both directions—that is, from left to right and vice versa—so that a slight indentation will be visible regardless of the angle from which the sheet is viewed.

How often the knife is moved back and forth depends on the lightness of the wire lines. Do not try to conjure them into the paper all at once. This would be completely wrong! Hard edges would form. It is impossible to soften wire lines afterward.

I do not consider it necessary for a beginner to learn to implant wire lines. Do not work too hastily and try to learn everything at once. We can talk about this again after a few years have passed. It is best to work on papers without wire lines first and then to try the ones with wire lines. Our profession is not the easiest in the world, and I am not telling you a secret when I tell you that I have not stopped learning either.

I do not want to end the section with these brief remarks about the mending of tears—which emphasize how necessary the correct procedure is for the achievement of successful results—without also mentioning special mending processes.

For instance, I would like to men-

Fig. 30.
Pirckheimer, German School, Dürer, 1524, engraving. The projecting paper shows the restoration.

tion that thin spots in the original paper are mended the same way as tears and holes, even if the front of the print does not show any damage. However, there is a minor difference in the choice of paper. To facilitate the process, choose weaker paper that, nevertheless, in all other respects such as expansivity, hue, and so forth, matches the original paper. If possible, select a thin sheet from the paper supply and implant it on the weak spots of the original. If you cannot find any matching paper, you will have to move on to the following procedure.

Tearing or Separating the Mending Paper

Tear the paper from the top right to the bottom left in such a way that both edges of the tear are quite thin. Turn the paper while doing this and try to widen the thin parts, moving down toward the left. You can hold the paper vertically or horizontally, depending on its strength and composition. Carefully extract thin parts of the torn edge with a knife. When the thin paper is implanted, paste is applied very sparingly to the torn side. This

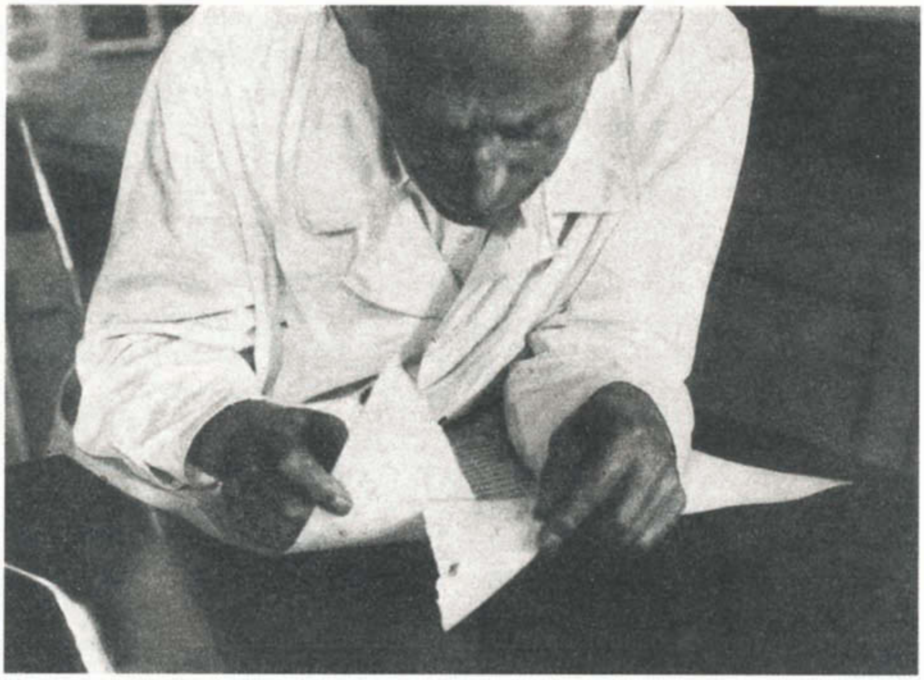


Fig. 31.
Tearing the paper

paper does not have to be cleaned with an eraser because the torn side is completely untouched and spotless.

The budding expert should use paper sparingly when he is first learning to tear it and not take the best kind either, especially if he has only a limited supply of good mending papers.

And now a few hints for especially difficult tasks.

When a print has been cut severely on one side so that part of the image and white paper is missing—for instance, in the sky—use your intuition to decide how much shaving needs to be done. It is often easier to do a restoration when the image is damaged by a tear. Mending white paper is a tricky affair; it is hard to describe all the incidentals that can affect this kind of work.

Much can be done by force, but this does not solve every problem. If the original can be treated deftly, many a task becomes simpler. But the lovely hue of the sheet has to be preserved, just as does the softness or hardness of the paper, and that means a great deal of thought has to be applied. I will be very frank: This kind of work can be undertaken only after many years of the most intensive preparation. As I mentioned before, if a tear goes through the image, the printing may help to disguise the damage. However, even the smallest tear on blank paper becomes a masterpiece when it has been repaired invisibly.

If an almost invisible repair of, say, 10 cm width is to be performed on blank paper, a great deal of thought has to be invested beforehand. Often it is hard to find the right paper to match the missing piece. Even if matching paper is found and applied perfectly, the wire lines are connected well, and there is no gray line discernible, the front can still be a problem.

The plate tone, the very subtle gray tone stemming from the copperplate, has not been taken into account. If this hue is transferred to the mend, you will doubtlessly find that it has darkened the paper when you hold it against the light. If this is the case, all efforts have been in vain. The paper, which seemed perfect, was not the right one after all. The gray plate tone, therefore, has to be looked at closely, beforehand, and a paper has to be chosen that is slightly lighter when held against the light. Of course, all other requirements—hue, expansivity, wire lines, softness, and texture—have to be fully considered, too.

Many clients even bring along their own mending paper, believing that as experienced collectors of the Old Masters for many years they have found the right thing. Unfortunately, these supposedly well-matched papers are almost never suitable. The clients are usually mistaken in this regard. It would be good if collectors were also connoisseurs of paper, if they were as well versed in old papers as in the evaluation of Old Masters.

A major restoration of unprinted papers is nerve-racking. You will know you have come a long way when such a task is successful.

THE ADDITION OF A MARGIN

It is desirable but not always necessary, and certainly not possible in the beginning, to add a margin invisibly. And yet many a beginner will add an artificial margin in order to give a finished appearance to a print. And he can consider himself successful if the overall impression of the print is not disturbed, especially if a well-preserved companion piece exists. In spite of all difficulties, however, any ambitious person tries to do his best. And if after many years he is lucky enough to add a margin almost invisibly, he will have achieved something that is achieved by only a few.

When you look at the front of a mezzotint to which a margin has been added, you should be able to spot the somewhat hard edge at the transition from the print to the new margin—if you have a trained eye. To shave the transition part takes a lot of time if you have the four sides of the margin to deal with. Because of the weak starch paste, the paper will become somewhat hard at the places where it has been pasted, and any shaving after the repair is done will be very difficult. The script, the "title," has to be matched with the utmost precision to the original title. Any little distortion or faulty position of a letter definitely has to be taken into account because otherwise the handwritten script would be conspicuous when compared with a well-preserved print. Also, the paper intended for the writing should not be sized too heavily. The sheet has to have the same texture as the original engraving. Only use a pen for writing if you are able to guide it lightly. Do not press down, because the surface of the paper may become scratched and the color may bleed. A fine, moderately long—about 1 cm—round brush with a pointed tip is best suited for writing. Any little hair protruding at the tip or the sides has to be singed off. Put a small, red-hot—but not burning—piece of wood carefully to the small hairs that have been slightly moistened by water, with your lips shape the brush to a sharp point, and singe off any little hairs that protrude from the sides.

The brush has to be so light in the hand of the restorer that he can create almost invisible lines with it. Never simulate more prominent lines or heavy pressure when writing with a pen; instead, always use a brush.

Even if the writing has been done perfectly by brush and looks precisely like the original, you are still far from having achieved a deception. The back will betray the added margin.

Do not mount a print on thin paper to hide defects. The place where the artificial margin joins the print itself—the area of transition on the back of the original paper—will start to expand. The added margin will then be recognizable, because heavy paste, which cannot be prevented from swelling, is used to attach the shaved edges, which will therefore stand out.

Of course, the paper chosen for the added margin has to be right in every respect. Since large, empty sheets are hard to find, an engraving of little value with a wide margin is usually selected. If

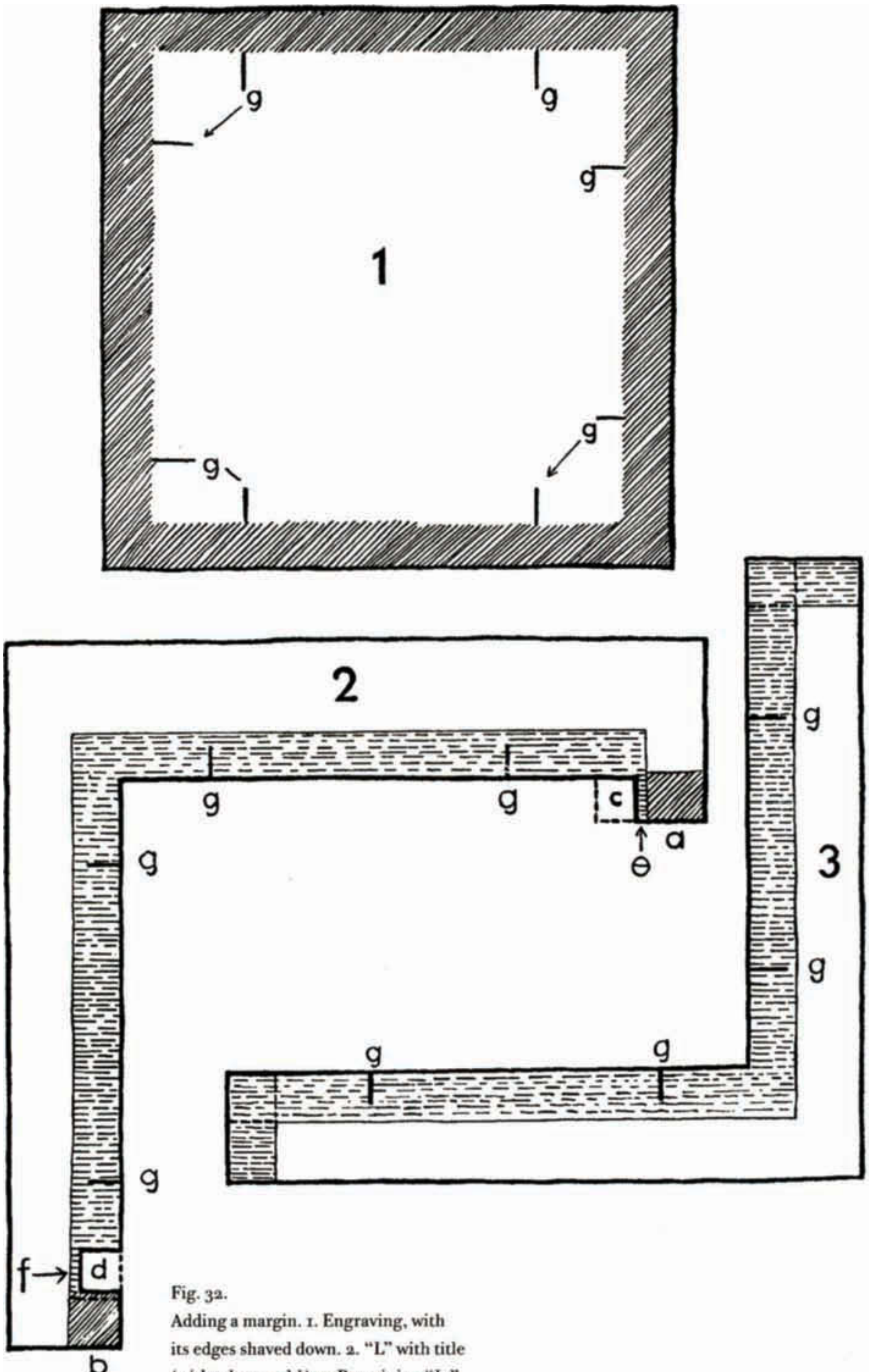


Fig. 32.
Adding a margin. 1. Engraving, with its edges shaved down. 2. "L" with title (with tabs *a* and *b*). 3. Remaining "L." Remove *c* and *d* from the margin with the title (2) because side 3 covers these areas; *e* and *f* have to stay on the "L" with the title and are shaved down before the remaining "L" (3) is added; (g) registration marks.

the print that needs the margin is small—25 to 30 cm in length or width—it is advantageous to add the margin in one piece.

For larger sheets, the margin will have to be divided; that means two to four parts have to be put together to form a margin. The margin with the title must be one piece and like an "L" can have a side piece on the left or right. Two "L's" will have to be cut in this case. Figure 32 shows how this kind of work is done.

Since here, too, the work is done moist on moist, it is advisable[108] that the sheet with the added margin be stretched in semidry condition.[109] Of course, the added margin is carefully rubbed beforehand with a bone folder and blotting paper. During the stretching process, the added margin is rubbed once more on the board or the glass pane, which helps to ensure the success of the work. After twenty-four hours, the sheet is cut off the stretching board and finished on the front. The transition from print to paper has to be shaved almost imperceptibly, just as the places where the sides have been joined together.

When a margin is added, the preparations are performed in the same way as for all other restorations. The shaved area on the original sheet is 8 to 12 mm wide, depending on the size of the sheet. Each "L" of the new margin has to be added separately; this means that the two "L's" should never be added one right after the other but only after drying out completely. As soon as one "L" has been added, pressure is applied with the bone folder to the sheet by putting it between blotting paper and cardboard on both sides. Before it dries completely, the sheet is taken out one more time, pressure is applied from both sides with the aid of a bone folder and blotting paper, and the sheet is then weighted again between dry cardboard.

The second "L" is cut out and prepared after the sheet has dried completely. Shave down the back of the first "L" well at the place where the new part is supposed to be added; then join the second "L." Soon to follow will be the stretching. When the "L's" are joined, care has to be taken that the new side is free of any particles of dust at the places where it is to be joined. After the shaving, the places where the sides come together should not be visible under any circumstances.

The preparations proceed differently when a print that needs a new margin still has a small margin of 1 to 2 mm, or when the plate mark is close to the image, or when one side of the margin is torn off because the plate mark has cut through.

At all costs the narrow remnant of the margin has to be preserved, because it facilitates all later work. If this small margin is removed, the softness of the sheet is also removed. And it is just this softness at the transition from the image to the new margin that is especially attractive. It is not easy to conjure into existence this soft, artificial transition when the engraving has been sharply cut.

In such a case, shaving at the back can only be done to the extent of the width of the small margin. If you go beyond this, you create useless work for yourself. Careful shaving of the narrow margin, where not the smallest particle may be lost,[110] is not that easy and has to be done carefully. The small edge where the dust has accumulated can only be scraped lightly from the top because the plate mark has to appear again in these

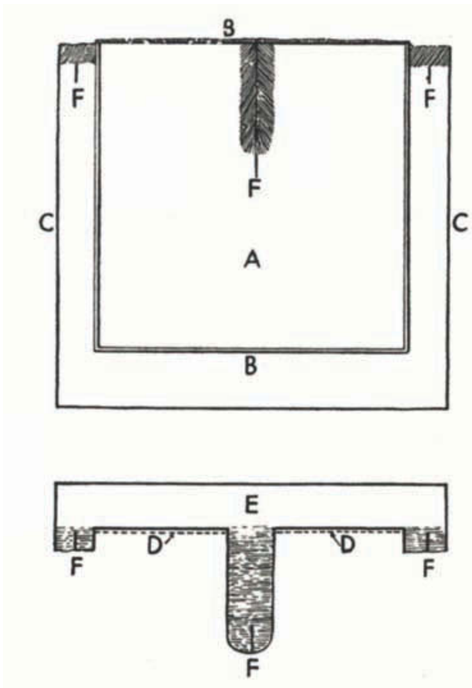


Fig. 33.
Adding a single border (close to the plate mark) in combination with repairing a simple tear. (a) Back of the sheet; (b) plate mark; (c) width of the margin; (d) unshaved edges; (e) back of the shaved piece; (f) registration marks. The missing border, including the area of the tear, is prepared from one piece of paper. Shaving of this strip is done only on the ends and in the middle.

places. The paper that is going to be added in this case is not shaved after it has been examined, only thoroughly cleaned. Shaving is omitted because it is too easy to scrape off tiny bits of paper. Under no circumstances can the paper in the margin be damaged. Any damage would show up as a light spot when looked at through the paper.

"L's" are not appropriate here. Separate strips have to be added. To ensure a better hold at the juncture, the area of attachment has to be made wider, maybe 3 to 5 mm wide. To prepare the strip, tear it on both front and back sides. To do this, put a ruler on the strip and use the point of a penknife to scratch in a faint groove. The scratch should not be made exactly where the strip is to meet the edge of the print; rather, the strip is torn a little farther in. After the margin is added, the sheet is stretched. This is done with the utmost care because the margin added is very narrow.[111]

The Addition of a Margin to Book Pages

Adding a margin to book pages is not quite so difficult, since the printed area appearing on both sides of a sheet usually does not coincide precisely; that is, the printed text or image is not positioned uniformly. The shaving is done on the side, where the strip can be joined more easily. Open areas in the printing have to be utilized wherever possible in order to give the margin a better hold. Of course, sometimes margins must be attached, one from the front and one from the back, depending on the condition of the sheet. Above all, the paper has to be examined closely to find out whether the hue matches. Shaving has to be done with utmost accuracy to avoid thick places.

If I have to do the shaving while the book is in its binding, I use a picture frame with glass, to which I add a support so that it forms a stand. I insert the frame into the book, open the page that needs to be treated and put it over the glass, and shave in the same way as on a shaving box.

THE ARTIFICIAL PLATE MARK

Impressing a plate mark into paper is not an easy task. Although the work is purely mechanical, much thought must be given during preparation. A plate mark that is not imprinted properly clearly shows that the work was done later on, as a replacement.

If a plate mark is to be imprinted on white[112] paper, about 3 to 4 cm outside the image, I would completely advise against it. An artificial margin is especially conspicuous if it is 5 to 6 cm wide. If possible, only narrow margins should be added because it is especially difficult to get the paper between the image and the plate mark smooth, and not every restorer succeeds.[113]

First, the paper has to be examined with regard to hardness or softness. That soft paper is more suitable than hard paper is certainly understandable. But soft and forbearing paper also requires more attention than hard paper. And it cannot be ignored that the print quality—the sharpness or depth of the image—has to be taken into consideration when a plate mark is embossed. A seldom-used copperplate has sharp edges. Hard edges cause breaklike indentations in soft papers. As a plate is used, its edges become less sharp. Weak proofs without depth in the print lines also have weak plate marks. I share this observation so that the process of indenting a plate mark is not taken lightly.

Above all, I advise against having metal plates cut to the size of a print to create artificial plate marks. An engraving, in contrast to a woodcut or a lithograph, is an intaglio print. A metal plate would eliminate the beautiful relief of the printed lines of the engraving. The engraving would begin to look different. Metal plates should not be used under any circumstances! Someone might also come up with the idea of giving the paper a plate mark before implanting a new margin. This would be possible, but the subsequent treatment is very time-consuming. Above all, the paper supply has to be very large for such a procedure. Still, I will describe this process for the sake of completeness.

First, the engraving is placed on the paper intended for the margin in such a way that a well-proportioned margin is created on all sides. After this, the plate mark is measured; that is, the distance from the print to the plate mark is marked on the margin paper with a pencil. A complete second copy helps in marking the correct distances. The margin paper is then placed into water and left to soak for a few hours. The bath will cause the margin paper to expand somewhat. After the bath, it is hung over a rod so that it can drip dry quickly. Next, it is put onto cardboard, and an accurate pattern of the new size of the plate mark is drawn. After its exact size is determined, the measurements are transferred to a zinc plate. The zinc plate, which is supposed to imprint the plate mark, is cut 0.5 mm smaller all around so that it will produce a plate mark of the required size. The second copy should be at hand so that the corners of the zinc plate can be shaped in accordance with the original.

The corners of the plate mark may be completely angular, or they may be curved. The embossed edges of the plate may also show variations. They may have a sharp edge or may be rounded or beveled. The zinc plate has to be cut accordingly. If this is not too successful in the beginning, repeated efforts will bring the desired results.

I would not bevel the edges of a zinc plate unless a sample proof taken from the plate shows that it is necessary. I would like to mention that this procedure can be used only when the margin can be made of one piece, which is only the case with small prints. Shaving of the paper to which the margin is to be added has to be done carefully, Before a margin is added or implanted, the distance from the picture to the plate mark must be ascertained to be the same on all sides. It often happens that the distance varies, for instance, perhaps a few millimeters greater on the right side than on the left. The pattern will show this. The plate mark is imprinted while the margin paper is damp, and this is best done with an intaglio printing press but can also be done successfully with a large copying press.

If you want to imprint a plate mark while the paper is dry, I would recommend the following: Cut a pattern out of strong ivory board.[114] This pattern has to be 1 mm smaller than the original plate mark, but the rounded corners of the plate mark—the edges—on the other hand, must correspond exactly with the original. Precisely measure the distance from the picture to the plate mark with a strip of paper and transfer this to the front of the artificial margin. With a soft pencil draw short lines in two places on each side so that the pattern can be adjusted with the help of these markings. The pattern is attached to the artificial margin with gummed paper. For this purpose, cut for each side two narrow strips of gummed paper, about 2 cm long. Moisten them only at the edges and put them down to attach the pattern. When the pattern is attached, turn the sheet over. The back of the print is now on top, and the lightly attached ivory-board pattern is underneath. The margin or the edges of the pattern will become visible when you run the palm of your hand across the sheet. With your thumbnail indent the edges of the ivory board into the artificial margin. To avoid shiny places when pressing down, put a sheet of blotting paper on the back of the paper. It goes without saying that the ivory board provides the guide for the movement of the thumbnail. If you want to use this method, you have to practice often beforehand, because a certain amount of expertise is indispensable. This process, too, is entirely a matter of sensitivity. If you press down too hard, the paper can easily tear.

I do not consider it advisable to indent the plate mark from the front with the aid of a bone folder. Small additions to the plate mark, however, have to be indented from the front with a bone folder. That is the case, for instance, when a tear that runs through the plate mark has been mended. In this case, too, blotting paper has to be placed between the tool and the material to avoid shiny places. The blotting paper should be narrow so that the plate mark remains easily visible on both sides.

The plate mark often runs close to the image. In this case, too, a pattern has to be made, or you can proceed as follows: Put a sharp-edged ruler without bevel or a metal ruler on the table. With the print lying face up, place the margin of the sheet far enough beyond the edge of the ruler so that with your fingertips you can fold the plate mark over from the front. One side is now folded over. However, be careful not to fold the side margin over all the way; stop shortly before it joins the other plate marks. The paper can now be taken in the hand and the side margin folded over sharply. The paper is placed on the table, and the folded-over side margin is rubbed from the front with blotting paper and bone folder. To create rounded edges, *Marienglas*[115] or transparent oiled paper is put on the front and the corners are pressed through this layer.

In individual cases certain subtleties in the plate mark have to be taken into consideration; these will not be mentioned specifically here. You have to be attuned to or look for all the special features of the original plate mark and try to put them, as if by magic, into the artificial plate mark.

Although the back of a paper will always show that a margin has been added, you still want to tidy up the front somewhat, and the artificial plate mark plays an important part in that.

THE STRETCHING OF PRINTS[116]

Stretching requires the following materials: drawing boards in assorted sizes, smoothly planed wooden boards, strong glass panes, stone board,[117] also glue, starch paste, and guards of varying widths and strengths.

When the stretching is done on polished, painted, or smooth supports, one should definitely apply starch paste to the guards, since guards spread with glue can easily become loose. In such an instance, a 1 mm wide border of glue is applied to the guard, which then has to be half covered with a second guard to secure it after the sheet is on the stretching board.[118] The rest of the guard is then firmly rubbed down onto the smooth support.

By "guards," I mean narrow strips of paper, about 1½ cm wide and about 50 cm long. They have to be nonabsorbent and as pliable as possible. The strength of the guard papér can vary. In time, you will discover the most appropriate kind of paper. You can also use packaging tape, which has a strong adhesive and is now being sold in rolls, if you work on matte-surface stretching surfaces, for example, drawing boards. The guards can be cut to any length you choose and moistened with a damp sponge. Since these rolls of gummed paper come in different strengths and widths, it seems appropriate to have a small supply of different widths and strengths on hand for a variety of applications.

Glue has to be applied in liquid form and very hot. Get an appropriate container so that the glue does not burn. The glue pot has to be surrounded by hot water so that the strength of the glue is not diminished by burning. Use only the best glue. Cakes of glue are chopped into small pieces and are put into cold water during the day. Glue in the form of beads or small tablets is even better. To start, put the pieces of glue into a container and pour enough water over them so that they are well covered. Over the course of a few hours, stir the glue in the cold water several times so that the particles of glue do not stick to the bottom.

The stretching of etchings has to be practiced often. The degree of dampness necessary for stretching is of utmost importance. If a paper is stretched when it is too moist, either the plate marks can disappear, in other words, the tension of the paper can pull the plate marks outward and flatten the paper, or the plate marks can open up, that is, tear and thereby endanger the paper. Creases in the image, which might have been caused by inept preparation of the paper during the printing process, can be pulled apart during moist stretching. Conspicuous white areas will appear in the print and will be obvious because of their precisely defined edges.

A number of questions arise before one stretches a print: When is the paper ready for stretching? When it is more than half dry. The semidry state of the paper makes one wonder, will it really become flat? Is it not too dry?

If these doubts are realized, the mistake is less severe than if the paper were moistened again for stretching. A paper is never in danger as long as it is half moist and is watched carefully. When a paper is stretched onto a drawing board, it should not lie flat as a board immediately but should still show some undulations. These undulations—let us say, wavelike prominences—should be in the center of the paper, never at the edges. If the undulations extend from the center of the paper to the edges of the margin, the sheet will not become flat. You will have to take it off the board and moisten it again. Moistening is best done with a flat bristle brush. A print without hand coloring has to be dampened until it can no longer hold water. Then it is allowed to dry off a little in the air. It is best for the paper if it dries slowly. If you try to get the sheet to dry faster by applying heat, the drying process will be uneven. This has to be avoided. If a sheet dries faster in some places, these places have to be covered by paper or have to be lightly moistened again. This will be the case with areas that have not been restored. You can recognize the dry parts immediately by holding the sheet against the light, since they appear somewhat darker. Additional moistening is best done with a sponge that has been squeezed out, since the paper is supposed to be dampened only slightly. The paper should not be rubbed but should only be dabbed lightly with the slightly damp sponge. If the sponge is more than slightly damp, the paper could be damaged in many ways, especially if you are dealing with soft paper. Rubbing would cause tiny clumps of paper fibers to come off, which, of course, would make the paper thinner.

Monochrome prints that have not been bathed in water have to be saturated fully before stretching, to avoid the formation of water stains; discoloration will often be present, even though it is not immediately apparent. The side margins, where the glue-covered guard has to be applied in various stretching processes, should be practically dry. It is the center of the sheet that has to be slightly moist in order to make it stretchable. The hardly noticeable dampness that still exists in the margins is sufficient for the sheet to become flat during the stretching process.

I repeat once more: The right degree of dampness is essential for the stretching process. According to its quality, paper will stretch more or less. Paper can be stretched up to 3 cm, depending on the size of the sheet. The expansivity of the paper has to be taken into consideration when it is stretched.

To determine the expansivity of a sheet, you have to measure the sheet when it is dry and again when it is wet. If you stretch a sheet while it is very wet and attach it to a drawing board in such a way that it cannot move, you will be surprised to see how the paper behaves. At the beginning of the drying process, the paper tries to contract to its original size. The stretching force works in proportion to the disappearance of the moisture. Often the tension of the paper during the stretching process is so great that the sheet gets damaged. The plate marks open up, and perhaps—even more damaging—the sheet tears completely in response to the tension.

If you stretch a damp sheet under glass or on cardboard, the glass or the cardboard has to be able to curve outward.[119] If the curving of the glass becomes too pronounced, the pane will crack. These examples show how important the correct degree of moisture is for stretching.

Large prints have to be stretched under glass. To prevent the glass from bowing too much, the stretched print can be put into the frame immediately but should not be nailed in or covered with a cardboard backing right away![120] The sheet could take on a mildewy odor, and there is also the danger that foxing will develop. After being stretched, the sheet cannot be stored upright (standing) but has to be kept horizontal (lying) for a while. In this position it is easier to observe sheets and to take a number of precautions.

Plate marks and restored places need to dry faster. To make this possible, the areas around the plate marks or the mended areas can be covered with paper, or these areas can be dabbed lightly with a sponge. If the plate mark dries later than the surroundings as tension develops, the plate mark will lose its character, which will lessen the attractiveness of the print. This should never happen. The sheet dries more evenly when it is stored horizontally instead of vertically. In the latter case, the moisture goes downward and endangers the plate mark. Breaks, creases—even printer's creases—can be rubbed down more easily when the sheet is lying flat; and, if necessary, you can easily remoisten the healthy parts of the paper with a sponge if they dry too soon. Before stretching a print, look for printer's creases. These creases have to be put on top of a torn piece of absorbent paper so that they do not open during the stretching process. I emphasize once again that you will have to use torn paper; paper strips with straight, cut edges would stand out on the front because of their hard edges.

If for some reason it becomes necessary to remoisten a stretched print, do not wipe or rub the printed side with a sponge. First, test to see whether the print gives off color. Some prints have too little oil in their colors or were previously treated inexpertly—for instance, had dry chlorinated lime sprinkled on them or were treated with chlorine water while dry—so that the colors can come off and soil the paper when you wipe them with a sponge. As a test, find a dark place in the print and rub a clean finger over it. If only a slight trace of color transfers to your finger, the color might simply be deficient in oil, not damaged from unskillful treatment. If the print gives off more color, then I would advise you to merely dab it with a moist sponge.

Prints colored with aniline dyes, especially engravings from the end of the nineteenth century, should not be moistened in the same way because the colors are guaranteed to run. On the front the margins are moistened up to the printed image so that no water stains form because of any slight yellowing of the paper. The back is moistened completely but lightly. The sheet is then left to dry. Before the stretching process, the back is lightly moistened once again.

Small prints especially have to be carefully watched during stretching. They are often printed on soft paper and therefore show distinct plate marks. To find the correct degree of moisture of these sheets, experiment first with prints of little value. A moistened plate mark, if weak, has to be supported by thin paper. Repaired places may be saturated with water, but if the repairs are extensive, they will have to be pressed down occasionally with blotting paper and a bone folder before stretching.

One other question: Is it always

absolutely necessary to stretch a small print? Stretching is done as a matter of course when the sheet has undergone major repairs or shows creases, breaks, broken corners, and so on.

Unfortunately, the previously mentioned expert gave the following advice in 1929: "Sheets that should not be stretched, but show breaks, creases, and so on, can also be flattened with an iron." I warn you never to use an iron in the workshop of a restorer of engravings! I committed this folly once when I was a boy of fifteen, and never again. Nothing damages the print, but above all the paper, more than intense warmth, let alone heat! I have mentioned this danger in several places in my book.

If you want to remove small creases or breaks without stretching, the weak or frail places have to be strengthened with a light gelatin solution. Dip a small round bristle brush into the warm solution and apply it to the back of the fragile places. The entire sheet is then moistened with a sponge, and the gelatin treatment is repeated on the damaged places on the front. After the sheet has dried somewhat, the creases or breaks are pushed out as much as possible from the back with blotting paper. This task is performed on moderately hard cardboard. If the print is comparatively flat (there should not be any big buckles), moderate weight can be put on it. If you have available some large, heavy books that cover the entire print, put the sheet between blotting paper and use two or three of the books to apply weight. The moderate pressure will prevent the plate mark from disappearing. If you were to start out with a heavy load or put the engraving under a press, the plate mark would vanish. After two or three hours, renew the blotting paper and double the load. However, it is advisable to rub down the brittle or fragile places once more before this additional load is put onto the sheet.

If an engraving with creases or breaks is stretched on cardboard or a drawing board, the creases and breaks should be saturated with sizing solution. The small creases and breaks are rubbed or pressed as soon as the real tension starts.

The following hints should also be taken into consideration: Never try to flatten a sheet when it shows buckling while being stretched. This [buckling] is actually necessary. It is a grave mistake to think that you should pull on the sheet from the sides. Pulling would change the plate mark and make it look curved. This cannot be done. Like all restoration processes, stretching has to be carefully thought through in advance. A sheet needs at least one hour, often three, to become flat. It sometimes happens that a sheet needs eight to ten hours if the paper is very soft or if the print is mounted. It is hardly worthwhile, therefore, to stretch a sheet shortly before the end of a workday, because you cannot observe the drying process. However, if the sheet does have to be stretched, it must be covered with a clean cardboard or a double layer of blotting paper. The sheet can then dry in peace. It would also be good, to safeguard the sheet against any eventuality, to put a doubly thick layer of paper on the area surrounding the plate mark. If the sheet were mounted shortly before the end of the workday and were not to be stretched until first thing the next day, it would have to be prevented from completely drying out. It would have to be covered with moist blotting paper and several pieces of clean cardboard. The sheet would then still have the necessary degree of dampness for stretching.

If one time you would like to investigate the expansivity of paper when it is being stretched, try the following experiment. Make two small cuts in each of the four guards. You should observe a certain sequence when cutting the guards. The cuts should be performed on opposite guards; you can see right away how the cuts widen. Of course, the sheet gives at these places and starts buckling. And the plate mark, too, loses its straight line.

I would also like to mention that stretching small repaired sheets that need more retouching should be done on a glass pane. It is easier to observe the depth of the retouching, therefore, the effect of the color, when you are occasionally able to lift the paper to the light during the course of the work.

After having discussed the preparations and the most important considerations for the stretching process and after having listed the materials necessary for stretching, we can now take a closer look at different stretching procedures.

If the margin of a sheet is wide and can be reduced somewhat without changing the overall impression [i.e., appearance or aesthetic effect], for stretching, it should first be laid with the printed side down, in such a way that the edges of the sheet extend 1 to 2 cm over the right and bottom edges of the cardboard. Glue, hot enough to run off the brush easily, is applied thinly to these two edges over an area of 2 to 3 mm wide. As soon as this has been done, the sheet is rotated and the other two edges are also brushed with glue. Next, take the sheet in both hands so that the right hand grasps the nearest right corner and the left hand the nearest left corner and lift up the sheet. You have to go well toward the center of the sheet with your fingers so that you do not touch the glue-covered edge. If the sheet is lifted according to instructions, the glue-covered edges will be on the side away from you.

When you are ready to take the sheet to the stretching board, first lay the sheet against your chest, that is, against your clean smock. Now let go with the left hand and grasp the lower left corner. Lightly swing the sheet away from your body, holding it with your hands, and the sheet will assume an arched shape.

This last procedure can be performed in other ways, and you can decide which way you find more convenient. It is even possible to immediately obtain an arched shape by grasping the upper right corner with the right hand, the lower left corner with the left hand. Just lift up the sheet and turn it with a slight swing—the glue-covered edge will be on the outside and the sheet will be curved. You must attain this arched shape. It is then possible for the sheet to touch the support first only in two places. When the other parts of the engraving are lowered, the correct position is found by skillfully adjusting the sheet. It is important to mention that in this method of stretching, the glue-covered edges of the margin are sacrificed because, as a rule, they are cut off after the stretching process. There are exceptions, for example, a support for stretching, to which the sheet is supposed to remain permanently attached. As soon as the sheet is positioned the right way on the stretching board, the edges are rubbed down firmly with old blotting paper. Describing this stretching procedure is more complicated than the actual performance. This procedure can actually be done quickly and easily.

Another possibility for stretching that involves the use of guard strips is mentioned now. To retain a full margin, which is definitely better, guard strips are added; that is, the margin is extended by a guard strip. Narrow lines of glue, approximately 1 mm wide, are applied to the guard strips, which are attached to the back of the sheet so that the part of the guard strips without glue extends beyond the sheet. The sheet is laid onto cardboard in such a way that it projects on the right and on the bottom for 1 or 2 cm. After that, half the width of the projecting guard strips is covered with liquid glue; the guard strips on the other two edges are placed in the same position so that they, too, can be covered halfway with glue. After this is done, the sheet is lifted up and the remaining process is performed as previously described.

I want to mention yet another method of stretching with the aid of guard strips. When the sheet has reached the necessary degree of dampness, it is put on the stretching board with the back side down. The printed side is always facing upward during this procedure. From a roll of gummed packaging tape, cut strips of the length required for stretching and use them as guard strips. Moisten the gummed sides with a damp sponge and affix them to the edges of the sheet, to a width of 2 to 4 mm, depending on the width of the margin. The rest of the guard strip is attached to the stretching board.

When dealing with smaller engravings, especially Old Masters, you have to use a completely different guard strip. In this case, the narrow guard strip consists of a kind of tissue paper. You often find this paper, which has the same wire lines as the stronger handmade paper, in old books, in which it is used to protect engravings. Cut strips 1 cm wide and about 20 cm long; thinly coat one edge of the guard strip with a somewhat stiff starch paste and position this narrow guard strip carefully on the back of the sheet. Immediately after positioning it, rub the guard strip down with blotting paper and a bone folder. After the narrow guard strips have been attached to all four sides of the sheet, the sheet is put on a glass pane with the back side facing down. Ordinary guard strips are then coated well with starch paste and are attached, half to the narrow tissue guard strips and half to the glass pane. These ordinary guard strips must be pressed on securely with your fingers and, after a few minutes, with blotting paper and bone folder. You must be careful not to dislocate the guards when rubbing them and thereby endanger the print. The stretched papers stay in an unheated room until they have dried completely and can then be brought into a warm room. Never place a stretched engraving near an oven or central heating unit to accelerate the drying!

Stretched papers should not stay on stretching supports for weeks. Unless major retouching has to be performed, take the sheets off the supports within forty-eight hours. The rest of this paragraph describes how to do this. The stretched sheet has to be taken off carefully. The sheet can be easily damaged in the process unless this work is performed with the utmost caution. First, very near to the edge of the picture, make a small incision in the guard, through which the knife can be inserted easily (see fig. 34).

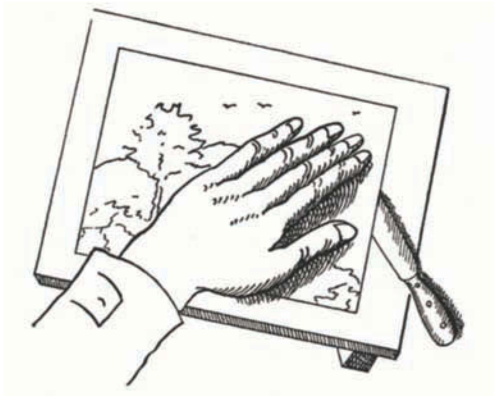


Fig. 34.
Cutting a sheet off the stretching support

Put your hand flat on the paper at the place where the cut was made. The hand has to continuously follow the knife while the guard is being cut open. If you do not put your hand on the paper but just try to cut with the knife, the stretched sheet could develop creases when the tension lessens and the sheet could be damaged by the knife. The pressure of the flat hand is only a precautionary measure. After the sheet has been removed from the stretching board according to the instructions, working from the front of the print, immediately cut off the projecting guard with scissors so that the sheet does not get distorted. Now, with the back side facing upward, the sheet is put on a smooth support. The remaining part of the guard still has to be removed from the back. To do this, place a smooth, clean, dry cardboard on the back of the paper so that the narrow remnant of the guard projects at least a centimeter or two. Carefully shave off the remainder of the guard with a restoring knife. The cardboard serves as protection. If you do not put down the cardboard, your warm hand, resting on the paper for a long time, will create buckling. After the remainder of the guard has been shaved off, the sheet is covered with cardboard so that it can recover further. Finally, it can and must rest.

THE STRETCHING OF DRAWINGS ON STRETCHERS OR STRAINERS

One cannot consider stretching engravings on stretchers and strainers.[121] If larger decorative drawings or blank sheets need to be stretched on wooden frames because they are going to be colored, it is advisable to attach a durable support sheet first. If this sheet is covered with a solution of aluminum subacetate and gelatin, the stretched drawings will have very effective protection. The moisture content of the paper should not be too high for stretching in this case either, because otherwise the frame will become distorted. The drawings are stretched only after the support sheet is completely dry.

If the support sheet is 3 to 5 cm larger than the frame, the following procedure is applied. Put the wooden frame on the support sheet, and apply hot glue to the projecting border [of the paper]. Before the glue is applied, this sheet should be cut diagonally at all four corners. After this, fold the projecting edges of the sheet upward, bend them over the [back of the] frame, and press them down firmly. If when folded over the edges do not cover the sides of the frame completely, glue broad strips of the same kind of paper over them. This will prevent the frame from getting distorted in the event that the support is too moist. After the support has dried out completely, you can also stretch a sheet over the entire back. This creates a closed space that is bordered by the two sheets and the four sides of the frame. Such an enclosed space would promote the formation of foxing if the sheet in the back were put on too moist. To avoid this danger, either you have to make absolutely sure that the sheet has been put on as dry as possible or you have to cut out three to four round holes, the size of a penny, for ventilation. After a while, when the sheets or papers have dried completely, these holes can be closed with a patch. The support is supposed to give the sheet additional strength and, as much as possible, to guard against damage. The second sheet on the back offers further protection and prevents the frame from becoming distorted.

RETOUCHING

Retouching always comes at the end of a repair. Very often a sheet has to be retouched even if it has had only a little local cleaning. There may be, for instance, unsightly foxing, which had to be treated a little more harshly, or a water stain, which left a faint ring, or some fly blow, which had to be taken off with a knife, and so on. In such instances, of course, a little touch-up is necessary.

Retouching is "work of the eye"; that is, you must look at the surrounding areas and mix the color accordingly. In the beginning a simple paint box with watercolors is sufficient, to which Chinese watercolors in solid form are added.[122] If you want to use Chinese watercolors as liquid paint, you must dip them in water[123] and rub them on something rough. You can mix them with ordinary watercolors, however you wish, if the color of the print makes it necessary. Before starting the retouching, you have to examine the mended places. Make sure that a tear that runs through the print does not have any raised places. Retouching is immediately visible if all irregularities have not been removed first. An expert takes this into consideration before he performs the repairs. However, sometimes if the restored area is large, it is impossible to remove all irregularities right away. The edges of a tear stand out a little more clearly when the restored sheet has been moistened and dried again, since dampness activates the paper. An insignificant swelling of the edges of the tear becomes visible then. The new raised spots are carefully shaved off with a sharp knife. After this shaving, the spots are sized with a weak gelatin solution.

A trained retouching artist and painter must be able to work well even on blotting paper. Of course, this is not an easy task. In addition to other skills, a light hand is important. This kind of work is not done with a pen but with a fine, well-pointed paintbrush. If you use a pen, your hand has to be so light that it just glides like a breath of air. As I mentioned before, any pressing down would damage the delicate surface of the paper and make the color run. There also would be ugly traces on the back. Of course, these mistakes should not happen.

