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MANUSCRIPT REPAIR IN EUROPEAN ARCHIVES¹

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FRANCE, BELGIUM, AND THE NETHERLANDS

ARCHIVES NATIONALES (Paris)

CREATED in 1789-1790 by the Constituent Assembly, the national archives of France were in the beginning only the documents relative to the operations of this assembly; but the events of the French Revolution and the centralizing spirit of the National Convention transformed the archives of the assembly into a general repository of all papers from the administrations of the old régime. Everything fell into the hands of the new government and was centralized not only in Paris but in the chief cities of the departments: archives of the seignorial justices; titles to ecclesiastical grants; records of the ancient provincial administrations, religious orders, judicial corps, lay corporations, and academies; papers of princes, emigrants, and condemned prisoners. First installed in the Louvre, the national archives were in 1808 transferred to the old residence of the princes of Soubise, acquired for the purpose by Napoleon I. To them were added, roughly, all the papers of the establishments of the old régime in Paris, forming the ancient section of the archives (the judicial papers, provisionally deposited in the Palace of Justice, were reunited in 1848 with the historical and administrative papers in the Soubise mansion). The modern section of the archives comprises the papers of the revolutionary assemblies and those transferred during the nineteenth century by various ministries (with the exception of some, such as the Ministry of War, which retained their own records). These transfers were continued in accordance with a decree of Janu-

¹ This is the second and concluding installment summarizing the results of Mr. Smith's investigations into methods of manuscript repair in some of the principal European archives.

ary 12, 1898, which provided for the periodical conveyance of *dossiers*, registers, and individual items no longer needed in the current business of the ministries. The national archives also receives records from certain private muniment rooms.²

The *atelier de réparation* in the Archives nationales is a smallish, dark, cluttered room, up a flight of narrow stairs. The light is rather feeble, and presses and bookbinding equipment crowd the room. Another room, below, is devoted to binding repair. Three or four repairers, headed by M. Dubos, comprise the staff. The principal characteristics of the repairing technique followed here may be briefly listed:

1. *Parchment repair*

For simple joins of two torn pieces, Japanese paper (very thin and yellowish) is pasted on both sides, pressed, and later almost entirely removed by means of sandpaper.

No moisture is applied during parchment repair. If the document requires previous flattening, it is pressed between moistened sheets of paper.

For supplying missing portions, pieces of old parchment (blank pages from manuscript volumes in the archives) are used, matching as closely as possible the color and texture of the document.

A thick, wheat flour paste, with alum added, is the adhesive.

2. *Paper repair*

Japanese paper is again used. It is considered less expensive and more transparent than silk gauze. Moreover, missing bits of writing are sometimes supplied in new ink, and it would be much more difficult to write over the gauze than over the Japanese paper.

3. *Binding repair*

The original style of binding is retained where possible, and old leather panels are replaced when they contain stamped patterns or anything of interest.

The stacks are of predominantly wooden construction. Long corridors have been converted into series of alcoves of tall wooden shelves. Outside windows are the only means of ventilation. Dust is one of the greatest problems encountered. There are many volumes,

² *Guide international des archives* (Paris: Institut International de Coopération Intellectuelle, 1934), pp. 112-113.

but most of the individual documents are kept in *dossiers* in uniform heavy strawboard boxes, with hinged tops and let-down flaps in front. Bundles are usually secured by a strip of webbing fastened around them, with a metal clip attached.

BIBLIOTHÈQUE NATIONALE (Paris)

A letter of introduction to M. Leroy, secretary-general of the Bibliothèque nationale, paved the way for a very brief visit to that vast institution. A short time was spent in the bindery with Madame Friedrich, the manuscript repairer. Japanese paper and a kind of parchment paper are her chief materials. Missing portions are supplied with the parchment paper, and the joins are covered with Japanese paper, pasted down with thin flour paste. Gradually increasing pressure is an essential step in repair, as usual.

Remodeling and modernization, including particularly the installation of proper lighting and ventilation, are proceeding steadily in the Bibliothèque nationale. There is still no electric light in the stacks, so that no book requests can be filled after a certain hour, which in winter is quite early in the afternoon. Additional space for books has been provided by the transfer of all the provincial newspapers to a repository (formerly the stables of Marie Antoinette) at Versailles. Working quarters have been rearranged and improved, notably the reserve reading room and the cataloguing department. A *salle de bibliographie* has been created by uniting in one room the library catalogues and principal works of reference. The manuscript reading room was fleetingly glimpsed, but the manuscript stacks were found to be closed to visitors by virtue of an inflexible rule.

ARCHIVES GÉNÉRALES DU ROYAUME (Brussels)

The Archives générales du Royaume in Brussels is one of nine repositories established in the chief cities of the provinces, each of which preserves the records of its particular province since 1830. The Brussels repository keeps, however, in addition to the provincial records of Brabant, the archives derived from the old central government administrations, excepting the ministries of foreign affairs and national defense, which maintain their own archival service. There is a series of printed and typed indexes of the national archives, in volume form, available to readers. The chief archivist is M. D. D. Brouwers, formerly conservator of the archives of Namur.

The repair laboratory, in the charge of M. Bolsée, is situated in a little annex to the main archives building, which must be approached from the outside. It contains two rather small rooms, one used by the printer and photographer, the other by the two repairers. The workbench, topped with a black marble slab, faces the window.

The chief method of repair in the Brussels archives has for about the last nine years consisted of the application of a celluloid solution called *zapon*, composed as follows:

Celluloid, fine shavings	3 gr.
Camphor	1 gr.
Acetone (or acetic ester)	20 gr.
Amyl acetate	76 gr.
<i>or</i>	
Nitro-cotton	3 gr.
Camphor	1.5 gr.
Amyl acetate	75.5 gr.
Acetic ester (or acetone)	20 gr.

The *zapon*, in liquid form, is brushed on one side of the manuscript, which is then hung up to dry. This takes about two hours, depending on the temperature of the room. When dry the *zapon* becomes a thin yet strongly hardened film, serving as a protective covering for the manuscript and even filling in small holes and tears. When a manuscript is thus "zaponized," no actual repairing (in the sense of filling in torn or missing portions) or resizing is deemed necessary, as it can be handled with perfect safety even if its edges are ragged. The occasional concession, however, of using a small piece of transparent silk gauze, may be made when there is a serious tear in the manuscript. Not only paper but also parchment documents have been treated with *zapon*.