For practice, I advise you to take prints as models and to copy individual portions in minute detail. You must practice precise copying, so it is inadvisable to draw indiscriminately. Eye and hand quickly become too willful when you try to sketch out line drawings freely on blotting paper or stronger sheets. It is easier to work freely than to follow a model. Greater attention is required for copying, and eye and hand become steadier. An individual's touch should never be recognizable in a work, or it is not a restoration. A restorer "restores."[124] In our field one may not create the new but brings the old into order.

A restorer of paintings has to recondition a painting in which a layman has taken off the varnish while practicing and has destroyed color and outline. In such a case, the expert works according to his own instinct, since paintings are one of a kind. Engravings, however, exist in several copies, and you have to obtain another copy or a photograph to restore everything that is missing.

I repeat once more that retouching is eye work. You have to teach your eyes to look closely. How often one thinks that everything is just one black color. Surely, the printer will not have used much of a mixture, but time, dear time, has been busily at work. If you have a skillful hand and an eye that can see and are able to adapt easily, then success is certain. There are no other hints I can give here, since each task will be different.

The back of repaired engravings will also have to be retouched in many instances, because it is not always possible to find matching papers, and the back [of a print] and the mends have to correspond to each other.[125]

I would like to emphasize once again that cleaning, mending, and retouching should only be undertaken by an expert of the highest order who is skilled in these tasks. This kind of work requires a certain amount of intuition and cannot be explained in detail. You have to familiarize yourself with your work. Many things have to be taken into consideration so that a mistake of a minute or two does not destroy the work of days.

The Spraying Method

Order an 8 kg bottle of carbon dioxide from a carbon dioxide factory, a mineral water factory, or a restaurant. This bottle should last for several months if it is sealed properly. You will also need an airbrush (with a cup to hold the liquid color), a pressure gauge (manometer), and a hose. Carbon dioxide is easy to handle; there is no danger involved for the user. I have been working with it for about twenty years, and I think it is appropriate now to report on my experiences.

When the apparatus is set and the cup is half full, press the little lever on the airbrush, and a fine stream of color will come out. If you want to increase the stream, just keep pressing down the lever. There is also a small device for regulating the spray if you want to use the same strength for a longer period.

Before you start to work, some templates, or cutouts, have to be prepared to cover the white paper margin. If sharp contours have to be restored in the sheet, you have to use a cardboard strip as a mask so that the thin stream creates these sharp contours. Since the stream can be well regulated, I think it is advisable to use the airbrush at a certain distance from the picture—10 cm will definitely be sufficient. The smallest and most delicate places can easily be touched up. For larger areas in the print, a greater distance is recommended. When using the spraying device, you will be able to see for yourself how far away the apparatus has to be held. The coloring is done when the sheet is dry.

Any mezzotint whose splendid colors have been damaged, have faded, or have suffered from rubbing or other circumstances can be restored this way.[126] If you know how to handle the airbrush in a masterly fashion, you will achieve excellent results. Even the transition from distinct to diffuse forms or vice versa is performed easily.

Only a mezzotint can be totally reconstructed this way; such complete restoration is not possible for other tech-

Fig. 35.
Lieutenant Colonel Tarleton, English School, 1782, mezzotint by J. R. Smith. Print before retouching.[127]

niques. The stream that leaves the airbrush can only work on surface areas; it cannot strengthen pure lines and points.

The apparatus can be used for many other retouching purposes. If a cleaning process has been too vigorous because the sheet was heavily soiled, coloring can be performed from both sides, even if only locally. The margin, which is especially important in this case, can be worked on several times. If you are dealing with a single sheet, after the overall coloring, the edges of the margin can be gone over several times without a template, so that a harmonious transition to the rest of the margin is possible.

Restored places on the reverse of the sheet can be colored especially well with the spray method.

Etchings often show a plate tone, which can be applied only by the spray method. I would like to repeat here

Fig. 36.
The same picture after being treated with the spraying method

that an extensive mending job can be retouched successfully only if the mending paper was examined for lightness before its actual use. Depending on the coloring of the retouching later, the paper has to be somewhat lighter when held against the light. If the paper in every way matches the original paper before retouching, it will become too dark after retouching. This should not happen.

The paint used for coloring has to be well settled; there should not be any extraneous particles or small hairs in it. To color the printed areas, take black from a watercolor paint box and mix it, perhaps with another color, until the exact tone is obtained. The color base for the margins is tea, to which other colors from the paint box can be added. It must be observed that coloring is not done in a single process.

After coloring, the airbrush has to be cleaned. This is done best by immersing it in clear water until the basin is filled. Press the lever, and let the clear water run through several times. Afterward, dry the apparatus with a woolen rag. It is also a good idea to take the apparatus apart completely from time to time. Unscrew all the parts and put them down on the table in the right order so that they can be reassembled in the same order. The small leather gaskets, which are put on in such a way that they are hard to see, have to be replaced with new, soft leather now and then. To cut the rings, take the leather in your left hand and turn it toward the scissors. The scissors stay in the same position. (You do this in the same way that an engraver guides the copperplate with his left hand when engraving a line.)

Assembly [of the Airbrush]

Assembly is very easy. First, unscrew the cap of the carbon dioxide bottle, then the brass screw, which is recessed about 5 cm below the head screw. Put both parts aside. They will be needed again when a new bottle is ordered. Take the hose and attach the tip, which will receive the airbrush, to one end. After the tip has been inserted and secured, a wire clip is added so that no carbon dioxide can escape. The other end of the hose is attached to the foot of the gauge in the same way. Firmly screw the gauge into the orifice of the bottle at the place where the brass screw was located before. After this, the valve screw of the bottle is turned a little to the left so that the carbon dioxide can go into the gauge. The tap of the gauge is opened a bit, and the carbon dioxide enters the hose. Depressing the small lever now will cause a thin stream of carbon dioxide to be pushed through the airbrush. The assembly is complete. (If there is any extraneous noise—carbon dioxide escaping—the parts have to be tightened again.)

If you can obtain a spraying device with a motor, then, of course, you do not need a carbon dioxide bottle. The apparatus can be attached to the motor.

The Pencil as Retouching Tool

A sharpened pencil—you should have different degrees of hardness at hand—is useful for a number of purposes. Above all, it helps to eliminate minor damage, especially when faint tones (plate tone) have been rubbed off and white areas of paper have become visible here and there. Crayon lithographs, too—they consist of countless black dots—can be touched up beautifully. Rich, heavily printed images, however, have to be retouched with a paintbrush or pen. On steel-plate proofs a pencil can often be used successfully when the abraded areas are not too large. To what extent such damages can be touched up with a pencil is a matter of sensitivity. The pencil, at any rate, is a good retouching aid.

Removal or a slight lightening of the retouching can be done with a soft eraser. To reduce the sheen somewhat—as seen at an angle—moisten a fingertip with warm water and dab the retouching with it. A very soft but finely sharpened pencil hardly leaves a shiny spot. Frequent sharpening is highly recommended.

THE TREATMENT OF CHINA PRINTS MOUNTED ON COPPERPLATE PAPERS

Engravings in black ink, printed on China papers, and mounted on copperplate papers can be well saturated with water. If little blisters start forming on the China paper, they have to be pushed out from the center of the paper to the sides with the aid of blotting paper and a bone folder. Blisters are removed only when the sheet is half dry. When rubbing the blisters, be careful not to harm the soft paper. Do not rub too forcefully. If the China paper becomes detached from the sheet or falls off, the task becomes a little harder. In this case, proceed as follows. Put the dry China paper on a clean, smooth, square table. The distance from the edge of the table to the edge of the China paper has to be such that the copperplate paper, after being moistened, fits exactly when it is later rolled over onto the China paper. That is, the plate mark has to frame the China paper equally on all sides. The distances are marked on the table. Then, if the China paper—it is positioned with the reverse side facing upward—gets slightly dislocated while it is being moistened, it can be brought back into the previously marked space. For saturating the sheet with water, a broad flat bristle brush is used. The brush is moved from the center of the sheet to all edges; it is frequently dipped into the water; in addition, a little water is poured on the China paper, and all blisters and creases are removed. The China paper is then positioned along the marks and dried thoroughly with blotting paper. This task, too, is done from the center, and the edges are treated with special care. The edges are dried, and the blotting paper is changed, lifted up from the center, and pulled off.[128] The blotting paper should not be lifted from the sides because traces of glue [on the China paper], often not even perceptible, could stick to the blotting paper and damage the margins. After the China paper has been dried well, moisten the table 5 to 10 cm around the China paper. Cut some strips of wrapping paper, smooth and not too thick, and push them 2 to 3 mm under the China paper. The wet border prevents the strips from moving when the China paper is brushed with a runny starch paste and does not allow the paste to get on the table. The starch paste is applied evenly everywhere. The best way to do this is to spread the paste from the center of the paper to all edges. Any impurities from the brush have to be removed after the application. The strips of wrapping paper are carefully taken away. The China paper, thinly covered with a layer of paste, is now positioned within its markings.

Before the China paper is treated, its support must be dampened well on both sides, blotted, and evenly rolled up. When rolling up the support, make sure that the front faces outward and that the rolling is done so evenly that no edges project. The rolled support is put flush against the lower edge of the table.

Do not completely unroll the support on top of the China paper right away; unroll it only as far as the edge of the China paper. Make sure that the plate mark frames the China paper evenly, and if it does, the support can be carefully unrolled over the China paper. If the side margin does not frame the China paper evenly, the support has to be shifted by deft movements back and forth in such a way that it fits properly. Of course, the distance from the plate mark to the China paper has to have been measured beforehand. If you have a helper, he can expedite the process by lightly pushing

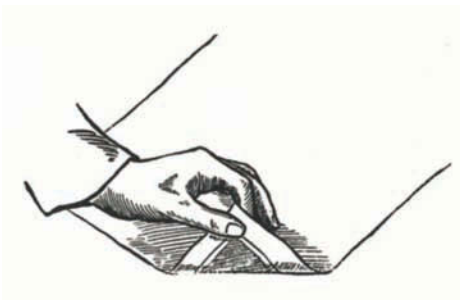


Fig. 37.
China paper lifted up diagonally from one corner[129]

the support down. He has to follow the process closely and always rub down the last piece of support unrolled, going from the center to the sides. For this, two to three sheets of blotting paper are put on the support. Then, using several pieces of blotting paper, press the support down firmly onto the China paper with a flat hand. After this, slowly lift one corner and make sure that the China paper is firmly affixed to the support. If the corner of the China paper stays on the table, the corner has to be put back and, after a little while, pressed down again firmly with blotting paper. The lifting should be successful now. Lifting is a feat in itself. You cannot lift the support parallel to one of the sides of the corner of the support but have to lift it diagonally from one of the corners (see fig. 37). As you lift further, you have to perform a rolling motion, curving the lifted corner downward toward the back of the support while continuing slowly to pull up the support with the attached paper. If there are any holes or tears in the China paper and you come to them while you are lifting the support, the support has to be pressed down firmly once again at these places. If there is only a single large tear in the China paper, it is advisable to start working on the corner opposite the tear; that is, first lift the side that is not damaged by the tear. This way, the tear will not cause a problem because it will be lifted first not on its open end but on its closed end.

If the work progresses satisfactorily, the paper is placed on clean cardboard. Now an attempt is made to close tears or other damage in the China paper. This work is done with the fingertips. Try to close the narrow opening of the tear by drawing together the edges of the tear without lifting or damaging the dampened China paper. The tear has to be slowly drawn together in a lateral direction by lightly putting the fingertips on the China paper.

If the support paper is soft, it should first be laid diagonally over a tube pole. Later, it should be laid onto cardboard, and the China paper should be firmly pressed down from the front with blotting paper.

I would like to briefly mention another method that can be used with small China papers. Put the moist paper, including the support, on the pane of glass or the table, and proceed as follows. Let the China paper and the support float in a tray with only a little water. The support is under the China paper, which is facing upward. Try to adjust the China paper by pouring water over it so that it is positioned correctly on the support.

Before the sheet is lifted out of the tray, the water has to be drained carefully. Gently press the China paper and the support with your fingers so that they do not change their position. Lift up the paper with the support, put it face up on a pane of glass or on the table, and cover one-half with a white, nonabsorbent sheet of paper. Carefully lift the uncovered half of the China paper and fold it back onto the white sheet. Brush soupy starch paste onto the half that has been folded over.

After this, carefully lift the China paper off the white paper, and have an assistant insert a clean rod under the lifted part. Take hold of the rod yourself, lift the pasted half of the China paper carefully and calmly from the white paper, and return it precisely into position on the support. This part of the China paper now has to be rubbed with blotting paper, while you watch for the development of little bubbles and creases. The other half is treated the same way.

You can also use a broad strip of paper to lift China paper, placing several centimeters of it underneath.

If the support sheet for the China paper is so heavily damaged that it must be entirely replaced, the work is considerably easier because there is no plate mark to take into consideration. The preparations are the same as for the various other processes mentioned. As soon as the support sheet has been rolled over onto the China paper and the print stretched and dried completely, the plate mark is pressed in from the reverse. To do this, the sheet is held against the light so the China paper becomes visible. Small marks are drawn onto the reverse side, where the plate mark is supposed to be formed. The sheet is placed on cardboard and a ruler put to the markings. The plate mark is pressed in with a bone folder. The rounded parts of the margin are done freehand.

The pressing of the plate mark has to be done with great precision. The ruler guiding the bone folder should not be allowed to slip. Above all, the pressure of the hand should not be so strong as to damage the paper.

THE TREATMENT OF MANUSCRIPTS

The mending of damaged manuscripts, documents, letters, and similar papers is performed in exactly the same way described for engravings. Shaving may be done only to a maximum width of 3 mm. If a tear runs through the writing, no more than a small amount of shaving may be performed in the spaces, and these areas have to be thinly covered with a paper of matching color. If there is enough clear space at the edges of the tear, these places have to be carefully shaved and mended. The paper has to be moistened cautiously, and, of course, only the parts without writing can be treated. In many instances, the ink or pigments used for writing do not meet requirements that we have today. They are in part water soluble, but in most cases they dissolve when treated chemically. Before any treatment it is a good idea to test to see if the ink is permanent. It is obvious that a letter should be first cleaned with an eraser. Rarely would I suggest cleaning chemically, and even then only if it would not affect the writing. There are remedies that can revive the remaining traces of writing in ink, but I do not want to mention them because I consider it very dangerous to treat autographs chemically. It should not be done!

When a letter is creased, I recommend the use of a weak gelatin solution. Since a letter should be made to look like an original, it has to be skillfully folded after pressing.

THE TREATMENT OF PRINTS ON PARCHMENT

Dusty and dirty parchments without any coloring can be put into clear water for cleaning purposes. The parchment is cleaned with a flat bristle brush. Press down a little with the brush when treating areas without printing. Do stay away from warm water, though, because the parchment will shrink. To prevent the parchment from rolling up in the bath, weigh it down with filled bottles. If heavy stains have to be removed, I suggest only the use of chlorine water, because hydrochloric acid can easily make the parchment transparent.

Painted parchments have to be treated from the reverse first, to make them soft and pliable. For this purpose I would suggest using no other means but clear water. The work is done on a table. Place the parchment with the back facing up, cover it with moist cloths and then with a flat board or a strong glass pane. After a while, sprinkle a little water on the cloths to keep them evenly moist, and repeat this procedure several times.

When the parchment no longer tends to roll up, the colored front can be treated. The chemical treatment of uncolored parchments is followed by the previously mentioned chlorine antidote, whereas colored parchment can be treated only locally with the antidote.[130]

So that you do not endanger the colors when flattening a painted parchment, put a wide, flat frame on the parchment, to cover much of the margins. When this is done, it may be that the frame will cover parts of the painting. Naturally, this should not happen. In such a case the parchment should be put on a drawing board or a flat tabletop, and thin paper strips that extend over the edge of the parchment should be placed on top of those places on which the frame cannot be put. The protruding part of these paper strips is fastened to the board or table. Thumbtacks are inserted in such a way that they do not make holes in the parchment but have one-half of their heads covering the parchment.

After this is accomplished, a smooth board is put on top and weighted with books or cardboard. The air space created is sufficient to permit rapid drying. Since parchments are of varying strength, you have to allow between six and twelve hours for the parchment to dry enough to be stretched. Parchments sometimes need twice that time to become ready for stretching. Stretching requires a great deal of attention. Even if a plate mark does not have to be taken into consideration here, the particular degree of moisture is of major importance. It is better to stretch the sheet when it is somewhat drier rather than when it is semimoist. A sheet will readily tolerate being remoistened once it has been stretched. Dab it with a semimoist sponge as needed. As with engravings, a guard is applied for stretching. The guard used has to be a little stronger than for engravings, and the area to which glue is applied has to be wider, about 2 to 3 mm altogether. If the parchment has been stretched on a drawing board, I would recommend adding a broad guard to the front. The guard should be wide enough to overlap the parchment in the same width as the guard attached to the back and to extend onto the board 5 to 10 mm. The adhesive for the second guard is starch paste. After the parchment has been stretched four to six days, it is cut off the stretching board and put between pieces of straw cardboard.

THE CHEMICAL TREATMENT OF PAINTED RICE PAPER

Chinese rice paper[131] is exceedingly fragile. If it is not treated skillfully, it can crumble like puff pastry. It is therefore advisable to use the utmost caution. Painted rice papers are usually glued at their edges to chalk-filled cardboard,[132] and difficulties can begin even when they are being loosened. They have to be loosened with a flat shaving knife. The knife is steadily moved forward between the paper and the edge of the cardboard while being pushed down onto the cardboard. If this process does not yield the desired results, and provided there is no coloring nearby, the front of the glued edge is moistened with a soft paintbrush that has been dipped into water. After being loosened, the sheet will be buckled. Hydrogen peroxide is applied carefully to the area around the coloring. Especially strong foxing is first treated locally with chlorine water, as usual. If the stains have faded considerably after further local treatment, one should be satisfied with the work. Of course, a chlorine water treatment can be used, too, but it has to be done skillfully. Chlorine water is more inimical than hydrogen peroxide to areas colored in reddish tones and colors mixed with brown. After the chlorine treatment, the affected areas are dabbed with clear water and the familiar antidotes. The sheet is left out in the air to dry a little. Once the sheet is semidry, it is turned with the back faceup. With a paintbrush the back of the colored section is brushed thinly with clean water. When the water has evaporated a little, the local dabbing is repeated. Under no circumstances should this dabbing soften the colors! If the cockling on the back of the color section appears to resemble that of the cleaned parts of the sheet, the sheet has been moistened evenly. It is imperative to carry out this moistening evenly.

To flatten the sheet again, proceed as follows. Put the sheet between two smooth pieces of blotting paper; watch that there are no small bumps in the paper or the pressing boards, and weight the sheet down with heavy books. After half an hour, replace the blotting paper and weight the sheet down with the same load. This procedure is repeated three or four times so that the sheet gradually returns to its original size. After three to four hours of drying under weights, the sheet—without blotting paper—is placed between smooth pressing boards and weighted with a heavier load, or it is put with the pressing boards into a press, which is slightly tightened. After the sheet is pressed for twenty-four hours, it will be smooth.

If tears have to be treated, no shaving should be done. Just put thin absorbent paper under the tear and rub it carefully with the bone folder. Do not use the round, flat tip of the bone folder but only the smooth surface. If the tip is used, irregularities may be rubbed in or the sheet may be torn. Since colored rice papers must be put on cardboard again, the sheets are stretched on cardboard. Stretching is done only after repeated light pressing, since even a hardly perceptible dampness has the ability to create great tension. Stretching has to be done because otherwise the mended areas would buckle.

I repeat once again: For stretching, the moisture content of the sheet has to be so low that it is almost dry. With great tension the cardboard would bow and the paper would tear. As an adhesive for the stretching process, one should use glue that is liquid but not too hot.

RESTORATION WORK ON LARGE-SIZE PAPER

If a colored map of a city or a general view several meters long needs to be removed from a support, the support has to be examined beforehand to find out whether it is able to absorb water. If a droplet of water is applied and remains standing, it is a sign that the support will create problems during its removal. The support has to be deprived of its strength; that is, its resistance has to be broken. We already know that the map will have to be cleaned dry as far as possible before the damp treatment. Since the colors, especially red and blue, may run during a moist treatment, the surrounding area has to be brushed with a solution of aluminum subacetate to prevent it from absorbing any bleeding colors. After this preparation, the support can be treated. The resistance of the support is broken when it is brushed with boiling soda water.[133] This procedure is repeated until the support willingly absorbs the soda water. However, in the process you have to watch that the moisture does not cause certain areas of the front to become too dark. The soda solution might then endanger the coloring or the printing.

We are next concerned with removing the support. This is accomplished with repeated applications of cold water. If the paste consists of rye flour, you know that you cannot work with hot water. If you are dealing with a coating of glue, it is also better to try the separation with cold water, since there is the danger that the glue might dissolve too fast with hot water. The hot water might seep into the paper and endanger the colors. If alum paste was used, further separation can be undertaken with hot water because the alum will have made the paper bearing the design impervious. The paste is then washed off in the usual manner.

Whether it is advisable to completely submerge a colored map in a bath depends on its condition, especially on the drawing and colors.

If the map consists of many composite parts, it might be more advantageous to take apart the map while dry. Try to divide the combined parts with the shaving knife, not scissors. After opening up a centimeter or less, attempt to cut with the shaving knife. If a map shows breaks, it is divided at those places, of course. The overall cleaning of the map is done with hydrogen peroxide, avoiding the colored parts.

TIPS

Treatment of Japanese Woodcuts

Japanese woodcuts have to be treated carefully, inasmuch as the colors do not contain oil as in engravings, although the paper itself withstands treatment well. Watercolors were used; flesh colors were mainly hand-colored; the silver background was applied in powder form. During wet treatment, especially when using chemicals, you have to work with special care because these colors, which have been applied by hand, can easily disappear.

I have not treated early woodcuts from the eighth or ninth to the sixteenth centuries. Therefore, I cannot make any comments on their colors or paper.

When uninked blocks have been used during printing, the woodcuts should not, of course, be pressed since the uncolored areas of embossing would be destroyed.

Treatment of Engravings on Japanese Paper

Engravings on Japanese paper are treated like other prints. Heavily ingrained dust is removed by first wetting the papers in water and then treating them with a flat bristle brush, as I recommended earlier for other papers. Hot baths should be avoided as much as possible. How much dust can be removed without harming the paper depends on the skill of the restorer. Rubbing hard should always be avoided since the surface of the paper can easily be roughened. The prints themselves should be washed only after all tests have had good results.

Japanese paper should never be treated with bleaching soda! Wetting is done with a grit-free sponge. The paper is dabbed, not rubbed.

Treatment of Prints on Silk

Early prints on silk can only be treated by mild procedures. You have to note the sheen of the silk and be careful during stretching so that the weave of the silk does not get distorted. If the print has been done on a big piece, it is advisable to cut off a sample diagonally—half a centimeter wide—and to test chemicals on it.

Repairs on Papers without Wire Lines

For repairs on papers without wire lines, in most cases posttreatment is required after an extensive amount of work has been done. After the mends have been applied and shaved down, many parts still look somewhat uneven. These irregularities are removed with fine sandpaper. But you have to work very carefully and cannot press down. There is no need for me to emphasize further that under no circumstances should the surrounding area be lightened.

Cut small pieces of sandpaper to the size of half a matchbox or even smaller, and fold them one more time so that they are manageable.

Posttreatment of Papers with Wire Lines

Only rarely can you use sandpaper to treat papers that date from the end of the eighteenth century to the present and that have wire lines. And then, greatest caution is required because these papers are usually very soft.

For now, I advise you not to treat earlier prints with sandpaper because they can be damaged too easily.

Sandpaper is used only after the principal shaving, performed at the window, and posttreatment on the table. Smooth the mends before applying gelatin, a weak sizing. After sizing, only the knife may be used. A slight dabbing locally with a semimoist sponge then takes care of the shaving done by knife—the roughened spots are made uniform with the surrounding area. If some of the restored parts are noticeably dull, soupy paste applied with a brush helps. You discover these dull places by holding the sheet at eye level against the light. The paste is applied very thinly.

Greatest caution should be exercised when rubbing or pressing with blotting paper and a bone folder! The thin layer of paste should not stick to the blotting paper. The sheet, therefore, must be rubbed when it is dry rather than moist. These procedures, too, first have to be tried repeatedly on papers of minor importance.

Restoring Texture

Now I would like to provide a few hints on how to give the mended areas a certain texture or surface from the reverse. Soft paper can easily be given a slight texture of wire lines or other characteristics when it is specially treated while moist or, even better, halfway dry. If a soft paper is supposed to have a slight texture of wire lines, put a nonabsorbent paper with pronounced wire lines on top of it and press it strongly with a bone folder and blotting paper. This way, the wire lines of the hard paper are transferred to the soft paper. All kinds of material, especially coarse linen, are useful for this purpose. This kind of procedure, however, should only be used when the surrounding of the restoration requires it.

Correct Measurement of Mends for Damaged Areas

It is important to know that mends for damaged areas should not be too large. An excess of mending paper has to be avoided by all means. For example, if you shave a tear to a width of 5 mm, you should not apply a mend that is 7 mm wide. These 2 mm can spoil the entire job. Shaving down the 2 mm later would create a shiny spot wherever there had been an excess of paper. If you have made the mistake, you have to put up with the shiny spot. Shiny spots that are caused not by paste but by the slight pressure of the bone folder or by the work process can be removed with a moist sponge.

Removing Residues of Paste

Only in rare areas should the paste be removed from the reverse of a sheet by putting it into a tray of water.[134] If dirt and paste were removed with a paintbrush while the sheet was in the tray, the waves created in the water by the movement of the brush would make it hard to see the sheet. Therefore, to protect the sheet from damage, drain all the water from the tray or wash the sheet on the table.

The Choice between Cutting Out or Chemically Treating Disturbing Spots

Spots that are especially obvious and that cannot be removed completely by being dabbed carefully with chlorine water in combination with 10 percent hydrochloric acid should not be eliminated by other means. This would endanger the adjacent areas if beautifully colored areas surround the spots. It is more advisable to leave the spot or to cut it out than to damage a wider area by applying the wrong treatment!

Treatment of Graphics Mounted on Wooden Boards

Prints mounted on wooden boards should never be weighted down with bottles or other weights if you want to remove them from their mount in a cold bath. The wooden boards would crack and severely damage the mounted prints. The sheet should be put on the water surface and the back of the board should be rinsed. The curving of the board, which appears in a short time, will recede again after a few hours.[135]

The Layering of Sheets to Dry

If you are forced to put moist sheets on top of each other because of lack of space, the image sides must always be put face down on the cardboard. If this advice is not heeded, the image sides can be seriously damaged when someone touches the stack of cardboard. Because of the moisture in the sheets, the cardboard will buckle. The buckled areas of the cardboard will slightly lift the sheets and touch the upper cardboard. If somebody should knock against the cardboard, the areas that touch the upper cardboard would start to rub. Although it is not advantageous to damage the back of the sheets, at least the damage will not be as considerable.

Observations on Various Procedures

When removing or ameliorating breaks, creases, folds, and so on, take care that no shiny places are created on the sheets. The sheet, which has been well prepared for stretching, is placed on a cardboard or a double layer of blotting paper and the break, and so on, is carefully rubbed with the aid of blotting paper and a bone folder. The bone folder should only be guided over the break and should never be pushed down too hard or vigorously. Any movement of the support should be avoided because the sheet will be damaged otherwise. Even if the sheet still shows slight traces after being stretched, it is better not to do any further rubbing.

The velvety tone of a mezzotint or aquatint is very subtle and, therefore, very delicate and has to be preserved by every means. The same caution is applied to French crayon-manner prints and engravings with burr as well as to old woodcuts with embossed ridges on the back. All other techniques, if they can be recognized as such—works performed with a burin (engraving), criblé, iron etching, stippling, mixed method (dots and lines), steel engraving, lithography, wood engraving—also have to be treated with care but are slightly less sensitive.

Points to Take into Consideration!

Heavily damaged sheets, if they are severely yellowed, must be cleaned quite thoroughly before they are repaired. For instance, it may be necessary to match the color of one sheet from a series to that of the other sheets. If only a slight brightening is carried out, further reconditioning, and therefore mending or "true" repair work, would not produce a satisfactory result.

The reasons for this are as follows. An insufficient cleaning lightens only the skin of the paper but not its flesh at the same time. Therefore, after the damaged places have been closed, a yellow area of the width of the area that was shaved down will appear if one carries out additional light shaving of the tear from the front. This not so pleasant surprise is caused by the fact that the brightening has not reached the interior of the paper. Even though this yellowing was not visible during the preparations, it was there. It also goes without saying that the mend has to undergo the same kind of thorough cleaning.

Color prints or hand-colored prints are treated as follows. Tears or types of other damage that run through the colored illustration are only brightened slightly or, often better, are not cleaned at all because any subsequent shaving of the mended tear from the front must be very limited. Only the edges of the paper, including the title, are cleaned more thoroughly.

If a damaged sheet shows more intense yellowing that for certain reasons cannot be removed or even reduced through cleaning with bleaching agents, the repair is preceded by at least a dry cleaning and a bath in cold water, which contains a small addition of table vinegar at most.

In such a sheet—which is not being treated any further, of course—the yellowing of the skin will naturally remain stronger than that of the flesh of the paper. Depending on the difference in yellowing, after shaving down the tear, evidence of a faint, light-colored area the width of the shaved area may appear on the front, where the lighter flesh of the paper has been laid open by the shaving knife. However, this trace can be matched to the surrounding area with relative ease by slight retouching.

Light, heat, and other influences—as causes of the yellowing—chiefly affect the skin of the paper. The flesh of the paper is affected only later and less severely by browning. Papers that were manufactured after 1840 and have wood fibers added are an exception. These papers "age" quickly; they take on a coloration that may extend to dark brown, affecting the skin and the flesh simultaneously.

CHATS ABOUT OLD AND NEW RESTORATIONS OF BOOKS

During my work as a restorer, I have frequently held in my hand old prints which were restored over one hundred years ago. Often it has been my task to improve on the restoration. Such old restorations are a joy to work with, books even more so than engravings. You can draw many valuable conclusions from the work of the restorers of that time. In one case, for instance, I was dealing with a major restoration on a book in which about twenty pages had to be worked on. The work of the colleague who had restored the book more than one hundred years ago showed that he was a skilled expert. I was especially interested in the adhesive that had been used. Since I could not discover any change in the restored part and found the surrounding parts in order, too, no special agent could have been added to the adhesive to protect it against decay. Let me remind you that more or less all agents that are mixed in with paste in order to preserve it from decay will develop acid and attack paper in later years at the mended places. Since the adhesive was colorless, I concluded it might be starch paste and performed appropriate experiments. First, I gave the sheet a water bath and discovered that the restored place readily absorbed water. Yet, after more than a hundred years, the quick water absorption was not definite proof that the paste did not contain some kind of preserving agent. There was the possibility that a weak agent had lost its efficiency over the long span of time, so much so that it could not be readily recognized anymore. I therefore gave a page of this book to a chemist friend of mine, asking him to find out whether the paste contained a special agent. The chemist informed me that he had not discovered any special agent and that one of his tests had shown that the adhesive was starch. I was very happy with these findings, since they agreed with my theory that it is not necessary to add any special agent to an adhesive to protect it against decay—a theory that, by the way, has been proven by my work of more than forty years also.

During my work, I have encountered other cases in which the restorers or bookbinders did not do their work neatly. Although they had been entrusted with the restoration of the entire book, they did not spend any time deliberating. The brittle binding was patched temporarily, but the different layers were not put together neatly. It has even happened that guards have been glued right up to the type area to strengthen the brittle paper. One definitely must try to improve on such repairs, and it is best to start by removing the old mends.

A few years ago I read in a small professional publication that potassium permanganate should be used for dyeing mending papers if it is impossible to find paper in the original hue. I caution you not to use this agent. Instructions should not list any chemicals unless their effects have been tested. I do not think that the author of that article could report actual results. At the beginning of my career, I used this agent too. I saw one such restoration later, when the client at that time informed me that the repaired places were standing out in strong contrast with their surroundings. I had to admit to myself that the restored places had changed so much that I would never use this kind of dyeing again.

If the mending paper is somewhat lighter in tone, there should not be any dyeing until after all work is done. Otherwise, because dye is easily dissolved and only clings to the surface, one might observe the following while continuing to work: first, the easily soluble dye might mix with the paste, making the mending paper darker in color than desired; and second, mottled spots might appear when shaving.

The dear colleague who recommended this kind of coloring should have asked himself what would happen if someone dyed just any piece of paper according to this method, perhaps using paper manufactured at the end of the nineteenth century as mending paper for a print from the fifteenth century. I do not want to deprive him of the answer. The nineteenth-century paper, having been manufactured with the addition of a lot of wood, would turn darker and darker over the course of time, whereas the paper from the fifteenth century would not change. This means that the restored places would stand out more and more distinctly. I mention this not only to caution against the use of such coloring but also because one should use paper in the original tone and from the appropriate time. The paper supply must be refilled continually. Even today, there is enough paper around if you just keep looking.

To protect a work from decay, place just as much value on whether your work is appropriate as on whether it is artistic.

In other suggestions by the restorer of books, mentioned above, I missed—as an absolute requirement for success in this kind of work—an urgent reference to painstaking cleanliness. Above all, repair of dusty sheets should not be attempted. The sheet has to be cleaned first, beginning with a dry method, that is, using an eraser.

A special repair technique from the writings of this expert should also be mentioned. He writes verbatim: "If a tear on a book page extends far into the printed part, apply paste to the tear in such a way that the paper can be overlapped 1 mm wide in the unprinted parts of the paper to stick it together, even if the writing appears slightly distorted this way." This calls for two criticisms. First, the mending will not hold when the edges of the tear are overlapped so narrowly; and second, everyone attaches great importance to being able to read the print completely. My suggestion would be to paste finely torn paper, matching the original in color, over the gaps between the writing or to cover the entire tear from both sides with extremely thin goldbeater's paper. For the technique of working with finely torn paper, see the section on tearing paper. The fine goldbeater's paper allows the writing to be visible and the tear to be closed in a simple way. This type of work can be done in the book itself even if the book is torn near the back. To work more efficiently, put a cardboard support under the tear so that the thin paper can be rubbed down well.

For the closing of wormholes, this "expert restorer" suggested verbatim the following as the best method: "Small pieces, slightly larger than the wormholes, are cut out of exactly matching repair paper. This is best done by cutting them out with a hole puncher; the hole puncher for the Soennecken loose-leaf binders is well suited for this. The small, circular pieces are glued over the wormholes in such a way that they extend a little beyond the holes. One prerequisite is secure gluing. When they are half dry, the sheets are pressed separately between two polished sheets of metal for a longer period of time, and afterward the little patches are pared off around the edges with a sharp knife. This work requires time and patience but is safe. For larger damage, larger pieces of paper are cut to size; the edges of the damaged parts are 'smeared' [quotation marks are mine] thinly and conscientiously with glue; the cover piece is stuck on, pressed when half-dry, and the edges around the damaged parts are pared. Finally, each

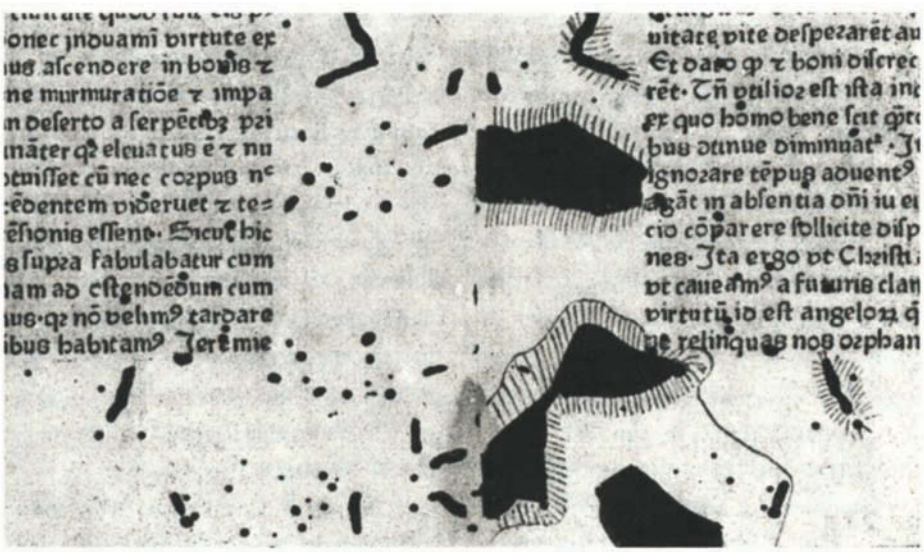


Fig. 38.
The wormholes which have been shaved down (2), indicated by hatched lines, have been cut out with the adjacent ones so that a better treatment is possible. The line around the wormholes (1) also extends into the healthy paper and is supposed to indicate that the restoration could also be done in this size. The cutting of the mends is done in exactly the same way as in other restorations. If there are many wormholes scattered over the unprinted areas of the paper—which are to be mended individually—I recommend that you number every mend and every small wormhole consecutively (3) so that the correct little piece is taken if it is to be applied while moist.[136]

sheet is pressed separately for a longer period of time between metal sheets."

I can hardly believe that my dear colleague from the book trade ever tried this prescription. I have the impression that he just imagined the method for closing wormholes to be something like this.

Based on my experience, I suggest the following process. First, the area surrounding the holes is cleaned, then some shaving is done from the side on which the hole does not go through the writing. Unfortunately, it is often the case that the wormhole goes through the writing on both sides of the sheet or is at least in close proximity to the writing. Then it is better not to shave but to apply finely torn paper equally to both sides so that the thinly torn edges of the paper hardly touch the writing. Tearing such extremely thin mends does not present any special problem to the expert. Small mends of this kind, however, should never be punched out because their abrupt edges need to be shaved down—posing a greater danger to the surroundings of the mend to the extent that there is writing. The small mends that are needed to close wormholes are prepared by scratching into a sheet of mending paper with a fine knife and then tearing them out. The tearing produces the extremely thin edges that are really needed. If you have not been able to acquire this skill yet, the mends have to be shaved down. Of course, the small fibers and hairs at the edges have to be left standing because they improve the implanting of the mend.

My procedure does not endanger the writing in the least, since after the preparations the applied mend only occasionally has to be shaved down. In any case, it is advantageous for the writing when the preparatory work is carried out accurately instead of having to do shaving in the book for hours. Since both procedures take the same amount of time, it is unnecessary to say which method of closing wormholes is to be preferred.

When there are several wormholes in one sheet, it is not advisable to close all of them from the same side. It is better to close some of them from the front and some from the back of the sheet. A one-sided restoration would be much more conspicuous. Let me emphasize one more time that when the surroundings of the hole permit it, it is definitely advantageous for the success of the work to shave down the edges of the wormholes. If the restored book pages are not brought back to the original thickness of the paper, the book will not shut properly once it is bound again.

I would not have included the specialist on books with his suggestions or given him considerable room in my description if he himself had not called his restoration methods "the best."

THE STORAGE AND PRESERVATION OF ENGRAVINGS

A work on paper is protected from damage by being mounted on cardboard and kept in a tightly covered, dustproof box or in a portfolio with wrappers. A good frame, of course, also offers protection if the sheet is not exposed to the sun too much. Therefore, the room that is supposed to hold the works may certainly be pleasant but not too sunny. Faded places on the wallpaper can help you to determine which walls get more sunlight.

A sheet is mounted on cardboard with the aid of strips of gummed paper. Strips 10 to 15 mm wide are cut from a sheet of strong, white gummed paper and divided into lengths of 2 to 3 cm. The small strips, which are cut from the adhesive strips with scissors, are called hinges. For mounting, the sheet is positioned agreeably on a piece of cardboard; that is, the distances from the edge of the picture to the edge of the cardboard are measured in such a way that the upper and lower margins around the picture correspond to the golden section[137] and equal margins are created on the left and right. The cardboard has to be strong enough to protect the sheet from breaking and tearing. It must be large enough that the viewer never has to touch the sheet with his hands.

It us not advisable to glue the sheet directly onto the cardboard at the upper edge; it is better to attach the sheet by means of hinges at its upper edge. These hinges make it possible to lift the sheet from the cardboard at any time; that is, the hinges permit the sheet to be lifted without being bent. If the margin were glued on, breaks would be easily created at the lower edge of the glued area.

When you are dealing with a small sheet, draw a dot on the cardboard with a pencil, just below each of the upper corners. Then turn the sheet—as if it were already fastened—and bring the corners to the dots. After that, moisten the hinges and attach them to the reverse of the sheet, up to 2 mm wide.[138] The hinges should only be moistened lightly, since the paper may become buckled and transparent where they are attached. The hinges must be attached so that they are flush with the edge of the sheet. There should be no distance between the edge of the sheet and the hinge. If more distance or space is left, the sheet can tear easily when someone tries to lift it, that is, wants to turn it, from the cardboard. Smaller tears in the sheet in the vicinity of the hinges occur only when inexperienced viewers try to turn the engraving like a book page instead of first looking to see to which side of the margin the hinges have been attached. Viewers usually assume that the hinges have been attached to the left edge of the sheet or margin. If the hinges are flush [with the edges] on the right and left, the viewer immediately knows that the sheet cannot be turned in the desired way. More space or distance will deceive the viewer.[139] Larger sheets, especially those that have much greater height than width, have to be fastened on the cardboard with hinges at the left margin, whereas smaller sheets—also because they lie better—are fastened to the cardboard at the upper margin. For this reason, unfortunately, no single system can be used. The larger sheets can be turned like a book page when the viewer wants to look at the back of the sheet or see the watermark by looking through the paper. The turning is done with the left hand, while the right holds the cardboard. Even for larger sheets only two hinges should be used, since the sheets could become distorted otherwise.

I had to offer this little observation in advance so that the work may be given due consideration.

After the hinges have been attached to the sheet according to the instructions, press the protruding portion of the hinges onto the cardboard with your fingertips. Turn the sheet back—the image is now on top[140]—align it with the dots, and carefully rub down the hinges with a bone folder and blotting paper.

In addition, I would like to mention that museum board[141] is especially suited as a support for prints, which lie as if set into a frame and are therefore well protected. Although such cardboard is somewhat expensive, I consider it an absolute necessity for pastels, chalk drawings, and so on.

For further protection of prints, I advise you to cover them with white, soft blotting paper. Tissue paper should definitely not be used because it cannot protect especially delicate prints, for example, mezzotints, chalk prints, or aquatints. Tissue paper is shiny and also too thin. If engravings are stored lying on top of each other in boxes or in folders, tissue paper does not offer any protection. If you want to take a particular engraving out of the box, the prints are lifted from the right to the left until the one desired appears. If you are not careful in removing a print, the one that is underneath can be damaged by scratches from the corners of the cardboard—even if these have been rounded or smoothed—because tissue paper does not have enough resistance. Such a scratch can cause a shiny line in a mezzotint, which in most cases cannot be removed. I recommend blotting paper as effective protection. It combines the advantage of sufficient protection against pressure and scratches with another one—the ability to render moisture, even as may occur when talking, ineffective.

Preservation

Preservation cannot be compared to restoration, nor is it necessary to do so. The essential point is that the prints and paper are protected from further deterioration. A blemish should be removed only if it could become a source of danger to the sheet.

Does foxing definitely have to be removed? Yes and no. The complete removal or destruction of a mold stain is not always possible. Usually, its color can be removed by chemical treatment so that it is hardly visible. At the same time this treatment also prevents the stain from spreading for a while. The better the composition of the paper—for example, early papers up to about 1650—the easier it is to remove and even permanently eliminate mold stains. Occasional mold stains in an early work are only rarely due to defects in the material. These spots might not have been covered by the surface sizing, perhaps because they had been made unreceptive by some kind of substance. Later papers—after

1650 to about the middle of the nineteenth century—were heavily mixed with cotton and are therefore more susceptible to outside influences. Papers after 1850, which were heavily mixed with wood pulp, are even more susceptible to outside influences and can show brownish discoloration in addition to the well-known foxing. Never apply strong remedies to free mold stains from a paper which has been mixed with cotton. If you not only want to hide seriously disagreeable spots by removing their color but also want to eliminate them completely, you have to treat them with strong agents while they are dry. It is not safe to assume that sizing the paper will protect it from further decay after the mold stains have been treated. After sizing, the paper can later become brittle and blistered. With increasing decay, the paper becomes like a piece of puff pastry. In such cases it will have to be enough that the color of the stains is reduced and their ability to spread is temporarily checked. You have to be aware of the fact, however, that mold stains can reappear in ten to twenty years, although in weaker form if proper storage is provided. With such care, small mold stains that are still in the beginning stages will not reappear because they have already been completely removed by the thorough treatment methods mentioned in earlier sections.

Papers after 1850 that are heavily mixed with mechanical wood pulp and have mold stains will also show good results after chemical treatment. These results, however, only extend to the surface, and unpleasant changes will often occur before fewer than ten years have passed. These changes are almost certain to take place if the sheets are exposed to light and air. In the past sheets were covered with a coat of varnish to save engravings and lithographs from decay and to prevent yellowing or the formation of mold stains. This measure did not work; after the varnish was removed, the decaying process was still visible.

Mold stains are the outward manifestations of an illness of the paper which, like many illnesses, spreads because it is contagious. If you are thoughtless and irresponsible enough to keep papers with mold stains in a folder with healthy papers, you will soon know what you have done. You will have enabled the illness to be transmitted to a healthy sheet to work on its destruction. In this regard, however, it has to be made perfectly clear that the original mold stains were produced on one or another sheet by dampness. Since you never know how the sheets were stored or treated before you acquired them, it is imperative that you examine the sheets from time to time. This advice should be followed even if the storage conditions are perfect.

I do not intend to enumerate all the different kinds of mold stains here and explain their special characteristics. This could be the subject of a scientific, chemical treatise but can hardly be incorporated into the framework of these practical instructions.

I consider it more appropriate to look at the mold stains that are caused by the climatic conditions in central Germany and to give a summary discussion of the methods for treatment of such stains, rather than to give lengthy explanations and to categorize.

However, one kind of mold stain that is especially worthwhile to mention looks like flyspecks and develops especially on the decaying, bluish-purplish parts of the paper. These symptoms indicate severe deterioration, and surgery cannot be avoided. The sick, rotting part of the sheet must be removed up to the upper skin of the paper.[142] This is usually a serious decision. It is also noteworthy that these areas of decay are reluctant to absorb water. In this case a bath of vinegar water, in which the sheet is soaked for twenty-four hours, is helpful. Since the decaying parts are brittle, no attempt should be made to clean them while dry. After the vinegar bath, I have had good experience with a sunbath. If this is impossible for some reason, the sheet should at least be dried in fresh, dry air. I would like to add that chemical treatment of this kind of mold stain is totally useless, since it does not yield any results; on the contrary, it is very dangerous because it would cause the paper to disintegrate.

After the sheet has dried, the areas of decay are sized with a weak but hot gelatin solution. You can also use a soupy starch paste if the paper can tolerate it, that is, if the paper does not wear away. The front can also be sized with a weak gelatin solution. Stretching is to be avoided in most cases because the paper tears easily.

If the print shows whitish spots, you are dealing with a fungus that is not dangerous and that has originated because the engraving has been stored moist. These fungi can be removed simply with soft bread crumbs on the surface. A strong, sour-tasting vinegar-and-water bath will cause them to disappear.

Severe water stains definitely must be reduced by treatment with water or removed by means of local treatments with warm vinegar. The dark brown color of the water stain is caused by the fact that all the dirt in the picture has been drawn in one line from the edge of the picture to the water stain. The sheet can therefore be damaged at these spots. Unfortunately, a water stain often does more harm than a mold stain.

The following test, which, however, takes a lot of time—even years—is useful if you want to determine whether the formation of mold stains is spreading or has been arrested. A sheet of no great value, heavily covered with mold stains, is cut into two pieces. To determine the condition of both pieces and to have a basis for comparison, a circle 5 cm in diameter is drawn on the back of each piece. The mold stains inside each circle are counted, the larger ones are circled by pencil marks, and the color of the mold stains is described in detail. One part is stored in a dust-free folder; the other is put in a dark place and protected by a glass pane. After three to four months, the pieces are compared with the aid of the notes, and, if necessary, new notes are made. It is also possible to put one piece in a twenty-four-hour vinegar water bath and then under glass after drying. Such comparisons are interesting and can dispel any doubts about the pros and cons of a treatment or a chemical cleaning procedure.

Old repairs must always be removed completely and replaced by new ones, expertly done even if they are only temporary. In the past mostly rye flour paste was used as an adhesive and was, unfortunately, applied generously. Flies, bugs, and bookworms found not only nourishment in the rye flour paste but also homes.

There may be reasons that force the restorer to line a sheet. This is the case when the sheet is affected too much by areas of decay and there is no other way to preserve it. Lining has to be done on the same kind of paper. Papers that are not the same—do not belong in the same category—have to be avoided for reasons mentioned earlier. For example, if you line an absorbent print on a nonabsorbent support, the support will buckle and distort the sheet. If we assume that the paper is appropriate, the following procedure is performed: Both sheets are placed into water, drip-dried thoroughly, and the back of the print covered with starch paste. The drying can be accelerated by placing the lined sheet under a pile of cardboard. The uniform weight presses the mounted print down better, and at the same time creases and small bubbles disappear. Of course, lined engravings and etchings always lose their plate mark; that is, the plate mark is visible, but the indentation is reduced. When stretching a lined sheet, take care that the sides of the sheet do not curve inward. If you put a ruler on the edges of the sheet, the edges should be parallel to the ruler. If this is not the case, the framer will encounter great difficulties. The picture will be warped in the frame.

Books, engravings, autographs, and so on are specially treated if they have deteriorated so severely that even a rather long water bath would harm them. Place the item that is to be treated on a glass pane while dry. Take light, transparent gauze, silk, fine China paper, Japanese paper, or goldbeater's paper; cut out a piece the size of the sheet and cover it with the soupy starch paste. Lay this piece on the deteriorated areas or over the entire sheet.

This is done in the following manner. The cut piece of paper or silk is placed on an absorbent or damp support paper, moistened with a flat paintbrush, dried lightly, and covered with soupy starch paste. The piece is lifted with the support and placed onto the deteriorated sheet. Be careful when lifting the support so as not to damage the brittle sheet. If the piece of silk or paper is also lifted up with the support, lay the support back down and moisten it with a flat hog's hair brush.

A few drops of turpentine and a little white wax mixed into the starch paste make the attached piece of paper or silk even more transparent, which is important for papers with print or writing on both sides, in order that the picture and writing become clearly visible.

The transparent paste is prepared according to the following recipe. Pour a teaspoon of refined turpentine and a piece of white wax the size of a white bean into a small enamel kettle and heat both over a low gas flame until the wax is melted. Take a heaping tablespoon of cold starch paste and mix it into the wax mixture. Bring the paste to a boil several times, stirring constantly with a stainless steel spoon so that all three ingredients mix together well. After cooling off, press the paste through a linen bag or a fine strainer. It is now ready for tasks requiring a transparent adhesive.

Framing

A word to the framer and the customer: Engravings of a size less than 60 to 80 cm should never be stretched under glass. There is a reason why I do not include larger prints. They are generally done on stronger papers and their plate marks are not quite as sensitive. Also, usually we are dealing with later prints that are not as valuable.

A customer should never demand of the framer that a framed sheet look as flat as a board. If occasional slight cockling[143] occurs, the customer should not criticize too much and find fault with the framer. Such grumbling only shows that the customer has little knowledge of paper and its treatment; otherwise, he would understand that his whole argument is useless. The formation of small wrinkles is proof that the framer has worked carefully. The customer must realize that development of minor wrinkles is quite important for the sheet. Is it really advantageous for a sheet to be tightly stretched for decades? Is it not even more advantageous if it is possible for the tension from the stretching to be reduced? I hardly think that many will adopt the first point of view, especially if they think of the consequences. The tension can one day become noticeable in an undesirable way. A major change in temperature can cause the plate marks to tear, through increased tension. This damage is not always immediately noticeable. It is not always possible to determine the damage from the front, since the plate mark first opens up from the back and can still be held together for a while by the thin paper surface. Much depends also on where the prints are hung. Often, damage remains unnoticed, because nobody looks closely at a picture in its usual place or because of the lighting conditions, until it becomes visible after a change in location. Sheets that have a few wrinkles, however, are different. The paper still gives, and the wrinkles prove that the tension is not too great. As far as the plate marks are concerned, they are not in danger. The framer, therefore, deserves credit for acting deliberately, and one should ignore minor perturbations in the interest of the preservation of the picture. One should recall that because the framer only has to moisten the picture, he would have a much easier time placing it under glass when it is as straight as a board.

This leads to the question whether excessive tension can cause further harm to the paper. When the print is to be stretched under glass, the framer has to attach a guard of 1 to 2 cm width to the back of the sheet. If the plate mark is located near the opening of the frame, it certainly cannot tear because it is completely affixed to the guard. However, the plate mark does lose its charm, and the print does tend to look flat. The use of adhesives is not beneficial to the print either, since the guard has to be removed when the frame or the glass is changed. If the guard is not taken off carefully or if the framer has added alum to the paste, then—as we know—the sheet can be harmed in many ways.

The rabbet should under no circumstances be too narrow or too shallow. The picture glass should not fill the entire rabbet. Keep in mind that the frame and the glass are not dead bodies! The picture wire should, therefore, not be attached too tightly. Between the glass and the rabbet there should be a space at least the width of a match. To achieve this, put a strip of thin cardboard on the cardboard backing. After nailing in the brads, pull the cardboard strip out and treat the other sides of the frame in the same way. This permits some room for play, and if the glass should bow—for example, when a sheet has been stretched inexpertly, excessively—the danger of the glass shattering will have been reduced.

What other dangers are there for engravings mounted under glass?

If a framed engraving that has been stretched under glass falls to the floor, it can be destroyed because the tension of the sheet at the moment the glass breaks can tear the entire sheet. Stretching under glass always poses a threat to prints.

When framed engravings are supposed to be hung on the wall and no picture railing is available to hold the chains on which the frame is suspended, nails have to be put into the wall. Who puts in the nails? In many instances an inexperienced person, since the master of the house does not have time and there is no money available to hire a carpenter. How often is the load capacity of the nails investigated? A nail does not get fastened securely in the wall just because you say, "It will hold all right, and the little picture is not that heavy." Valuable engravings are often entrusted to a totally inadequate hanger! People spend thousands of dollars on an engraving and then save a fraction of a penny on the hanger. Economy does not have a place here! Obtain good hooks and steel nails, and make sure that the wall will hold the hook or nail without any further preparation. After the nail is hammered in, it should be examined carefully to find out if it is really secure, and no valuable piece should be entrusted to a loose one. Each vibration of the house caused by passing cars, each vibration of the room caused by falling objects or the running and jumping of a child, can cause considerable damage.

Another hint at this point: If you want to protect your picture—be it an engraving, pastel, or oil painting—from damage that might be caused by moisture emanating from the wall, put several pieces of cork between the frame and the wall.

How should prints be framed? Prints always have to lie loosely under the glass; the print, having been stretched previously,[144] is fastened with two hinges to cardboard the size of the rabbet, and the clean glass is put on top. At the same time, to frame the sheet in a dust-resistant way, the glass and cardboard are sealed to each other with a wide strip of paper. The loosely framed print cannot change; the plate mark stays the way it is; and even major changes in temperature cannot cause any harm. Minor wrinkles will not be disturbing since a previously stretched engraving does not show any large wrinkles. This method of dust-free framing is much more beneficial for the print than stretching under glass. In the latter case, the guard is under tension because the moist sheet dries and becomes taut at the same time as the guard. You will have observed a number of times that the guards at the edge of the glass give over the course of time and become loose. Dust penetrates and soils the surface of the print. Of course, the damage is less than if the plate mark is harmed; in this case the tension affects the guard, not the plate mark.

However, a guard is not under tension if it is put onto dry cardboard and affixed to the glass. If a framed print falls down or if the glass is changed, there is much less danger for the print that has been placed loosely between the cardboard and the glass, since tension is absent.

A double cardboard backing is recommended as protection against external influences. To protect the print in all circumstances, a double layer of greaseproof paper should be placed between the cardboard and the print if the backing consists of wood pulp cardboard.[145] Wood pulp cardboard absorbs moisture, and the oxygen in the air renders it fragile and brittle. Finally, sealing the backing with a sheet of paper that does not contain wood pulp is highly recommended. The most inexpensive material is commonly used because it is generally assumed that nobody will see the back since it is facing the wall. This is a terrible mistake! The protective backing needs a lot of attention, and the best material should be used. One should bear in mind that mold stains find their way through the layers of cardboard. Generally, it may be sufficient to soak the cardboard with a tar preparation or varnish. It is even better to use cardboard that has been made without wood pulp.

And now to another unfortunate matter: water stains. Their origin will be known or understandable to many art lovers. Water stains usually originate when the glass is cleaned or polished. The picture is hanging on the wall, and the glass is wiped with a moist chamois or a sponge. When pressure is applied, excess water runs down the glass to the lower edge of the frame. Moisture penetrates through the guard into the engraving and creates an ugly water stain. If the cleaning water is dirty, water stains of a dirty gray hue are created which cannot be removed even by chemicals. Here, we cannot simply recognize the creation of such stains; we must also be emphatic about their prevention.

Pictures to be cleaned should be placed on an empty table. The chamois or sponge should be dampened very lightly and should never be dripping. Also, no moisture should remain standing on the surface of the glass during the cleaning process. Methylated spirit is often added to the cleaning water. This procedure has the disadvantage of turning the glass surface bluish if it is used frequently.[146] It should also be mentioned that a generous amount of methylated spirit can affect the finish of the frame. It is, therefore, better to add vinegar to the water, which results in the same cleaning power but without detriment to the glass or frame.

When cleaning glass, remember the following rules:

1. Place the picture flat on an empty table.
2. Wipe off any dust on the glass while dry.
3. Add a shot of vinegar to the cleaning water.
4. Polish the glass with a wrung-out chamois or a well-squeezed sponge.

(If you want to have a chamois always ready for use, do not hang it on a clothesline to dry but fold it several times while moist or roll it up. This way the chamois cannot break, since it will always be a little moist.)

If you use this method, you protect your pictures from water stains, save your frames from damage, and avoid loosening the picture nails in the wall during cleaning. I certainly must not overlook this last problem, since a loose nail is a special source of danger for works of art.

THE STORAGE AND PRESERVATION OF BOOKS

The most ideal temperature for prints and books is so-called museum air. Overheated rooms pose a great danger to books because they promote the propagation of bookworms. Also, when books are kept on open shelves or in closed cabinets, one seldom checks to see whether the wood itself is in good condition. It is imperative that valuable works be kept cool and out of the sunlight. I have often been asked whether the larvae could be exterminated. Looking at valuable works, I have found the question justified. If someone owns greatly treasured books and has not yet had any bad experiences, I advise him to consider the following: Earlier collections were usually stored in dry basements. If a book was needed, it was fetched from a cool basement and read in a warm room. Therefore, it is advisable to turn off the central heating in one's library or to provide adequate ventilation. It is also not good if books stand close together on the shelves. To impede the progress of the larvae, it is often sufficient to place a small piece of wood between books. Moreover, if the pieces of wood are coated with a tar or petroleum preparation, the larvae are further restricted. Exactly fitting glass panes are also recommended. The question mentioned above—can larvae be exterminated completely?—does not have a simple answer.

I recommend several remedies, which I have tried. A glass container, an aquarium of any size, can easily be obtained. The upper rims are covered with window putty so that no vapors or gases can escape when the container is turned upside down on the table. Several glass bowls or wide, bowl-shaped liqueur glasses are filled with strong liquid ammonia and positioned at different heights on the inner walls of the glass container. These are best attached by means of suction-cup holders. The open book is put upright under the glass cover and left for the ammonia vapors to take effect. A few hours later you can observe the larvae emerging. If none appear, it is possible either that they have succumbed to the ammonia or that they are only immobilized.

Before you start to exterminate the larvae, to permit the vapors to work much more intensely and achieve success more quickly, the paper powder that is left in the insect channels must be removed completely. Depending on the condition of the book, this can be achieved by simply knocking the book with a long or square ruler. If the binding is severely weakened and only loosely connected to the pages, the knocking has to be done very carefully. After the extermination, the book is isolated. In four to five weeks the book is tapped again to determine whether any paper powder is present. If more powder has appeared, the ammonia has not been effective enough. You must attempt to attack the larvae in other ways. Experiments have to be made with everything from spirit of wine to gasoline to the foul-smelling hydrogen sulfide.

Spreading camphor on the floor is also highly recommended. Or you can work with sulfur gases or T-gas, which in recent days has also been used for the extermination of insects.[147] In this case I recommend that you consult an experienced exterminator. These gases do not cause harm, and even valuable works with precious bindings can tolerate this cure.

Another preventive method consists of rubbing the inner sides of the cabinet with kerosene. Small bowls filled with kerosene and laid out in the cabinet can also help to destroy the larvae. (It should also be mentioned that moths cannot tolerate the smell of kerosene.)

In addition, there are larvae that cannot tolerate any sweet smells. In such cases experiments can be made with strong-smelling perfumes.

If these experiments for the extermination of larvae are made with three or four glass containers, the most effective preparation can be discovered in a short time.

By using these simple methods of extermination, collectors, librarians, conservators, bookbinders, and so forth, can contribute further to the preservation of valuable works so that they can be passed on in better condition to future generations.

A Few Small Observations and Hints Regarding the Preservation of Books

There are many experts on books who occupy themselves with the conservation of books and prints. Some of them have the habit of stepping into the public light now and then with small articles or with the revelation of dubious recipes, perhaps because they feel the need to unburden themselves or perhaps because a publisher has become interested in them. As much as this is desirable in itself, it can also be quite dangerous because here—as anywhere else—quality, not quantity, should be the deciding factor.

I would never have moved my pen to write about restoration and conservation if the opinions and ideas of many of these published experts had not been so conflicting and often so dangerously far from practice. For instance, it can be read in many places that paper is more vulnerable to decay when it is soaked in a sizing solution made from animal products. What does the proponent of this opinion really mean? Does he want to give instructions on how to prepare paper for the printing process? Such instructions are unnecessary. Our modern paper factories prepare paper perfectly. If, however, he is talking about old papers, I have to answer him. Papers that were manufactured hundreds of years ago have survived well over time without having been afflicted by decay in any way in spite of their being sized with animal substances. I have never heard that any substances were added to animal sizing to protect it from decay or spoiling. At the end of the eighteenth century, paper manufacturers occasionally used rosin sizing—not an animal product—and added a small amount of alum, thinking that it would make the paper more durable. This thought did not prove correct since this kind of sizing, as mentioned previously, dissipates within a few years if the papers are exposed to air.

I now feel justified in asking the question, Why should we not use, with the same success as seven hundred years ago, animal sizing without preservatives to size restored sheets and the like? The only secrets that I can divulge here are the following useful suggestions:

1. Use utmost cleanliness.
2. Use only boiled water.
3. Boil the starch paste.
4. Boil the gelatin water.

These four innocuous but important basic conditions have been proven over the centuries to be correct. After all, soaking a coating of gelatin and exposing it to light and air is bound to turn it quickly into a bacterial culture. But this is not proof that animal sizing cannot be used or that animal sizing in paper might be subject to the same danger.

Unfortunately, there are experts who do not deliberate before occasionally making their own adhesives. I recently asked a master bookbinder how he prepared his starch paste and learned that he mixed it cold and, if he was in a hurry, simply added boiling water. That is, of course, totally wrong. It is right that the paste should be started cold. But it is wrong to pour boiling water into it. The water that is going to be used for the preparation of paste should have boiled for at least fifteen minutes. And the starch mixture should be brought to a boil several times over a small flame while being constantly stirred. If this is done, you will always have a sterile adhesive handy. The preparation of starch paste for repairs is not the work of an apprentice but a task to which the master should devote a few minutes. Not only the immediate but also the long-term success of the work depends on the quality of the paste.

To what can the decay of books be attributed? Is it the use of poor materials? Did papermakers in the twelfth century not consider that their products were supposed to last over thousands of years? Did the longevity of their products not concern them? On the contrary, as we can see in the many books and writings that have survived seven hundred years splendidly, the material is excellent. Poor storage and treatment are mainly to blame for the decay of books. Moisture is the greatest enemy of paper. Oxygen, too, contributes to its decay. The frequently used rye flour paste does its part. I have already mentioned the enemies of paper, so a short reminder should suffice at this point.

The following should be added regarding the storage of old books. From time to time on dry days they should be cleaned. The accumulation of dust contributes greatly to their decay. Use a hand sweeper to brush every sheet individually, or better yet, use a vacuum cleaner. When using a vacuum cleaner, cover the book pages with a fine-mesh wire screen to prevent any damage through suction. I would suggest to a bibliophile to have this kind of work done by an experienced bookbinder who can detect signs of deterioration in its beginning stages and thereby prevent the book from being destroyed. It is also recommended for large collections of books that remarks about the condition of the book and any restorations be added on index or catalog cards. It is important for the future restorer to know what treatments the book has undergone—if water baths or chemical baths were used, if treatments for insects were performed, and which preparations were used.

IMPORTANT PRINTMAKING TECHNIQUES

Excerpt from My Book *Collecting and Picking*[148]

We distinguish between relief, intaglio, and planographic printing. The early woodcut, perhaps the oldest graphics technique, is a relief printing process. The lines of the image, left standing in relief by the carving knife, are covered with ink and impressed deeply into the paper during printing. The term "relief printing" is derived from the ridges on the printing block (fig. 39).

In intaglio printing, it is the lines of the print itself that are raised. After dampening, the paper is printed and absorbs the ink from the incised places on the metal plate. The ink thus lies in relief on the paper. If you run a finger lightly over strongly printed areas of an intaglio print, you can easily feel the raised parts, whereas the woodcut print will show indentations. The intaglio printing process derives its name from the incised places or engravings on the metal plate (fig. 41).

Planographic printing is done almost exclusively from slabs of stone. The image in this case lies flat on the paper, and the printing does not show any raised or indented areas. The use of stone permits production of as many prints as desired because it does not get worn by the printing process. Since stone also is not subject to splitting, as is wood, its period of use should be unlimited, provided it is stored properly (fig. 42).

Before the graphic artist began to work, it was necessary to prepare the material that was to express his artistic concepts. The printing surface was made completely smooth and even and—depending on the material and technique chosen for the enterprise—was treated specially, which is discussed in the individual paragraphs on techniques.

After the preparations, the image chosen for graphic reproduction was drawn onto the printing surface, reversed as in a mirror. The graphic artist usually needed two drawings for this: one that showed only the outlines of the picture (outline drawing) and another—if he did not draw from the original with a mirror—that was true to detail but was a mirror image of the drawing. If the drawing was not a mirror

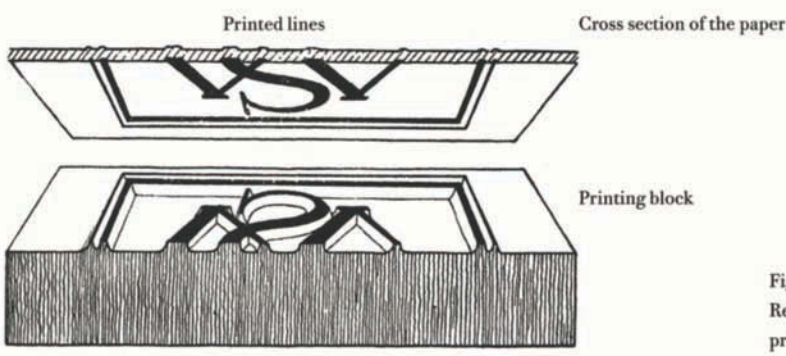


Fig. 39.
Relief printing; cross section through printing block and paper

Fig. 40.
Woodcut by Lucas Cranach, 1509,
German School

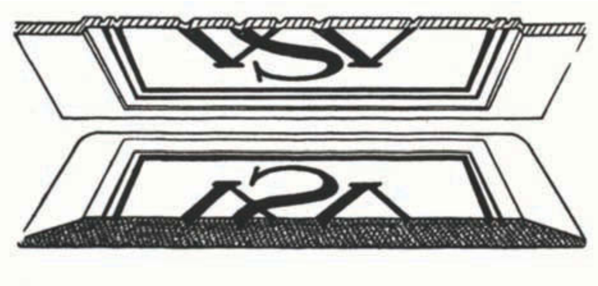


Fig. 41.
Intaglio printing. Plate mark; printed lines (showing the raised texture of the ink)

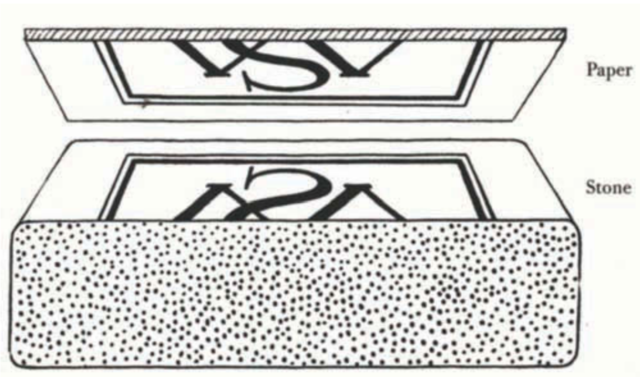


Fig. 42.
Lithography. Cross section: stone and paper with top view

image, the print would not correspond to the original.

The outline drawing was placed on the plate, with the picture side down, and traced. The paper was oiled for this purpose to make it transparent. Sometimes the oiled drawing was glued to the plate with an easily removable adhesive and the outline was scratched into the plate through the paper.

The literature shows us that very early on some engravers transferred the outline drawing to the plate by etching—the same method used in making etchings. If the outline was only traced, the drawing on the grounded plate had to be made resistant to wiping by means of a fixing agent. Only after the main lines of the picture were cut or engraved into the plate was the ground washed off and work started on the details, with the aid of the second drawing.

The Woodcut

Up to about the end of the eighteenth century, primarily nut or pear trees provided the material for woodblocks, which were cut in lengthwise planks from the trunk. About 1788 very hard boxwood was used—for the first time by Thomas Bewick in England—and planks were no longer cut with but, rather, across the grain (end-grain). The thickness of the

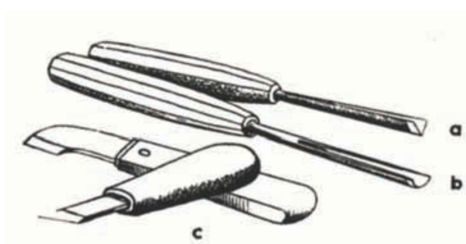


Fig. 43.
Tools of the woodcutter's craft:
(a) V-cutter; (b) gouge; (c) knife

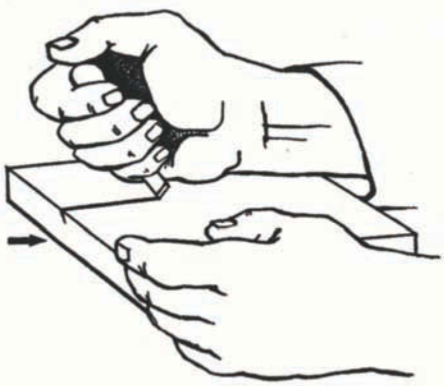


Fig. 44.
Cutting with a knife

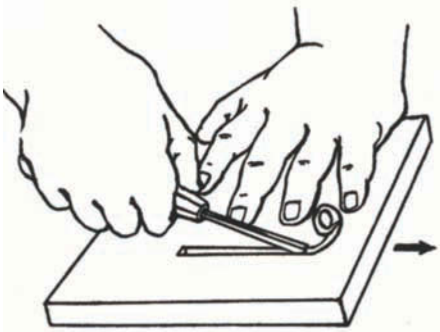


Fig. 45.
Cutting with a gouge

Fig. 46.
Clearing the wood from around the printing surfaces with a flat chisel

early woodblocks varied according to the size of the picture—somewhere between 2 to 8 cm. For larger pictures, several blocks were joined together.

In the early woodcut, which—as already mentioned—was done by relief printing technique, the wood surrounding the lines of the drawing was cut from the woodblock with a wood-carving tool. The lines of the drawing, which remained standing, appeared as relief-like ridges (fig. 43). To achieve the clearest possible image when printing, larger blank areas were cut especially deeply out of the woodblock with stronger, chisel-like knives. To create softer transitions, the ridges were sanded finely in these places so that they lay under the level of the other ridges when seen in cross section (figs. 44, 45, 46).

In the beginning, and sometimes even today, proofs of woodcuts were pulled by hand. The edition could be almost unlimited because of the low mechanical stress on the woodcut.

Slightly dampened paper was placed on the inked woodcut and covered with several sheets of dry paper, and the sheet was pressed down with the flat hand, a brush, or a broad bone folder wrapped with leather. If the printer was not sufficiently skilled or careful, the proofs showed breaks in the printed lines in areas that had not been rubbed down thoroughly. With the invention of movable type for book printing, the screw press was also used more frequently for woodcut prints. In the beginning, room was left for woodcut illustrations when a book was printed. But the woodblock was printed together with the type in the press (fig. 47).

Using the press for woodcut proofs, however, had the disadvantage that the

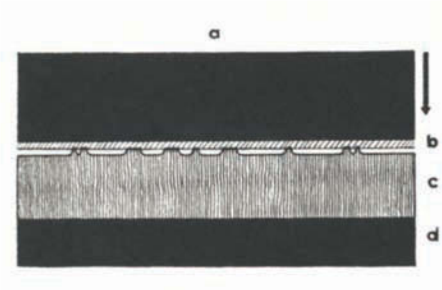


Fig. 47.
Cross section of a relief printing press: (a) platen; (b) paper; (c) printing block; (d) bed of the printing press

woodblocks could split under the great pressure, the cracks showing up as white lines in the proof. This happened quite frequently. The cracked woodblocks were sometimes repaired again, and it takes an exacting comparison to distinguish between earlier proofs—made from the undamaged woodblock—and later ones made from the repaired block (fig. 48). (It is very important to understand that the restorer should never touch up these lines to imitate an earlier proof!)

As already mentioned, the relief printing method described here was used until the end of the eighteenth century. Bewick, who was the first to use the boxwood end-grain for his work, at the same time went a step further, using the engraver's burin instead of the usual wood-carving tools. This afforded him greater freedom—compared to the severe restrictions of the older woodcutting techniques—in the creation of lines and increased pictorial effects. The very thin plaques of end-grain wood were glued onto thick wooden boards to protect them from damage.

Bewick's work was the start of the development of more refined, or tonal, woodcuts, which were to play a big part around the middle of the nineteenth century, especially in book illustrations (fig. 49).

Fig. 48.
Colored print from a repaired woodblock (from 1470)

Fig. 49.
Wood engraving by Adolf Menzel

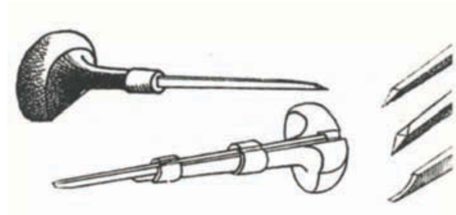


Fig. 50.
Burin for metal engravings

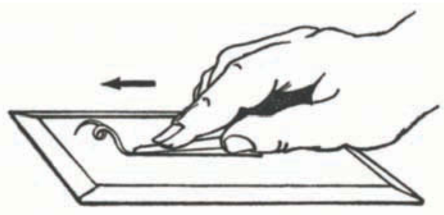


Fig. 51.
Engraving straight lines

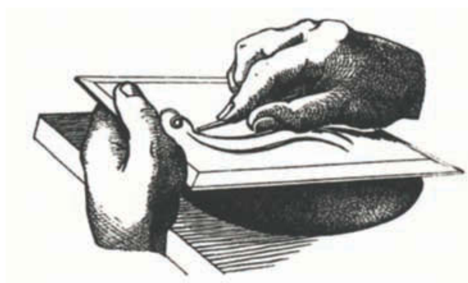


Fig. 52.
Engraving curves on the cushion

Engraving

Engraving techniques have changed very little if at all. The plate consists of hard copper, hammered and polished. If soft copper were used, the wear on the plate would be such that very few proofs could be made.

Whether the work is successful or not depends to a great degree on the careful preparation of the plate and its hardness and smoothness.

Using a burin, the engraver gouges out the lines of the drawing from the copperplate. Depending on the work to be done, he uses burins of different widths (fig. 50). The burin is held flat (fig. 51); only the handle of the burin, which rests in the right hand, is lifted slightly. The artist now digs into the copper at the start of the line to be engraved and moves the burin forward. To create straight lines, the copperplate is put down flat. Curved lines are engraved as follows.

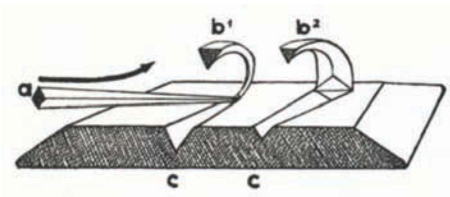


Fig. 53.
Cross section of the individual engraving techniques: (a) burin and burin movement; (b) metal cuttings, tapering at the end of the groove; (c) beginning of the groove, increasing in width; (d) grooves created with burin

Fig. 54.
Inking the plate on a hot plate preheated over charcoal

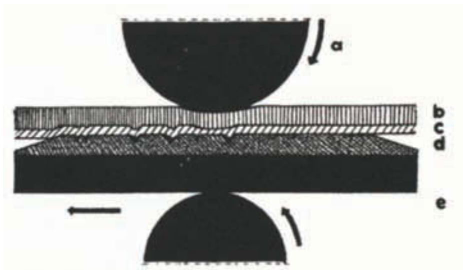


Fig. 55.
Cross section of an intaglio press: (a) steel roller, adjustable up and down, rotating in place, but otherwise not movable; (b) printing felt; (c) dampened paper; (d) copperplate; (e) bed of press, driven by a roller that moves the printing plate, paper, and felt simultaneously under the upper roller

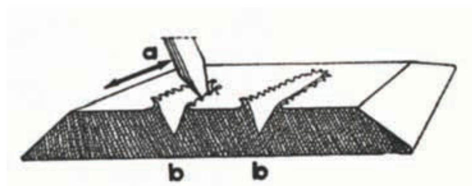


Fig. 56.
Drypoint: (a) drypoint needle and direction of movement;
(b) drypoint line with burr pushed up from the metal

The plate is placed on an engraving cushion. The cushion is circular, firmly filled, slightly flattened on both sides, and covered with leather (fig. 52). The right hand, which is holding the burin, stays in position. The left hand guides the plate toward the burin, following the lines of the drawing. By the degree of penetration and movement of the burin, finer or wider copper cuttings are removed (fig. 53). Depending on the pressure or the movement of the burin, the line gouged out runs flat, deep, narrow, or wide until it tapers to a point, since the engraver eventually has to guide the burin up again to remove the cuttings. The engraving created has sharp, prominent edges called burr that have to be removed with a burnisher.

The deeper the engraving, the more proofs of usable quality the plate can produce. Properly prepared and completed, a copperplate yields three hundred to five hundred proofs. Since the copper is

Fig. 57.
Wolfgang Kilian, engraving on copper, 1629

greatly affected by the application of color and wiping and finally by the printing process itself, the first three hundred proofs are sharper, the later ones less distinct and softer.

To produce very fine lines, engravers use a sharp needle called a drypoint, with which the lines are not cut but scratched into the copper. The disadvantage of the drypoint is that during the printing process the finely engraved lines wear quickly and therefore have to be rescratched repeatedly.

Criblé

Criblé[149] began in the second half of the fifteenth century but only survived for a relatively short time. Technically, it is a relief printing technique like the woodcut. Soft metals, like copper, tin, bronze, brass, and, very rarely, wood, were commonly used as plate materials. The drawing was chased into the plate with punches of various shapes. It was therefore not recessed in the plate but raised like the woodcut (figs. 59, 60).

The high areas or lines are the ones that print in the relief printing process. In criblé prints the drawing is recessed

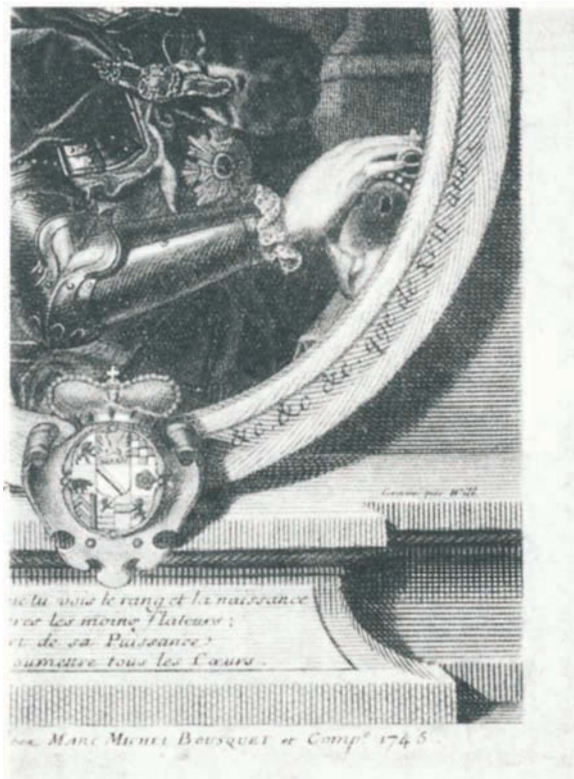


Fig. 58.
Will, engraving on copper, ca. 1720

Fig. 59.
Punch hammer and punches

into the plate and appears white; the surrounding, which remains high, appears black (fig. 61).

Soon after the beginning of the sixteenth century this technique became obsolete. The number of extant criblé prints[150] is very small. Therefore, they are difficult for the collector to obtain.

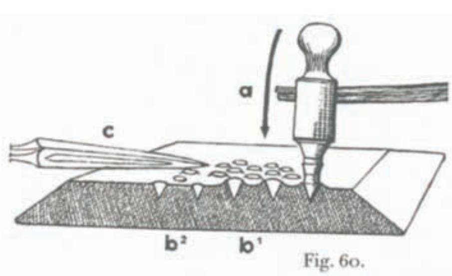


Fig. 60.
Punching technique: (a) punching hammer with conical tip on a flexible shaft; (b) indentation of the punch, with raised burr; (c) with burr removed; (d) scraper for removing the burr

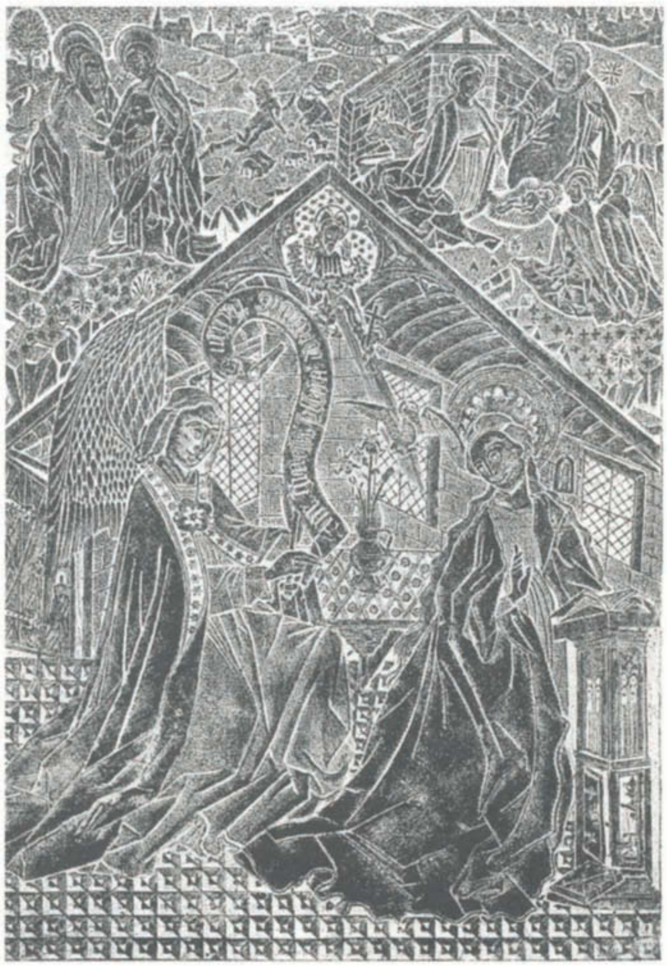


Fig. 61.
Example of the criblé technique

Fig. 62.
Dürer, etching on iron, 1518; detail from *The Canon*

Iron Etching

Iron etchings were attempted for a short time. Although this print medium was used by famous graphic artists, it was never successful because the proofs were too coarse in comparison with copper engravings. The following is worth mentioning. Inscriptions, especially delicate details of the image and ornamental borders, were executed with a wax solution on the etched iron plate. Since the wax solution did not absorb the ink used at that time, the places that had been painted with wax stayed white when printed (fig. 62).