Although nine years have produced no discoloration or apparently harmful results in paper documents treated with *zapon*, not enough time has elapsed to justify a final verdict as to its chemical stability. Inflammability is another question to be seriously considered. Although experiments seem to indicate that the "zaponized" documents burn no more easily than ordinary paper, there is a definite danger of the vapor from the *zapon* catching fire, especially in rooms with any type of open fires. It has been suggested that this inflammability could be reduced by replacing a considerable quantity of the solvent with chloroform or carbon tetrachloride; but this would not only be more expensive but would necessarily involve special arrangements

for ventilation in the workroom. While there is no doubt that fragile paper documents treated with *zapon* are thereby strengthened and protected against further damage, it is also true that much the same strengthening and protection can be obtained by an application of ordinary animal size (from pieces of vellum or parchment boiled down in water), as at the Public Record Office in London. All early western papers were animal-sized at the time of manufacture. This size is not only cheaper, simpler to make, and less hazardous to use than the *zapon*, but also has the added recommendation that it restores to the paper the quality which it has lost. Parchment documents treated with *zapon* in the Brussels archives appeared crinkly and brittle to the touch, and in some cases the ink had spread.

In the Brussels archives it is the usual practice to use chemical means for bringing up faded or stained writing. This has been done not only in cases of manuscripts previously stained with gall but also with those which were faded because of any one of a number of factors. There are two separate and successive chemical baths indicated—the first (one part ammonium hydrosulphate to twenty parts of water) to bring up the writing and the second (0.4 gr. of tannin and 5 cc. of acetic acid to 100 cc. of water) to make the reaction permanent and at the same time to prevent any harmful effects of the first reagent. M. Bolsée made it clear that the second bath could sometimes be used alone, particularly in cases where the manuscript had been previously stained with gall.

The manuscripts which had been given these treatments were not very reassuring in appearance, having great, discolored blotches. The more recent method of bringing up faded writing by examination under ultra-violet light is not yet in favor with the authorities here, as they feel that anything made visible under the ultra-violet must necessarily be visible in the first place to the naked eye. They have not yet had the opportunity of testing the remarkable results which can be obtained with ultra-violet light, both for visual examination and for purposes of photography. Furthermore, they do not take into account that the use of ultra-violet light entails no risk whatever to the manuscript (something which certainly cannot be said of chemical reagents, no matter how carefully they may be applied).

The methods of repairing and molding seals in Brussels originally served as a model for the Public Record Office, so that the two procedures are virtually identical. In general, however, there are more added refinements in the English method of molding—such

as the use of waxed paper to protect the seal, and the making of an overhang in the plaster cast in order to facilitate its separation from the mold. Very little actual seal repair is undertaken in Brussels—only where absolutely necessary to prevent the seal from cracking up—and there is no filling out of missing portions with new beeswax. An impressive semi-circular room containing tiers of drawers has been built to house the collection of over 28,000 plaster molds of seals, in addition to some of the more precious documents with seals. There is a carefully compiled index, with descriptive information, of all the molds in the room. It was disturbing to note that some of the original wax seals were wrapped in cotton wool without any protective covering of waxed or greased paper to keep the inherent moisture of the wax from being withdrawn.

The outstanding features of the stacks observed were: (1) steel construction and very tall shelving, necessitating a stepladder to reach the upper shelves; (2) exceptionally wide aisles; (3) fire extinguishers at intervals; (4) ventilation only by opening windows occasionally; (5) long distance for attendants to walk to bring manuscripts to the reading room; and (6) unbound manuscripts left unbound (placed between pulp-boards and tied with tapes with flaps of cloth and paper at top and sides to keep out dust, or else in paper folders within large pasteboard boxes); but documents bound up at some time in the past left undisturbed.

The photographic department in the Brussels archives is quite active on behalf of both readers and correspondents. In many cases photographs of fragile manuscripts are shown to readers instead of the manuscripts themselves.

ALGEMEEN RIJKSARCHIEF (The Hague)

The Dutch system of provincial archives, with a central repository in the capital city, is very much on the order of that in Belgium. The Algemeen Rijksarchief, in The Hague, preserves in addition to the usual governmental records the archives of the Dutch West Indies up to and including the year 1846. There are a number of printed summary catalogues of the various classes of documents, which are being added to as finances and available time of staff permit. There is no card catalogue. A yearly résumé of progress in cataloguing was formerly added to the archivist's *Annual Report*, but this has now been discontinued except as an occasional separate publication. The chief archivist is Professor R. Fruin.

Here, as in many other archives visited, the bindery and repair-shop are combined, and the chief repairer, in service at the archives for twenty-five years, is a man who has a wide background of binding experience. The room in use has windows on two sides, with the workbenches facing them. A large cutting machine occupies the center of the room.

Japanese paper is the principal repairing material. The usual procedure for repairing a paper document which is in bad condition, with perhaps a portion missing, is to fill in the missing section with old paper (selected to match the document as closely as possible) and then to cover both sides of the document completely with a sheet of Japanese paper. A commercially prepared binder's paste, well diluted with water, is used as an adhesive. The document is finally subjected to pressure, light at first but increasingly heavy, until it is thoroughly dry. The same method is used for the repair of parchment documents, except that filling in (with old parchment if possible) is seldom done. Flattening is accomplished in the press, as with paper documents; but it is sometimes necessary when dealing with large charters to spread them on a large surface and tack them down at the edges to insure their drying straight. No resizing is done, as it is deemed unnecessary when the document has been covered on both sides with Japanese paper.

The cardinal objection to the use of Japanese paper as a covering for fragile manuscripts is that it is not completely transparent. Handwriting which is in a heavy or even ordinarily intense ink is usually quite readable through the Japanese paper, but faded writing is apt to be almost completely obscured. Another question which arises, as with all materials employed in manuscript repair, is this: Will the Japanese paper change color in the course of time? It is generally conceded to be absolutely stable, and its long and meritorious record of service in the Dutch archives (since 1858) would seem to indicate that it is unobjectionable on this score. In more than one case during this tour of archives in Europe, the writer was told in all seriousness that a slight yellowish tinge in the Japanese paper was all to the good, as it disguised the newness of the repair. Here there is a definite and rather deplorable departure from the accepted view that manuscript repairs should never be disguised or made so intentionally fine that they are not immediately apparent to the naked eye.

What about the practice of using blank sheets from old documents as repairing material? No doubt in many repositories the supply is practically inexhaustible, but the mere fact of availability is not the only thing to be considered. More important—in fact, often extremely vital to the scholar—is the evidence furnished by blank leaves as to the original physical condition of the document. In other words, if a document is worth preserving for posterity, it should be preserved in its original state, unchanged (as far as possible) in physical appearance or content. Only thus can it be of the fullest, unquestioned value as historical or literary evidence. Any sign of tampering may lead to confusion or even doubt of its authenticity.

There is no seal repair or molding attempted in the Algemeen Rijksarchief, except the occasional gluing together of broken seals.

The *magasijn* (stack) was built about 1900 and consists of six floors, of all-steel construction, with grill flooring and stairs. The shelving is of slate. The ironwork, painted white, is unusually clean, in the Dutch tradition. Handlifts operated by ropes are found at intervals for transferring documents from one floor to another.