Etching

Three methods are known to us from earlier times: drypoint,[151] etchings on hard ground, and etchings on soft ground. By far the most common technique was etching on hard ground. For this, the copperplate was coated thinly with a mixture of pitch, wax, asphaltum, and rosin. After drying, the ground was smoked with a pitch or wax taper. Care had to be taken that the hard ground did not melt, contract, or get scorched. After this preparation, the principal outlines of the drawing were transferred onto the smoked ground. The image was then scratched into this ground with the etching needle. The needle was used in the same way as a pencil is used for drawing a sketch on paper—but with somewhat more pressure. Wherever the needle removed the hard ground, the bare copper became visible against the blackened ground. The parts of the plate not protected by the ground—the back and the edges—were covered with an acid-resistant varnish, and after this dried, the plate was placed into an acid bath. The acid solution would bite into the copper exposed by the etching needle, the depth of the metal determined by the strength and duration of the bath (fig. 63). The plate was left in the water for ten to twenty minutes, depending on the strength of the acid solution, then taken out and rinsed with clear water. Since acid works uniformly, there had to be certain gradations in the etching process to create tonal values and soft transitions. The etcher examined the subtlest parts first. If he found that they had been etched sufficiently, he coated them with an acid-resistant varnish. He then returned the plate to the acid solution. This procedure was repeated until all tones and shades reached the desired depth.

These gradations were the source of the special pictorial charm of an etching. It was also possible to create the finer lines after the main etching process. Then, however, the etcher had to scratch the fine lines into the hard ground. But at the same time, undertaking this further work had the advantage that additional lines could be created by the same technique if examination of the plate indicated that this was necessary. After the final etching, the hard ground was removed from the plate. It was now ready for the printing.

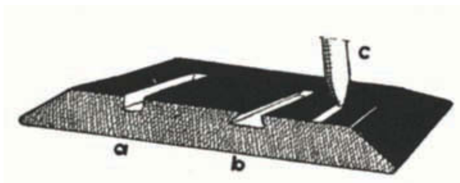


Fig. 63.
Cross section of the etching technique. Etching plate coated with hard asphaltum ground (etching ground). (a) Even etching line, created by very dilute acid; (b) uneven and underbitten etching line, created by concentrated acid; (c) etching needle, drawing through the ground and revealing the copper.

When looked at with a magnifying glass, the etched line is completely different from the engraved line. There is no thickening and thinning of the line; instead, it appears as an even, one could say monotonous, stroke with an equally blunt beginning and end.

To give the end of the etched line a finer point, several early etchers added minor so-called corrections to their work. With a drypoint needle or a reinforced etching needle, they gave individual lines the appearance of an engraved line. But only a small minority of etchers undertook additional work of this sort.

Much more common was the execution of new lines and the drawing of details with drypoint in the etched plate. Depending on whether the needle was held vertically or at an angle, special effects were created in the print. If held vertically, the needle created rough edges along the line. No cuttings were removed as in the engraving process, but the copper was slightly gouged and the edges of the furrow were raised.

Only when the needle was held at an angle was the well-known burr produced, which collectors appreciate. Again, the copper was gouged but was raised up prominently only on the side on which the needle formed a sharp angle, while the other side was roughened only very slightly.

The burr—which gave the shadows of the etching not only a richer tone but also almost the velvety depth of a mezzotint—soon disappeared because of the mechanical wear on the plate during the application of ink and the printing process. Depending on the strength of the burr, ten, at the most twenty, such first-quality proofs with burr were produced.

The third and last etching technique was soft ground etching (fig. 66). It was certainly as old but not as frequently used as the two other methods. The procedure went as follows. The well-prepared plate was coated with a ground consisting of wax and tallow but was not blackened. The image was drawn on textured paper, put on the ground upside down, and impressed into the wax ground by tracing with a needle that was not too pointed. Because the paper had prominent ridges, the needle could not be drawn evenly over the paper; therefore, the impressions from the paper were irregular. If the paper was lifted after the drawing was impressed, the soft ground was pulled up, exposing the copper wherever the needle had pressed the paper more force-

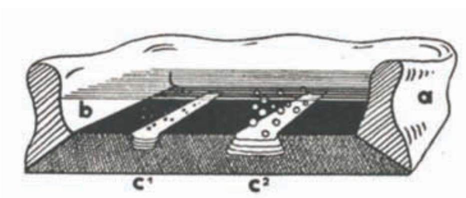


Fig. 64.
Etching of the grounded plate: (a) rim formed with modeling wax around the edge of the plate; (b) etching solution (nitric acid, hydrochloric acid, or ferrous chloride); (c) slow etching with very dilute nitric acid (weak formation of bubbles); (d) rapid etching with concentrated nitric acid (vigorous formation of bubbles)

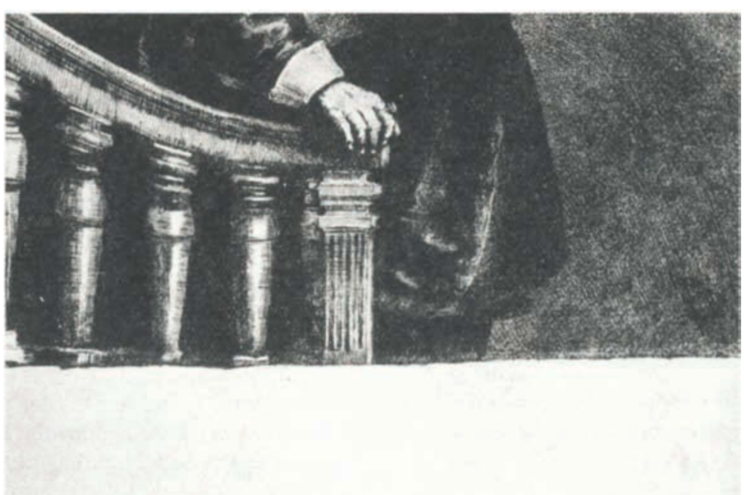


Fig. 65.
Etching on hard ground; detail of a print by Rembrandt

Fig. 66.
Working with a mattoir: pressing the drawing and the paper texture into the soft ground

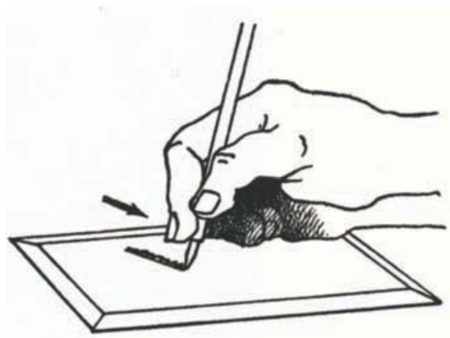


Fig. 67.
Drypoint etching

fully into the ground.

This etching method, too, was carried out in stages to achieve different tones and gradations. Small corrections were made with drypoint.

The lines the acid bath bit into the copper were not continuous but showed many interruptions—similar to the crayon manner. In the print they appeared much softer than lines etched into hard ground or created by drypoint (fig. 67).

Mezzotint

Mezzotint was somewhat revolutionary as a copperplate technique but less so compared with the etching method than with engraving. Surfaces that had previously been represented only as systems of lines with the burin suddenly could be expressed in a completely different, tonal manner. This possibility, of course, was not unknown to the etcher who—like Rembrandt—by this time had already used burr to create the aesthetic effect of surfaces. After all, it was the burr created by the drypoint which, especially in areas where the lines in the shaded parts were close together, gave the first proofs the velvety depth we admire so much in prints by the Old Masters.

The smooth copperplate was made rough by a rocker (fig. 68). If you look through a strong magnifying glass at the lighter print in a mezzotint, you can still see the traces of the rocker. They are all even, closely spaced, and visible as short dashes. Since they also cross each other, they form small diagonal squares the size and distance of the rocker teeth (figs. 70, 71).

After the plate was completely roughened, the image was drawn or painted on it, and the mezzotint was worked out on the copper with the

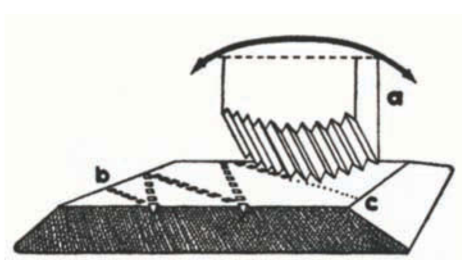


Fig. 68.
(a) Rocker, with movement indicated;
(b) indentations from the rocker

Fig. 69.
Mezzotint, English School, ca. 1770

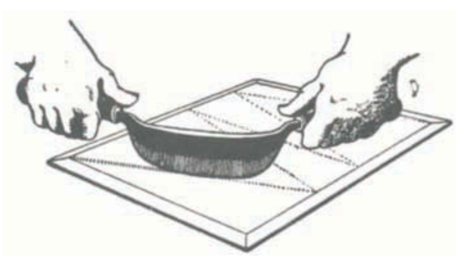


Fig. 70.
Rocker and pattern of rocking

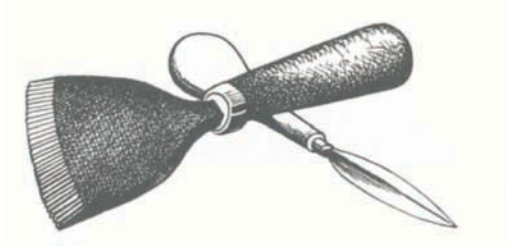


Fig. 71.
Rocker for one hand and scraper

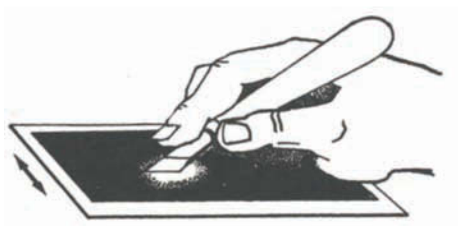


Fig. 72.
Scraping

Fig. 73.
Mezzotint, English School, ca. 1780 (proof before addition of writing). Refined technique.

scraper. Where there was supposed to be a deep, full tone—in the background and especially in the dark, shaded parts (fig. 72)—the roughened areas remained. The lighter the individual tones were supposed to be, the more the roughened places were smoothed. Places that had to stay entirely white were polished completely smooth. A burnisher was used for this (fig. 73).

Assuming that the plate was handled extremely carefully by the printer—not only when he applied the ink but also when he pulled the plate through the press—one mezzotint plate could yield about one hundred to one hundred fifty usable proofs.

The Crayon Manner

In the softness of its lines, the crayon or chalk manner is similar to soft ground etching. The technique originated from attempts to reproduce chalk or crayon drawings or pastels as closely as possible in graphic form. Although in soft ground etchings the line shows numerous interruptions, in the crayon manner it consists entirely of finer or coarser points applied next to each other. This technique should not be confused with pure stipple method in which all surfaces in the image are characterized by countless closely spaced dots. In the crayon manner, however, the sketchlike, linear character is preserved.

The width and depth of the lines were determined by the shape of the roulette used (fig. 74). There were some with narrow and some with wide wheels, with teeth spaced evenly or unevenly in one or more rows. The different applications possible with the many varieties of the instrument were clearly evident. The distance between the rows of teeth on the wheels varied between 0.3 and 0.5 mm. The closer the spacing of the teeth, the deeper and fuller the lines; the wider the spacing, the looser and more delicate the lines. If individual lines were supposed to end delicately, several separate dots were engraved into the plate with a stippling burin after the etching process (fig. 75). For the background and wide areas of shade, a mattoir—the instrument usually employed in the stipple technique—was also used in the crayon manner, although very seldom. In contrast to the

Fig. 74.
Drawing done by the roulette, sky executed with the mattoir, English School, ca. 1787

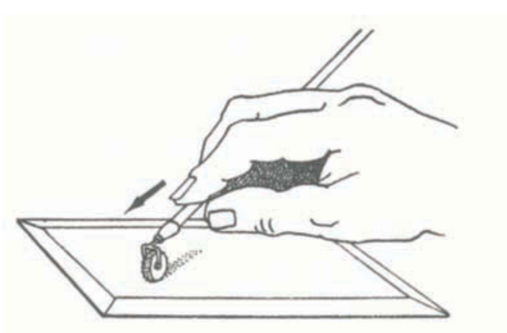


Fig. 75.
Roulette

roulette, the mattoir was shaped like a ball and covered with irregularly spaced teeth and, therefore, produced randomly textured strokes.

The prepared plate was covered with a hard ground and blackened with smoke and the drawing was transferred reversed, as in a mirror. The roulette was then guided across the plate, making strokes. The small teeth exposed the copper in a pattern of dots. Since the roulette was applied with more force than the etching needle, the teeth not only penetrated the ground but also left more or less deep impressions in the copper. The acid solution, therefore, had much more of an effect on the dots produced by the roulette than on the lines drawn into the ground with the needle.

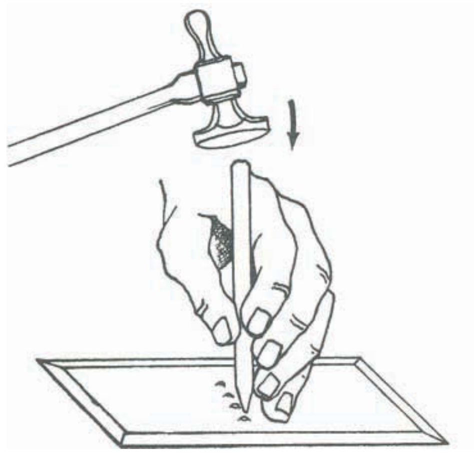


Fig. 76.
Punching

The Stipple Technique

Originally, the dot puncher, an instrument which consisted of one needle or a bundle of up to seven needles, was employed for the stipple technique. Over the course of time, the instruments used for the crayon manner were also employed (figs. 77–80).

By simply looking at the surface, you can recognize the stipple print, because on almost all sheets the dots cover the entire area of the illustration, regardless of whether it is a round, oval, or square image. Even if the background is depicted as light and transparent, there are no areas without evidence of printing. The print in the crayon manner, on the other hand, may show many areas in which there is no trace of printing. Whereas the sketchlike, linear technique of the roulette was supposed to reflect the character of a chalk drawing, the stip-

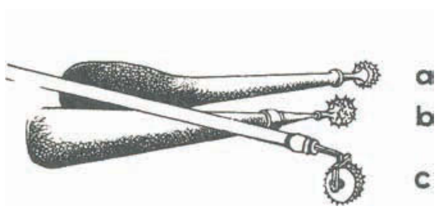


Fig. 77.
(a) Mattoir; (b) moulette; (c) roulette

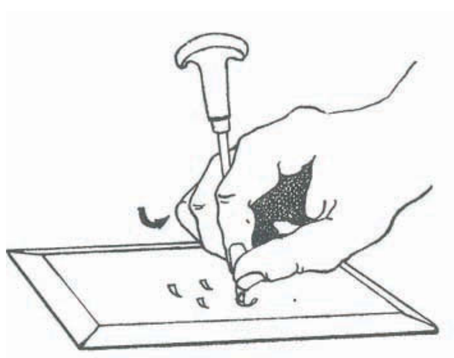


Fig. 78.
Stipple engraving

Fig. 79.
Stipple engraving, English School, ca. 1780. Larger areas worked with mattoir and roulette, delicate parts with a roulette, fine contours with a drypoint (mixed technique). A roulette was used for the dotted border.

Fig. 80.
Stippled work, German School, ca. 1770. Same instruments as in figure 79, only with stronger etching.

ple technique was intended to imitate miniature paintings, which for the most part provided the models for artists working in this technique.

As another more frequently encountered example of stipple technique, I would like to mention the dotted border, which was applied 1 to 2 mm from the image as a frame around the picture.

It is assumed today—and certainly not without justification—that artists using the stipple technique generally worked on hard ground. After the light parts were covered, the plate was etched in stages until the pictorial effect was achieved. Small details were applied "dry" to the exposed copper after the etching process was finished.

The Aquatint Technique

The aquatint technique, also called the watercolor or *lavis* technique, provided a means of reproducing watercolor, sepia, or bistre drawings in graphic form. Like the older mezzotint process, aquatint permitted treating large areas. As we know, the tonal areas of mezzotint were created by the formation of burrs with a rocker. In aquatint this effect is cause by a special kind of granular etching.

The following procedure was used. The prepared plate was covered with ground into which the outlines of the drawing were scratched. The plate was then etched in the acid (fig. 81).

After this preliminary etching, the ground was removed and the plate was covered with fine or coarse grains of rosin. For this work, a series of the most varied methods was developed over the course of time. Of these, only the two oldest ones, which dominated the field from the time of their invention until well into the nineteenth century, are described here in detail. This limitation is justified insofar as we are dealing only with older graphics.

The bare copperplate, from which the ground had been removed, was dusted with a fine-grained, acid-resistant rosin powder, which was then fused to the plate by heating. One had to be careful to heat the plate only enough so that the granular rosin became fused to it, forming small droplets.

The finer and more evenly the rosin powder could be distributed on the plate, the more evenly and finer could the acid bite the bare parts of the plate between the granular rosin.

Another procedure was the following. Heated sea salt was sprinkled on a plate coated with a ground that was not too hard, and because of the heating, the salt sank through the ground onto the copper. When the plate had cooled, the grains of salt were washed out to the ground, leaving the copper exposed in these places. The tone achieved through etching with this method was much coarser because salt particles have a larger diameter than granular rosin.

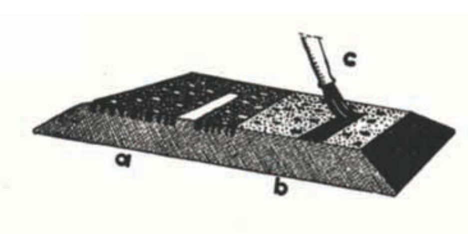


Fig. 81.
(a) Large aquatint grain etched and inked for printing; (b) large aquatint grain before etching, fused to the plate surface; (c) brushing asphaltum onto the parts of the plate that are not supposed to be etched. These areas appear blank in the final print.

Fig. 82.
Aquatint, German School, ca. 1800

Fig. 83.
Print in the crayon manner,
French School, ca. 1770

The application of acid was done in stages as in etching.

The Lithograph

The best stone for the various lithographic techniques is found in Solnhofen in Bavaria. It comes in slabs of a thickness of up to 15 cm. There are light and dark stones. The dark stone is harder and is preferred in most instances.

For the crayon technique, the stone must be prepared specially. Depending on the type of image, the stone can have a fine, medium, or coarse grain. The greasy crayon used to draw the image on the stone produces in its lines a certain excitation caused by the grain of the stone, in the same way as strokes drawn lightly with a pencil on rough paper appear indistinct and are interrupted by many white dots (figs. 84, 85).

Once the illustration has been drawn onto the stone, it is sprinkled lightly with talcum and then etched. Acid is applied to the stone with a broad paintbrush. To etch delicate drawings, a wax edge is placed around the stone and then the acid solution is poured onto the stone. The marks of the greasy crayon color are acid resistant. However, all other parts of the stone, where there is no drawing, are affected.

When the printer rolls ink onto the stone, the places where there is drawing

Fig. 84.
Crayon drawing on stone, by Demanne, French School, somewhat coarser technique

Fig. 85.
Crayon drawing on stone, French School, more refined technique

Fig. 86.
Materials for drawing

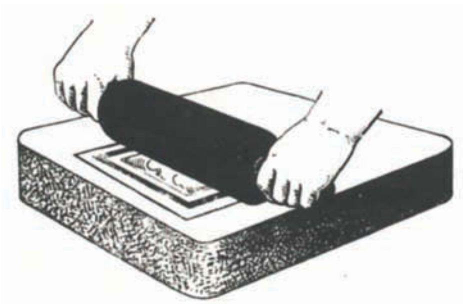


Fig. 87.
Rolling ink onto the stone

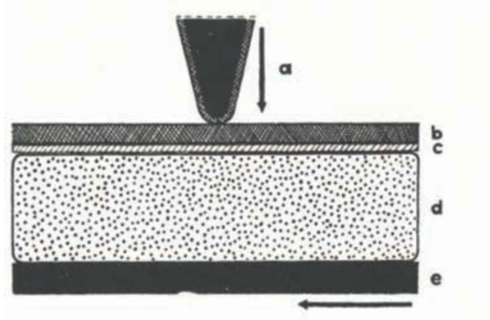


Fig. 88.
Cross section of a flatbed press:
(a) scraper bar covered with leather, adjustable up and down, otherwise fixed; (b) tympan; (c) paper; (d) stone (e) gear-driven press bed that moves stone, paper, and tympan under the scraper bar.

Fig. 89.
Dark-field manner lithograph, by Adolf Menzel, with remarques on the margins.

will accept ink, whereas the etched parts reject it. The entire process of lithography is based on the mutual repulsion of grease and water.

If small light areas or highlights are to be created, they must be done not with a finger but with a scraper. The finger leaves a little grease, just enough to reduce the effect of the etching solution at the places that were touched. In opposition to the desired effect, these places will take on ink, causing the print to have shadows where there are supposed to be lights.

For pen-and-ink lithographs, a lighter color stone is used, and it has to be ground especially smooth. After it has been ground, it is covered with turpentine and rubbed dry with a linen cloth. The lines of the drawing are applied with a greasy ink or tusche with pen or paintbrush and, in contrast to the crayon technique, form continuous strokes (fig. 90). For this reason, the etching process for

Fig. 90.
Pen-and-ink drawing on stone, German School

the pen-and-ink lithograph is a different one too. After it has been etched, the stone is rinsed with warm water—a soft, grit-free sponge is used—and coated with a gum solution. For the crayon drawing, on the other hand, the etching solution stays on the stone until it is completely dry so that the lighter breaks in the line can be thoroughly bitten.

For the dark-field technique, one again uses the hard, dark stone (see fig. 89). The outlines of the image are drawn in pencil, and the stone is coated with a thin asphaltum varnish. The drawing remains visible through the varnish. The image is worked out with a scraper. The etching solution has to be stronger than in the other two techniques, but otherwise the etching process is the same as for the crayon technique.

Fig. 91.
Proof from a steel plate

Steel Engraving

When working with a steel plate, one applies the same methods used with a copperplate (fig. 91). Mezzotint, drypoint, etching, aquatint, and stipple technique as well as diamond-tipped needles and burins can be used. Before the artist works with the plate, the steel is annealed to make it easier to use. After the work is completed, the plate is hardened.

ADDITIONAL HINTS FOR THE RESTORER OF POSTAGE STAMPS

Also included in the broad field of graphics is the postage stamp. I have not mentioned this area of restoration up to this point because other fields of graphic arts have taken up my time. For this reason, I have put more emphasis on collecting recipes than on performing practical work. The little knowledge that I have accumulated over the course of many years generally is not suitable for a professional book on graphics. Only in the past few years have I been able to find a number of guides, catalogs, and extensive treatises that, in my opinion, contain useful hints for the restoration of stamps. I have tried the recipes I received, selected the best ones, and put forth new methods, hoping that I have been of some service to both philatelists and expert restorers of stamps.

In my view, cleaning is more important than pure restoration. The mending of small margins and the addition of parts present no problem to me as a restorer of old prints, since that kind of work is performed in the manner described earlier in this book. (And I would like to point out that these pointers should be followed very closely.) I am not going to give any special hints or instructions because the restoration of postage stamps is exactly the same as that for the Old Masters. The following remarks refer to special considerations in this context.

Several advisers have recommended that a mend should extend onto the stamp 1 to 2 mm beyond the shaved area. This advice betrays the dilettante. To put more adhesive or mending paper than necessary on the undamaged part of the stamp is reprehensible. One should not be surprised if the stamp buckles, especially when it travels to exhibitions and is exposed to different climates. The more a stamp is exposed to daylight, the faster it will deteriorate. Impregnating the stamps with paste, too, will eventually have rather unpleasant consequences. It is impossible for a stamp saturated with paste to hold a mend over many years. (Please read about the damage paste—a foreign body—can cause, earlier in this book.) I will return to this kind of treatment, which should not be used under any circumstances.

The catalogs of the Michel and Senf Brothers generally list separately the stamps that were printed with water soluble inks.[152] In addition, different methods for cleaning and treating such stamps are described. Among other things in these instructions, I do not like the suggestion of putting wet stamps on towels. Moist stamps should be dried between pristine blotting paper. Furthermore, the recommendation that hydrogen peroxide be used to lighten postage stamps is only correct within limits; lighter stamps can become discolored again within a short span of time or can become even darker. Cleaning with potassium permanganate and a subsequent bath in oxalic acid, which is used by most restorers of stamps, is also not a harmless cleaning and detoxification procedure.[153]

How often a stamp has to be treated

with potassium permanganate depends on the condition of the stain. But, and this is important, if you follow every cleaning attempt—no matter how slight—with a bath of oxalic acid, there is no telling what can happen. After all, consider that you are working with two potent poisons, oxalic acid being a stronger cleaning agent than potassium permanganate. Oxalic acid is used to bleach straw and yellowed wicker furniture and to remove strong rust spots from clothes and paper. Instead of oxalic acid (also popularly called saccharic acid), you should use potassium metabisulfite.

All other instructions given in the catalogs I can recommend.

Before you start to lighten them or merely to remove small paper remnants, the stamps should be sorted according to colors. Never treat more than ten stamps of one color at the same time. You should always have a good view of the stamps floating in a bath, to prevent one stamp from losing color or bleeding and thus endangering the others. It is a good idea to place all stamps—only a small percentage have to be omitted—into a bath that tastes strongly of vinegar or table salt. In many cases this bath prevents the loss of color.

For cleaning or lightening stamps, I use dissolved chlorinated lime. This agent, which I have been using for more than fifty years—I work with more than ten different solutions—has never done any harm or damage to a sheet. Chlorinated lime in the right dosage is an excellent cleaning agent. The weakest solution should not even smell like chlorine. Cleaning French aquatints printed in color, including stamps, presents the most difficult restoration problem among all graphic techniques. Even a very minor mistake can cause the color to fade. And what use is the application or hydrogen peroxide—it is only a short-term expedient—if it has not been preceded with a mild chlorine treatment? Even the adhesive coating, which in many cases contains some coloring, can cause yellowing that eats deeply into the paper.

Stamps that are not able to withstand even water or benzine must be excluded from any cleaning treatment. After all, it is impossible to call those stamps unique that have changed color.

Cleaning with the weakest chlorine water is carried out from the reverse. The picture side should be treated locally with chlorine only when all other means have failed. As an antidote, vinegar baths should be used, followed in turn by frequent baths in fresh water. Only in one case is it appropriate to go to a somewhat stronger chlorine solution, and that is when a change in color has been caused by oxidized lead carbonate.

In an impressive book, whose author—allegedly a serious collector—maintains that he has occupied himself for years with the restoration of stamps, the following monstrous piece of advice is given: Mold stains cannot be removed unless one erases them with a knife, even though a hole is scraped into the stamp this way! Who can simply ignore this and not raise his voice?

In all his suggestions I find lacking the exhortation to use absolute cleanliness. And it is cleanliness that is the basis for successful treatment. If a stamp has been shaved down for repair, it should not be put into a paper bag or container until twenty or even thirty stamps have accumulated to be treated. The treatment of the stamp—except for retouch-

Fig. 92.
Tools for the restoration of stamps

ing—should be continued immediately. If everything I have written about restorations is followed, repairing stamps should not be too difficult a task for a sensitive restorer.

If you shave only 0.5 mm, the work is bound to fail. This need not be. Each shaved area should be 2 mm wide. After mending, any additional shaving is done strictly according to instructions.

A new procedure is the pasting of thin paper onto the face of the mended stamp, outside the stamp design. To achieve a smooth transition from the original paper to the restored parts of the stamp, very thin, matte-finish paper is pasted over the mended place on the side with the design, precisely up to the edge of the original. When doing this, take into consideration (as mentioned earlier in this book) that the moist treatment revives all parts once again; that is, because of the rice starch paste they swell 0.01 mm, although this swelling can only be seen under a magnifying glass. Therefore, to achieve an invisible juncture, the space from the beginning of this swelling must be filled with the thin paper. Subsequent shaving will be necessary in most instances. Again, look at the front side and remove the fine fibers along the edge of the thin paper, since it was not cut with scissors but torn. To make the pasting more efficient, a slight roughening of the thin paper is recommended.

If the stamp is damaged in such a way that it shows many thin spots, shave the entire stamp thin. The shaving can be performed dry or moist, or the picture side of the stamp can also be glued onto a small glass pane with acid-free glue. As with all other treatments, gluing is done while the stamp is moist. (Shaving, of course, is practiced first on stamps without any value.)

The paper used for backing should be so thin that together with the stamp it

Fig. 93.
Repairing stamps

equals the thickness of the original stamp. Shaving is done in the usual manner. If a stamp that has been shaved thin has a watermark, transfer the watermark ahead of time, reversed, as in a mirror, onto the inside of the backing paper.[154]

Restoration of the printed parts (retouching) is difficult only if you are not sufficiently experienced in using the paintbrush or drawing pen. But you can get help by finding, for use in restoration, extra stamps that are healthy in those parts in which the good stamp is sick. When deliberating what shape and what size of mend to cut out of the damaged stamp, you should start by finding a salient feature that might be useful. If possible, choose a dark point in the stamp design, a wider line in a letter, a darker line in the drawing, or a similar place. This facilitates the work of creating a transition and saves you from more extensive retouching. The additions must be minor because otherwise you run the danger of being considered a forger. The less retouching, the better.

Depending on how the mend will be set into the original, use the restoration knife to cut the mend out of the extra stamp so that it is a little larger than the area to be mended, which has been shaved down in advance. Go to a window or the shaving box and put the original stamp on it; take the little piece of the extra stamp, put it exactly in place, and with the back of the knife (edge facing upward) carefully scratch out the part that is to be added. The scratching must be done cautiously (the wrist has to be loose) and should under no circumstance damage the original stamp. The excess, projecting paper is removed, and the mend is placed exactly onto the empty area of the original stamp. It should fit precisely. (If too much has been cut off, there is no point in continuing.) The mend is shaved exceedingly thin and again placed into the empty space.

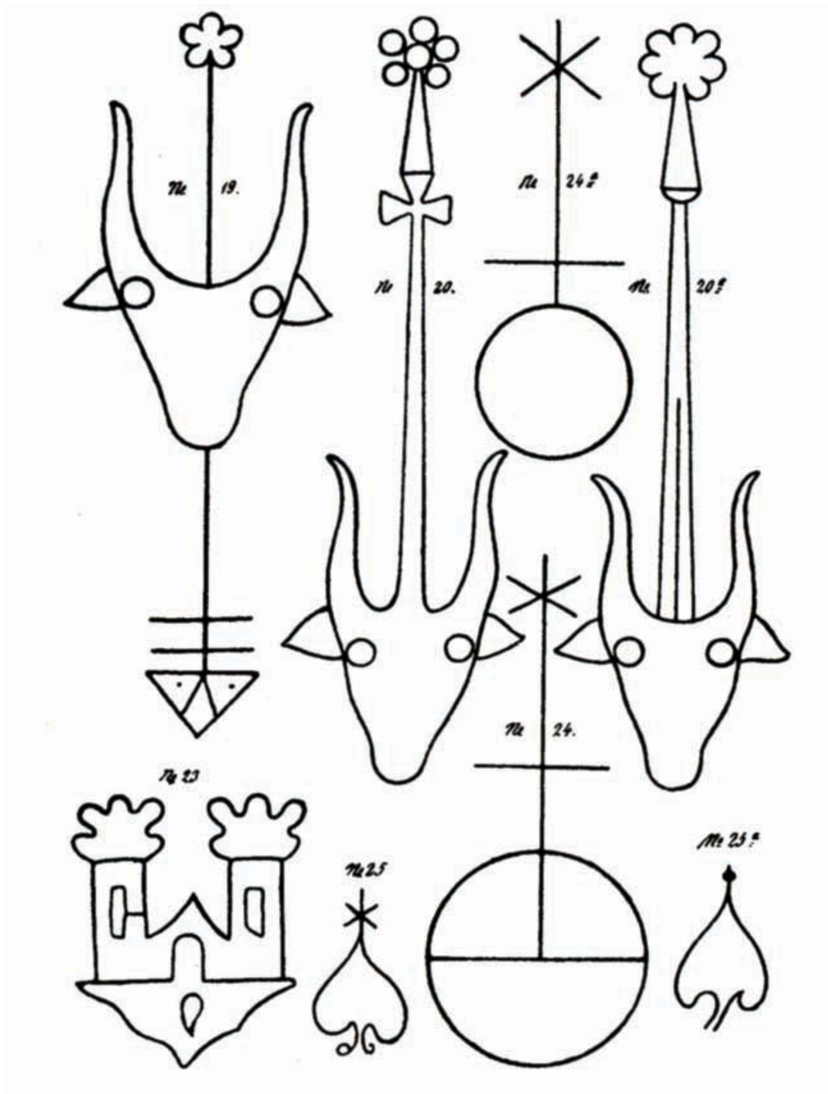


Fig. 94.
Well-known watermarks from the early sixteenth century

Several drops of water are applied to the stamp and the mend so that both float. Should the mend become displaced a little, direct it back into a proper position with a small, blunt wooden rod. This can be done very easily while the stamp and the mend are moist. To remove the excess water, put blotting paper carefully onto the stamp, first covering the side of the glass pane with the blotting paper and gradually lowering it onto the stamp.

A previously cut piece of blotting paper, which is the full size of the glass pane and, like the pane, is to be used for positioning the mend, is dabbed with water, lightly dried, and laid flat onto the stamp. The front of the mend (stamp design) has been dabbed with a weak paste beforehand so that it can be transferred to the blotting paper when the blotting paper is put over it. To accomplish this, press down on the blotter with your finger directly over the location of the mend, and the mend will adhere to the blotting paper with the back side facing upward. After applying a little stronger paste to the mend, it is peeled off the blotting paper, and the part is returned to its place on the stamp. If the mend does not fit within a hair's breadth, drip a few more drops of water on it and, with the aid of a magnifying glass, move it into the right position again with a small wooden rod. The stamp is put between blotting paper under a copy press [see Rhodes 1999], and the press is tightened slightly. After two minutes the paper is removed, and the stamp is again placed under the press between new sheets. The pressure of the press now has be to be little greater.

This finishes the restoration.

In writing the above essay, it was my intention to point out to the expert restorer things he might have overlooked that are essential. For this reason, the essay is merely supposed to give certain hints and not to be an exhaustive treatise for future restorers. To explain all details in the repair of damaged stamps, I would have to write a special book, which would take too much time at the moment.

The following are little, practical hints.

A few remarks about paper pulp. Paper pulp—recommended by many, rejected by many—needs to be put in its rightful place. In the section "Actual Mending or True Restoration" (pp. 109-22), I rejected paper pulp because it should not be used for restoration purposes. When I recommend paper pulp here it is because pulp serves well for the smallest repairs on stamps (needle pricks, thin places, perforations, etc.) when the shaving is done properly and utmost cleanliness is observed. For larger repairs follow my guidelines.

Paper pulp. Clean paper containing no wood pulp is finely shaved, mixed with a small amount of water, and stirred well. Before using the pulp, the water is drained off, the stamp is put on a clean piece of linen, and the pulp is filled into the places to be restored. When the pulp has dried a little, the stamp is carefully placed between blotting paper and both parts are put under a press. The pressure from the press should be light and last two minutes. This procedure is repeated until the pulp is as strong or thick as the paper.

Long soaking in water. A stamp does not lose its firmness through extended soaking in water—five to ten hours. Neither do paper fibers start to dissolve, an impossibility even when hot water, which now and then has to be employed for removing a stamp, is used. Prolonged boiling can endanger the colors but can never cause the deterioration of paper if the water does not contain any destructive additives. The sizing of the paper, which was weak and contained a small addition of alum, is reduced through this procedure or completely eliminated.

Sizing or strengthening. Each chemical treatment (chlorinated lime, hydrogen peroxide, potassium permanganate, oxalic acid, *eau de Javelle,* strong vinegar, or salt solutions) causes a sizing loss. Often an old or new stamp that received only a rosin sizing loses its sizing when it has been exposed to wind and weather even if it has not been treated with chemicals. The lost sizing can and should be refreshed by adding a small dash of aluminum subacetate or the smallest amount of alum. The stamp is soaked in this solution before retouching and is dried off immediately.

Removing the gum. The gum on some stamps is firm and tenacious and cannot be removed even after long soaking in water. First, treat such a stamp in a cold bath, then follow with lukewarm to hot baths in short intervals. Place the stamp on a glass pane, and try to lift the gum with a bone folder and a restoration knife. Be careful in this process not to damage the stamp and render your work pointless. The gum has to be pulled off the stamp, not the stamp off the gum. If this cannot be done in one procedure, put the stamp back into the lukewarm water, wait a while, and continue to work.

Dyeing of mending papers. Dyeing can be done by mixing color into the paper pulp or in stages by boiling in a color solution. The more experience you gain, the more successful you will be. To be useful, each colored paper must become thoroughly impregnated with color. Before using the paper, you should perform a tearing test. Tear the paper in such a way that overlapping edges are created (see fig. 31). If the interior of the paper, as seen at the edges, is considerably lighter or even white, only the surface of the paper has been colored, and it cannot be used for repairs.

Eau de Javelle consists of a certain percentage of soda[155] and is therefore not a suitable cleaning agent. (Soda affects colors.)

Removal of grease spots. Grease spots can be removed by producing a magnesium oxide poultice that is heavily saturated with benzine or carbon tetrachloride. The poultice is applied to the back, and after evaporation of the liquid, the magnesium oxide is removed by tapping. This procedure is repeated until the spots are removed. Dipping the stamps and soaking them for some time in benzine, ether, and so on, is not good for the stamps since the slight oil content of the colors can be lost and the stamps can become useless.

Removal of old oil stains. Dab the stamps softly from the back with a small linen cloth that is dampened again and again with carbon tetrachloride. The blotting paper—the stamp has been placed onto it with the design facing downward—takes up the old oil and turns yellow. Repeated treatment is advisable.

Copying-ink pencil or similar crayon lines can be removed by simple methylated spirit baths. Longer soaking is not recommended since certain stamps cannot tolerate a bath of several hours. At certain intervals—say, every ten minutes—the stamps should receive a bath in fresh water.

Removal of writing in ink. A major part of writing in ink can be removed completely when you go over the writing with a 5 percent solution of hydrochloric acid after local treatment with chlorine. Immediately after treatment, even if the writing is still visible, put the stamps into a vinegar bath. Repeat this procedure until the writing is removed. If the writing has not faded at all after the first attempt, do not continue with the treatment. Caution is called for!

Foxing is treated with chlorine water.

Each chlorine bath requires an antidote—a bath in vinegar or sodium bicarbonate (natron)[156]—which in turn is followed by baths in fresh water.

Hydrogen peroxide. No more than a 10 percent solution can be used even if the cleaning process is slowed down this way. A stronger solution could cause the stamp to decompose and become worthless.

Potassium permanganate can be used up to almost 5 percent by volume.

Instead of oxalic acid use potassium metabisulfite, which can be mixed for you by a pharmacist, photographer, or dentist.

Examining paper for the presence of mechanical wood pulp. Two percent phloroglucinol should be mixed with 10 percent alcohol and well shaken. (Order from the pharmacy.) To try it out, put a drop of the phloroglucinol solution and a drop of 10 percent hydrochloric acid, which does not have to be pure, on a piece of paper. The place immediately turns dark red if the paper contains a large amount of mechanical wood pulp. A lighter color appears if the paper contains only a little mechanical wood pulp. Should a 10 percent solution of hydrochloric acid not be sufficient, a stronger solution, almost up to a concentrated one, can be used.

Fifteen percent aluminum subacetate prevents colors from bleeding onto restored places. After saturating the stamps, dry them immediately with blotting paper to prevent shiny spots from appearing.

Waterproofing colors. Add a drop of purified water glass to the retouching color.[157] Retouching should not be done on papers containing wood pulp, because they would develop a slightly yellow tone.

Removal of dirt. Do not use benzine to wash the stamps, since the slight oil content of the stamps could be lost. Pure, clean water is the best cleaning agent. The paintbrush used for cleaning should not be too soft or too hard. It can be pressed down somewhat forcefully.

Starch paste. Starch paste used for stamps may be prepared a little stronger than for other repair work. The main consideration here is that all pasting as well as all lightening or cleaning procedures are done while moist. Adhesive strength is not thereby reduced; on the contrary, paste will adhere better to the fibers of the original paper. The moisture—wetness—is immediately removed with blotting paper in order to continue further treatment.

SUMMARY

I have arrived at the end of my book but certainly not at the end of all I could say about restorations. Caution prevented me from talking about some things. I wanted to avoid making a bad situation worse. My book should not be regarded as a cookbook that contains instructions for all circumstances. A restorer has to be a very sensitive person who avoids harmful methods of treatment and knows how to adapt useful treatments to his object. This is how my remarks should be understood and used. The reader is free to try other methods on his own. He should, however, do this as a responsible connoisseur and lover of the arts and experiment with his new methods first on worthless things and try them over and over again before he treats valuable works and perhaps exposes them to destruction. The reader will have noticed that I took a similar road. My friends have a great advantage: I have revealed to them the experiences of my fifty years of professional life. The responsibility of the restorer to objects of cultural value is the same as that of the physician to human beings. My book cannot be a cookbook, for the cook can throw out the soup if it does not taste good. But when the physician or the restorer has made an error, frequently all is lost. And we restorers often deal with a dangerously ill patient and are happy when we succeed in bringing it back to life again, when we succeed in saving a culturally valuable work of art not just for decades but for the foreseeable future.

Some time ago, in a monthly publication for bibliophiles, an article appeared under the title "Clinics for Antiquities." This is a title after my own heart. The restorer should feel in his workshop—his clinic—like a medical chief of staff who recognizes with an experienced eye whether treatment or an operation is indicated. There is a certain amount of basic knowledge that definitely has to be followed by the physician; this is also true of the restorer. In medicine much depends on the experience of the physician and everything on the constitution of the patient, and the same applies in restoration. The restorer has to collect experience and possess it. His success or lack of success often is dependent on the object he is working on. A lack of success is not always his fault; it is also not a consequence of the methods of treatment recommended here but can depend on the treated material with its mortal weaknesses.

Only he can become a restorer who enjoys his occupation, who treats the objects of his work with love. This love of the object caused me to write down my experiences. It has forced me to explain why I work a certain way and what dangers I have avoided, to help others and to spare them lost efforts and destructive methods.

I emphasized in the foreword that I would like to exchange experiences. I would be happy if in a later edition I could distribute suggestions that others have worked out and would like to make them available to the public just as I have done with mine. In the path toward the preservation of works of cultural value there should not be any professional secrets, for we owe it to our nation and mankind to preserve the few treasures that have been handed down to us from past times.

THE AUTHOR

This page intentionally left blank

EDITOR'S NOTES ON THE TEXT

1 Hugo Ibscher (1874–1943) was a restorer of manuscripts and papyri. Trained as a bookbinder, he entered the service of the Berlin Museum in 1891, where he was entrusted with the mounting and restoring of the papyri, at first under the direction of Ludwig Abel but independently after 1894. He also undertook private commissions for collections elsewhere. For his work on restoration of parchments and other manuscripts in the Vatican, he was awarded the Order of Saint Gregory. See Dawson and Uphill 1972.

2 A. Bonnardot, *Essai sur la restauration des anciennes estampes et des livres rares* (Paris, 1846). A second revised edition was printed in 1858, titled *Essai sur l'art de restaurer les estampes et les livres,* and a German translation appeared in 1859 (Stevenson 1995:117).

3 See glossary.

4 See glossary.

5 In U.S. dollars as of 2002, this would be equivalent to approximately $4,786. This conversion is based on the assumption that in 1934, about 4.20 German marks was equivalent to U.S. $1.00 and that the value of U.S. $1.00 in 1934 is equivalent to $13.40 in 2002. Officer 2002; Williamson 2002.

6 Presumably it was possible in Schweidler's era to purchase paste ready for use, and from the context it seems likely that this paste contained alum, but I have not found further information about this kind of commercially prepared paste.

7 See the section "Removing Prints from Backings," pp. 58–63.

8 See glossary. Although the method of attachment is not entirely clear here, the point seems to be that a print should not be glued directly to a mount but should instead be attached by means of narrow strips of paper applied around the margin of the print. Schweidler elaborates on the mounting of prints and the use of guards in the section "The Stretching of Prints," pp. 130–36.

9 Schweidler's reference is unclear.

10 I.e., those who prepare window mats for pictures, in conjunction with fitting the matted pictures into frames.

11 Approximately $4,786 in 2002 U.S. dollars. See note 5.

12 The phrase *zum Abspülen der Blätter* is translated here as "rinsing off the prints." To most readers, the distinction between "rinsing" and "washing" may seem trivial, but to paper conservators the implications are important, especially in the context of using water to remove from paper any reagents or chemicals that might have been used in treating a print and that might damage the paper if not removed. The verb *abspülen* connotes cleansing, as one would do with one's dishes. If Schweidler had wanted to imply a more thorough cleansing, as in washing of one's clothes, he probably would have used the word *waschen.* Schweidler discusses rinsing and washing of paper in more detail in the section "Brightening and Cleaning," pp. 51–57.

13 See glossary.

14 As stated on p. 66, by "vinegar," Schweidler means wine vinegar (presumably white wine vinegar, since it is essentially colorless). Generally, the strength of the wine vinegar sold for home use is approximately 6 percent.

15 See glossary.

16 [Author's footnote a] Carbon tetrachloride is harmless, since it is not flammable; it is a good substitute for gasoline and a very good spot remover for fresh grease spots. [Although the author asserts that carbon tetrachloride is harmless, it should be emphasized that this solvent is now considered quite hazardous and a potent carcinogen.—R.P.]

17 Distilled ethyl alcohol.

18 See glossary.

19 See glossary. In the text that follows, Schweidler sometimes refers to a "soda solution," by which one should understand that it is a solution of "bleaching soda."

20 [Author's footnote b] A sponge is only usable when the little stones found in it have been completely removed. The sponge has to be

examined by touching it, and the stones have to be removed one by one.

21 [Author's footnote c] Excerpt from Hugo Ibscher, Das Papyrusblatt und seine Wiederherstellung nach fünftausend Jahren, *Westermanns Monatshefte*, February 1935.

22 In the original, Schweidler uses the German word *Schleudern*, which means "to fling, hurl, or swing" but also "to centrifuge." In this context Schweidler must have in mind the device sometimes called a "duster," which Labarre ([1952] 1969:83) defines as follows: "a mechanical contrivance, usually consisting of a revolving drum of mesh wire fitted with teeth for opening out and cleaning rags, books, wastepaper, esparto grass, straw, etc." Also, in Cutbush's *American Artist's Manual:* "The duster is made in form of a cylinder, four and a half feet in diameter, and five feet in length. . . . A convenient quantity of the rags after the selection are enclosed in the duster, and the rapidity of its motion separates the dust from them, and forces it through the wire" (Bidwell 1990:63).

23 Schweidler uses the word *Feuchtigkeit*, which means "dampness," but perhaps he intends to suggest that the rags would be inspected for discoloration due to mold.

24 Schweidler's knowledge of papermaking is inaccurate. Usually, two paper molds were in use alternately by the "vat man" and his assistant, the "coucher," whose task was to take the pulp-laden mold from the vat man and turn it upside down onto a felt, thereby transferring the wet pulp to the felt. The coucher would then cover the pulp with another felt, in preparation for receiving the next layer of pulp. Next, he would place the empty mold within easy reach of the vat man, who, in the meantime, would have been scooping up another layer of pulp on the second mold. Thus, at any one time, one sheet of paper is being formed by the vat man while the previous sheet is being placed between felts. Eventually, when many layers of paper and felt had accumulated, the entire stack would be pressed to remove excess water. Then the wet, pressed sheets of paper would be separated from each felt and hung up to dry.

25 See glossary.

26 Schweidler's description of the structure of paper molds is vague if not incorrect. Here, for example, he indicates that the chain stitches that serve the important function of holding all the wires in place are merely wires that are used for support. In general, his explanations of the materials, tools, and techniques of papermaking are sometimes inaccurate. For more reliable information, refer to Hunter 1947.

27 Current practice is to use the phrase "laid lines" to refer to the closely spaced lines in laid paper. The widely spaced lines—the "chain lines"—are due to the chain stitches on the paper mold; these serve to anchor the closely spaced wires to the wooden ribs that lie beneath and give support to the surface of the mold. Collectively, all the lines in laid paper, whether formed by the wires or the chain stitches, are usually called "wire lines." For information on European laid paper and the molds used to make it, see Hunter 1947:114–38.

28 *Bleichholländer*, a machine used for bleaching paper pulp (Labarre [1959] 1962:23).

29 This paragraph is confusing. In the first two sentences Schweidler seems to recognize the dangers of rosin sizing, compared to traditional gelatin sizing, but the paragraph eventually descends into a muddle of inaccurate information—alum-rosin sizing does not prevent water stains and foxing—compounded with lack of clarity.

30 Here he seems to assume that because the paper is inherently strong enough, it will not be necessary to have any additional support. But on p. 49, he indicates that severely torn or damaged sheets need the additional support of a good piece of paper.

31 See note 30 about not requiring a support when a sheet is strong enough not to require one.

32 Marginal note by C. S.: "That would be a self-accusation."

33 Marginal note by C. S.: "*Never* erase within the *printing*, only on the margins and back of the sheet."

34 See glossary.

35 The author does not offer a reason for using a bath of dilute vinegar, but it may have a basis in common household cleaning methods. The use of a bath of dilute vinegar recurs throughout the book. When I was a fellow at the J. Paul Getty Museum doing research on this book, Mary Sackett, conservator at the Getty Research Institute, made it possible to conduct some simple experiments using scraps of four old papers that showed slight signs of discoloration. One paper was machine made, and it may have been sized with alum-rosin sizing. The other three were probably handmade, with gelatin sizing. On a whim, we brushed some animal glue across the ends of two of the

papers to see what the effect would be after bathing. Each of the scraps was cut into three pieces. One piece was retained as a "control" for comparison; the second was bathed in plain water; the third was bathed in 5 percent distilled white vinegar, with a pH of approximately 2. Perhaps the most interesting result was that all four kinds of paper wetted more readily in the vinegar bath than in plain water. Also, we noted that more of the swaths of animal glue were removed from the samples that had been bathed in vinegar. After bathing the samples for one hour at room temperature, they were removed and air-dried on blotters. With regard to the overall appearance of the samples, those that were bathed in vinegar were not dramatically different from those bathed in water, although all those that were bathed looked somewhat lighter than the controls. In short, it is not clear what benefit if any might result from bathing paper in vinegar, so it is not clear why Schweidler would recommend this practice. On the other hand, the effectiveness of the vinegar in dissolving the animal glue suggests one possibility. To the extent that a water stain on a gelatin-sized paper might consist of deteriorated gelatin, perhaps the stain might be reduced more in vinegar than in water. Without further study, this is merely speculation, so Schweidler's reasons for recommending baths of vinegar to remove stains remain uncertain. Regarding vinegar as an "antidote" to be used following bleaching with a chlorinated bleach, see p. 66.

36 Just imagine that one would have on hand enough "worthless prints" of sufficient size to use merely as a support while bathing a print!

37 Marginal note by C. S.: "Nonsense! That almost always affects the print."

38 For more information on bleaching soda, see glossary.

39 See glossary for more information on bleaching soda ("soda solution").

40 Marginal note by C. S.: "Why soda, which is so dangerous? Borax is also helpful."

41 Marginal note by C. S.: "Therefore, hands off the soda 'medicine.'"

42 Marginal note by C. S.: "can destroy the sheet."

43 Schweidler probably means that if the paste has not yet become sufficiently soft to permit easy removal of the mounted print, attempts to remove the print may leave residues of incompletely dissolved paste on its back in a pattern caused by the brush with which the paste was applied. It is also possible that he means that minute bits of the mount may be left behind on the back of the print, and that the pattern of these residues may result from variations in the amount of paste brushed onto the print during its mounting.

44 Schweidler probably means to say that if the wooden strainer is larger than the print, then it is easy to cut through the secondary support, which, in this instance, would extend out beyond the edges of the print so that it would be easy to cut through the support, thus freeing both the print and its support from the strainer. On the other hand, if the strainer is exactly the size of the print, then there would be no margin of the support beyond the print, and it would therefore be more difficult to cut both support and print off of the strainer.

45 I.e., papers that are dense and strongly sized. Whatman papers were well known for these characteristics.

46 The author often refers either to dry calcium hypochlorite powder or to a solution of chlorinated lime (calcium hypochlorite) as "chlorine," although technically the latter should apply only to the element itself, which is a gas.

47 The "Dr. X" referred to is Dr. Hans Böhm, and the book is *Die Praxis des Restaurators*. See references. This book is Böhm's update of a much earlier book by Friederich Lucanus, *Vollständige Anleitung zur Erhaltung, Reinigung und Widerherstellung von Gemälden, Aquarellen, Kupferstichen, etc.*, which was published in 1812 and has been described as "the first major tract on print restoration" (Stevenson 1995:117).

48 The quote is from Böhm [1929] 1979:84.

49 That is, rather recently, considering that the first edition of Schweidler's book was published only nine years after the publication of Böhm's book.

50 Marginal note by C. S.: "So, chorine treatment after all, you old racketeer!"

51 I.e., a solution of "chlorinated lime" (calcium hypochlorite).

52 In this section, Schweidler mentions two "antidotes," vinegar and sodium hyposulfate, but later, on p. 202, in discussing treatment of stamps, he suggests using sodium bicarbonate as well.

53 The idea of using an acidic bath to remove chlorinated bleach appeared two years before the first edition of Schweidler's book in a publi-

cation in English (Keck 1936:117–26). The theory was that lowering the pH of the bath (making it more acidic) would cause a shift in the equilibrium of the reactions in the solution so that any residual chlorine would be turned into chlorine gas, which would eventually be expelled from solution. In the following decades, it was shown that causing the pH of a chlorinated bleaching solution to shift from an alkaline state (pH higher than 7) to an acidic state causes more disintegration of cellulose, and hence greater loss of strength of paper, than if the pH of the bleaching solution were to be kept somewhat alkaline.

54 Marginal note by C. S.: "in a *zinc* tray?" Carl's terse comment is hard to understand. Perhaps he is questioning the fact that the tray is made of zinc and suggesting that there could be an undesired chemical reaction between the vinegar and the zinc. Alternatively, he could be questioning whether an entire bottle of vinegar is an appropriate amount.

55 Schweidler's appreciation of sunlight as an effective and desirable means of reducing or removing discoloration from prints is in keeping with a long tradition. "As print restoration developed in the seventeenth and eighteenth centuries, the use of the sun's rays to bleach prints was repeatedly 'discovered' by individual restorers before Robert Hecquet finally published his 'secret' in 1751. Until the development of chlorine bleaches and their application to print restoration in the late eighteenth century, sun bleaching was the usual manner of lightening the paper of prints, and in some circles, particularly among collectors who restored their own prints, it was still employed into this century" (Stevenson 1990:422). Johann Wolfgang von Goethe was a notable practitioner of sun bleaching. In his autobiography he describes how, with the help of his sister, he "laid prints belonging to his father on boards, wetted them, and propped them in the roof gutters so they could bleach in the sun" (Stevenson 1995:124 n. 20). For more on the use of light for bleaching, see also Keyes 1982:100–104; Van der Reyden 1988:73–106.

56 Marginal note by C. S.: "How profound!"

57 Marginal note by C. S.: "God only knows!"

58 See glossary.

59 The nature of this peculiar reaction is uncertain, but it resembles an effect described by A. D. Baynes-Cope (1977:3). He reported that brown stains had developed during treatment of paper with hypochlorite bleaches and discovered that this was probably the result of prior treatment with potassium permanganate, a chemical that can be employed either as a bleach or as a means of tinting paper a yellowish hue, depending on the circumstances of its use. Certain colorless residues of the permanganate, if present, may react to form manganese dioxide, a brown compound.

60 The reference is unclear. Perhaps the author is trying to suggest that early colored woodcuts were influenced by pictures on ancient Egyptian papyrus.

61 Schweidler mentions "Swiss color prints" or "Swiss color artists" several times in this section of the book and elsewhere. He is probably referring to delicately and decorative hand-colored etchings that were made in Switzerland in the late eighteenth and early nineteenth century and often represented picturesque views of various parts of Swiss scenery. A few of the artists working in this vein were Gabriel Ludwig Lory Pere (1763–1840), Heinrich Rieter (1751–1818), Johann Jakob Biedermann (1763–1830), and Carl Hackert (1740–96).

62 See glossary.

63 In this paragraph the author must be referring to the drawing technique called metalpoint, but I am unaware of examples of such drawings in which two to four parallel lines could be drawn by special shaping of the metal. For metalpoint drawings, it was customary to prepare the paper not with chalk alone but with a coating of chalk, ground or calcined bone, or other white substances, which, when mixed with animal glue and water, were applied to paper as a ground on which the drawing would be executed. Colored pigments were also often added to this mixture to produce a colored background for the entire drawing. I am grateful to Timothy Mayhew for sharing with me his expertise about metalpoint drawings.

64 In other words, the author asserts that pencil drawings were indeed made from as early as the seventeenth century and that a drawing that appears to be from that period should not automatically be regarded as a forgery simply because it is in pencil.

65 The darkening of white lead pigment is the result of reaction with sulfur, not oxygen, light, and air as the author suggests (although air polluted with gaseous sulfur compounds *can* cause oxidation of white lead).

66 Marginal note by C. S. regarding this paragraph: "Wrong! It must be treated with dilute hydrogen peroxide." Carl is quite correct, in that the usual treatment for oxidized white lead pigment is dilute hydrogen peroxide, not citric or hydrochloric acid.

67 Marginal note by C. S.: ". . . then hardly possible." He refers to his previous marginal note indicating that hydrogen peroxide is the correct means of treating oxidized white lead pigment.

68 See glossary. I know of no source for Schweidler's use of this material. From the chemical standpoint, given that aluminum ions are trivalent, it is possible that aluminum subacetate may harden gelatin and hence make gelatin sizing more effective, but it also may make it more acidic.

69 See glossary.

70 See glossary.

71 This section is likely to be confusing because the author does not begin substantive description of the process of shaving down paper in preparation for mending until the section "Actual Mending or True Restoration," especially pp. 112–14.

72 The location of this reference is unclear, but considerable discussion of paste, especially alum paste, occurs on p. 34 and in the section "Removing Prints from Backings," especially pp. 58–59.

73 It is difficult to interpret the assertion that paste only swells when boiled repeatedly, or that swelling of paste during cooking must be prevented. When the temperature of the water and starch mixture is raised to a certain point, the starch granules inevitably swell and burst, forming a gel, regardless of how much water is added during cooking. Perhaps the author means that water should be gradually added at a rate that keeps pace with the swelling and that by continuous dilution in this manner the paste will not become very thick.

74 A bone folder is a flat, smooth tool, traditionally fashioned from bone, although the author suggests that one might use an old toothbrush to make such a tool (see fig. 25). It is invaluable, particularly in the practice of bookbinding, and is often used for manipulating paper and other materials.

75 See note 53 regarding using a hypochlorite bleach in combination with an acid.

76 Technically, a solution of bleaching soda would not be giving off anything as "vapors," but given (as he says later) that the solution is actually boiling, it is certainly conceivable that minute droplets from the boiling solution could be present in the steam just above the solution and that it would be wise to cover those areas of the print that one did not intend to expose to the solution.

77 Although these directions are confusing, the author seems to suggest that oil stains in the margin of a print can be dissolved by rolling the print as described and standing it in boiling bleaching soda solution, which is drawn up into the margin.

78 It is likely that the effect described by Schweidler is due to the dissolution and transport of water-soluble substances present in the paper (these are responsible for the "yellowing") toward the perimeter of the area to which the bleaching soda solution was applied. At the center of this area, the bleaching soda would certainly dissolve these substances and cause them to move outward (and thereby lighten the paper), but these very same dissolved substances would be deposited at the perimeter, thus creating a brownish ring. (An experiment I carried out some years ago seemed to indicate that sodium carbonate can also have a lightening effect on some of the discolored materials in paper, perhaps due to the alkalinity of this chemical.)

79 See glossary.

80 The author does not indicate why the water should be boiled for this much time prior to pouring it into the starch. Perhaps this is to kill any bacteria that might be present; or if the water contained high concentrations of mineral carbonates, boiling it would cause them to precipitate and thus help to purify the water, but it is not clear how this would improve paste made with this water.

81 Schweidler seems to assume that the more absorbent a paper is, the more likely it is to have foxing. Today one may try to distinguish foxing that is due to mold growth from those stains that result from the presence of small particles of metal. Given that mold grows so readily on gelatin, surely it would be *more* likely for a paper that is heavily sized to grow mold, and hence develop brown stains, than a paper that has little or no sizing. Foxing that is due to oxidation of small particles of metal would be as likely to develop regardless of how much gelatin sizing is present.

82 Schweidler is probably trying to say that papers from about 1750 and later generally have less sizing than earlier papers and therefore will easily lose some of their "weaker sizing," especially when treated with baths of chemicals.

83 The discussion of dissolving white gelatin actually occurs a few pages later, on 102–3.

84 C.S. marginal note: "Like, for example, the Rembrandt that I have here from Colnaghi to remove the spots that my brother Max messed up."

85 Marginal note by C. S.: "What about the stretching that also takes place in nonabsorbent paper and that has to be checked even more thoroughly?"

86 C.S. marginal note next to fig. 22: "Wrong placement of marks *[falsche Zeichenstellung]*. The marks were already erased." It is unfortunate that Carl did not elaborate on his cryptic remarks on the diagram, given the importance of this subject in the book. Also, note that figure 22 seems somewhat out of place, as it is even more relevant to the section "Actual Mending or True Restoration," especially pp. 113–14, where he gives more specific instructions for chamfering and inserting mends into their precise positions.

87 The original reads: ". . . man pflanzt die Flicken ein." Here and in many places in the following pages Schweidler uses the verb *implant (einpflanzen)* to refer to the process of pasting and inserting a repair into the area on the back of a print that has been deliberately thinned as part of the repair process. Later he uses the same word to refer to the process of thinning the repair paper in order to simulate the appearance of the wire lines in paper. I have tried other ways of translating this but ultimately decided to leave it as simply the most expressive choice, though it may at first sound rather odd to the reader.

88 "Die geklebte Stelle wird sich wölben oder seitlich ganz kleine Fältchen schlagen." In this context, it seems best to translate *kleine Fältchen schlagen* as "develop slight puckering." For more on the translation of the word *Fältchen*, see note 143.

89 Here Schweidler touches on an important aspect of this repair technique. From the standpoint of the restorer, it is obvious that buckling of the repair will detract from its effectiveness. On the other hand, from the standpoint of anyone who needs to detect such repairs, it is good to know that in my experience it is quite unusual that chamfered repairs do *not* in time become evident as result of buckling unless they are rather small. (See Appendix: the splicing in the Altdorfer woodcut is only a few inches long and yet is somewhat buckled, whereas the repaired wormholes in the Housebook Master drypoint are small and show no signs of buckling.) Indeed, if one discerns any buckling in a print or drawing, the area of buckling should be scrutinized with great care, as this might indicate the presence of a repair.

90 In this context, one might wonder if the author is suggesting that one first cut and shape the repairs and then check them for expansivity, but that would of course be very labor intensive. He is instead suggesting that after one has selected two or three papers that match the original visually and therefore might be suitable for making mends, these could be tested as a group to see which of them might have expansivity characteristics that match the original. A marginal note by Carl confirms this interpretation: "That's right, one must test not the repair pieces but rather the papers [from which they are made]."

91 Marginal note by C. S.: "It is absolutely necessary."

92 It is interesting that in Schweidler's discussion of how to split paper he says nothing about its use in conjunction with adding margins. For more on this application of the splitting of paper, as well as information about notable British practitioners of this technique in the second half of the nineteenth century, see Walsh 2000:383–90. Also, see in the Appendix the discussion of the splitting of a Dürer engraving.

As to historical precedents for splitting of works of art on paper, I am indebted to Kristal Smentek for directing me to an eighteenth-century example. In 1775 a sale catalog was published of the vast art collections of the well-known collector Pierre-Jean Mariette (1694–1774). In this catalog, item 116, by Francesco Albani, is described as having originally been double-sided, but either Mariette or his assistant separated it into two layers so that the two sides could be mounted and seen separately. According to a recent catalog of the work of Albani, the two drawings still exist and are in the collections at Frankfurt and Dresden (Puglisi 1999:72).

Although paper splitting has generally been regarded as an offensive and inappropriate practice, in recent times this concept has been revived as a means of preserving badly damaged archival materials. For more information, see Brückle and Dambrogio 2000:295–325.

93 Considering the date of Schweidler's book, "carpenter's glue" must have been a gelatin-based glue, made from animal by-products, rather than the synthetic, polyvinylacetate emulsion adhesives that are now more commonly used in carpentry.

94 Probably Schweidler means that one should practice this procedure by splitting another sheet of paper. It is possible, however, that he is suggesting that one could try to split one of the two half-sheets that were just produced, thus producing a sheet of only one quarter the original thickness.

95 For a reference to splitting of a double-sided drawing in the late eighteenth century, see note 92.

96 For other breathtaking examples of the use of prints for decorative purposes, see Editor's Introduction, note 16.

97 The author's terminology is not in accordance with usual practice whereby the so-called bottom side of a sheet of paper shows the wire pattern more clearly than the "top" side. It is interesting that the word *Schale,* translated here as "surface," has a more organic or biological connotation than can be conveyed by the English word. The German word refers to "skin," "bark," "peel," or "shell," none of which quite make sense in this context as English equivalents. The author later speaks directly of the "skin" and "flesh" of paper, and although such terms may seem quaint or strange in reference to paper, perhaps their use is in keeping with Schweidler's image of the restorer as a doctor.

98 Regarding the process of stretching a print, see the section that begins on p. 130.

99 Marginal note by C. S.: "Oh, how nice!"

100 Marginal note by C. S.: "or a great one."

101 From Schweidler's description of the results he had seen of the use of macerated pulp for repair of holes, his antipathy to this approach is understandable. In more recent times, however, considerable skill and success have been attained in using paper pulp for repairs not only of small holes but also of large losses in sheets. See, for example, the AIC Book and Paper Group catalog of treatment procedures relating to paper repair, vol. 26. Also, note that Schweidler himself is not entirely averse to the use of paper pulp repairs as applied to stamps (p. 201).

102 It may seem odd, having just described shaving away some of the back of a picture, to emphasize preservation of the paper. I think that Schweidler's point here is that one should be careful during the process of shaving down paper that one does not remove more of the original than is really necessary to carry out the repair.

103 Note that he does not specify by what means the color matching can be done.

104 See figure 29.

105 The author's statement that the mended area will be quite thick may come as a surprise. It indicates that although the mending paper has been thinned along its edges to give it a wedge-shaped cross section (see p. 113), nevertheless, the shaving of both the original and the mend must have been done only to a limited extent, with the result that the combined thickness of the two papers when pasted together will be greater than that of the original. Therefore, he instructs the reader that further thinning down of the mend will be necessary. This additional shaving on the back of the mend is likely to be much more noticeable than if the previous amount of shaving had been continued until the two papers were of the required thickness when the mend was put in place. In general, mends of this latter type are much more difficult to detect.

106 One might wonder if Schweidler really meant to say "millimeter by millimeter."

107 The reader will probably realize that the procedure Schweidler describes for creating wire lines can be applied for creating a watermark. (See Appendix, Urs Graf and Schongauer.) On p. 199, he alludes to creating a watermark in a lining sheet that is to be affixed to the back of a stamp.

108 Marginal note by C. S.: "Nonsense! Will certainly tear into pieces."

109 Regarding the procedure for stretching a print, see pp. 130–36.

110 Given that he is discussing shaving away paper, it may seem odd that he expresses concern that one not lose the "smallest particle." I interpret this to mean that one must be especially careful that in the process of shaving the paper absolutely no more than necessary be removed, otherwise the final effect—re-creating a margin

around the print—may not be appear to be seamless and would therefore be less convincing to the viewer.

111 It may seem odd, considering all the effort of adding a new margin, that one would not have chosen to add a wide margin. I think that Schweidler is well aware that even a very narrow margin around an Old Master print can enhance its value substantially and is thus quite sufficient. Moreover, in my opinion, the wider the margin one adds, the greater the chance that buckling—in either the print or the margin (or both)—will result from differential tension between the original paper and the added margin.

112 I.e., plain paper. See note 113, below.

113 This paragraph exemplifies Schweidler's frequent lack of clarity. Marlies Comjean, with whom I collaborated on the initial translation, observed, "Schweidler is no Thomas Mann." The problem here stems from his use of the word *margin*. When speaking of intaglio prints (etchings and engravings), a margin is that portion of a sheet of paper that begins at the plate mark, and thus bears no printed image, and extends to the outer edge of the sheet. Schweidler, however, refers to the "margin" in this context as any paper that is added by the restorer to compensate for whatever trimming was done. In many prints from former centuries, blank paper beyond the plate mark was removed; in other instances, both the margins and the plate mark were cut away. Schweidler's instructions presuppose that if a print has been trimmed the restorer will need to add paper around the perimeter so that the print would appear *not* to have been trimmed. From the standpoint of the restorer, the ideal circumstance is that very little if any of the original plate mark will have been trimmed away, so that it will only be necessary to extend the existing paper slightly beyond the plate mark. If, however, the plate mark has been trimmed away entirely, the restorer must add enough paper (a new "margin" of paper) that one can simulate a plate mark, as he goes on to describe. The worst scenario is when not only the plate mark but also some of the printed image has been trimmed away. This is the situation he refers to in the first sentence of this paragraph. In this instance it would be necessary to add "white paper," that is, plain paper, around the printed image in effect to fill in the gap between the trimmed image and the place where the original plate mark would have begun (it is assumed that the width of this gap can be determined by looking at an example of an untrimmed impression). He advises undertaking such a restoration because if the added paper "is 5 to 6 cm wide" it would be "especially conspicuous." Also, "because it is particularly difficult to get the paper between the image and the [new, artificial] plate mark smooth," given that the added paper will not have been subjected to the pressure of printing. Regarding the textural differences between an added repair paper and the paper that has been smoothed by the process of intaglio printing, see the discussion of the Master of the Housebook and the van Dyck in the Appendix.

114 See glossary.

115 See glossary.

116 Note that in the following pages the assumption is that stretching of prints is simply a normal and expected part of the final stage of treating prints. Schweidler does not explain directly why stretching is necessary, but by the end of this section several reasons emerge. On p. 133, to the question of whether it is "always absolutely necessary to stretch a small sheet," he answers that stretching is done "as a matter of course when the sheet has undergone major repairs or shows creases, breaks, broken corners, and so on." From this, I assume that one purpose of stretching is to help to flatten a print and reduce any buckling or irregularities it might have as a result of repairs, damage, or aqueous treatments. He also implies, on p. 134, that in some instances a print that has been stretched may remain permanently attached to its support, presumably in order to put it into a frame. Indeed, on p. 132, he states that large prints must be stretched as part of the framing process; but this, too, seems ambiguous: on p. 135, he says flatly that "stretched papers should not stay on stretching supports for weeks." Later he states that engravings "less than 60 to 80 cm should never be stretched under glass" (p. 164) and that "if a framed engraving that has been stretched under glass falls to the floor, it can be destroyed" (p. 166), and for this reason stretching prints under glass for purposes of framing is bad practice.

117 See glossary.

118 Considering his remark in the previous sentence, it is likely that this second guard is coated with paste, rather than glue, but this is unclear, as is most of this paragraph.

119 Schweidler is trying to say that as the stretched print dries, it shrinks. Therefore, the glass or cardboard needs to be somewhat flexible so that it can bow outward, away from the print, as the tension from shrinkage of the print increases.

120 The author's suggestion here that a large print can be stretched under glass seems to contradict advice later in the book, according to which it is bad practice to attach a print to the picture glass. In any case, it is not clear why simply laying the stretched print into the frame would help to prevent the glass from becoming bowed.

121 Two types of rectangular wooden structures have been employed as supports for pictures, particularly for paintings on canvas but occasionally for works on paper. If the corners of the support are glued or nailed together so that they are permanently fixed in position, the support is called a strainer. If the corners can be spread apart to permit changing the amount of tension on the picture, the support is called a stretcher.

122 Presumably Schweidler refers to paints of the kind used by both Chinese and Japanese artists. Typically, these consist of a pigment and a water-soluble binder prepared in the form of a hard stick or cake. For use, they must be rubbed on a dish or flat surface with sufficient water to dissolve enough color for the artist's purposes. His remark, "If you want to use Chinese watercolors as liquid paint," is puzzling since such sticks cannot be used dry. Perhaps he means to say that one might apply a wetted brush to a stick of color to obtain just a small amount of color but that it would be necessary to rub the stick in water if one needed a greater quantity. He does not explain whether Chinese watercolors are in some way better or more useful than European watercolors.

123 Marginal note by C. S.: "only distilled water."

124 The German phrase is *stellt wieder her,* which has a connotation similar to that of the English word "restorative": causing a return to good health.

125 In other words, Schweidler is concerned that even when one looks at the back of a print, there should be no apparent difference between the mends and the surrounding areas of the original print. The Cleveland Art Museum's impression of the Pollaiuolo engraving, *Battle of the Nudes,* provides an example of a concerted effort through retouching of the mends to make the repairs resemble the surrounding areas of the back of the print by simulating the way that printing ink often penetrates through to the back of a sheet of paper. (See Appendix, Pollaiuolo.) See the Cleveland Museum of Art web site regarding this print for detail views of the retouching of the mends (www.clevelandart.org/exhibcef/battle/html).

126 Perhaps Schweidler is referring to hand-colored mezzotints, but equally he may be speaking of mezzotints in black ink, since they are so easily damaged by abrasion or rubbing.

127 John Raphael Smith, b. Derby, 1752; d. Doncaster, 1812. English printmaker, publisher, and painter. He made numerous mezzotint engravings after paintings by Romney, Reynolds, and others.

128 This sentence resists comprehension. If Schweidler means that the back of the China paper is to be covered with one sheet of blotting paper, it is hard to see how one would lift the blotting paper "from the center." Perhaps—although I find this explanation rather forced—he assumes that the back of the China paper would be covered with four sheets of blotting paper, each covering one quadrant of the China paper and arranged so that their edges are butted together. Then it might be feasible to lift the sheets of blotting paper starting "from the center" by lifting each one by the corner lying nearest the center of the China paper.

129 In this illustration one corner of the support sheet has been lifted to reveal a portion of the China paper, which is now affixed to the underside of the support sheet.

130 By "chlorine antidote," Schweidler probably means vinegar, although he sometimes uses this word to refer to sodium hyposulfate (p. 66) and, on one occasion, sodium carbonate (p. 202).

131 It is likely that "Chinese rice paper" refers to thin layers of pith, the soft, spongy interior of certain woody plants. Cut into sheets, this material was sometimes used instead of paper as a support for watercolor paintings. Because of its similarity to paper and its origin in China, it was misnamed "rice paper," although it is neither a true paper nor made from rice.

132 It is possible that by "chalk-filled cardboard" Schweidler may be referring to cardboard that has some kind of coated or chalk-filled paper on one or both sides, but this is uncertain. In any case, if one can infer that the paintings on "rice paper" usually encountered by Schweidler

are attached to cardboard of this kind, it is not clear why this should be the case. Perhaps this was the way in which they were typically mounted before export from China.

133 Although the author uses the term "soda water" here and in the following sentence, he later refers to "soda solution," and it is clear that the material referred to is a solution of bleaching soda, not simply carbonated water. See my introduction and the glossary for further discussion of "soda solution" and bleaching soda.

134 Marginal note by C. S.: "Crazy! *Must* be treated in a tray."

135 Schweidler means to say that a print that is affixed to a wooden board should not be submerged face up in a tray of water because the wooden board would absorb water, begin to bow, and thus damage the print. (Weighting with bottles relates to the fact that the wooden board would of course be buoyant and would impede wetting of the print unless one were to weight down the board to keep the print submerged.) Thus he recommends that the print should be placed face down into the water while applying water to the back of the board to counteract any bowing of the wooden board.

136 It may not be apparent, but this illustration represents two adjacent book pages that have been opened out flat to show the presence of numerous wormholes. The location of the holes in one page is therefore mirrored by those in the other page. The author explains that for the sake of more efficient treatment, contiguous clusters of holes should be cut out, as has been done on the page on the right, thereby reducing the problem to that of repairing a few large holes rather than many small ones. Note that the numbers 1, 2, and 3 mentioned in the caption of this figure were omitted in the actual illustration.

137 In mathematics, the golden section is a geometric proportion in which a line is divided or sectioned into what are called mean and extreme ratios. Since ancient times, the golden section has intrigued many philosophers, artists, and mathematicians. In practical terms, if a line is divided into two segments, the length of the larger of the two will be approximately three-fifths the length of the entire line. Therefore, in this case, the author suggests that the width of the bottom margin of the mat should be about three-fifths of the combined widths of the top and bottom margins.

138 It would have been helpful if Schweidler had included an illustration of the hinging of a picture. The key point is that one should attach the top two corners of a picture to the backboard by means of folded, gummed paper hinges of short strips of gummed paper, as described above, and that the portion of the hinge affixed to the picture should extend onto the back of the picture by "up to 2 mm." It is interesting that his suggestion corresponds essentially to current practice in the United States (although he subsequently indicates that large prints should be hinged at the sides), except that gummed paper has been supplanted by Japanese paper and starch paste. Also, it is interesting that he recognizes in the following sentences that his suggestion for hinging is not the norm and that it is usually assumed that the hinges would be affixed along the left edge of the picture.

139 Presumably he means that if the hinges are placed so that they are flush with the left and right edges, this might become apparent as soon as the viewer tries to lift the sheet. By observing that "more space or distance will deceive the viewer," he means that placing the hinges farther away from the edges (i.e., toward the center of the top edge) might permit the viewer to start turning the sheet without quickly encountering the resistance (and hence a warning) that would occur if the hinge were attached near the left and right sides, near the top corners.

140 That is, the picture is now rotated on its hinges so that it is turned with its front facing down.

141 I have been unable to determine exactly what he means by "museum board" but assume that then, as now, some kind of cardboard was available that was regarded as being better in quality than ordinary cardboard.

142 The author seems to suggest removing all the deteriorated paper from beneath the upper "skin" (surface) of the sheet, but steps for replacing or repairing this portion of the paper are not given.

143 "Sollten sich gelegentlich kleine Fältchen zeigen. . . ." The word *Fältchen* can mean "small folds, pleats, creases, wrinkles, or puckering," all of which seem to suggest a surface quality that, in the context of this sentence, seems too abrupt or sharp. The verb *falten* can mean "to cockle," so it is this connotation that seems most appropriate to convey here.

144 The reference to stretching pertains to the procedure for drying and flattening prints described in an earlier section (pp. 130–36).

145 The author seems to be saying that two layers of oilpaper will provide sufficient protection for a print if the oilpapers are put between the print and the backboard, but obviously one might worry whether oilpaper itself could harm the print.

146 Marginal note by C. S.: "It also turns blue with alcohol alone."

147 It is not clear which sulfur gases the author has in mind, nor has it been possible to identify "T-gas," but presumably the latter is a proprietary gaseous compound used for extermination of insects.

148 See Editor's Introduction, p. 1.

149 See glossary.

150 See glossary.

151 The inclusion of drypoint under the heading "Etching" may be puzzling because it is properly regarded as a method of engraving. In succeeding paragraphs, however, the author indicates that the drypoint technique is often used as an adjunct to the etching process in order to execute new lines and add details.

152 The catalogs of the Michel company are still widely known as resources for information on stamps from countries throughout the world, and the company also offers specialized catalogs relating to Germany. The Senf Brothers, in Leipzig, were active from around the 1870s well into the twentieth century. Thus far, I have found no catalogs by either Michel or Senf from Schweidler's era that contain information about the price of stamps as well as directions for cleaning them, as Schweidler indicates. As to the activities of Louis and Richard Senf, however, it is worth noting that they are included in a book on forgers of stamps. It seems that they were known for producing high-quality facsimile reproductions of stamps that were clearly marked as "falsch" or "facsimile," but they also made and sold some forgeries as well (Tyler 1991:115–16). I am grateful to George S. Norton, Curator of Philatelic Collections, Spellman Museum of Stamps and Postal History, for his assistance with my inquiries.

153 Chemically, oxalic acid is a chelating agent; that is, it is able to react with metal ions (such as iron), thus effectively converting the metal ions into a form that is more readily soluble. For this reason it has long been mentioned as a reagent that can remove iron stains from organic materials such as paper.

154 That is, re-create the watermark on the backing sheet by shaving away fibers so as to correspond exactly with that portion of the original watermark that remains on the front of the stamp. The backing sheet, with its re-created watermark, is then affixed to the stamp so that both the original portion of the watermark and the re-created portion coincide. For more on how the shaving of paper is done to create wire lines, see pp. 118–19.

155 This is incorrect. See glossary.

156 See also the section on "antidotes" for chlorine, p. 66.

157 See glossary.

This page intentionally left blank

APPENDIX

Eleven Case Studies

In assessing the condition of a print or drawing, the conservator, curator, or collector must try to answer many questions, such as whether there is any retouching, whether the color and the texture of the paper seem appropriate, and whether there is evidence of former stains, or chemical treatment to remove them. Answering only these questions is challenging, but occasionally one also may discover that the basic structure of the paper support has been repaired or, in some instances, substantially altered. Sometimes these structural changes may be fairly obvious, but they can also be so difficult to detect that their presence may go unnoticed for many years.

Although there are many facets of Schweidler's book that are fascinating, one of the most interesting and important is his detailed instructions on how to execute structural repairs and alterations (sometimes, major reconstructions), which, if skillfully done, can be so effective as to be nearly invisible. It is thus fitting to include in this appendix several prints that illustrate such repairs or alterations. I hope that these examples will help readers to become more adept at detecting them. Structural changes in some of the prints described below (Raimondi, *Massacre of the Innocents;* Rembrandt, *Landscape with a Cottage and a Large Tree;* Lucas van Leyden, *Susanna and the Elders*) are not especially difficult to discern—provided that one knows in advance that the kinds of alterations they illustrate were in fact performed on prints. Other prints illustrate that some repairs or alterations can be extraordinarily difficult to detect. One print that is known to be an outright forgery (Urs Graf, *Two Landsquenets with a Maid and Death*) is included as an example of a fake watermark (for Schweidler's discussion of how to create wire lines in paper, and hence a watermark, see the section "Implanting the Wire Lines" (pp. 118–20). I regret that no examples of false margins are included, but I could find no satisfactory means of communicating what they look like through photographic illustrations. The task of finding false margins must be left as "an exercise for the reader," but examples abound in virtually every large print collection.

When they first entered the collections of which they are now a part, some of the examples in the following pages were not initially recognized as prints bearing moderate to substantial changes or repairs to their paper supports. This fact provided my initial motivation for this translation project: if one needs to detect certain features in a print or drawing, it is helpful if one knows both the kinds of things that could have been done and the techniques by which they were done. The works on paper shown here serve to illustrate the methods described in Schweidler's manual, but the main goal in assembling these examples is to help acquaint the reader with ways in which one can discern the presence of structural features of paper supports that might otherwise elude detection. As mentioned above, some of the examples show repairs or alterations that one can discern with relative ease; but even the most apparent of these can be vexing if one has never encountered them before. In any event, showing some of the simplest examples can be a useful foil against which to compare the most challenging, in which the level of skill required to have executed the repairs is quite remarkable. The Cleveland Pollaiuolo is such an example.

The first encounter with a deceptive repair can generate paranoia—one begins to see deceptive repairs everywhere—but one should not assume that the examples given here are extremely common. Nevertheless, awareness of what one *may* encounter can be a means to become a better conservator, curator, or collector.

Tools and Techniques for Examination

For detecting deceptive repairs, the best starting place is one's own eyes, aided by excellent light; north light is especially helpful. I am often impressed with how much one can see with these simple means, coupled with insistence on understanding anomalous features of an artwork and provided that one knows what sorts of things one might find. When examining a print with light directed across its surface at a low angle, why does the paper buckle where it does? Why does the surface texture of the paper change in a particular area? Why is the paper thinner in certain areas when examined with transmitted light? Why is the paper somewhat stiffer than one might ordinarily expect? When looking at a picture with strong light bouncing off its surface, why are there variations in the gloss or reflectivity of the paper? In trying to obtain the best possible photographic illustrations for this book, I have often been frustrated in trying to capture in photographs those subtle features one's own eyes can discern. One element of the process of examination is simply impossible to duplicate in a photograph: the subtle ways in which color, texture, and reflectivity of paper can change as one moves a print slightly or as one shifts viewing position in relation to the print. I have often wished that instead of photographs I could offer a video presentation of what the prints look like under varying conditions of lighting. On the other hand, given that many of the prints shown here are in the collection of the Museum of Fine Arts, perhaps the reader will accept this open invitation to see the originals in person. The other collections represented are also open to the public and would no doubt be willing to make their prints available to visitors.

While direct observation with one's own eyes is generally the best way to begin examination of a print, special equipment can also provide useful supplementary information. Auxiliary equipment and techniques include a binocular microscope, ultraviolet light, betaradiography, x-radiography, and infrared imaging. Technical or scientific equipment is generally most useful in providing clues one might have missed through direct visual examination and in confirming or helping to provide photographic documentation of repairs or alterations. The binocular microscope is of considerable value chiefly because it allows one to magnify small features and to see them in three dimensions. It is especially helpful for revealing minute variations in the finest details of paper texture, microscopically fine ridges where one layer of a paper repair might overlap onto the original, and evidence of scraping by a knife or retouching along a join. Fiber optic light sources for microscopes are now available in which the light-emitting glass fibers are held in a flat, linear configuration that can be especially effective in enhancing textural features of paper.

When examining a print or drawing with ultraviolet light, one may see variations in paper color or residues of adhesive, or certain areas that look quite normal under visible light may appear unexpectedly absorptive (dark) or fluorescent (light). All such anomalies should be scrutinized by every means possible. Betaradiography and x-radiography have been used for several decades to record accurately details of watermarks (Kushel 1999:116–23; Stevenson 1967), but because they are so effective at revealing minute features of paper structure, they can be helpful in ferreting out the truth about a print (see the discussion below about Dürer's *Adam and Eve* and van Dyck's *Portrait of Lucas Vorsterman*).