The steel shutters on the windows, electrically operated, can be closed all over the entire building in two minutes. Ventilation is secured only by occasional opening of the windows. Heating pipes along the lower floor keep the winter temperature up to about 58° F. in the stacks; in summer no artificial adjustment is necessary.

The prevailing types of container for the storage of documents are portfolios (two boards tied together, as at Brussels) and boxes. The portfolios in general have no dust flaps. Loose documents are not bound. Documents bearing seals are placed in separate envelopes, then arranged upright in boxes with let-down flaps on one side. Maps are kept flat if possible and laid in heavy portfolios in drawers.

Records of documents taken from the stack for use by readers take the form of entries in a charge-book. No slips are placed on the shelves to show where documents have been removed, except in portfolios from which a single item is taken. Documents reserved for readers are not returned to the stacks nightly but are kept in the reading room while in use.

At one side of one floor of the stack is a row of “cells” with separate doors, where items of particular value are kept, such as:

1. The original Treaty of Westphalia, 1648, by which the Netherlands gained their independence from Spain—in French and Spanish; two separate volumes (original red velvet); signed by Philip of

Spain, with his seal in gold; kept in a glass case within a steel safe, the top of which when lifted to a vertical position and pushed downward causes the glass case to come up into view.

2. Several large charters on parchment bearing the seals of all the principal cities of Holland, in order of date of founding (from left to right), with accompanying signatures of burgomasters. Greenish wax predominant in the seals.

3. Some very early maps of Holland and one or two of New Netherland. The very early charters on parchment, going back in some instances to the twelfth century, are stored in wooden cabinets on deep thin wooden shelves, which may be pulled out. The documents are kept flat and in position by tapes.

A photographic department supplies reproductions of documentary material upon request and occasionally undertakes ultra-violet photography. An ultra-violet apparatus of the Hanau quartz-lamp type is available to readers in a dark chamber provided in the photographic department. This particular lamp is a therapeutical model, nickel-plated, and can be lowered or raised by a cable. Readers themselves may bring manuscripts up from the reading room to the ultra-violet chamber. A consultation period of longer than fifteen minutes is inadvisable, as there is no air in the chamber when the door is closed.⁸

GERMANY AND AUSTRIA

PREUSSISCHES GEHEIMES STAATSARCHIV (Berlin-Dahlem)

The Preussisches geheimes Staatsarchiv in Berlin-Dahlem contains the central archives of Brandenburg and Prussia, dating from

⁸ For additional material on the French archives see: Léon Dorez, "L'incendie de la Bibliothèque nationale de Turin," *Revue des Bibliothèques*, XIV (1904), 77-99. Franz Ehrle, "Sur la conservation et la restauration des anciens manuscrits," *Revue des Bibliothèques*, VIII (1898), 155-172, translated from the Italian by Léon Dorez. The same article appears in *Bibliothèque de l'École des chartes*, LIX (1898), 479-495. F. C. Lonchamp, *Therapeutica graphica, ou l'art de collectionner, de conserver et de restaurer les dessins, les manuscrits, les estampes et les livres* (Paris and Lausanne: Librairie des Bibliophiles, 1930). Méray, "Moyens de restaurer les vieux livres," *Annuaire du Bibliophile* (Paris, 1862). "Procès verbal de la Conférence internationale pour la conservation et la restauration des anciens manuscrits tenue à Saint-Gall," *Revue des Bibliothèques*, VIII (1898), 415-425.

For Belgium, see Elise Samuelson, "De la restauration d'anciens manuscrits par le kitt," *Actes du Congrès international des Archivistes et Bibliothécaires de Bruxelles* (1910) (Brussels: Siège de la Commission permanente des Congrès, 1912), pp. 205-208; and for the Netherlands, Maarten Schoengen: "Over het Zapon," and "Verlag van Dr. Sello's lezing over Zapon op den Dritten deutschen Archivtag, te Dusseldorf," *Nederlandsch Archievenblad*, XI (1902-1903), 32-45, 143-156.

the end of the sixteenth century. These consist of the records of the central Prussian authorities (Privy Council, General Direction, ministries of the modern era, other central administrations, high courts of justice, etc.), the archives of the Prussian army (up to 1866), the records of the Ministry of Foreign Affairs (to 1867), and of the "Kingdom of Westphalia" (1807-1813), in addition to a collection of maps, etc. There is a printed summary catalogue of the archives, in two volumes. Many early manuscript and printed lists of departmental records (called *Repertoria*) are available to readers, and a partial card index to the *Repertoria*, covering names and subjects, is helpful in a number of instances. Dr. Heinrich Otto Meisner is chief archivist.

Except in the case of documents of extreme fragility (which are reinforced where necessary by a double thickness of Japanese paper and covered on one side with transparent silk gauze), the prevailing method of repair in the Prussian archives involves the application of parchment paper (a transparent paper, German-made, similar to parchment). This material is applied with wheat flour paste to both sides of the document, thus covering it completely. The advantages urged for parchment paper by the staff of the Prussian archives, as compared with silk gauze or Japanese paper, are several:

1. It is cheaper.
2. It is easier to apply. More documents can be repaired in a shorter time (an important point in a large archival repository). But this simplicity of application is offset by a disagreeable crinkled condition apparent in the repaired document, which persists in spite of pressure and repeated smoothing subsequent to application.
3. It is flexible. In this respect it is supposedly much superior to *zapon*, which is brittle and may cause the paper to crack when bent sharply. But, in common with *zapon*, the parchment paper gives to the document an unnatural, slick appearance and feel.
4. It is not likely to change in color. At least, after about ten years' use in the archives no change has been evident. But the color of the parchment paper is yellowish to begin with, and consequently a distinctly yellowish tinge is imparted to documents covered with it.
5. It is free from acidity, which may be injurious to the paper. This was not true of the earlier parchment paper, but now a special quality is manufactured for the Staatsarchiv by the firm of Knoeckel, Schmidt, & Co., in Lambrecht (Rheinpfalz), guaranteed to be acid-free. Sev-

eral thicknesses are available, but a medium weight—not the thinnest—is used by the Staatsarchiv. It costs about 680 Rm. per 1000 kilograms.

A similar procedure is followed in the repair of parchment documents; no new parchment is employed. Seal repair is done on a small scale.