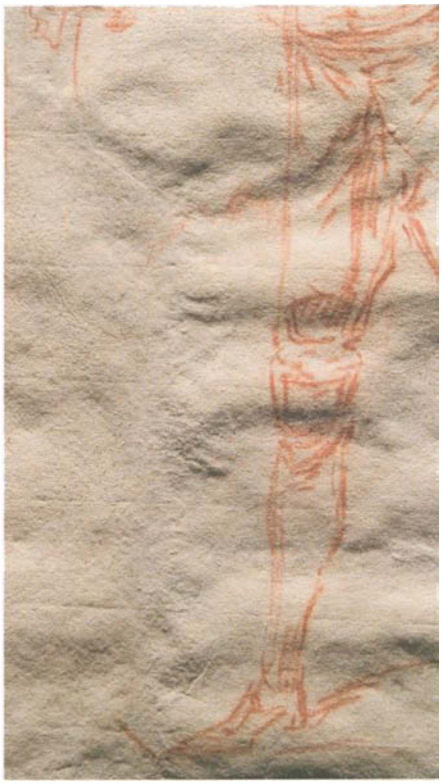
The newest technique for discovering repairs in prints is infrared imaging. Using infrared wavelengths from around 3.0 to 5.8 microns,[1] Moyna Stanton and her colleagues at the Cleveland Museum of Art have had notable success in revealing and documenting repairs in their impression of Pollaiuolo's *Battle of the Nudes* and have produced an informative web site with details and images relating to their research.[2] They have kindly agreed to allow a few of these images to be reprinted below. Infrared imaging has been in use for many years to study underdrawing in paintings, but its application to the study of repairs in works on paper is so new that it is still unclear why it works. Indeed, it was surprising to find that infrared imaging would be so useful in making repairs in paper more visible. Infrared light has been widely used for the study of paintings and occasionally in research on works on paper because it is effective at revealing underdrawing and other features that may ordinarily be concealed beneath layers of paint, but this is the first time that anyone has tried using this particular portion of the infrared spectrum to record and document repairs of which it may be otherwise difficult to capture images.

NICOLAS LANCRET, *THE SKATER*

Figure A.1. Nicolas Lancret, *The Skater* (study for *Winter*), ca. 1735–38. Red chalk on cream laid paper. 20.6 × 12.9 cm. Fine Arts Museums of San Francisco, Museum Purchase, Achenbach Foundation for Graphic Arts Endowment Fund, 1964.133.

Provenance: Jean Masson; Georges de Batz (after 1953); Achenbach Foundation for Graphic Arts purchase, 1967.

This drawing is included here to illustrate two points: structural alterations are found in drawings as well as prints; and when two pieces of paper are joined, buckling often results along the join (see the Altdorfer print below) unless they are pasted or glued to another sheet of paper or to cardboard. When the drawing is viewed under illumination coming more or less from the front, as in figure A.1, it is not immediately apparent that a piece of paper has been added at the lower left. Figure A.1.a shows the line along which the two sheets of paper are joined. The color, texture, and presence of minute impurities in the two sheets—the original and the added paper—were chosen with considerable care, and until I examined the drawing carefully in conjunction with curatorial research for a catalogue (Hattis 1997), no one had noticed that a piece of paper had been added, presumably in order to repair the loss of the lower left corner. Knowing that part of the original sheet has been lost and that a piece of paper has been added to the original has considerable effect on one's understanding of the drawing. The drawing might once have been continued at the left—possibly a sketch of the sled that the standing figure is pushing—but the visual effect of the blank paper is to deny this possibility. Figure A.1.b demonstrates how useful it can be to examine drawings and prints with raking light, which easily reveals the buckling along the join and, in turn, provides strong evidence of the repair.



Drawings are commonly laminated, or, as it is sometimes called, "mounted," onto a secondary support of thin cardboard, and if that has been done in this instance it would been more difficult to detect the repair. In the past, prints, too, were affixed to secondary supports (pages of albums or books), but for many decades it has been more common for prints to be sold "loose," without such secondary supports. Therefore, if the restorer judges it necessary to apply a secondary support in order to overcome the buckling that can result when a print has been repaired with one or more pieces of paper, he or she may attempt to downplay or conceal its presence by opting to use a lining of extremely thin paper rather than thin cardboard or paper of an ordinary thickness. Among the following examples, the Rembrandt, Dürer, and van Dyck have been lined with a thin sheet of paper.

| Figure A.1.a.
Nicolas Lancret, *The Skater.*
Detail showing join between the original and the added paper.

Fine Arts Museums of San Francisco, Museum Purchase, Achenbach Foundation for Graphic Arts Endowment Fund, 1964.133.

| Figure A.1.b.
Nicolas Lancret, *The Skater.*
Raking light view showing the buckling along the join.

Fine Arts Museums of San Francisco, Museum Purchase, Achenbach Foundation for Graphic Arts Endowment Fund, 1964.133.

MARCANTONIO RAIMONDI, *MASSACRE OF THE INNOCENTS (WITH THE PINE TREE)*

Figure A.2. Marcantonio Raimondi, *Massacre of the Innocents (with the Pine Tree),* 1511–12. Engraving, Bartsch 18, first state. 28.3 × 43.31 cm. Museum of Fine Arts, Boston, Harvey D. Parker Collection, P1217. Photograph © 2005 Museum of Fine Arts, Boston.

Provenance: Purchased by MFA, November 1897, from the estate of Henry F. Sewall (1816–96, New York, Lugt 1309); Louis Gallichon (Lugt 1060); Ambroise Firmin-Didot (Lugt 119).

The repairs in this print, though extensive, are relatively easy to detect, although if framed behind glass, it might pass as a print in fairly good condition. This is a good illustration that buckling of paper can be an important clue to the presence of structural repairs and demonstrates that the simplest techniques of examination—in this instance, raking light—can be fruitful in detecting such repairs. It is also interesting historically as an example of a repair performed in the nineteenth century.

The majority of the print is intact, although it is somewhat rubbed and has an overall grayish color. Approximately 1/4 inch of the entire bottom edge has been repaired by the addition of paper; from 3/4 to 1 3/4 inches across the entire top have been added; and there are numerous instances of damage to the paper and image throughout, which have been repaired by various fills and retouching.

Figure A.2.a.
Marcantonio Raimondi, *Massacre of the Innocents (with the Pine Tree).* View with raking light.

Photograph © 2005 Museum of Fine Arts, Boston.

Examination with raking light (figs. A.2.a, A.2.d) easily reveals areas of buckling along the top and bottom of the sheet, corresponding to where paper repairs were added. Use of ultraviolet light (fig. A.2.b) shows that the repairs fluoresce differently from the original paper, thus confirming the presence of the repairs. We also examined the print with infrared (see discussion below regarding the Pollaiuolo), but in this instance this technique yielded no additional information.

On the back of the print, the three collector's marks (see provenance information, above) suggest the probable sequence of owners: Ambroise Firmin-Didot (1790–1876), Louis Galichon (1829–93), and Henry F. Sewall (1816–95). It was acquired by the Museum of Fine Arts in 1897 from the Sewall collection through purchase funds provided by Harvey David Parker. The stamp of Firmin-Didot overlies the restorations along the bottom edge, which were probably done at the same time as the more apparent restorations along the top edge and elsewhere. Therefore, it seems plausible that all the restorations were done before Firmin-Didot's death in 1876. Considering that it was in three very important private collections subsequent to these restorations and prior to its acquisition by the Museum of Fine Arts, one might wonder whether experts in the nineteenth century were less adept at discerning restorations; but the description in the catalogue

Figure A.2.b.
Marcantonio Raimondi, *Massacre of the Innocents (with the Pine Tree).* Detail, upper left, ultraviolet light fluorescence.

Photograph © 2005 Museum of Fine Arts, Boston.

Figure A.2.c.
Marcantonio Raimondi, *Massacre of the Innocents (with the Pine Tree).* Detail, upper left, normal lighting.

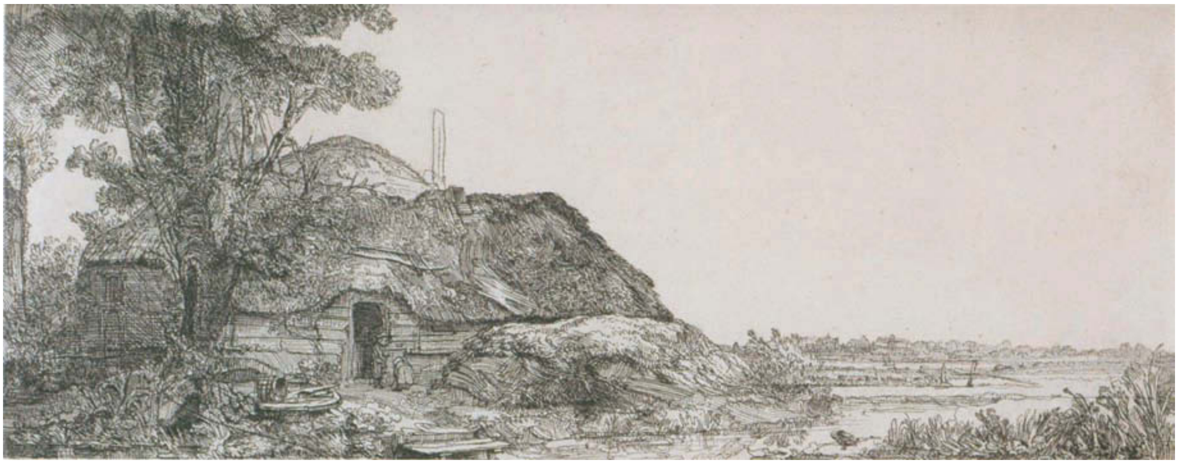
Photograph © 2005 Museum of Fine Arts, Boston.

Figure A.2.d.
Marcantonio Raimondi, *Massacre of the Innocents (with the Pine Tree).* Detail upper left, raking light.

Photograph © 2005 Museum of Fine Arts, Boston.

for the 1877 sale of the Firmin-Didot collection states clearly that the print is restored.[3] Therefore, a more plausible assessment of the print is that because it is quite rare and because there was great demand for Raimondi's prints in the late nineteenth century, collectors were simply willing to overlook its defects for the sake of adding a rarity to their collections.

The restorations of the print have led to the kind of buckling that sometimes, but not always, results from joining two different papers (the original and the repair paper) (figs. A.2a, A.2.d). Buckling such as this seems to occur more often in instances where the join extends for more than one or two centimeters and where both papers are more than a few millimeters wide. (The addition of narrow margins to prints can sometime cause buckling, but often there is none, although the length of the added margin may be several centimeters long. Remarkably, the Lucas van Leyden print, discussed below, shows virtually no buckling.) It is plausible that the buckling now evident in the Raimondi was not immediately apparent following the restoration but only developed over time as a result of differences between the expansion and contraction characteristics of each paper. Buckling along a join is also seen in the Altdorfer, discussed below. In prints whose margins have been lost and where extremely narrow margins ("thread margins") have been added, buckling may not occur as readily, presumably because the added paper is so narrow that its own characteristics of expansion and contraction with changing humidity are overridden by the behavior of the print itself.[4]



REMBRANDT HARMENSZ. VAN RIJN, *LANDSCAPE WITH A COTTAGE AND A LARGE TREE*

Figure A.3. Rembrandt Harmensz. van Rijn, *Landscape with a Cottage and a Large Tree,* 1641. Etching, Hind 178. Harvard University Art Museums, Gray Collection 3267. Courtesy of the Fogg Art Museum, Harvard University Art Museums. Gift of William Gray from the collection of Francis Calley Gray. Photo: Allan Macintyre. © 2004 President and Fellows of Harvard College.

Provenance: Francis Calley Gray, to Harvard University, 1857.

At the first glimpse of this print, someone familiar with Rembrandt's prints is likely to be suspicious: the sky has none of the subtly atmospheric veil of plate tone or subtle suggestions of cloudiness that one should see in a good impression (see fig. A.3.a). Viewed with nondirectional light, or if the light is mostly from overhead, the back of the print (fig. A.3.b) may look normal. I selected this print, however, as an excellent example of the power of raking light (light directed from the side at a very low angle to the surface of the paper) to reveal important information that one might otherwise miss. Figure A.3.c gives dramatic evidence that there is something very odd about this print. There is a long, irregularly linear pattern in the surface horizontally across the middle of the back, almost as if someone had creased the print from the front and had caused the paper to protrude upward on the back wherever the front was creased. This anomalous feature corresponds exactly to the location of the contours of the horizon.

A similar pattern, toward the left side, coincides on the front with the opening in the branches and leaves of the copse of trees next to the cottage. The reason for this becomes clear when the print is examined with transmitted light (fig. A.3.d). Note that the spacing of the parallel wire lines in the paper in the area of the sky (and in the opening in the trees) is farther apart than in the bottom half of the print, although some effort seems to have been made to try to line up the chain lines of both papers. The inescapable conclusion is that two separate

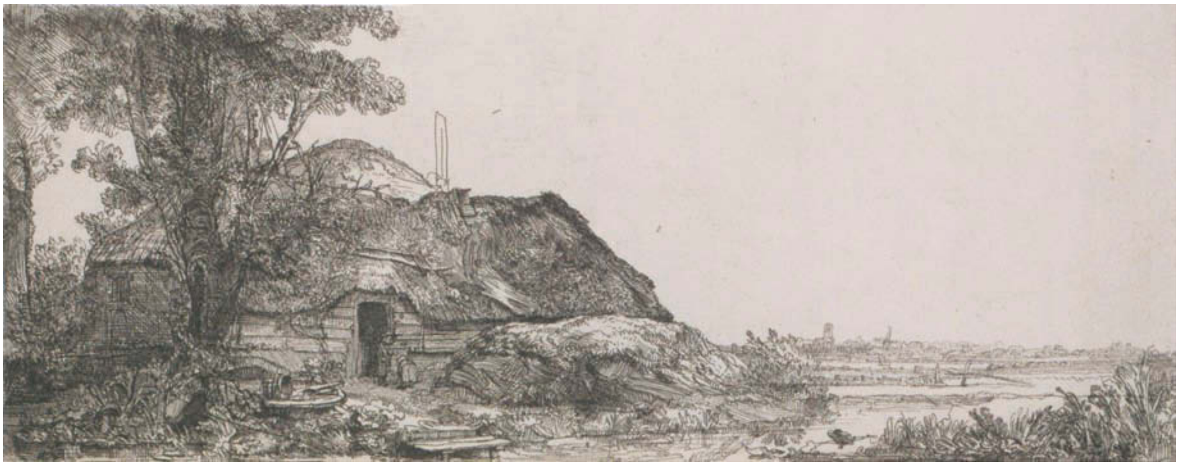


Figure A.3.a.
Rembrandt Harmensz. van Rijn, *Landscape with a Cottage and a Large Tree,* 1641. Etching, Hind 178. Plate mark: 12.7 × 32.1 cm. Sheet: 13.7 × 33.8 cm.

Museum of Fine Arts, Boston. Harvey D. Parker Collection, P609. Photograph © 2005 Museum of Fine Arts, Boston.

pieces of paper have been spliced together. There is no way to know why such extensive "reconstruction" was undertaken. Was there extensive damage in the sky? Were there unsightly stains? Or was it simply an instance where some blemish would have decreased the price of the print in the marketplace?[5]

With light coming through the print (figs. A.3.d, A.3.e), small thinned areas are also visible along the contours of the horizon, the cottage, and around the opening in the trees. If the two papers were joined by shaving down overlapping edges and then pasting them together, the thinned areas must be places where the restorer failed to match the thickness of the overlapping edges so that when pasted together their combined thickness would have equaled the surrounding paper.

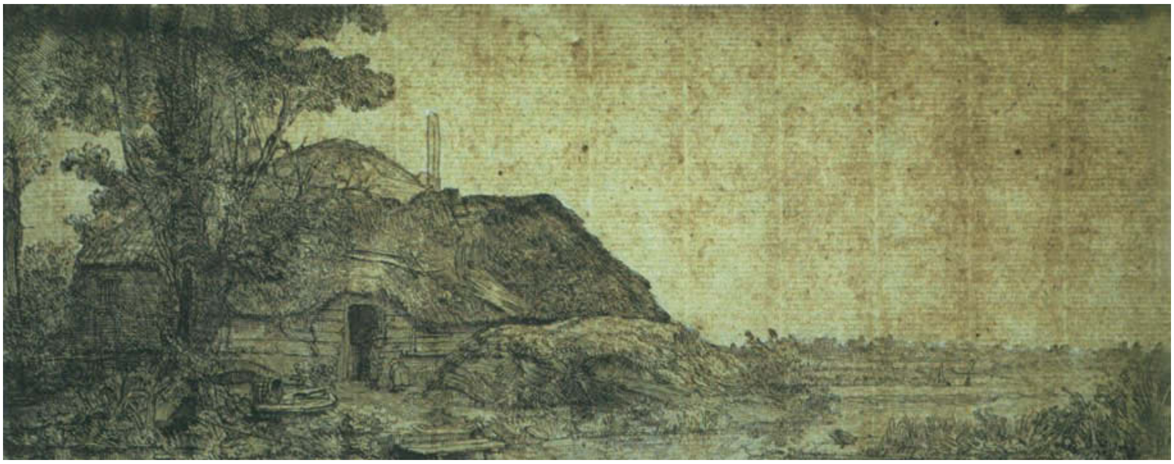
Perhaps partly to conceal any flaws in the joinery and perhaps to try to make the print lie as flat as possible, at least initially, the entire back of the print was lined with a piece of paper. Measuring the present thickness of the lined print showed that the paper used for this lining must be remarkably thin, probably only about 0.002 to 0.003 inch thick. Microscopic analysis of fibers in the lining sheet showed that the paper is made of linen. Given that this work must have been done before 1857, when Francis Calley Gray died and left his collection to Harvard, there are several possibilities for the kind of paper that could have been used for the lining. One is "pottery transfer tissue," which was used since the eighteenth century as a means of transferring printed designs onto

| Figure A.3.b.
Rembrandt Harmensz. van Rijn, *Landscape with a Cottage and a Large Tree.* Harvard University Art Museums.
View of back.

Photo: Allan Macintyre. Photograph © 2004 President and Fellows of Harvard College.

| Figure A.3.c.
Rembrandt Harmensz. van Rijn, *Landscape with a Cottage and a Large Tree.* Harvard University Art Museums.
View of back, raking light, showing ridge that follows the main contours of the image.

Photo: Allan Macintyre. Photograph © 2004 President and Fellows of Harvard College.



| Figure A.3.d.
Rembrandt Harmensz. van Rijn, *Landscape with a Cottage and a Large Tree.* Harvard University Art Museums.
View with transmitted light. Note thinned areas along the contours of the landscape, the cottage, and the opening in the trees.

| Figure A.3.e.
Rembrandt Harmensz. van Rijn, *Landscape with a Cottage and a Large Tree.* Harvard University Art Museums.
Detail view with transmitted light, to show thinned areas along the contours of the cottage and landscape, which is evidence of the joins between the original and the added paper.

unfired pottery, prior to glazing and firing.[6] Another is early-nineteenth-century cylinder machine–made papers, such as those produced by Gilpin, which were made to be especially thin for the popular "gift" books of the day.[7] A third possibility is that a sheet of paper of the thickness of book paper (about 0.005–0.006 in. thick) could have been split into two layers, as described by Schweidler. This procedure would have produced two sheets, each half the thickness of the original, and either half could have been used as a thin lining paper.

MARTIN SCHONGAUER, *ST. JOHN THE BAPTIST*

Figure A.4. Martin Schongauer, *St. John the Baptist,* 1470–91. Engraving, Bartsch 54. Plate mark: 15.5 × 9.9 cm. Museum of Fine Arts, Boston. 23.894. Photograph © 2005 Museum of Fine Arts, Boston.

Provenance: O. Gerstenberg; Gift of W. G. Russell Allen, 1923.

This print is a good example of a practice known in the world of prints as "silhouetting." Prints to which this is most often done are those in which the main part of the image is visually distinct from a surrounding of blank paper. The van Dyck *Portrait of Lucas Vorsterman* (see below) is another example.[8] In this instance the print also has some retouching with a shiny ink, and also reconstruction of some of the lines in the hair, the

Figure A.4.a.
Martin Schongauer, *St. John the Baptist.*
Detail of area around the head, showing boundaries between the original print and the added paper.
Photograph © 2005 Museum of Fine Arts, Boston.

originals of which were lost in conjunction with the silhouetting. Figure A.4.a shows the boundaries between the original and the added paper. Another feature of this print is that it has evidence of scraping to create a portion of a watermark. There was a watermark in the original, but because of the silhouetting, slightly more than half of this watermark was lost. To simulate the missing portion of the watermark in the surrounding

Figure A.4.b.
Martin Schongauer, *St. John the Baptist.*
View of back of print. Note bull's head watermark (upside down) at right. The half of the watermark on the print is original. The half that extends onto the surrounding paper is false, having been created by scraping away paper fibers.
Photograph © 2005 Museum of Fine Arts, Boston.

Figure A.4.c.
Martin Schongauer, *St. John the Baptist.*
View of back of print, with transmitted light. Note bull's head watermark (upside down) at right. The portion of the watermark on the print is original. The portion that extends onto the surrounding paper is false, having been created by scraping away paper fibers.
Photograph © 2005 Museum of Fine Arts, Boston.

| Figure A.4.d.
Martin Schongauer, *St. John the Baptist.*
Microphotograph, showing the roughening of paper fibers where the paper was scraped to create a false watermark (red). The microphotograph also shows retouching in the form of minute, short strokes of gray ink or watercolor, to simulate the appearance of printing ink coming through the paper from the printed image (blue).

blank paper, the paper was carefully scraped away on the front and, to a lesser degree, on the back of the added paper (see figs. A.4.b, A.4.c). Figure A.4.d shows the roughened paper fibers where the false watermark was produced, as well as some retouching in gray ink or watercolor in order to simulate the appearance of ink coming through the paper from the printed image. For Schweidler's directions for simulating wire lines (and hence watermarks) by scraping away paper fibers, see pages 118–20. Also see the discussion below about the Urs Graf print, in which the entire watermark is false.

LUCAS VAN LEYDEN,
SUSANNA AND THE ELDERS

Figure A.5. Lucas van Leyden, *Susanna and the Elders*, ca. 1508. Engraving, Bartsch 33, second state. Image: 19.8 × 14.5 cm. Sheet: 19.9 × 14.6 cm. Museum of Fine Arts, Boston, 63.2829. Photograph © 2005 Museum of Fine Arts, Boston.

Provenance: Gift of Mrs. Lydia Evans Tunnard in memory of W. G. Russell Allen, 1963.

Significant portions of this print have been removed and replaced with portions of another sheet, as with the Rembrandt and Schongauer above. Unlike the Rembrandt, however, it is not lined (fig. A.5.a), and unlike the Schongauer, the contours along which the original paper was cut away are much more complex and irregular. In some places, blank areas of the original paper were removed from within the boundaries of

Figure A.5.a.
Lucas van Leyden, *Susanna and the Elders*.
View of back.

Photograph © 2005 Museum of Fine Arts, Boston.

the image proper, in effect creating holes that then were filled in with the new paper. In a few instances new ink lines had to be drawn in to replace some of the original engraved lines that were lost when the original paper was cut away.

This is an excellent example of what can be seen with the simple means of using specular illumination. Figure A.5.b shows the print lying on a table, with light reflecting

Figure A.5.b.
Lucas van Leyden, *Susanna and the Elders.*
Specular illumination. The original portions of the paper of the original print are noticeably glossier than the added paper.

off its surface. This method of illumination involves placing the print midway between yourself and the source of illumination. Position your eyes so that you view the print at an angle to the table (about 30–45 degrees) that is exactly equal to the angle between the table and the lamp on the far side of the print. (If the print were a mirror, you would see the lamp's reflection on its surface, hence the term "specular" illumination.) With the print illuminated in this manner, one can see a dramatic difference in the reflectivity of the paper of the original print and that of the added paper. The paper of the print itself is much glossier, having been in contact with a metal printing plate and under great pressure during the printing process.

Using another simple method of examination, transmitted light, it also becomes clear (figs. A.5.c, A.5.e) that the laid lines in the original are much finer than those of the added paper—conclusive evidence of what has been done to this print. Mismatched laid lines were also a feature of the Rembrandt mentioned above. Figure A.5.d shows the boundary lines of all the areas where the original and the new paper were joined.

I often wonder why someone felt that it was necessary to do this work. Perhaps there were some disfiguring stains in the blank areas of paper, but this does not easily explain why it also seemed important to remove the smaller areas toward the interior of the image, thereby creating holes that would then have to be filled. In any case, we in the paper conservation laboratory have found this to be useful pedagogically, in part because the "repairs" are remarkably extensive but also because it is, after all, relatively easy to find them.

| Figure A.5.c.
Lucas van Leyden, *Susanna and the Elders.*
Transmitted light.

| Figure A.5.d.
Lucas van Leyden, *Susanna and the Elders.*
Transmitted light. The purple lines indicate the boundaries between the original print and the added paper.

| Figure A.5.e.
Lucas van Leyden, *Susanna and the Elders.*
Detail, transmitted light.

ALBRECHT ALTDORFER, *ST. GEORGE AND THE DRAGON*

Figure A.6. Albrecht Altdorfer, *St. George and the Dragon*, 1511. Woodcut, Bartsch 55. Sheet: 19.5 × 15 cm. Museum of Fine Arts, Boston, 55.481. Stephen Bullard Memorial Fund. Photograph © 2005 Museum of Fine Arts, Boston.

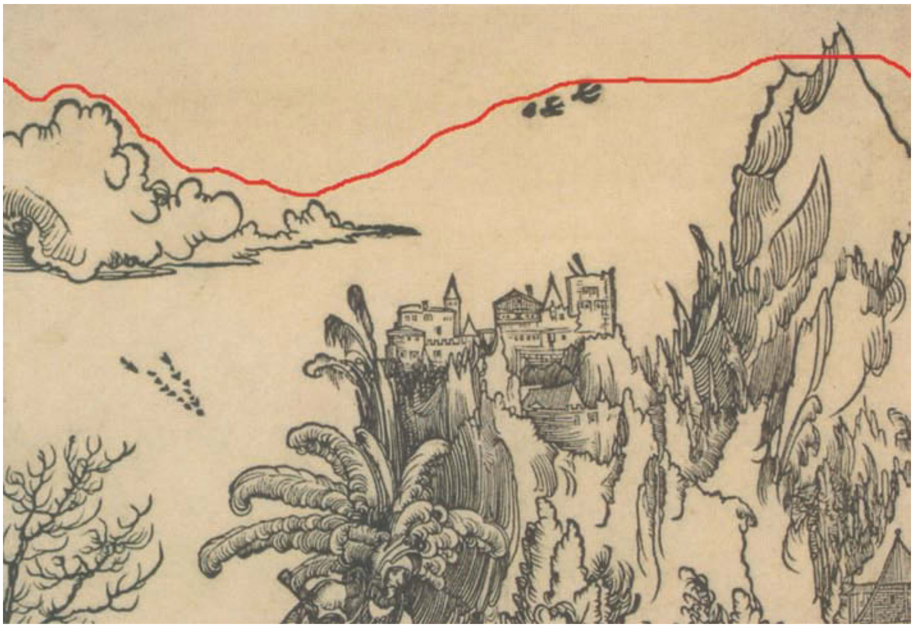
Provenance: Purchased from Richard H. Zinser, 1955.

In the course of examining this print (figs. A.6, A.6.a) in conjunction with a request to borrow it, my colleague Elizabeth Lunning discovered that it had been repaired quite deceptively. It took considerable time to determine the extent of the repair, but it now seems clear that approximately 1 to 1½ inches of the top of the print have been replaced with paper that is remarkably similar to the original (fig. A.6.b). Presumably this

Figure A.6.a.
Albrecht Altdorfer, *St. George and the Dragon.*
View of back.

work was done to repair some kind of damage or loss in the uppermost part of the print.

The first clue to the existence of the repair was the buckling (fig. A.6.c) across the top part of the sheet. Careful scrutiny of this buckling, both from the front and the back of the print, revealed no signs of glue, paste, or other adhesives that might otherwise have explained the buckling. With transmitted

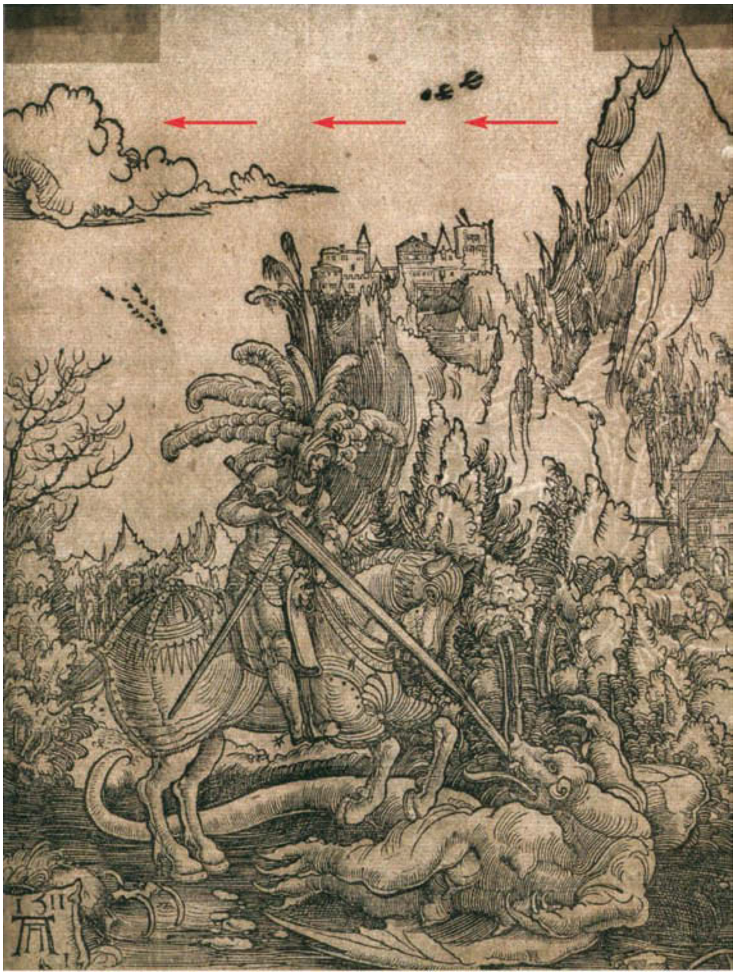


| Figure A.6.b.
Albrecht Altdorfer, *St. George and the Dragon*.
Detail. The red line shows where the added paper is joined to the top of the original print.

Photograph © 2005 Museum of Fine Arts, Boston.

| Figure A.6.c.
Albrecht Altdorfer, *St. George and the Dragon*.
Detail of top of print, raking light. Buckling of the paper extends in a more or less horizontal line across the width of the sheet. This buckling was the first indication that a portion of the top of the print had been replaced with added paper.

Photograph © 2005 Museum of Fine Arts, Boston.



| Figure A.6.d.
Albrecht Altdorfer, *St. George and the Dragon*.
Transmitted light.
Note that, starting above the points indicated by the arrows, the chain lines in the top part of the print (which was replaced with a paper repair) lack the prominent shadows on either side of the chain lines, as are visible in the rest of the print. Also note that the chain lines of the repair are slightly more distinct than those in the original.

light (fig. A.6.d), however, one can see a subtle difference between the two papers: the shadows on either side of the chain lines in the original are essentially absent in the added paper, and the chain lines in the added paper are slightly more distinct than those in the original. Also, the paper that was added across the top has very slightly less texture than in the rest of the print. Moreover, when viewed under a microscope, there are a number of roughened fibers in the area of the buckling, but these are so difficult to discern that it was not possible to obtain an adequate photograph of them.

Note that the provenance of this print includes Richard H. Zinser, from whom the MFA purchased the Housebook Master print (below) and from whom the Cleveland Museum of Art purchased its Pollaiuolo (discussed below).

MASTER OF THE HOUSEBOOK, *BEARDED MAN WITH BLANK SHIELD*

Figure A.7. Master of the Housebook, *Bearded Man with Blank Shield*, ca. 1475–80. Drypoint engraving, Lehrs 85. Plate mark: 9.3 × 7.3 cm. Museum of Fine Arts, Boston, 66.376. Katherine E. Bullard Fund in memory of Francis Bullard. Photograph © 2005 Museum of Fine Arts, Boston.

Provenance: Purchased from Richard H. Zinser (1966); Count von Maltzan (Castle Militsch, Upper Silesia, 20th century).

This remarkable print (figs. A.7, A.7a)—one of only five in existence—has long been enjoyed as a great and beautiful work by the artist who is often credited with inventing the technique of drypoint engraving, but also (and much less significantly from the art historical standpoint) for its place in the lore of the Department of Prints, Drawings, and Photographs at the Museum of Fine Arts.

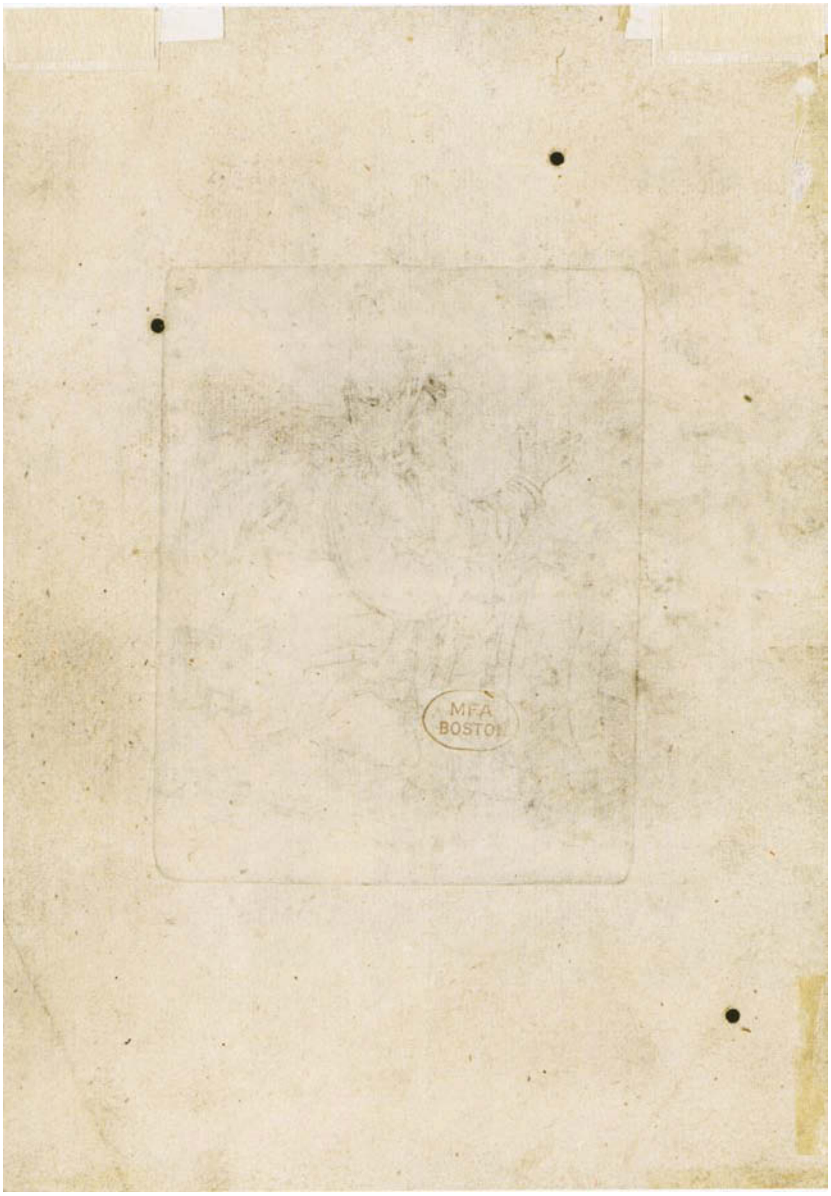


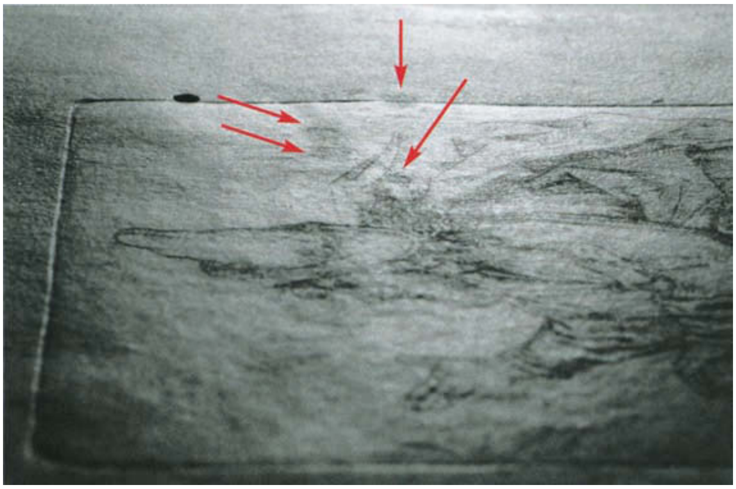
Figure A.7.a.
Master of the Housebook, *Bearded Man with Blank Shield.*
View of back.

Photograph © 2005 Museum of Fine Arts, Boston.

The print was acquired in 1966, and when I began my apprenticeship with F. W. Dolloff in 1967, the story surrounding its acquisition was still fresh. Eleanor Sayre, assistant curator at that time, said that when this print was first presented to Henry Rossiter, the curator, to consider for possible purchase, the dealer (Mr. Zinser) had said that this impression was from the prestigious collection of Count Andreas von Maltzan. During study of the

Figure A.7.b.
Nineteenth-century photographic facsimile of Master of the Housebook, *Bearded Man with Blank Shield.*
The arrows indicate wormholes.
Courtesy Museum of Fine Arts, Boston.

print, Sayre consulted a large number of facsimiles of Old Master prints that the department had in its storerooms. Among these facsimiles was an old photograph (fig. A.7.b) that was identified as being of this specific impression, but immediately a discrepancy was noticed. The photograph showed four wormholes: two in the blank paper above the back of the man, one on the plate mark, and another (rather hard to see in this old photograph) in the man's cloak. The problem was that in the impression left by the dealer there were only three wormholes, and none was in the same location as those in the



| Figure A.7.c.
Master of the Housebook, *Bearded Man with Blank Shield.*
Specular illumination. Note that the areas that correspond to the filled wormholes are duller in appearance than the surrounding paper, which is burnished by the pressure of the metal printing plate.

photograph. The dealer had not disclosed the fact that any repairs had been made. No one was able to resolve this apparent problem.

As research continued, one day, according to Sayre, she was sitting in Rossiter's office when she happened to glance toward the print, which was lying face up on a work surface near a window in the office. What then happened is a good example of how the simple technique of using effective lighting can often yield useful results. Suddenly, in the light of the window that was reflecting off the surface of the print (probably rather like the specular lighting mentioned above with regard to the Lucas van Leyden print), she saw three or four small areas on the print that were slightly less shiny than the surrounding paper (fig. A.7.c) and realized that these duller areas corresponded to the location of the wormholes as shown in the facsimile photograph. This confirmed that the print was indeed the one from the Maltzan collection but left unresolved the means by which the holes had been repaired, and why.

Several years later, I became interested in Schweidler's book, having been introduced to it by Christa Gaehde, and learned of his technique of chamfered repairs. I examined the print with transmitted light (fig. A.7.d), but the places where the four old wormholes had been filled looked quite good—scarcely different from any of the surrounding paper. With Schweidler's directions in mind (see the section "Actual Mending or True Restoration," pp. 109–22 and pp. 157–59), I examined the back of the print under very good natural

| Figure A.7.d.
Master of the Housebook, *Bearded Man with Blank Shield.*
View with transmitted light.

light, with the aid of a magnifying glass, and was able to see that the perimeter of each of the four repairs (as seen from the back) was slightly larger than the hole it filled and just slightly—but subtly—darker than the surrounding paper. It is likely that the extremely thin chamfered outer edge of the repair paper has a minute amount of paste embedded in the fibers and that this causes a faint difference in the color of the paper around the circumference of the repair. On the front, the only evidence of the fill is, as noted above, that the repair is slightly less shiny than the rest of the print, which is reasonable given that the surrounding paper would have been burnished by the intaglio printing process. Much more recently, having learned of the work done by Moyna Stanton and her colleagues in Cleveland on infrared imaging (see the discussion of the Pollaiuolo, below), we examined the print again. Using infrared imaging, we obtained an image of the back of the print, which provided useful photographic documentation not only of the repairs of the wormholes (fig. A.7.e) but also—to our great surprise—a previously undocumented repair in the right side of the print (seen on the left in the image of the back). Even now that we know of the presence of this repaired tear, it is remarkable how difficult it is to see any indication of the repair: only a slight disturbance of the fibers can be detected under ordinary light.

One puzzling aspect of the condition of this print remains. It is not surprising that the four wormholes were repaired, given their prominent location, but it is curious that there are now three additional wormholes, none of which was visible in the nineteenth-century facsimile, although because of the close cropping of the facsimile it would have been possible to see only the new wormhole that slightly interrupts the plate mark at the upper right. In his catalogue of the prints of the Housebook Master, Lehrs (1893:7) states that "the print at Militsch [i.e., in the collection of Count Maltzan] has its full margins, and is an excellent impression, with no drawback but a few worm holes." The photographic facsimile above (fig. A.7.b), which was probably made around 1890–1910, shows four wormholes—those that have since been repaired—and it is likely that these are the wormholes to which Lehrs refers. It seems improbable that after having the repairs done, the print would have been stored in a place where it would have once again been attacked by book worms. Instead, the more likely scenario is that the repairs were done in the late 1950s in preparation for its sale; and if by that time there were seven wormholes, surely all of them might have been filled. On the other hand, to have filled all of them—especially having done the repairs so that they were almost undetectable—could have been problematic for possible purchasers who, on checking Lehrs's catalog, would probably have uncovered the discrepancy between his description of the Maltzan impression (with "several wormholes") and a print that had none. Following this reasoning, it is conceivable that three unfilled "wormholes" were created by the restorer—in a position so as to be less disfiguring than the original holes—to avoid the discrepancy that otherwise would have arisen with Lehrs's description. However, having now learned of the previously unrecognized tear, I wonder if it was not the wormholes and a desire for their "relocation" and repair that precipitated having the print taken to a restorer but rather that their repair was merely occasioned by the more immediate need to repair the tear in the right edge.

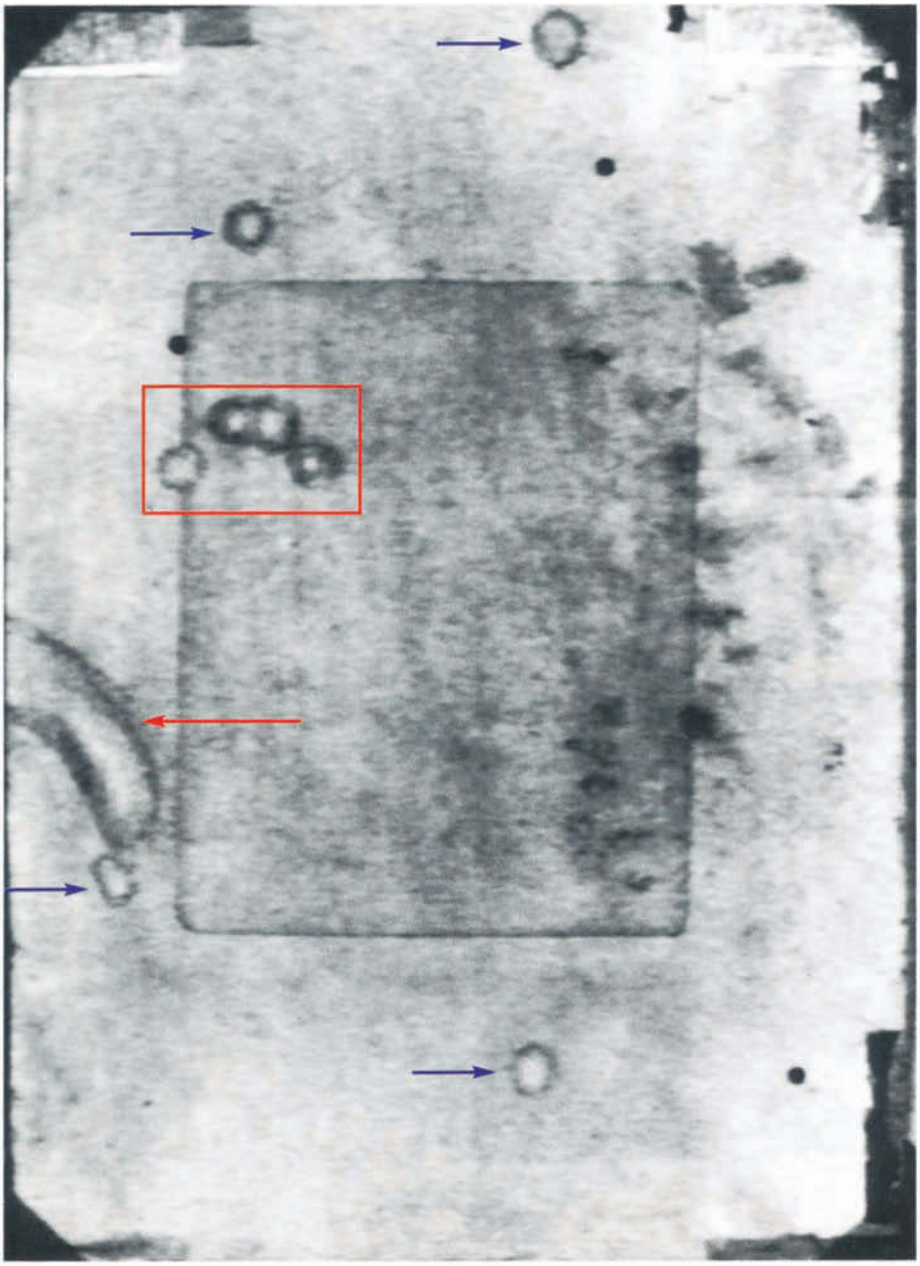
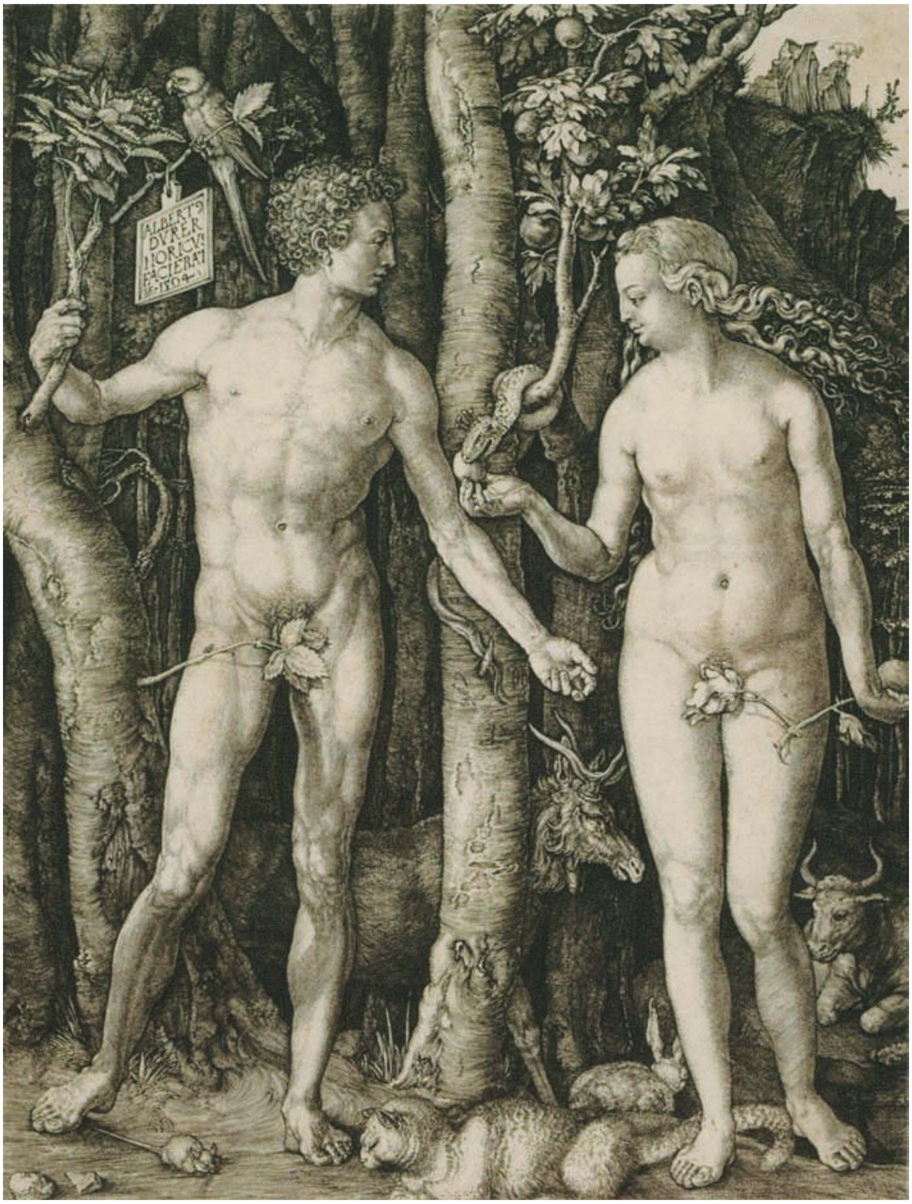


Figure A.7.e.
Master of the Housebook, *Bearded Man with Blank Shield.*
Infrared image of back. Note the dark circular lines around the perimeters of the four repaired wormholes (red box) and the long repair at the left (red arrow). The four circles in the margins (blue arrows) may be additional repaired wormholes.



ALBRECHT DÜRER, *ADAM AND EVE*

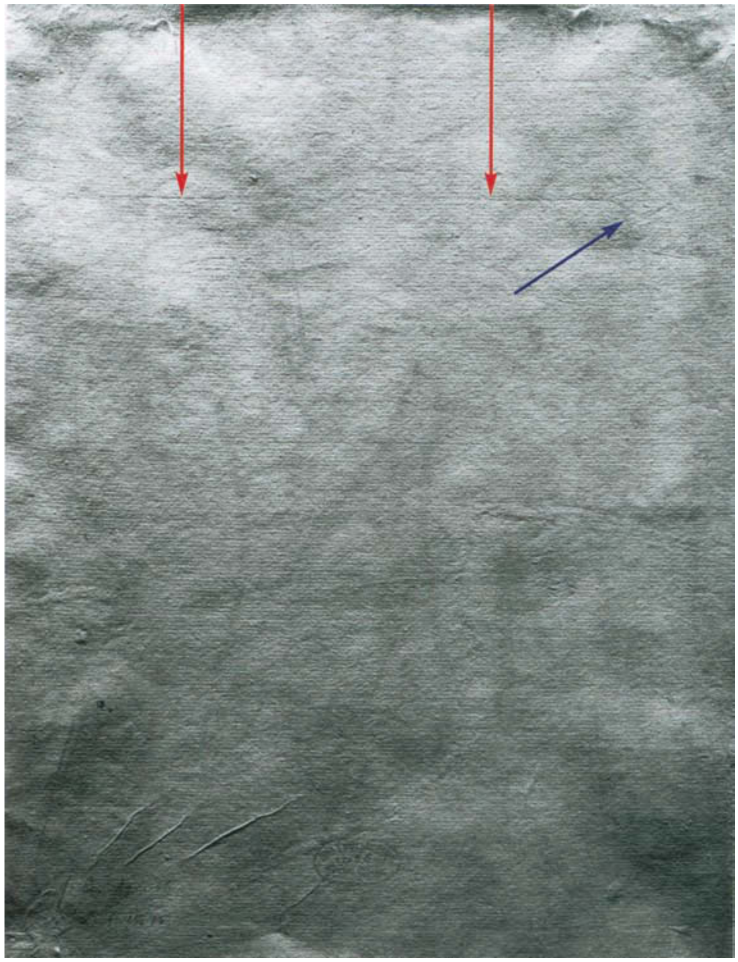
Figure A.8. Albrecht Dürer, *Adam and Eve.* Engraving. Harvard University Art Museums, Harvard University, G1055. Courtesy of the Fogg Art Museums, Gift of William Gray from the collection of Francis Calley Gray. Photograph by Allan McIntyre. © 2004 President and Fellows of Harvard University.

Provenance: Francis Calley Gray (1790–1856)

This fine impression (figs. A.8, A.8.a) of one of Dürer's masterpieces entered the collection of the Fogg Art Museum, Harvard University, soon after the death of the great benefactor, Francis Calley Gray, in 1856. For well over a century its condition, which is good, albeit with a somewhat browner paper tone than comparable impressions, raised no questions. In 2002 Marjorie Cohn, curator of prints, requested a betaradiograph in order

| Figure A.8.a.
Albrecht Dürer, *Adam and Eve.*
View of back.

to provide a clearer image of the watermark, which is faintly visible on the back under raking light (fig. A.8.b), which is quite similar to the bull's head watermark reproduced in Meder's (1932, no. 62) catalog of the prints of Dürer (fig. A.8.c). The betaradiograph (fig. A.8.d) revealed a surprising feature. The watermark was clearly visible running horizontally across the sheet; but in addition to the set of wire lines associated with this watermark, there was a second set of wire

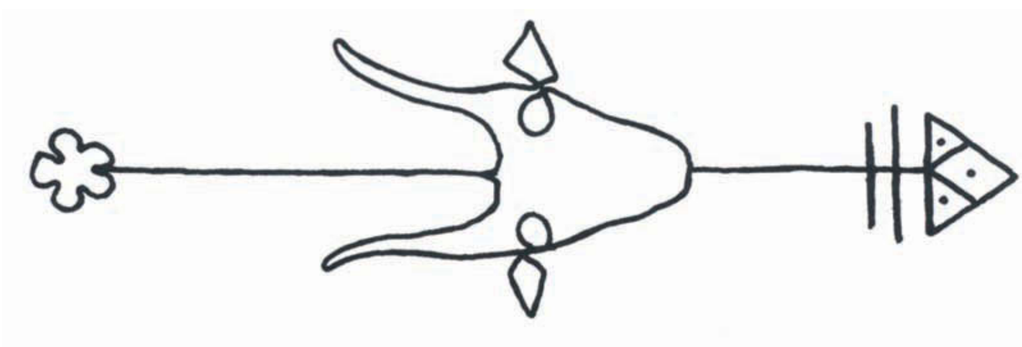


| Figure A.8.b.
Albrecht Dürer, *Adam and Eve*.
View of back, with raking light. Note bull's head watermark oriented horizontally across the top of the sheet. The red arrows point to the straight lines that extend from the top and bottom of the bull's head; the blue line indicates the triangular design.

Harvard University Art Museums, Harvard University. Photograph by Allan Macintyre. © 2004 President and Fellows of Harvard College.

| Figure A.8.c.
Bull's head watermark, Meder 62. This is quite similar to the watermark found in Dürer's *Adam and Eve*.

Reproduced from J. Meder, *Dürer-Katalog* (Vienna: Verlag Gilhofer & Ranschburg, 1932).



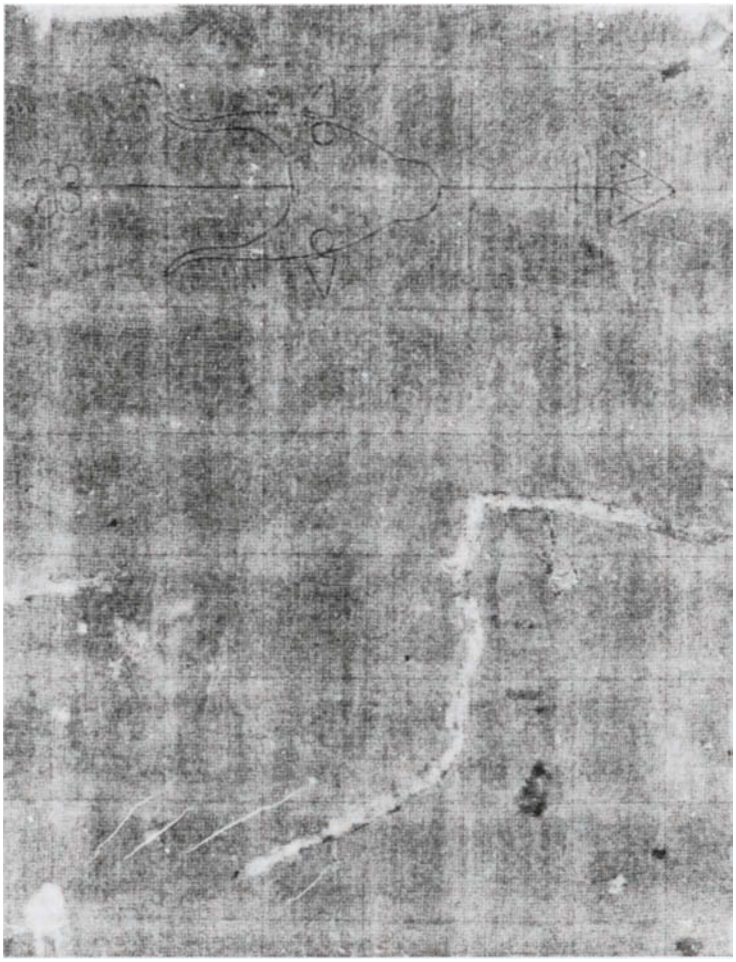


Figure A.8.d.
Betaradiograph of Albrecht Dürer, *Adam and Eve*.

Courtesy of Paper Conservation Laboratory, Straus Conservation Center, Harvard University. © 2004 President and Fellows of Harvard College.

lines running perpendicular to the first. Normally this suggests merely that there is a lining on the back of the engraving and that, for some unknown reason, the lining was applied to the print with its wire lines at ninety degrees to those of the print.[9] However, as seen in the lower left quadrant of the betaradiograph, there is a prominent diffuse white line that starts at the left edge, runs about one-third of the way into the print, then vertically downward, and eventually slanting off to the right. Also, there are four narrower white lines at the lower right, not far from the more prominent line.

One should recall that the betaradiograph is a negative and that thicker areas of the paper are recorded as lighter, whereas thin places—such as the watermark and wire lines—are darker. This means that the white lines just mentioned are thicker than the surrounding paper. When I first saw this print, I did not understand why these thicker places existed. When viewing the front of the print with raking light, it appeared as though there were four printer's creases near the bottom, but when these "creases" were scrutinized with a binocular microscope it was clear that they were not creases but fine cracks. The cracks did not continue all the way through to the back. Looking down into these cracks with very high magnification, a layer of paper fibers could be seen, and this layer seemed to be separate from the front of the print.

Recalling that the cracks corresponded to white lines in the betaradiograph, which indicated greater thickness of paper, it then seemed clear that some additional paper fibers had been put behind each of the four cracks, in effect to repair them. Microscopic examination of the area on the front of the print that corresponded to the much longer and more prominent white line revealed subtle disturbance of the printed lines. As with the cracks, the conclusion was that some paper fibers must have been affixed to the back of what was probably once a long, irregular tear. Further, it was clear that the lining had been applied to the back of the print to conceal the added paper fibers and also that the print had once been torn. Viewed from the back, the paper appeared perfectly intact.

It occurred to me that while the paper seemed somewhat stiffer and less supple than that usually encountered for this engraving, it had not seemed as thick as one might expect for the print and a lining paper. Measurement of the paper showed it to be only around five to six thousandths of an inch—no more than the normal thickness of the print alone. Suddenly I realized that the only way to account for the thickness would be to assume that the print had been split and furthermore that the lining might consist of another sheet of paper that had also been split so that when the two sheets were glued or pasted together the net result would appear to be a normal thickness.

From all this, a likely scenario can be proposed. Somehow the engraving—a very fine, early impression—became torn. Whoever repaired it did so by splitting or delaminating the print into two layers, discarding the back (or saving it for other projects).[10] Considering that printers' creases are generally never found in any impressions of this print, it is probable that the four cracks occurred as an unfortunate by-product of the splitting process. Next, small quantities of paper fibers (or very thin bits of paper) were pasted onto the back of the tear and the cracks. A second sheet of paper was also split to yield a thin lining, which was then pasted onto the back of the print.

It is reasonable to suppose that the print and the lining paper were split using the same technique described by Schweidler (see the section "Splitting Paper," pp. 104–6). Splitting of paper requires that some supporting material, either paper or cloth, be affixed to both sides of the item to be split. Consequently, one can expect that prints that have been split may show some evidence of a slight "fuzziness" of the printed surface,[11] probably due to both disruption of the surface of the print and the presence of remnants of fibers from the supporting material. One might also find traces of residual adhesive. In this instance, no adhesive residues are present, but the surface of the Dürer does have a fuzzy appearance, although this is scarcely visible without high magnification.

It is tempting to speculate that the work on this print might have been done by William A. Baldwin, who was employed in London by Colnaghi's since 1836, or perhaps by his successor, Mr. Grisbrook.[12] (There is no record of any treatment of the print after it was accessioned by the Fogg Art Museum in 1857.) In the mid-nineteenth century, splitting of prints must have been sufficiently unusual that on learning that Baldwin had split a print for Michel Hennin, Bonnardot, who is sometimes regarded as the "first modern paper conservator" (Stevenson 1995:117), considered the feat remarkable (Hennin 1856:215–16). Walsh (2000:383) notes that information on the method of performing paper splitting was not published until 1883, although as I have learned (see translation, note 92), there is evidence that knowledge of how to do this existed as early as the late eighteenth century.

It is unsettling to find this done for purposes of repairing a print; it is equally unsettling to know that splitting of prints was practiced as a means of adding new margins. During the course of a recent exhibition of the work of Rembrandt, Annette Manick, paper conservator at the Museum of Fine Arts, found at least one instance in which it was likely that margins had been added to a print by splitting it and inlaying it into a slightly larger sheet of paper, probably using Grisbrook's method. As described by Tuer (1882:1:92), to add new margins, Grisbrook would take a sheet of paper of the desired size and quality and split it about two-thirds of its length: "The print to be operated upon is now split completely through, so as to make it extremely thin, the edges having been previously cut perfectly square and close to the engraved work. A square piece, corresponding exactly to the size of the print, is then cut in its proper position (about the center) from the face of the split portion of the clean sheet of paper; the print is inserted in its place, and the whole is carefully mounted up, or pasted together, forming a solid and homogeneous sheet. A print thus treated naturally shows no marks of inlaying at the back, which is a perfectly unbroken sheet of paper, and the edges of the print having been pared down to the substance of tissue paper before mounting, the front is equally unimpeachable." Considering that Schweidler wrote about both paper splitting and adding margins, it is surprising that he did not at least indicate that the former could be used as a means to carry out the latter.

URS GRAF, *TWO LANDSQUENETS WITH A MAID AND DEATH*

Figure A.9. Urs Graf, *Two Landsquenets with a Maid and Death*, 1524. Woodcut (deceptive replica), His 280; Luthy 49. Sheet: 20.7 × 12.1 cm. Museum of Fine Arts, Boston, 61.1142. Katherine E. Bullard Fund in memory of Francis Bullard. Photograph © 2005 Museum of Fine Arts, Boston.

Provenance: Purchased from William H. Schab, 1961.

Although this print does not illustrate deceptive repairs, it is an excellent example of a technique Schweidler mentions briefly: how to make a fake watermark. Also, it is interesting as a remarkable instance of a complete forgery—one that illustrates how photomechanical processes can be used to produce deceptive forgeries. Acquired in 1961 by the Museum of Fine Arts, it was not until about two decades later that it was determined to

Figure A.9.a.
Urs Graf, *Two Landsquenets with a Maid and Death.*
Stamp applied to lower left corner of the back of the print.

be a fake. A curator at the National Gallery in Washing-ton, D.C., was considering purchase of another impression of this image and brought it to the MFA for comparison with ours. Cliff Ackley, curator of prints, drawings, and photographs at the MFA, told me that he had concerns about our impression, largely because it seemed to his eye a bit too heavily inked. He recalled seeing another impression that seemed clearer and somewhat more delicately inked and asked for an opinion from the paper conservation laboratory.

When I first examined this print, the identity of the stamp at the lower left corner on the back (fig. A.9.a) was puzzling; it is not in Lugt's comprehensive catalogs of collectors' marks (Lugt 1975, 1988). Years later, while doing research as a Getty Scholar, I learned that the stamp may be bona fide (although I still have doubts, considering what else has been learned about the print). After World War II, this mark was applied by authorities in Germany to objects of cultural

Figure A.9.b.
Urs Graf, *Two Landsquenets with a Maid and Death.*
View of back.

importance before they were exported.[13]

The back of the print (fig. A.9.b) looks completely normal at first glance, and in transmitted light the paper seems quite consistent with what one would expect for sixteenth-century paper. There is a watermark that is difficult to see clearly with transmitted

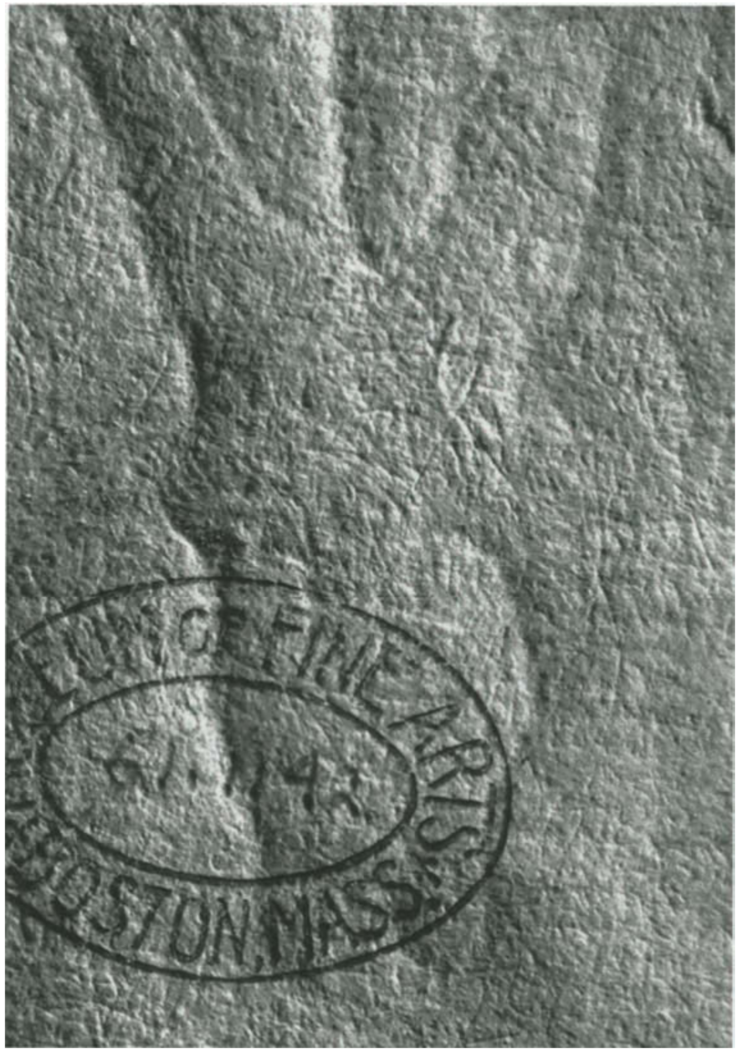


Figure A.9.c.
Urs Graf, *Two Landsquenets with a Maid and Death.*
Microphotograph of watermark, viewed from the back of the print, with raking light.

Photograph © 2005 Museum of Fine Arts, Boston.

light but easily seen when examining the back with raking light. It is also easy to see that the watermark is that of a bull's head. To make the design of the watermark clearer, it was photographed with raking light and subsequently enhanced with color, as shown in figure A.9.c. Piccard's (1966) album of tracings of bull's head watermarks contains none that is similar to this one. In a recent catalog of Urs Graf drawings in Basel, Switzerland, there are a number of images of bull's head watermarks, but again, none is a good match (Müller 2001). Most marks of this type often show at least the ears, eyes, and nostrils of the bull, but these are missing in ours.

I recalled that Schweidler's book contained directions for how one could artificially create wire lines in paper, and hence a false watermark (see pp. 118–20). The technique he described involves very carefully and methodically scraping away the paper with a sharp knife to create thin areas (just like a real watermark) in whatever pattern or design desired. Scrutiny of the watermark

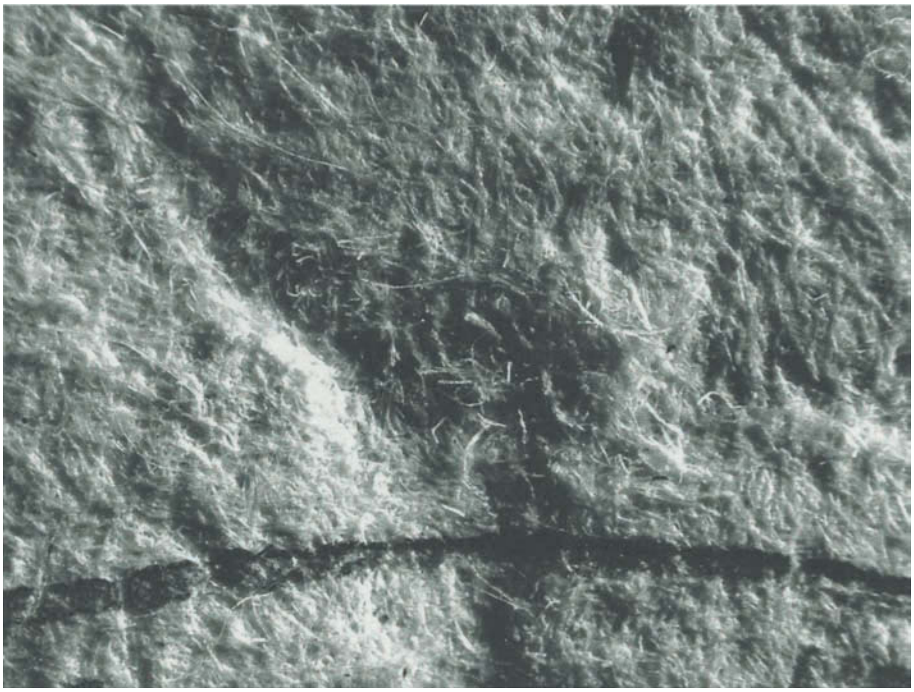


Figure A.9.d.
Urs Graf, *Two Landsquenets with a Maid and Death.*
Microphotograph of part of the false bull's head watermark, showing roughening and cutting of the paper fibers.

under high magnification (fig. A.9.d) showed that paper fibers had indeed been roughened up and cut in order to create a semblance of the bull's head watermark.

Considering that the watermark is fake and that the inking is atypical of the image, I wondered if the entire print were bogus. Among the facsimile reproductions at the MFA there is one of this same image (fig. A.9.e). It was made several decades ago by photographing an original print in the museum in Basel. The facsimile was made from the photograph, in exactly the same size as the original, by first producing a metal relief printing plate. That is, the image on the metal plate consists of raised lines (just as in the original woodblock used for Urs Graf's print). The raised lines are inked, and the plate is printed on a sheet of paper. The facsimile was printed on modern, machine-made paper, but it is obvious that if one were to have printed it on sixteenth-century paper the image might be difficult to distinguish

| Figure A.9.e.
Photomechanically produced (metal relief print) facsimile of Urs Graf print.

Courtesy Museum of Fine Arts, Boston.

from an original.[14] To make the print seem more convincing, it would be even better if it had a bull's head watermark. I suggested to the curator that it seemed likely that our print was a fake.

Some years later, I happened to be discussing this curious print with a highly respected dealer in Old Master prints. I was startled when he said, "I know who did this, but I promised that I would never reveal his name." This dealer has since died. His children, who now carry on the business, confirmed that their father did indeed know who did this but that all that could be said is that he helped "a young man who had made a terrible mistake." I suppose the author of this fake will never be known. Considering all this, I still wonder if the stamp on the back of the print is real or whether that, too, was made by the forger. After all, such stamps are very easy to make or buy. On the other hand, if the forgery were done prior to the end of World War II, the stamp itself could be genuine.

ANTHONY VAN DYCK, *PORTRAIT OF LUCAS VORSTERMAN*

Figure A.10. Anthony van Dyck, *Portrait of Lucas Vorsterman,* ca. 1630. Etching, engraving, silhouetted and backed, with retouching in pen and black ink. Wibiral 14. Catalogue Raisonneé: NH 12. Probably second state (possibly third) falsified to appear as a first state. Sheet: 31.5 × 22.7 cm. Museum of Fine Arts, Boston. 25.1143. Gift of Miss Ellen T. Bullard. Photograph © 2005 Museum of Fine Arts, Boston.

Provenance: Gift of Miss Ellen T. Bullard, 1925

Surely there must have been considerable satisfaction and delight when this print was acquired by the Museum of Fine Arts in 1925. After all, the first states of this print are rare, and in this state all of the engraving was done by van Dyck himself. Only a few are known to exist, and in 1925 the MFA did not own one. After completing his image of the sitter, van Dyck had his assistants add the background shading and legend at the bottom, as seen in the fifth and final state (fig. A.10.a). The later states are less valuable

| Figure A.10.a.
Anthony van Dyck, *Portrait of Lucas Vorsterman*, 1630s. Etching. Wibiral 14, fifth state. Museum of Fine Arts, Boston. Harvey D. Parker Collection, P7564.

than the first state, as they do not represent the work of van Dyck alone and are less rare.

It is not known when someone first began to suspect that something was amiss with this print, but it may have been some thirty or forty years after its acquisition. If one compares this impression with a first state from the Art Institute (fig. A.10.b), there are persuasive similarities, even though the Art Institute's print has been trimmed across the bottom, thereby removing the area where the title would have been. In the background of each there is the overall grayness one associates with a film of ink left on the plate—so-called plate tone. And because a copper printing plate is easily scratched, it is not surprising to see a long scratch just above and to the right of the head. But notice that some others scratches or abrasions in the plate, present in the Art Institute impression, are missing from the MFA's print.

Other peculiarities can be found. For instance, ordinarily the pressure of printing will cause the paper to become much

Figure A.10.b.
Anthony van Dyck, *Portrait of Lucas Vorsterman*, 1630s. Etching on paper. 241 x 156 mm (plate). Clarence Buckingham Collection, 1944.607. Wibiral 14, first state. The Art Institute of Chicago.

Figure A.10.c.
Anthony van Dyck, *Portrait of Lucas Vorsterman*. Museum of Fine Arts, Boston.
Detail of false platemark. Note that the paper above the "plate mark" has the same texture as that below.

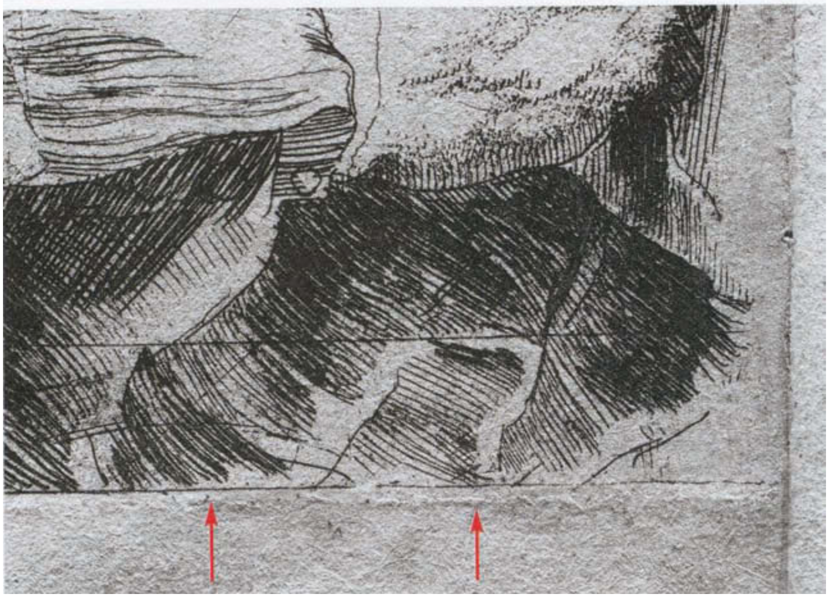


Figure A.10.d.
Anthony van Dyck, *Portrait of Lucas Vorsterman*. Museum of Fine Arts, Boston.
Microphotograph, with raking light. Note the ridgelike disjuncture in the paper.

smoother where it was in contact with the metal plate, but in this case there is virtually no difference at all in the texture of the paper in the margin, outside the plate mark, and the area that should have been in contact with the printing plate. In figure A.10.c, the "plate mark" runs horizontally across the center of the illustration. If this were a true plate mark, the paper above this line would have been made much smoother by the pressure from the metal printing plate, but in this instance there is no difference in the texture of the paper above and below the line (in what is supposed to be the margin). When one examines the plate mark itself, it seems to have been made not with a metal printing plate but rather has been incised with something like a metal stylus or other blunt tool. Another anomaly is that the paper is somewhat stiffer than normal, as is the case with the Dürer discussed previously.

There is a minute white line—an anomalous juncture within the printed area—across the bottom of the print just where the printed image ends and the blank title area begins, but this is hard to see, and I was unable to obtain a satisfactory photograph of it. Under the binocular microscope, with light directed at a very low angle across the paper to accentuate its texture, this line is resolved as a very slight ridge, a peculiar disruption in the paper (fig. A.10.d). There is, however, no

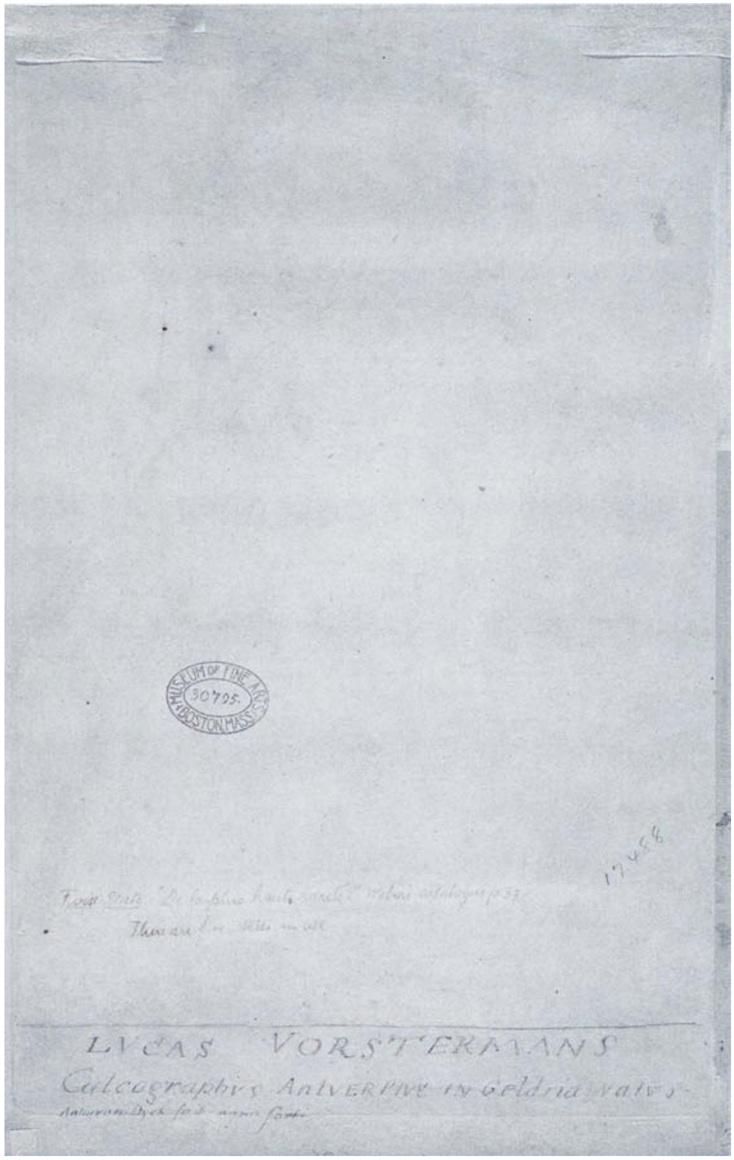


Figure A.10.e.
Anthony van Dyck, *Portrait of Lucas Vorsterman.* Museum of Fine Arts, Boston.
View of back.

evidence of the ridge or discontinuity on the back (fig. A.10.e), which appears quite normal (although more about this later). There are a few inscriptions in various hands and the MFA stamp but nothing that immediately raised suspicions.

We decided to make a betaradiograph, in part to get a clearer image of the elaborate watermark at the bottom of the sheet. Our beta plate is not large enough to do the entire print at once, so the top and bottom half were radiographed separately and combined electronically into one digital image; see figure A.10.f. (The dark line across the center of this image is due to having to make the radiographs separately, and the white patches at the top corners are due to old paper hinges on the back of the print and are not part of the print itself.) Notice the elaborate watermark at the bottom of the sheet. Also, in the top half of the radiograph (fig. A.10.g) there are some unusual white areas that seem to coincide more or less with the contours of the head and shoulders of the figure. It is as if there were a kind of ghostly image of Lucas Vorsterman. And there are rather strange dark blotches here and there within the figure. On the other hand, the

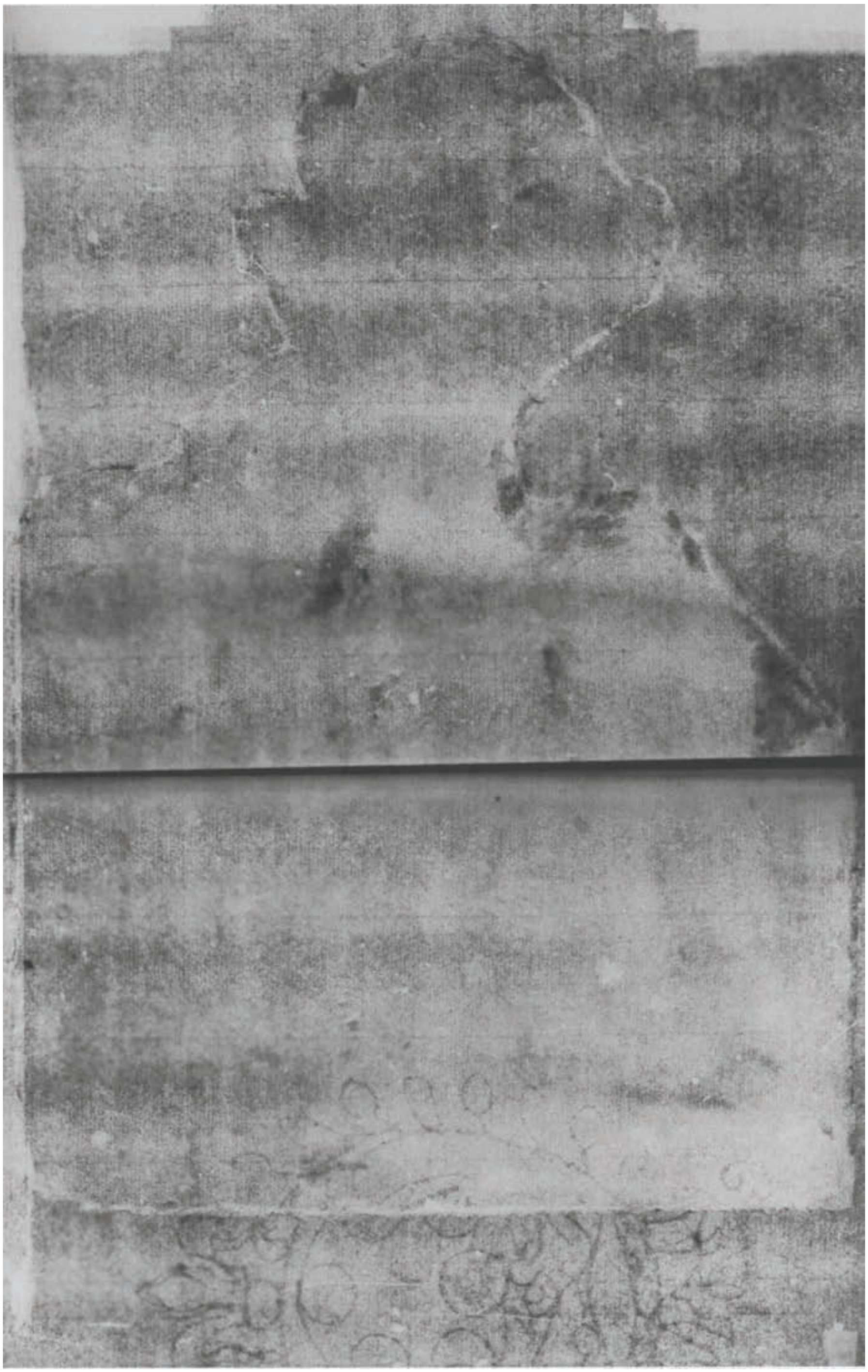
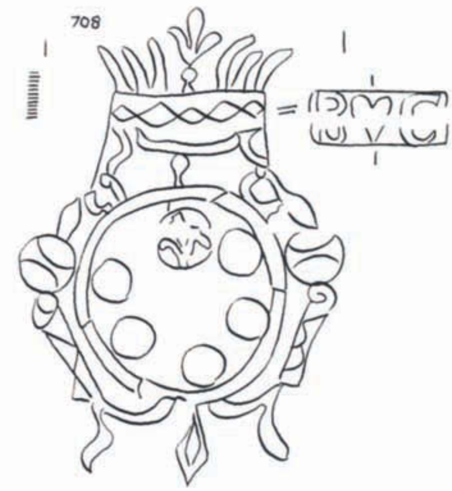


Figure A.10.f.
Anthony van Dyck, *Portrait of Lucas Vorsterman*. Museum of Fine Arts, Boston.
Betaradiograph of entire print, viewed from front.