The Prussian archives issued under the date of October 6, 1936, an official communication addressed to all German archives, entitled *Richtlinien für die Ausbesserung von Archivalien* (Guides for the Repair of Archives). This mimeographed circular emphasizes the necessity of proper conservation and restoration of records, both official and unofficial, including such important sources of local history as parish registers. An offer is made to repair local archives in the technical repair-shop of the Geheimes Staatsarchiv, or, in case such work has been undertaken by the local staff or in a commercial workshop, it is suggested that the repaired manuscripts be sent to Berlin-Dahlem for examination. A brief outline of recommended repairing methods is set forth, and it is pointed out that adaptations of procedure can be made with regard to different types of archives. Silk gauze, Japanese paper, parchment paper, old paper, and new wood-free and weakly-sized paper are all listed as possible repairing materials, but the parchment paper is suggested to be most suitable in a large number of cases. It is explained that the parchment paper is manufactured only under special conditions and in large quantities, so that it is best to order through the Geheimes Staatsarchiv, which undertakes to deliver smaller quantities cost free to local archives or at cost price to private bookbinders connected with the archives.

The stacks, in a fireproof wing of the Prussian archives building entirely separate from the offices, are quite new but already full almost to capacity, and an addition is therefore contemplated. The construction is of steel throughout, but the shelves are wooden. The linoleum-covered floors are kept spotlessly clean.

In general, documents as transferred from the state departments are already bound in some form, or perhaps only sewed together. It is customary to place two or three of these volumes together and wrap them in a dustproof paper folder, which is tied and labeled. The records of each department are of course kept separate, generally in chronological order. Very early documents with seals are kept in paper envelopes in boxes. The earliest records in the office date

from about A.D. 1200 and mostly relate to lands, etc., in the mark of Brandenburg. There is a collection of loose seals—removed, at some unknown time in the past, from the documents to which they were originally affixed—which are numbered, classified, and kept in drawers. Certain rooms in the stack are devoted solely to state treaties, which are usually quite spectacular in appearance, with silver skip-pets and velvet covers with fancy tassels.

The reading room in the archives is modern and well lighted, with accommodation for about a hundred readers. Superintendents sit at raised desks at each end of the room, behind which are shelves where documents are retained overnight. A large proportion of the readers are bent on genealogical research.

DR. IBSCHER

At the recommendation of Dr. Rohr, of the Prussian archives, a visit was paid to Dr. Ibscher, widely known as a restorer of ancient manuscripts, whose headquarters at the time were in the Egyptian Department of the Neues Museum in Berlin. One of Dr. Ibscher's most expert accomplishments is the repair of ancient manuscripts on papyrus. He has even succeeded in making papyrus according to the ancient method, from the papyrus plant. There were numerous papyri on hand which he had already treated, together with a very badly damaged and matted specimen which awaited attention. The latter had been water-soaked at one time and seemed a solid, inseparable mass, with the writing worse than illegible. By dint of great care and unending patience, however, it is possible to lift the papyrus sheets one by one with small steel pincers, fit together fragmentary pieces, and mount them individually between glass. No attempt is made to restore or reinforce the damaged papyrus; it is simply protected against further damage.

Dr. Ibscher's methods of paper and parchment repair (with Japanese paper and silk gauze) are almost identical with those in use at the Prussian archives. One minor deviation in technique, however, is worthy of note. To flatten and dry a repaired document on paper, Dr. Ibscher does not resort to pressing; he simply pastes down to the board or repairing surface the surplus edges of the Japanese paper and silk gauze, which he intentionally has allowed to extend a little beyond each edge of the document, and leaves it to dry out. A paste-board is lightly laid on the document to protect it from dust, but no pressure is exerted. Documents on parchment, on the other hand,

are flattened and dried in a press. They are usually repaired in much the same manner, although new parchment may be used for reinforcement if the items are particularly valuable. The paste used in this operation is Hofmann's *reis-sterg* (commercially prepared), which has, obviously, a rice basis. Dr. Ibscher mixes it with water (first cold, then boiling), stirs constantly till it is of a creamy consistency, and strains it through a cloth to get rid of lumps. He makes it freshly every two or three days to insure purity and cleanliness and freedom from bacteria. No resizing is done, as the paste itself is supposed to contribute sufficient strengthening qualities.

HERR RICHTER

Herr Richter, of the Department of Engraving of the Neues Museum, specializes in cleaning, repairing, and mounting etchings, drawings, engravings, etc., and also in the repair of old bindings. For the removal of the brown spots which often occur on engravings, Herr Richter recommends the following treatment:

Immerse the engravings consecutively, for the periods of time indicated, in four baths as follows (large shallow porcelain trays will be found most suitable)—

- | | |
|---|----------------|
| 1. Pure water | 2 hours |
| 2. <i>Chlor</i> (A solution of 400 gr. of chloride of lime in 4 liters of pure water) | 2 or 3 minutes |
| 3. <i>Anti-chlor</i> (A solution of 200 gr. of hyposulphite of soda in 4 liters of water which neutralizes the effect of the <i>chlor</i> and serves as a fixing agent) | 3 minutes |
| 4. Running water | 6 hours |

Dry between frequently changed blotters or other absorbent sheets. [Note: The *chlor* and *anti-chlor* are kept in yellow glass bottles. The *chlor* is always strained through a cloth before use.]

REICHSARCHIV (Potsdam)

The Reichsarchiv, or national archives of Germany, was founded in 1919. The archives building is a former military school, extensively remodeled and enlarged, on a hill in Potsdam called the *Brauhausberg*. The institution is divided into two principal departments: archives and historiography. The archives include the records which are periodically transferred from the departments of the Reich. They are subdivided into political, economic, juridical, and military documents, bequests and collections relating to contemporary history, maps, and photographs. The historiography section is at present

working on the subject of the World War, for which there are masses of historical material in the archives.

The documents in the Reichsarchiv are practically all less than a century old, dating back no earlier than 1870, and originating mostly during and after the period of the World War. This fact entails a somewhat different approach to the problem of repair and preservation. The primary object is not so much to restore and strengthen as to protect from fading and any other damage to which the manuscripts might eventually be exposed. Cases of water-soaking, insect ravages, etc., are comparatively infrequent among documents of recent date, although they do of course occur, particularly if methods of storage are lax. It has therefore been thought wise to cover these late documents completely with some transparent, impermeable substance, or to varnish those portions which are most apt to suffer from exposure to light or moisture.

The covering material formerly in use at the Reichsarchiv was parchment paper (the same quality as that used at the Prussian archives in Berlin-Dahlem), but this has been largely replaced by cellophane, which has the advantage of being more transparent and absolutely colorless. The cellophane is obtained from Kalle and Company, *Aktiengesellschaft*, Wiesbaden-Biebrich, Germany. A descriptive booklet issued by the manufacturers lists the superlative qualities of the cellophane, among which the following are of especial interest to the archive repairer:

Cellophan is a transparent membrane made from pure cellulose. . . . It does not decay, ferment, get moldy, or permit the passage of bacteria. . . . It is harmless and perfectly free from any hygienic objections. . . . It is dust-proof and air-proof. . . . It is neither explosive nor inflammable (it burns no faster than a chip of wood) and it is stable in all climates and under all local conditions.

The cellophane is applied to the manuscripts with a special *leim*, or size (not paste). The documents when covered are flattened by rolling under a cylinder, but even after this treatment a disagreeable crinkled appearance may be noticed. Documents covered with cellophane can be submerged in water or exposed to the sun indefinitely without any damage.

A varnish preparation derived from copal, called *kopallack*, is the nearest approach to *zapon* in the Reichsarchiv. It is sprayed on the manuscripts, forming a protective (although yellowish) coating and preventing fading or running of the ink. It has been found

particularly useful in preserving documents written in pencil (liable to rubbing and dimming) and maps marked with colored ink or paint (liable to run if wet). Certain tests have been carried out at the Reichsarchiv to prove the efficacy of *kopallack*; e.g., a pencil-written page, half treated with *kopallack* and the other half untreated, was exposed to the sun for several hours. At the end of this period of exposure the untreated portion had faded into practical illegibility while the *kopallack*-covered part was as fresh and unfaded as before. *Kopallack* is not suitable for use with wood pulp papers, such as newsprint, in which case the application of parchment paper or cellophane is indicated. The same objections which have been raised with regard to other varnish preparations, such as *zapon*, hold good also with regard to *kopallack*.

The modern steel stacks are light, airy, and clean, and in general style of construction are very similar to the Prussian archives in Berlin-Dahlem. Two sections of particular interest were those devoted to maps and photographs. The huge collection of thousands of maps—which mostly originated during the World War—are kept flat in drawers within steel cabinets. Many of them have been treated with *kopallack*. There are numerical labels on the drawers and a regular catalogue of the entire collection. The photographs, which are only lately coming into their own as an integral, valuable part of archival records, are arranged in wooden drawers, by subject. The photographic department utilizes the Leica camera almost exclusively.

HAUPTSTAATSARCHIV (Munich)

The Hauptstaatsarchiv, or principal archives of Bavaria, was formed in 1921 by the amalgamation of certain special archives, established in 1799 to deal with the records of foreign and internal affairs and the dynasty of Wittelsbach. There is a good collection of ecclesiastical and monastic records, which was assembled when the monasteries of Bavaria were secularized in the nineteenth century. The chief archivist is Dr. O. Riedner.

Repair work is carried on here only to a very limited extent, and there seem to be no prescribed methods of procedure. Seals are occasionally repaired and often molded in plaster and cast in metal.

The entire archives were at the time of this visit in a state of upheaval, as it was a period of cleaning and renovation. The reading room, for instance, was quite unrecognizable, with furniture and books piled helter-skelter and workmen whitewashing the arched

ceilings. The records themselves were in the process of being transferred from the old stacks (of wooden construction) to a new and modern steel section adjoining. The new stacks, completed only about a year, are to be shared with the Staatsbibliothek, which occupies the same building.

With regard to the type of storage containers used in the Hauptstaatsarchiv, there were noted not only the usual portfolios and volumes but also some old chests and even metal containers (no doubt intended originally as a measure of safety in case of fire). A geographical arrangement of the material seems most frequently followed, although in certain cases single items, in folders, are in alphabetical order.

HAUS-, HOF-, UND STAATSARCHIV (Vienna)

The tripartite name of these archives may be separated into its component parts and explained thus: Haus—the family papers of the Hapsburgs, Maria Theresa having founded the archives in 1749; Hof—court and legal records; and Staat—archives of government departments.

The Austrian archives dwindled considerably after the World War, when the new nations carved out of Austrian territory, such as Czechoslovakia, wished to build up their own record repositories. To do this, they requested that documentary material originally sent from their districts to be deposited at the central archives in Vienna, and also material relating to their districts, should be transferred to them. Vienna, on the other hand, wished to keep its archives intact. This difficult situation was at last solved by a compromise: Material sent in for deposit was to be returned, but documents of the central administrations relative to the various sections of the country were retained, although in some cases lists were furnished. Sometimes documents were turned over but lists and indexes were kept, which means that searchers must often come to Vienna in order to consult the essential key to material actually deposited elsewhere. Professor Ludwig Bittner is in charge of the Haus-, Hof-, und Staatsarchiv.

There has been no secularization of monasteries in Austria such as that which occurred in Bavaria, so that many monasteries still possess large and important collections of manuscripts. Only financial stringency has in some instances compelled these institutions to part with their treasures.

A compound of cellulose acetate called *cellon* is chiefly used in

repair. It is applied in liquid form with a brush (as *zapon*), forming when hardened a protective varnish. This substance, together with a special solvent, is manufactured by *Cellon-Werke* (Dr. Arthur Eichengrün), Berlin, Charlottenburg. It is very similar to *cellit*, used (in solution in ether) in some other German archives, which is manufactured by *I. G. Farbenindustrie, Aktiengesellschaft, Abteilung L.*, Frankfurt-am-Main. Dr. Heinrich Frederking, prominent German archivist and author of an article on archive preservation and repair in *Archivalische Zeitschrift* (Series 3, vol. VII, pp. 201-218), recommends both *cellon* and *cellit*.

The cost of *cellon* is 3.50 Rm. per kilogram. Three liters of the liquid are sufficient to repair 3,000 manuscript leaves. It has been in use in the Haus-, Hof-, und Staatsarchiv for about five or six years and according to report has proved much superior to *zapon*, which was formerly employed in repair work. The two substances are very much alike in appearance, although *cellon* seems to form a thinner layer on the surface of the manuscript. It is quite customary to supplement the *cellon* coating with strips of rather thick Japanese paper where there are ragged edges and weak joints or folds to be strengthened. The procedure is simply to apply the *cellon* (which in this case acts not only as a varnish but also as an adhesive), lay the strips of paper in place, and brush more *cellon* over them. *Cellon* may also be used as a protective varnish for wax seals.

The principal objections to *cellon*, based on observation of a few manuscripts treated with it, may be briefly stated. Apart from the questions of chemical stability, inflammability, and the dubious advisability of varnishing manuscripts with a substance essentially foreign to their original and basic composition, which persistently recurred in spite of apparently logical reassurances, the chief concern in this instance was the factor of physical appearance:

1. The *cellon* dries in streaks.
 2. The area where it has been applied is definitely more brownish than any untreated portions.
 3. There is a noticeable discoloration on the verso of leaves treated.
- The method of treatment does not provide for prior flattening of the manuscripts, an operation which appears to make the manuscripts easier to deal with and also improves their appearance after repair. It is claimed that *cellon* brings up faded writing, but this may be regarded with definite suspicion, as any possible intensification of the writing is offset by the brownish stain caused.

One repair problem which has not yet been satisfactorily solved is how to deal with leaden *bullae* (affixed to papal documents) which seem to be corroding and flaking off. This condition has been particularly noticed on certain documents which came from Salzburg.