Figure A.10.g.
Anthony van Dyck, *Portrait of Lucas Vorsterman.* Museum of Fine Arts, Boston.
Betaradiograph of upper half of print, viewed from the front.

Figure A.10.h.
Anthony van Dyck, *Portrait of Lucas Vorsterman.* Museum of Fine Arts, Boston.
Detail, betaradiograph, digitally enhanced, of watermark at the bottom of the print.



| Figure A.10.i.
Watermark of a Phoenix surrounded by laurel leaves. This mark is frequently found in impressions of van Dyck's *Lucas Vorsterman*.

Reproduced from Fr. Wibriral, *L'Iconographie d'Antoine Van Dyck* (1877).

| Figure A.10.j.
Watermark of the Arms of the Medici. Note the six disks (bezants), which are commonly associated with the Medici coat of arms.

Reproduced from E. Heawood, *Watermarks Mainly of the 17th and 18th Centuries* (Hilversum, Holland: The Paper Publications Society, 1950).

paper as a whole looks fairly normal. Clearly it is a laid paper, as it should be, and the chain lines running horizontally at regular intervals throughout the paper look normal.

To aid identification of the watermark, it was enhanced using digital imaging software (Adobe PhotoShop®) as shown in figure A.10.h (in this illustration, the watermark is oriented vertically, whereas in the actual print it is horizontal, as seen in fig. A.10.f). Extensive study of numerous catalogs of watermarks yielded nothing comparable, and the effort to identify the mark was abandoned for a number of years. Eventually, I realized that because there is a rather peculiar discontinuity running down the middle of the watermark it might be useful to analyze the right and left sides of the design separately. The right side of the watermark is in that part of the sheet that is directly behind the printed image. (The left side is in the paper that is now blank, but in later states it is where the title would have been engraved.)

A recent catalog containing tracings of watermarks found in the papers used in van Dyck's prints shows the mythical Phoenix (Mauquoy-Hendrickx 1991: pl. 180, no. 252), which is repeatedly consumed by flames and reborn from its own ashes (fig. A.10.i). Surrounding the Phoenix is a garland of laurel leaves. Notice how similar this is to the right side of the watermark in the MFA's van Dyck print. It seems clear that the paper in this portion of the van Dyck bears a fragment of the Phoenix watermark, which is usually

Figure A.10.k.
Anthony van Dyck, *Portrait of Lucas Vorsterman*. Museum of Fine Arts, Boston.
Detail of the collar, showing the gray line along the junction of the original print and the paper into which it was inlaid. The lines above this join were made with pen and ink, to simulate etched lines.

found in papers used for van Dyck's engraving of Lucas Vorsterman.

As to the other part of our elaborate watermark—present in the blank area at the bottom of the sheet, outside the printed image of Lucas Vorsterman—I found something similar in Heawood's book on watermarks (fig. A.10.j).[15] The six circles or disks ("bezants" is the term usually applied in heraldry) in the center of the design relate to the coat of arms of the Medici family. Paper bearing this mark was made in Italy but is found in France as well and can be dated to within only a few decades after the probable date of van Dyck's engraving in the early 1630s. In this instance, the mark may relate to the mill of Benoît Colombier of Ambert, France. The reason for the reference to the Medici coat of arms is that Marie de Medici, who was regent of France from 1610 to 1617, had family ties to the famous French papermaking region of the Auvergne.[16]

Putting the information about the two watermarks together, it is clear that the watermark in our van Dyck consists of two fragments. The Phoenix watermark, which is in the paper beneath the printed image, is an appropriate watermark for this print. The other fragmentary watermark, with reference to the coat of arms of the Medici, is in paper of a slightly later date and is not ordinarily found in prints by van Dyck. But when these two marks are married in this way, the result can be quite convincing. The inescapable conclusion is that we are dealing with two pieces of paper: one with the printed image, the other somehow surrounding it.

Indeed, a closer look at the outer contours of the printed image confirms these suspicions. A grayish line cuts across the collar and continues up toward the chin (fig. A.10.k). This grayish line coincides with the junction of the original paper and the added paper. With the aid of a binocular microscope one can see that the lines to the left and below this junction are real printed lines, whereas the lines on the other side,

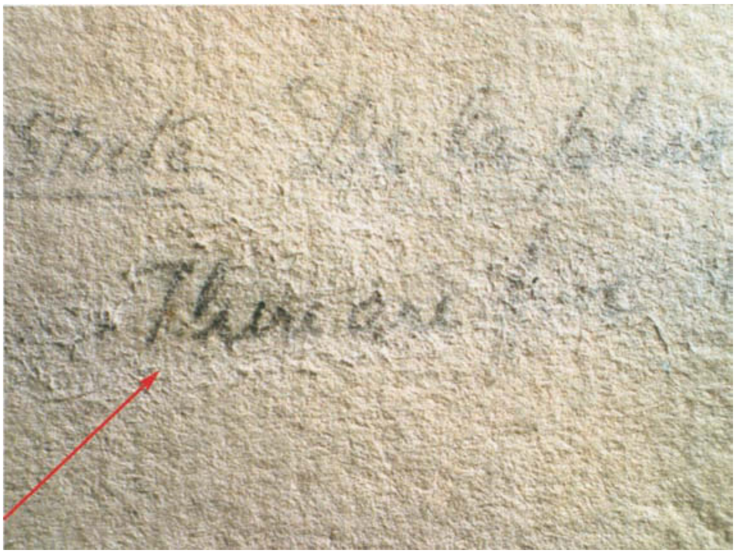


Figure A.10.l.
Anthony van Dyck, *Portrait of Lucas Vorsterman*. Museum of Fine Arts, Boston.
Microphotograph of the back of the print, showing where the thin lining paper was scraped away to avoid obscuring an inscription in pencil.

toward the right and above, were drawn in with pen and ink.

The join continues around the entire head, and its presence explains the white line that follows the contour of not only the head but also the entire image, as seen previously in the betaradiograph (see fig. A.10.g). Given that everything outside the image is not original, the scratch at the upper right of the head must be fake, and on microscopic examination it is evident that it was drawn in with pen and ink. In 1925 the most authoritative catalog then available on van Dyck's prints (Wibiral 1877) mentioned that in all impressions of the first state there is a scratch at the upper right, just above the head, so the forger could hardly have left it out without immediately casting suspicion on his handiwork.

As to why the back of the print did not show signs of any discontinuities from the joining of the two pieces of paper, it turns out that the entire print was lined with an exceptionally thin paper, something resembling lens tissue, to conceal the joins. This lining paper was not initially detected. Where the inscriptions were slightly obscured by even this thin layer of paper, the lining was carefully scraped through in order selectively to remove just enough of the thin tissue to help overcome the effect of looking through a layer of paper (fig. A.10.l).

A print that was once regarded as a rare and important first state of van Dyck's print thus turns out to be a kind of pastiche masquerading as a first state. I now believe that someone took a late state, perhaps a second or third state, cut out the image more or less around its contours, and laid it into another piece of paper.[17] But I have to admit that this was a feat of remarkable skill. The chain lines in both papers line up extremely well, and whoever did this was extraordinarily fortunate to have had on hand a sheet of paper dating to just one to three decades later than the original and which had in it a watermark that could be married to a portion of a different watermark in the original.

ANTONIO DEL POLLAIUOLO, *BATTLE OF THE NUDES*

Figure A.11. Antonio Pollaiuolo, *Battle of the Nudes,* 1470–75. First-state impression, engraving, Hind 2. Florence, 15th century. 42.4 × 60.9 cm. J. H. Wade Fund, 67.127. Overall view. Cleveland Museum of Art. Courtesy of the Cleveland Museum of Art. Photo credit: Gary Kirchenbauer.

Provenance: Prince of Liechtenstein; Colnaghi, London; purchased by Richard Zinser from Colnaghi in 1954; acquired by Cleveland Museum of Art from Zinser, 1967.[18]

This final example is included primarily to direct the reader to more extensive information on the recent discoveries that have been made about what is simultaneously one of the most important prints in existence and one of the most extraordinary instances of the kinds of repairs described by Schweidler.[19] It is also appropriate to include here in that the restoration work may well have been done by Carl Schweidler, Max's brother.

As explained by Louise Richards in her article on this print, all known examples of this print show signs of having been creased, abraded, and soiled over time, as well as losses of the printed image (Richards 1968:64), yet this impression is of great importance in that it is the only known first state (Richards 1968:65). A careful examination before it was acquired in 1967 revealed that "areas at the right and left margins and down the old center fold show pen restoration" (Richards 1968:70 n. 8). Since this

Figure A.11.a.
Antonio del Pollaiuolo (1431–98), *Battle of the Nudes*, 1470–75. First-state impression, engraving. Florence, 15th century. 42.4 × 60.9 cm. J. H. Wade Fund 1967.127. Modified raking light, overall view, verso.

Courtesy of the Cleveland Museum of Art. Photo credit: Howard Agriesti, Gary Kirchenbauer.

original examination, however, it has been learned that some of the missing areas may have been restored by filling the losses with collotype reproductions.

The focus here, however, is on structural repairs and how to detect them. In this instance, the most immediate clue to the presence of repairs is the buckling that is often caused by such repairs when they extend for more than just a few millimeters. (See the discussion about buckling in the Altdorfer, above.) Once again, the simple technique of using raking light to examine the surface topography of a print yields important information, as shown in this photograph of the back of the Pollaiuolo (fig. A.11.a). There is no indication in Richards's article that anyone examined the print by this means, but even if this had been done it is easily possible that no one would have grasped the implications of the buckling, inasmuch as knowledge of the technique of chamfered repairs was not then widely known; even less, there was virtually no understanding then of how this technique of repair might manifest itself over time. The salient aspect of this buckling that points to

Figure A.11.b.
Antonio del Pollaiuolo (1431–98), *Battle of the Nudes*, 1470–75. First-state impression, engraving. Florence, 15th century. 42.4 × 60.9 cm. J. H. Wade Fund 1967.127. Thermogram, composite image from twenty detail captures, overall view, verso. The image shows the location and shape of the repairs. (The light area at the lower right is the back of a facsimile repair. See discussion in text.)

Courtesy of the Cleveland Museum of Art. Photo credit: Larry Davis, Brendan Curtin, Moyna Stanton.

the presence of repairs is its pattern or shape. Often when paper buckles from exposure to moisture or humidity changes, the result may be somewhat more random. In this instance, the buckling suggests a more or less linear pattern, which, as should now be apparent, corresponds to the perimeter of the long repairs.

The location and contours of the repairs are shown more clearly using infrared imaging equipment with the capability to detect wavelengths from 3.0 to 5.0 microns, as has been demonstrated by Stanton and her colleagues at the Cleveland Museum of Art (fig. A.11.b). Note that the configuration or shape of the repairs is quite similar to the diagram in Schweidler's book relating to how to make repairs of tears (see translation, fig. 27). For related images, as well as for further details about the restoration of the lost portions of the image, the reader should consult the information presented on the interesting and informative Internet web site of the Cleveland Museum of Art mentioned in note 18 of this Appendix.

Given the remarkable craftsmanship of the repairs, as well as their number and extent, it is tempting to think that they were done by either Carl or Max Schweidler. According to information obtained by Stanton, Christa Gaehde stated that the Schweidlers carried out restorations for Richard Zinser when he was in Germany. If Carl's comments about his brother are to be credited (see Editor's Introduction, note 5), and if the obituary about Carl is accurate (see Editor's Introduction, note 1), it seems to me more likely that Carl, rather than Max, would have been the one who had the experience and skill to have done this work. Carl Schweidler's obituary states that he had a stroke at age seventy and that thereafter he did not undertake repairs of the kind for which he had been so well known. Given that he was born in 1884, he must have had his stroke around 1954, the same year that Zinser bought the print from Colnaghi.[20] Hence, if it was Carl who did the restoration, it seems likely that his client would have been Colnaghi,[21] which had purchased the Liechtenstein collections, possibly in four lots, between 1948 and 1952.[22] Of course, it is also possible that he might have been commissioned by Liechtenstein prior to the sale to Colnaghi. No matter which lot contained the Pollaiuolo, this time frame would probably have allowed Carl to do the restoration before the print was sold to Zinser in 1954, and this would accord with the fact that the stamp of the Colnaghi firm is found on top of one of the restorations.

The authorship of the restorations rests on multiple suppositions, and other scenarios can be proposed. Kurt Schweidler, Carl's son, was born in 1910 and would have been in his late thirties or early forties by the time the work on the Pollaiuolo was done. Was he sufficiently skilled by then to have carried out such a remarkable feat of restoration? Perhaps father and son did the work together. Or was it Max? Given the difficulty of finding restorations that can be traced definitively to the hand of either Carl or Max, perhaps the authorship of the Pollaiuolo restoration will never be known.[23] In any event, if the reader ever has an opportunity to see the print firsthand, it will be worth it—first and foremost because of its rarity and beauty, but also because it will surely stand for years as one of the most remarkable examples of a kind of restoration that is an important part of its history.

NOTES

1 According to the Infrared Processing and Analysis Center at the California Institute of Technology, the infrared region of electromagnetic radiation is usually divided into three spectral regions, near-, mid-, and far-infrared, although there is no widespread agreement on the precise boundaries between these regions. www.ipac.caltech.edu/Outreach/Edu/Regions/irregions.html.

According to Marcia Steele, conservator of paintings at the Cleveland Museum of Art, wavelengths of around 1.5 to 1.8 microns are commonly used to study underdrawing in paintings. In this instance, for capturing images of the repairs in the Pollaiuolo, their Mitsubishi IR imaging equipment was fitted with a germanium lens which transmits wavelengths of 3.0 to 5.8 microns.

2 www.clevelandart.org/exhibcef/battle/html/3405295.html.

3 *Catalogue des dessins et estampes composant la collection de M. Ambroise Firmin-Didot,* Sale April 16–May 12, 1877, at the Hotel Druot.

4 Schweidler refers often to the subject of buckling—how to avoid it and how to eliminate it. See the sections "Actual Mending or True Restoration" (pp. 109–22) and "The Stretching of Prints" (pp. 130–36).

5 This reminds me of a story I was told in the 1960s by a conservator who, in the early stages of her career, worked for a dealer in fine prints. One day someone came into the store with a Rembrandt print that had a tear in the sky, and he asked whether the tear could be mended so that it would be invisible. After some discussion, the dealer said that he expected that although the extent of the service his firm could provide would probably not yield the result the owner hoped for, it would be possible to send it to someone he knew of in Switzerland (probably Kurt Schweidler) who was well known for doing "invisible repairs." The owner agreed that the print be sent to the individual suggested. Time passed, and eventually the print was returned to the dealer. Eager to see what had been accomplished, the dealer and the young conservator were impressed that there was no evidence whatsoever of the tear. Then, after closer scrutiny, they were astonished to discern that the entire top half of the print—where once there had been sky—had been removed and replaced with another piece of paper that matched the original with remarkable fidelity. Unfortunately, I never heard what the original owner thought of the result.

6 "The problem of transferring a design engraved on rigid copper-plate to the curved surface of a pot was solved by the use of a thin sheet of tissue. . . . The inventor of transfer paper and precise details of its early development remain uncertain. We do know . . . John Brooks[,] . . . who came to England in the 1740s, played an important role in the improvement of techniques" (Leary and Walton 1976:13–14). According to Leary, John Brooks presented patents in the 1750s, and it seems that the 1750s were a period of development of this paper and technique of transferring designs.

7 I am grateful to John Krill for this information.

8 At the National Gallery, Washington, D.C., a notable example of such silhouetting is an impression of Schongauer's *The Censer,* reproduced in the catalog of fifteenth-century engravings at the National Gallery (see Shestack 1967:item 110). According to the catalog entry about this print, about half of the forty known impressions have been silhouetted. According to Richard Field, former curator at the Yale University Art Gallery, an impression of this same image at the Yale University Art Gallery may also be silhouetted. Another example of a silhouetted Schongauer is at the Fitzwilliam Museum (Clarke 2001:52, pls. 3, 4).

9 Walsh cites a print by Master E. S., *St. Mark,* which as a result of its treatment now consists of four(!) split sheets in which at least two are laminated together with the wire lines oriented perpendicular to each other. For more on this and on the subject of paper splitting, see Walsh 2000:383–90.

10 In the late 1960s, soon after I obtained a copy of Schweidler's book, the photograph of Max tearing a sheet of paper in such as way as to create a very wide overlap (translation, fig. 31) motivated me to try this. I experimented with a sheet of modern laid paper. Soon I noticed something that I had not expected. When I inspected each side of the tear I had produced, it was apparent that half of the tear still showed a laid pattern, whereas the other half seemed to lack almost all of its laid pattern, as if it were a wove paper. I then tried to split another piece of this same laid paper, using the technique suggested by Schweidler (by gluing two pieces of strong paper on either side of the laid paper, splitting the three-layer laminate so as to split the laid paper—the middle layer—and then

soaking off the strong papers to free the two halves of the now split laid paper). This exercise confirmed that one-half of the laid paper (the wire side) retained its laid lines, whereas the other half (the top or upper side of the paper) had lost its laid pattern. Applying this observation to this Dürer engraving, it seems clear that the image was printed on the wire side of the sheet, since the original bull's head watermark is still present. I can imagine that the restorer who carried out this nerve-racking procedure must have been pleased to see that the watermark was still present after splitting the print. After all, in this instance having this specific watermark may have translated into a higher market price for the print.

11 As Walsh (2000:385) observes, the interior of the split sheet would inevitably exhibit disrupted fibers—like the fuzzy side of suede leather—but in this instance the interiors of the split sheets are not visible, having been pasted together.

12 Tuer (1882:1:92) indicated that while "Baldwin had a great reputation amongst print collectors and dealers . . . for very many years he personally seldom touched a print, leaving everything to his manager, Mr. Grisbrook."

13 A similar stamp is reproduced in Brückler 1999. I am grateful to Carol Togneri for bringing this information to my attention.

14 As observed by Eduard Trautscholdt, "Photomechanical reproductions are in this way dangerous, especially reproductions of rare woodcuts" (in Bloch and Zick 1970:182; translation by Britta Bothe). Coincidentally, Trautscholdt is mentioned in an obituary for Carl Schweidler as having been one of the latter's clients. See Editor's Introduction, note 1.

15 Heawood 1950:pl. 708. The mark was found in paper from J. G. Tavernier, *Serrail du Grand Seigneur,* 1675, Paris.

16 Gaudriault (1995:92) says that the example given above in Heawood, no. 708, dates from 1675 and is sometimes accompanied by "B ❤ C" within a cartouche, and that this refers to Benoît Colombier of Ambert. Related marks bearing the Medici coat of arms can be found in French papers from the 1640s into the early 1700s.

17 See also the discussion above about the print by Martin Schongauer.

18 Stanton 2002. Stanton's paper, "Finding the Pieces to the Puzzle," reveals and describes the print's extensive and historic repairs, makes a strong case that one of the Schweidlers was responsible for these restorations, and introduces thermal infrared imaging (thermography) as a valuable analytical technique for detecting and documenting repairs in works of art on paper. www.clevelandart.org/exhibcef/battle/html/3405295.html.

19 Extensive information about the recent examination of this print is to be found on the web site of the Cleveland Museum of Art, www.clevelandart.org/exhibcef/battle/html/3405295.html. I am especially grateful to Moyna Stanton, paper conservator at the Cleveland Museum of Art, for sharing this information with me, of which I only present a few highlights.

20 "Provenance," Cleveland Museum of Art web site.

21 From a marginal note by Carl in his copy of Max's 1938 edition (see translation, note 84), it is clear that Carl did work for Colnaghi. In that note Carl indicates that Colnaghi had asked him to try to correct or improve a restoration that had been done by Max. Thus it is questionable whether Max would have been doing any further work for Colnaghi after 1938.

22 "Provenance," Cleveland web site.

23 To my knowledge, the only documented instance of Carl Schweidler's work dates from 1931 and relates to carrying out retouching of a small scratch on a Rembrandt print belonging to Lessing Rosenwald (Stevenson 1995:121).

GLOSSARY

Alum; Alum paste. Aluminum sulfate. Old recipes for paste sometimes specified the addition of alum, which enhanced the adhesive properties of the paste and may have helped to preserve it. From the point of view of someone trying later to dissolve or remove the dried paste, a serious disadvantage of adding alum to paste is that it causes chemical changes that chemists refer to as "cross-linking," with the result that the paste becomes virtually insoluble in water. Another serious drawback is that the addition of alum to paste would cause the paste to become more acidic. (In the paper industry, the term "alum" often refers to potassium aluminum sulfate—"papermaker's alum.")

Aluminum subacetate. Aluminum subacetate solution *(Essigsäure Tonerde)* contains about 8 percent aluminum diacetate and is a clear, colorless liquid, acidic to litmus. It is used as a mordant in cotton dyeing, in printing fabrics, and in water- and fireproofing tissues. It is used medicinally as an astringent and antiseptic (Stecher 1968:47). I know of no source for Schweidler's use of this material. From the chemical standpoint, given that aluminum ions are trivalent, it is possible that aluminum subacetate may harden gelatin and hence make gelatin sizing more effective, but it may also make it more acidic.

Ammonia. A solution of ammonium hydroxide gas in water. Schweidler does not specify the concentration of the ammonia solution he suggests using. Presumably it is equivalent to the strength commonly used for household cleaning, that is, a dilute solution of 5 to 10 percent ammonia gas in water. www.epa.gov/grtlakes/seahome/housewaste/src/basics.htm.

Biedermeier. "Of or relating to a type of furniture developed in Germany during the first half of the 19th century and modeled after French Empire styles" (*The American Heritage Dictionary of the English Language*, 3d ed. [Boston: Houghton Mifflin, 1992]).

Bleaching soda; "soda solution." A mixture of sodium silicate ("water glass") and sodium carbonate. On September 26, 1876, Fritz Henkel (1848–1930) founded the company Henkel & Cie. in Aachen, Germany. In 1878 the company produced the first brand-name detergent for washing clothes, Henkel's Bleich-Soda (bleaching soda).[1] Note that bleaching soda does not contain any chorine compounds. (See the introduction regarding the potential for confusing bleaching soda with a chlorinated bleach, p. 11.) Schweidler illustrates its effects as a cleaning agent in figures 12, 13, and 15. Schweidler sometimes refers to a "soda solution," by which one should understand that it is a solution of "bleaching soda."

Chlorinated lime. An old-fashioned name for calcium hypochlorite. This chemical is used as a bleaching agent but should not be confused with bleaching soda (see above), which contains no chlorine. Schweidler occasionally refers to the use of either dry calcium hypochlorite or a solution of "chlorinated lime" (calcium hypochlorite) as "chlorine," but properly speaking, this should apply only to the element chlorine, which is a gas.

Citric acid. Naturally present in many fruits such as oranges and lemons, its molecular structure is such that it can act as a chelating agent, readily combining with metallic ions, which explains why both citric acid and lemon juice have long been found in books of recipes regarding how to remove ink (iron gall ink) and rust stains. (See *oxalic acid,* below.)

Collotype. "Based on a French discovery patented in 1855, and in full commercial use by the 1870s, collotypes remained an important element in fine printing until recent years. . . . The process is based on the fact that sensitized gelatin exposed to light will harden and become non-absorbent, whereas unexposed portions will remain soft and receptive to water" (Gascoigne 1986:definition 40 [unpaginated]).

Copying-ink pencil. An indelible writing tool containing a mixture of clay, earth color, and aniline dye. These pencils were used principally by clerical staff for making copies of permanent records or accounts (by dampening the original and transferring the writing to a sheet of copy paper), but the purplish black marks of these pencils are occasionally found on the back of prints. (Both Max Beckmann and Lovis Corinth sometimes signed their prints with a pencil of this sort.) The author's warning is well founded since the dyes used in these pencils are readily soluble and intensely colored. For further information, see Dube 1998; also see Rhodes 1999.

Criblé. A relief process of printmaking, in which punches are used to stipple a plate with numerous indentations to create decorative patterns. Sometimes called "dotted prints."

Eau de Javelle. A solution of potassium hypochlorite. When freshly prepared, the solution contains about 2.5 percent active chlorine (Stecher 1968:595).

Estompe. The French word for a slender cylinder of paper that tapers to a blunt point at one end; it is used by artists to blend tones in charcoal drawings.

Glazier's shop. The term refers to a store that specializes in the sale of glass for frames, windows, and so on, but it is clear that prints, frames, glass, and mirrors were also available for sale, rather like frame shops today. On page 33, Schweidler says, "A glazier does not only put in windows; he likes to find other sources of income. Often in a small glass shop, run by a glazier, you see pictures and frames. If you go into such a shop, you often find portfolios filled with engravings, even individual pictures specially displayed."

Guard. Ordinarily a bookbinding term that refers to a narrow strip of paper sewn into the binding and used as a means to attach a loose sheet into the book, but Schweidler uses the term to refer to a narrow strip of paper used to attach a print to a mount. He elaborates on the mounting of prints and the use of guards in the section "Stretching of Prints," on pages 130–36.

Ivory-board. Ivory-board *(Elfenbeinkarton)* is a type of moderately stiff cardboard that consists of one or more thicknesses of high-quality paper and has an ivory tint. It is sometimes finished with beeswax and has a high degree of uniform transparency (Labarre [1952] 1969:138).

Jalousie. "A blind or shutter having adjustable horizontal slats for regulating the passage of air and light" (*American Heritage Dictionary of the English Language,* 3d ed.).

Marienglas. The common name in German for either mica or selenite, naturally occurring minerals that can be separated into transparent or translucent layers.

Methylated spirits. A denatured alcohol consisting of a mixture of ethyl alcohol and methyl alcohol. (*American Heritage Dictionary of the English Language,* 3d ed.).

Oiled paper; oilpaper. Sometimes translated as "grease-proof paper," the original word in the text is *Ölpapier,* which is paper made somewhat transparent by treating it with oil, usually boiled linseed oil, poppy seed oil, olive oil, or a mixture of oil and turpentine. Schweidler probably suggests it in this instance because it would resist wetting and therefore retain its strength when immersed in water (Labarre [1952] 1969:175).

Soda; soda solution. When Schweidler refers to either "soda" or "soda solution," he is referring to bleaching soda (see above) or a solution of bleaching soda. Note that this is different from English popular usage, in which the word *soda* often refers to carbonated water, although in a chemical context it refers to sodium carbonate.

Sorrel salt. Potassium binoxalate. It is poisonous and occurs as white, odorless crystals. It is soluble in forty parts of cold water and slightly soluble in alcohol. The pH of a 0,1 molar aqueous solution is 2.7. It is used for removing ink stains, scouring metals, cleaning wood, and as a mordant in dyeing (Stecher 1968:852). For the latter purposes, it is similar in its effect to oxalic acid and citric acid. Its use is also mentioned in Buck's earlier treatise on book repair as a reagent for removing ink stains (Buck 1918:33).

Spirit of wine. An old-fashioned phrase for distilled ethyl alcohol.

Stone board. Stone board *(Steinpappe)* is a kind of papier-mâché made from paper pulp, whiting, and glue. It is made to imitate stone or bronze and has also been used as a roofing material (Labarre [1952] 1969:41).

Vinegar. As stated on page 66, by "vinegar," Schweidler means wine vinegar (presumably white wine vinegar, since it is essentially colorless). In his book, he employs vinegar both as a cleaning agent and as an "antidote," following treatment with either bleaching soda or chlorinated bleach. Chemically, vinegar is a dilute form of acetic acid. Generally, the strength of the wine vinegar sold for home use is approximately 6 percent.

Washing potcher. "The potcher is a mixing, bleaching, and washing 'engine' of the Hollander type, has a roll fitted with wooden paddles, a drum washer but no bed-plate. Hence such combinations as Washing Potcher, Mixing Potcher, Bleaching Potcher" (Labarre [1952] 1969:204).

Water glass. "An aqueous solution of sodium silicate that dries to a hard glasslike mass. Sodium silicate is prepared by fusing silicon dioxide (SiO_2) and sodium oxide (Na_2O) in a ratio that varies from 2 to 3.5. A water glass solution is viscous and has little tack, so when it is used as an adhesive, pressure must be applied to hold materials together while bonding. The dried product is brittle and water sensitive. Aluminum salts can be added to the formulation to improve water resistance. Water glass has been used to make artificial stone. Most commonly, it is used as an air-setting cement for bonding paper, corrugated boxes and cartons, wood, glass, porcelain, leather, and textiles. Water glass is also used to fireproof textiles and wood. It was tried unsuccessfully as a binder in the 19th century for fresco paintings. . . . Potash water glass is composed of potassium silicate. Double water glass is a mixture of equal parts potassium silicate and sodium silicate. . . . Soluble in water forming strongly alkaline solutions (pH = 11–12.5). Partially miscible with primary alcohols and ketones." In powder form, sodium silicate is one of the constituents of bleaching soda (see above). (Definition source: CAMEO [Conservation and Art Materials Encyclopedia Online], the online dictionary and database sponsored by the Museum of Fine Arts, Boston, www.mfa.org/_cameo/frontend/ [accessed December 7, 2004].)

NOTES

1 This material would have been a common household item. To my knowledge, no one has explored what the long-term effects of bleaching soda are on the properties of paper, but perhaps this is not surprising given that this material is, to my knowledge, no longer in use for treatment of works of art on paper. Indeed, aside from Schweidler's use of this chemical mixture, I have found no other references to its use in paper conservation. While initially soluble, after sodium silicate dries it becomes extremely resistant to water (a method for preserving eggs is to apply a solution of sodium silicate which, when dry, forms a moisture-impenetrable coating around them), so I wonder whether any residue of sodium silicate in paper might change its absorbency or other properties. Schweidler illustrates the effect of using a solution of bleaching soda in figs. 12, 13, and 15.

According to Thomas Wölk, Archivist of Henkel Corporation, Henkel's Bleich-Soda was probably packaged in paper bags, such as the one shown here, until July 1911, at which time the manner of packaging changed from bags to cartons. In 1921 this product appeared under another name, Henko, which continued in production until 1998. Wölk stated that the composition of the product was changed and improved regularly over the decades.

Henkel's Bleich-Soda, introduced in about 1878. This is one of the original packages.

Photo courtesy of Henkel Corporation Archives.

REFERENCES

Baynes-Cope, A. D. 1977. The effect of residues of manganese compounds in paper on the bleaching of prints, etc. *Paper Conservator* 2:3.

Beaufort, T. R. 1926. *Pictures and How to Clean Them.* New York: Stokes.

Bidwell, J. 1990. *Early American Papermaking: Two Treatises on Manufacturing Techniques, Reprinted from James Cutbush's American Artist's Manual (1814).* New Castle, Del.: Oak Knoll Books.

Böhm, H. [1929] 1979. *Die Praxis des Restaurators, by Dr. Fr. G. H. Lucanus.* 5th ed. Rudolf Schönherr; reprint, Cologne: Böhlau-Verlag.

Bonnardot, A. 1846. *Essai sur la restauration des anciennes estampes et des livres rares.* Paris: Deflorenne neveu.

——. 1858. *Essai sur l'art de restaurer les estampes et les livres.* 2d ed. Paris.

Brückler, T., ed. 1999. *Kunstraub, Kunstbergung, und Restitution in Österreich 1938 bis heute.* Vienna: Böhlau Verlag.

Brückle, I., and J. Dambrogio. 2000. Paper splitting: History and modern technology. *Journal of the American Institute for Conservation* 39 (3):295–325.

Buck, M. S. 1918. *Book Repair and Restoration.* Philadelphia: Nicholas L. Brown.

Churchill, W. A. [1935] 1967. *Watermarks in Paper in Holland, England, France, etc., in the XVII and XVII Centuries and Their Interconnection.* Amsterdam: M. Hertzberger.

Clarke, B. 2001. Searching for evidence of nineteenth-century print restoration. *British Museum Occasional Papers,* no. 145, pp. 49–55.

Colvin, H. 1985. *Calke Abbey, Derbyshire.* London: Antler Books.

Cumberland, G. 1827. *An Essay on the Utility of Collecting the Best Works of the Ancient Engravers of the Italian School.* London: W. Nichol.

Dawson, W. R., and E. P. Uphill. 1972. *Who Was Who in Egyptology.* 2d rev. ed. London: Egypt Exploration Society.

Depauw, C., and G. Luijten, et al. 1999. *Anthony van Dyck as a Printmaker.* Amsterdam: Antwerpen Open; Rijksmuseum.

Donnithorne, A. 1988. Early approaches to the conservation of works of art on paper: Cleaning, repair and restoration. *British Museum Occasional Papers,* no. 65, pp. 16–25.

Dube, L. 1998. The copying pencil: Composition, history, and conservation implications. *Book and Paper Group Annual* (American Institute for Conservation) 17:45–52.

Filedt Kok, J. P., et al. 1985. *Livelier than Life: The Master of the Amsterdam Cabinet, or, The Housebook Master, ca. 1470–1500.* Amsterdam: Rijksmuseum.

Friar, S., ed. 1987. *A Dictionary of Heraldry.* New York: Harmony Books.

Gascoigne, B. 1986. *How to Identify Prints.* London: Thames and Hudson.

Gaudriault, R. 1995. *Filigranes et autres caractéristiques des papiers fabriqués en France aux XVII^e^ et XVIII^e^ siècles.* Paris: CNRS Editions.

Gore, A., and A. Gore. 1991. *The History of English Interiors.* London: Phaidon Press.

Gunn, M. J. 1911. *Print Restoration and Picture Cleaning.* London: L. Upcott Gill.

Hattis, P. 1977. *Four Centuries of French Drawings in the Fine Arts Museums of San Francisco.* San Francisco: Fine Arts Museums of San Francisco.

Heawood, E. [1969] 1981. *Watermarks Mainly of the 17th and 18th Centuries.* Hilversum: Paper Publications Society.

Hecquet, R. 1751. *Catalogue des estampes gravées d'aprés Rubens: Auquel on a joint l'oeuvre de Jordaens & celle de Visscher. Avec un secret pour blanchir les estampes & en ôter les taches d'huile.* Paris: Chez Briasson, Chez Charles-Antoine Jombert.

Hennin, M. 1856. *Les monuments de l'histoire de France: Catalogue des productions de la sculpture, de la peinture, et de la gravure.* Paris.

Hoeniger, C. 1999. The restoration of the early Italian "Primitives" during the 20th century: Valuing art and its consequences. *Journal of the American Institute for Conservation* 38 (2):144–61.

Hunter, D. 1947. *Papermaking: The History and Technique of an Ancient Craft.* 2d ed., rev. and enl. New York: Alfred A. Knopf.

James, C. 1997. *Old Master Prints and Drawings: A Guide to Preservation and Conservation.* Translated and edited by Marjorie B. Cohn. Amsterdam: Amsterdam University Press.

Keck, S. 1936. A method of cleaning prints. *Technical Studies in the Field of Fine Arts* 5 (2):117–26.

Keyes, K. 1984. Alternatives to conventional methods of reducing discoloration in works of art on paper. In *Postprints from the AIC Tenth Annual Meeting, Milwaukee, Wisconsin, 26–30 May 1982,* pp. 100–104. Washington, D.C.: American Institute for Conservation.

Kosek, J. M. 1994. Restoration of art on paper in the West: A consideration of changing attitudes and values. *British Museum Occasional Papers,* no. 99, pp. 41–50.

Krill, J. 2001. *English Artists' Paper: Renaissance to Regency.* 2d ed. New Castle, Del.: Oak Knoll Press.

Kushel, D. 1999. Radiographic methods used in the recording of structure and watermarks in historic papers. In *Fresh Woods and Pastures New,* edited by F. W. Robinson and S. Peck, pp. 116–23. Chapel Hill: Ackland Art Museum.

Labarre, E. J. [1952] 1969. *Dictionary and Encyclopedia of Paper and Paper-Making.* 2d. ed. rev. Amsterdam: Swets and Zeitlinger.

Leary, E., and P. Walton. 1976. *Transfer-printed Worcester Porcelain at Manchester City Art Gallery.* Manchester: City of Manchester Cultural Services.

Lehrs, M. 1893. *The Master of the Amsterdam Cabinet.* London: International Chalcographical Society.

Lugt, F. 1921. *Les marques de collections de dessins & d'estampes.* Amsterdam: Vereenigde Drukkerijen. Reprint, San Francisco: Alan Wofsy Fine Arts, 1975.

———. 1988. *Les marques de collections de dessins & d'estampes.* Supplement. San Francisco: Alan Wofsy Fine Arts.

Mauquoy-Hendrickx, M. 1991. *L'iconographie d'Antoine van Dyck.* 2 vols. Catalogue raisonné. Brussels: Bibliothèque Royale Albert 1.

Meder, J. 1932. *Dürer-Katalog: Ein Handbuch über Albrecht Dürers Stiche, Radierungen, Holzschnitte, deren Zustände, Ausgaben und Wasserzeichen.* Vienna: Gilhofer & Rauschburg.

Müller, C. 2001. *Urs Graf: Die Zeichnungen im Kupferstichkabinett Basel.* Basel: Schwabe & Co.

The National Trust. 1995. *Uppark, West Sussex.* London: The National Trust, Great Britain.

Officer, L. H. 2002. Exchange rate between the United States dollar and forty other countries, 1913–1999. Economic History Services, EH.net. www.eh.net/hmit/exchangerates/.

Piccard, G. 1966. *Die Ochsenkopf-Wasserzeichen.* Findbuch II, pts. 1–3. Stuttgart: Verlag W. Kohlhammer.

Plenderleith, H. J. 1937. *The Conservation of Prints, Drawings, and Manuscripts.* London: Oxford University Press.

Podany, J. 1994. Restoring what wasn't there: Reconsiderations of the eighteenth-century restorations to the Lansdowne

Herakles in the collection of the J. Paul Getty Museum. *British Museum Occasional Papers*, pp. 9–18.

Puglisi, C. R. 1999. *Francesco Albani*. New Haven: Yale University Press.

Richards, L. S. 1968. Antonio Pollaiuolo: *Battle of the Naked Men*. *Bulletin of the Cleveland Museum of Art* 55 (3):63–70.

Rhodes, B. J., and W. W. Streeter. 1999. *Before Photocopying: The Art & History of Mechanical Copying, 1780–1938*. Newcastle, Del.: Oak Knoll Press.

Schweidler, M. 1941. *Sammeln und Sichten: Eine praktische Graphikkunde*. Innsbruck: Universitäts-Verlag Wagner.

Scott, A. 1921, 1923, 1926. *The Cleaning and Restoration of Museum Exhibits*. London: His Majesty's Stationery Office.

Shestack, A. 1967. *Fifteenth-Century Engravings of Northern Europe from the National Gallery of Art, Washington, D.C.* Washington, D.C.: National Gallery of Art.

Stanton, M. 2002. Finding the piece to the puzzle. In *Battle of the Nudes: Pollaiuolo's Renaissance Masterpiece*. Cleveland: Cleveland Museum of Art. www.clevelandart.org/exhibcef/battle/html/3405295.html.

Stecher, P. G., ed. 1968. *The Merck Index*. 8th ed. Rahway, N.J.: Merck and Co.

Stevenson, A. 1967. *The Problem of the Missale Speciale*. London: Bibliographic Society.

Stevenson, M. 1990. A seventeenth-century manual for the restoration of prints. *Print Quarterly* 7 (4):420–24.

———. 1995. Print restoration in northern Europe: Development, traditions, and literature from the late Renaissance to the 1930s. *Conservation Research 1995*, pp. 111–25. Studies in the History of Art, 51, Monograph Series II. Washington, D.C.: National Gallery of Art.

Trautscholdt, E. 1970. Zu Nachahmungen und Fälschungen: Ein Beitrag aus der Perspective eines Graphikhändlers. In *Festschrift für Heinz Ladendorf*, edited by P. Bloch and G. Zick, pp. 180–83. Cologne: Böhlau Verlag.

Tuer, A. W. 1882. *Bartolozzi and His Prints*. 2 vols. London: Field and Tuer.

Tyler, V. E. 1991. *Philatelic Forgers: Their Lives and Works*. Sidney, Ohio: Linn's Stamp News.

Van der Reyden, D., M. F. Mecklenburg, M. Baker, and M. Hamill. 1988. Update on current research into aqueous light bleaching at the Conservation Analytical Laboratory. *Book and Paper Annual* (American Institute for Conservation) 7:73–106.

Walsh, J. 2000. The use of paper splitting in Old Master print restorations. *Print Quarterly* 17 (4):383–90.

Wibiral, F. 1877. *L'iconographie d'Antoine van Dyck, d'après les recherches de H. Weber*. Leipzig: A. Danz.

Williamson, S. H. 2002. What is the relative value? Economic History Services. April. www.eh.net/hmit/compare/.

This page intentionally left blank

INDEX

Note: *Italicized* page numbers indicate illustrations.

ABOUT THE EDITOR

Roy Perkinson holds a B.S. in physics and philosophy from the Massachusetts Institute of Technology and an M.A. in art history from Boston University. He received his conservation training at the Museum of Fine Arts, Boston, where he held an apprenticeship under the direction of F. W. Dolloff from 1967 to 1970. A member of the Print Council of America and a fellow of the American Institute for Conservation, Perkinson has published widely in the fields of paper conservation and fine art. Since 1976 he has been Head of Paper Conservation at the Virginia Herrick Deknatel Paper Conservation Laboratory, Museum of Fine Arts, Boston.

THE GETTY CONSERVATION INSTITUTE

"Essential reading for paper conservators and print historians"

—*Studies in Conservation*

THE **RESTORATION** OF **ENGRAVINGS, DRAWINGS, BOOKS,** AND OTHER WORKS ON PAPER

MAX SCHWEIDLER

Ever since its original publication in Germany in 1938, Max Schweidler's *Die Instandsetzung von Kupferstichen, Zeichnungen, Büchern usw.* has been recognized as a seminal modern text on the conservation and restoration of works on paper. This volume, based on the authoritative revised German edition of 1950, makes Schweidler's work available in English for the first time, in a meticulously edited and annotated scholarly edition. An extensively illustrated appendix presents case studies of eleven Old Master prints that were treated using the techniques Schweidler discusses.

Translated and edited by Roy Perkinson, Head of the Virginia Herrick Deknatel Paper Conservation Laboratory at the Museum of Fine Arts, Boston

Getty Publications
(800) 223-3431
www.getty.edu/publications

ISBN 978-0-89236-835-8

9 780892 368358 90000

PRINTED IN CHINA