There is no ultra-violet or photographic apparatus in the Haus-, Hof-, und Staatsarchiv.

There are eleven stories of steel stacks, divided into sections of two or three stories each by solid floors, the remainder being of steel grill. If all the floors were of steel grill there would be a greater danger in case of fire, as the draft would draw the flames from floor to floor. There are only stairs for inter-floor communication. Natural light is admitted.

The predominant form of storage container is the portfolio, as usual. Wooden boxes are also in evidence, likewise metal cabinets with wooden trays containing medieval documents in paper envelopes.

One end of one floor of the stacks is sectioned off as an exhibition room. Here the shelf space has been inclosed with glass, behind which the documents are displayed on inclined boards. The exhibit is open to the public from about 10 to 1 every day. Among the most interesting manuscripts on view were: the last letter of Maria Theresa; letters of Kaiser Wilhelm, Queen Victoria, Bismarck, Schubert, Haydn, and many personages famous in the history of Austria; documents on vellum, some beautifully illuminated and with curious and unusual seals, mostly in perfect condition—several gold seals and some in wooden skippets.

NATIONALBIBLIOTHEK, HANDSCHRIFTEN-SAMMLUNG (Vienna)

The Nationalbibliothek, until 1920 called the Hofbibliothek, is the largest library in Austria and one of the most important in Europe. Among its collections are 1,210,000 printed volumes, 9,000 incunabula, and 27,000 bound manuscripts (2,360 Oriental), with 100,000 papyri from the collection of Archduke Rainer. Since 1808, the library has enjoyed the privilege of receiving a copy of every book published in Austria. The chief of the Department of Manuscripts is Dr. Emil Wallner.

In its methods of repairing manuscripts the Nationalbibliothek resembles the Public Record Office more nearly than any other institution visited. To begin with, handmade paper, supplemented where necessary by transparent silk gauze of French manufacture, is used for the repair of manuscripts on paper. It is, however, artificially

toned by dipping in coffee, to approximate as nearly as possible the color of the manuscript; and this is a doubtful practice as it is in the nature of disguising the repair. The technique of application of the repairing paper is almost identical, except that at the Nationalbibliothek the edges of the repairing paper are cut with a knife instead of being torn to provide a less noticeable featheredge. Manuscripts are fully backed if there is no writing on the verso. No resizing is done. Pure silk gauze is used only when some portion of the writing is to be covered; in other cases a mixture of silk and cotton, called *etamine*, is preferred, as it is less expensive and easier to obtain. The paste is a mixture of wheat and rice flour, cooked before use. New parchment is used to reinforce, strengthen, and fill out manuscripts on parchment. Flattening is accomplished by light pressing between blotting papers. Very fragile documents are placed between glass. One example was a leaf of a manuscript on black vellum, written in gold; part of it had also been covered with silk gauze, as it was torn. The Nationalbibliothek has rejected *cellon* and other cellulose acetate compounds because of suspicion of qualities which might possibly be harmful for the manuscripts.

The policy advocated for the repair of bindings is exactly that recommended so strongly by Mr. Jenkinson at the Public Record Office: Restore damaged bindings as far as possible to their original condition, if there is sufficient evidence in the way of surviving pieces of leather, etc. Incorporate such surviving pieces in the new binding, or if this is not practicable, insert them inside the cover where they may be examined if desired. If there are old oak boards, use them if they are not too damaged; wormholes may be plugged up and missing or broken portions may be replaced by new pieces of oak if necessary. If there are fragmentary clasps, repair them; if only one survives, make another which will be closely similar but not an exact duplicate.⁴ Retain the original sewing if intact; renew only when necessary, and always in the same holes as the original sewing. Remove fragments of parchments, etc., found in old bindings and keep where readily available for examination. If the original binding has completely disappeared or has been so disguised by a later one (also damaged) that it cannot be reconstructed, rebind the volume in a style contemporary with the date of the manuscript, utilizing only the best, most durable

⁴ At some time during the eighteenth century almost all the brass clasps on the medieval volumes in the Nationalbibliothek were removed, and many of the medieval bindings were replaced by the typical, uninteresting, gilt bindings of the period.

materials. Make a note on the flyleaf or in some other convenient position as to exactly what has been done in the present rebinding operation, so that in future there will be no question as to which portions of the binding are actually original.

There are about 100,000 loose documents in the library, and they are kept in heavy paper folders filed in wooden boxes. They are fully catalogued on cards.

There is an ultra-violet lamp in the library, but it is a very old model, and it is hoped that a new one may be purchased in the near future.⁵

ITALY

ARCHIVIO DI STATO (Venice)

The Venetian archives, renowned for the inexhaustible wealth of material which they contain, are housed in the Franciscan monastery of the Frari in Venice. They consist of the records—diplomatic, judicial, commercial, notarial, etc.—of the Venetian Republic, whose interests were at one time world-wide. These records were gathered together into one place by the Austrian government, from the various buildings where they had been stored, and arranged in some sort

⁵ For further material on the subjects of this section see: Baur, "Bemerkungen zur Konservierung von Archivalien," *Archivalische Zeitschrift*, Neue Folge, XII (1903), 156-170. Hans Beschoner, "Noch Einiges zum Archivalienschutz," with an appendix, "Zur Technik der Archivalienkonservierung," by Walter Bauer, *Archivalische Zeitschrift*, 3rd series, VII (1931), 219-226. Franz Ehrle: "Die internationale Konferenz in St. Gallen am 30. September und 1. Oktober 1898 zur Beratung über die Erhaltung und Ausbesserung alter Handschriften," *Centralblatt für Bibliothekswesen*, XVI (1899), 27-51; "In sachen der internationalen Konferenz von St. Gallen (1898)," *Zentralblatt für Bibliothekswesen*, XXVI (1909), 245-263; "Über die Erhaltung und Ausbesserung alter Handschriften," *Centralblatt für Bibliothekswesen*, XV (1898), 17-33. Heinrich Frederking: "Archivalienkonservierung," *Archivalische Zeitschrift*, 3rd series, VII (1931), 201-218; "Zapon oder Cellit," *Protokolle der deutschen Archivtage seit 1902* (1910). Raphael Kögel, "Gelatine oder Cellit zur Konservierung von Handschriften," *Studien und Mitteilungen zur Geschichte des Benediktinerordens*, XXXV (1914), 353-358. E. L., "Ueber die Anwendung von Zapon bei Archivalien," *Centralblatt für Bibliothekswesen*, XX (1903), 67-68. Adolf Martens, "Festigung morscher Papiere oder Pergamente durch Behandlung mit cellitlösung," *Kgl. Materialprüfungsamt Mitteilungen* (Berlin, 1911), vol. XXIX. Friedrich Philippi, *Einführung in die Urkundenlehre des deutschen Mittelalters* (Bonn and Leipzig, 1920), p. 221 et seq. Otto Posse, *Handschriften-konservierung . . .* (Dresden, 1899). E. Schill, *Anleitung zur Erhaltung und Ausbesserung von Handschriften durch Zapon-imprägnierung* (Vienna, 1904). E. Schneider, "Neues Verfahren zur Ruckfärbung verblasster Schriften," *Korrespondenzblatt des Gesamtvereins der deutschen Geschichts- und Altertumsvereine*, LXI (1913), 163-165. Georg Sello: "Die bei der Zaponverwendung in der Archivpraxis gemachten Erfahrungen," *Korrespondenzblatt des Gesamtvereins der deutschen Geschichts- und Altertumsvereine*, LII (1904), 119-122; *Erhaltung und Wiederherstellung von Archivalien* (Oldenburg, 1905). Georg Sello and Rose, "Das Zapon in der Archivpraxis," *Korrespondenzblatt des Gesamtvereins der deutschen Geschichts- und Altertumsvereine*, I (1902), 195-202.

of order. The present director of the archives is Signore Conte da Mosto.

There is no regular repairing department in the Venetian archives. Numerous manuscripts were seen to be in bad condition, with water-stains, etc.

The high-ceilinged rooms of the former monastery are now lined with wooden cases, which are filled with row upon row of manuscripts. Almost all of the manuscripts are vellum-bound, although some are in rough portfolios; no boxes of any sort were visible. They are arranged according to the departments of state from which they emanated. The windows were wide open at the time of this visit, letting in the damp, cold morning air. Some of the rooms were empty, or nearly so. Heavy layers of dust covered everything. There was no staff visible, except a few monks in the entrance hall. A reading room is set aside for accredited research workers.

The high, glass-topped, dust-covered cases in the dark and gloomy exhibition room were literally stuffed with manuscripts, folded and laid overlapping one another so that the greatest possible number could be crowded into the cases. Among the many manuscripts on view were several relating to American history, such as a letter signed by Benjamin Franklin, Thomas Jefferson, and John Adams, suggesting a treaty of commerce between Venice and the United States, 1784. Several huge Turkish documents were exhibited in cases on the wall. Papal documents with leaden *bullae* attached, and parchment deeds with wax seals (some cracked) were present in profusion. There were some illuminated missals and other service books, mostly of a rather poor quality. The earliest document shown was of the Carolingian period about 828. In the way of later correspondence, all the kings of Italy and many foreign rulers were represented.

BIBLIOTECA APOSTOLICA VATICANA (Rome)

The Vatican Library is largely the creation of the great humanist popes of the fifteenth century, of whom Nicholas V is usually regarded as the real founder. The present magnificent building was erected by Sixtus V in 1588. The library has greatly increased since its original foundation and has frequently been enriched by the acquisition of private and monastic libraries and papal collections. It was separated from the archives by Paul V (1605-1621). Father Anselmo M. Albareda is the present prefect of the library.

The archives comprise the written records of most of the numerous congregations (permanent committees of cardinals for transacting various departments of the business of the Roman Catholic Church), offices, and tribunals in the Holy See. Certain congregations still retain their own records, although documents may in some cases be transmitted to the central repository if requested by a research worker. The archives are often called, even today, the "secret Vatican archives," despite the fact that they have been largely open to public use since January, 1881, in accordance with a decision of Leo XIII. The term "secret archives" is now applied only to that portion which includes the oldest and most important documents, consisting of registers, briefs, correspondence, and all sorts of miscellaneous records. These are stored in seventy-four cases and divided into several groups according to source (such as archives of Avignon or archives of the Secretariat of State) or subject (*Diversa Germaniae*, etc.). The prefect of the archives is Cardinal Mercati.

Extensive alterations in the repair laboratory, incorporating many improvements in working equipment, have recently been made. The two rooms in use have been entirely renovated and a new room adjoining has been equipped with special plumbing fixtures and an electrical stove for the making of paste, dissolving of gelatine, heating of the special gelatine bath, etc. At one end of the main room is a cabinet containing chemicals of various kinds for experiments and certain repair operations. A large standing press and two or three small bench presses comprise the equipment for flattening and pressing documents. Stretched tautly across the room at short intervals are lines of narrow cloth webbing on which to hang freshly repaired or gelatine-treated paper documents to dry before they are pressed. The type of sink newly installed is specially designed, with unusually large drain boards, and at the side a deep, lead-lined basin for acid baths, etc.

Working quarters are provided for about nine men, under the supervision of Signore Arbo Magliochetti. Wooden tables, accommodating two or sometimes three repairers, are adapted to the peculiar requirements of manuscript repair, each having two or three sheets of plate glass ($24\frac{1}{2} \times 18\frac{1}{2}$ inches), let into the top as working surfaces. These glass surfaces can be illuminated if need be by electric light from below, for very delicate repair work; the remainder of the top surface of the tables is covered with brown linoleum. Each

man is supplied with certain tools, such as white enamel ware containers for paste, water, sponges, etc.; aluminum pots and cups for dissolving gelatine; sponges (smaller and of looser quality than at the Public Record Office); several sizes and types of brushes for applying gelatine, paste, etc.; and an assortment of knives for paring parchment and various cutting operations.

The Vatican technique of repairing manuscripts on parchment or vellum differs in certain essentials from that followed at the Public Record Office in London:

1. *The adhesive agent is not paste but gelatine.*

The gelatine, of the quality called *gélatine extra*, is obtained from the *Société des Produits Chimiques Coignet*, 3, Rue Rabelais, Lyon, France, at 35 francs per kilogram. It comes in thin sheets, which are cut up and dissolved either in water or an aqueous solution of acetic acid, as the case may be, preparatory to use. The acetic acid is the solvent if the gelatine is to be used for sticking two pieces of parchment together (25 gr. of gelatine to 100 gr. of acetic acid). To make the gelatine insoluble, after application, it is lightly brushed with formalin (5 gr. in 100 gr. of water). If the gelatine is intended more as sizing, for strengthening delicate parchments, it is dissolved in boiling water (gelatine, 12 gr.; water, 100 gr.) and applied while still hot. More water may be added if the mixture becomes too thick. The use of gelatine as an adhesive permits the joining of new parchment to the manuscript without an overlap—an extremely important point when there is writing on both sides of the manuscript extending to the very edge which is being repaired.

There are numerous Byzantine manuscripts in the Vatican Library, written on purple parchment with gold and silver ink. In the repair of these manuscripts, court-plaster, of the requisite thinness, is used as an adhesive for joining new parchment (also colored purple) to the old or for filling up a crack in the manuscript. Only alcohol is used for dampening prior to flattening.

2. *The new parchment used in repairing is not so bleached as usual, so that the hair side is quite noticeably yellower than the flesh side.*

Parchment of various qualities is supplied to the Vatican Library by Gentili Ferruccio, Via Agostino Bertani, No. 1, Rome.

3. *Dampening prior to flattening is done with alcohol sprayed on the*

document if the document is in an exceptionally fragile condition or if the ink is very bad.

If the ink is good (not carbon or flaky) and the manuscript is in fairly good condition, water may be applied lightly with a sponge. In general, however, the reverse is true, and it is best to avoid direct moistening of the manuscript. A safe method of flattening several manuscript leaves at one time is by light pressing between sheets of dampened absorbent paper, which, however, are separated from the manuscript leaves by dry sheets. When the manuscript leaves are sufficiently impregnated with the moisture to be pliable, they are subjected to heavy pressure between completely dry sheets of absorbent paper.

4. Complete backing of the document with the new parchment is almost never done; filling in missing portions is the usual procedure.

The meticulous refinement of the technique of parchment repair at the Vatican Library may be accounted for not only by superior equipment (primarily the glass working surface), but also by the precious character of many of the manuscripts which have to be treated. It is admittedly a matter of greater skill to repair a beautifully illuminated liturgical manuscript than an ordinary deed. Although not all of the parchment manuscripts needing repair at the Vatican Library are illuminated or even unusually precious, by any means, still the painstaking, careful procedure which has been worked out for the particularly valuable items is largely followed in every instance. The practice of supplying missing portions of manuscript, essentially much more complicated than simple backing, has therefore been perfected to a high degree. It is possible on the illuminated glass working surface to trace on a sheet of new parchment the irregular indentations and jagged outlines of damaged portions of the manuscript, and with a small pair of manicuring scissors to cut precisely along this traced line, so that the new piece will fit exactly into place. As a general rule the two edges to be joined are carefully pared with a sharp knife, thus allowing a slight overlap for additional strength, but if writing extends to the edge of the manuscript such an overlap is manifestly impossible, and the gelatine must serve as the sole bond between the two adjacent edges.

The practice of strengthening damaged manuscripts with a covering of transparent silk gauze was instituted at the Vatican Library by the

late Cardinal Ehrle, prefect of the library from 1895 to 1914, who was also responsible for the use of new parchment and gelatine in the repair of manuscripts on parchment. This is not, however, the sole method of paper repair, as there are frequent instances where the manuscript, while damaged, does not require reinforcement with silk gauze.

For the application of the silk gauze, gelatine once again serves as an adhesive, at the same time imparting new life to the paper. The solution, in water, is much thinner than required in parchment repair, only about 7 or 8 gr. of gelatine being added to 100 gr. of water. If the paper is thick or very decayed the gelatine content may be slightly increased. The silk gauze is simply laid on the surface of the manuscript and lightly stroked with a brush dipped in the hot gelatine solution. The manuscript is hung up to dry before pressing and flattening.

If a paper manuscript is in need of resizing but does not require strengthening with silk gauze, it is briefly immersed in a bath of the hot gelatine. The long, shallow tray of chromium-plated copper containing the gelatine fits into a large, electrically-heated basin filled with water, which serves to maintain the gelatine at the proper temperature. Standing in position over the tray are two uprights of the same metal with a horizontal crossbar over which to draw the manuscript after it has been passed through the liquid, in order to remove excess gelatine before hanging the manuscript up to dry.

It is sometimes desirable to fill in small holes in manuscripts after the silk gauze has been applied. This is accomplished in the Vatican Library by the use of "liquid paper." Unsized wove paper (Italian-made) is cut up into small pieces and placed in a small glass; water and a small amount of flour paste are added. The whole is stirred for about fifteen minutes in a mechanical mixer (of the malted milk type) until the mixture is quite smooth. It is then strained to get rid of surplus water, laid on a glass surface and mashed carefully with a supple, broad-bladed knife to remove lumps, and strained again if necessary. The final result is a thickish, white, pasty-looking mixture, which may be bottled till needed. This "liquid paper" is applied to holes in the manuscript on the point of a knife blade, on both verso and recto of the page. Very little is required—just enough to fill up the hole to the same thickness as the paper of the manuscript. The "liquid paper" adheres easily to the silk gauze with which the manuscript is already covered.

Filling in on a larger scale, when there are large portions of the manuscript completely missing, is done in the Vatican Library with unsized wove paper—either the ordinary Japanese paper or a special quality (heavier in weight) made in Italy. Wheat flour paste is used as an adhesive. The Japanese paper is neither cut nor torn to size, but the surplus portion is removed bit by bit with fine pincers after it has been pasted down. One or two additional layers of wove paper may be applied if necessary to approximate the thickness of the manuscript itself.

Some manuscripts on paper have turned dark brown because of the corrosion of the ink, or exposure to damp, or other reasons. To bleach to some extent this brownish stain and to make the writing more readable, before repair, the following special treatment is prescribed at the Vatican Library: Prepare in two large, rectangular glass jars a 4 per cent solution of potassium permanganate and a 3 per cent solution of oxalic acid, both in water. Place the manuscript between pieces of coarse gauze in a wire screen frame. Immerse the frame successively as follows:

1. In the solution of potassium permanganate (until the reddish color has penetrated the paper) 3 minutes
2. In a basin of cold water (until the reddish color is removed) 3 minutes
3. In the solution of oxalic acid 3 minutes
4. In hot water for only a moment, then in running cold water until thoroughly washed

The manuscript when removed from the frame is laid on a horizontal wire drying frame for at least an hour. Silk gauze can then be applied if necessary, or if not, a gelatine bath alone may be sufficient before flattening.

The reference department is in the Sistine Wing, where there occurred on December 22, 1931, a disastrous collapse of the roof, burying some 15,000 volumes under the débris. The damage was soon repaired, however, and provision made against the recurrence of such an accident. The library and archive stacks are in separate wings. Both are of the latest steel construction and are well ventilated and lighted.

GROTTAFERRATA

In Grottaferrata, a village near Rome, is situated a former Greek Basilian monastery which has been converted into a national monu-

ment by the Italian government. A repair-shop has been established similar to that in the Vatican Library, under the supervision of Signore Aloisi, the chief repairer. Manuscripts and books may be sent here for repair or rebinding by libraries and archives in any part of Italy. Father Nilo Borgia is the director of the institution.⁶

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⁶ The following may be consulted for additional material on the Italian archives: Guido Biagi: "La conferenza internazionale di S. Gallo per il restauro degli antichi codici," and "Della conservazione dei mss. antichi," *Rivista delle Biblioteche e degli Archivi*, IX (1898), 168-171, 154-160. Gino Borghezio, "Come si salvano le pergamene in rovina," *La Bibliofilia*, XXIV (1923), 349-350. Eugenio Casanova: *Archivistica* (Siena, 1928); "Il primo Congresso internazionale degli archivisti e dei bibliotecari in Bruxelles," *Rivista delle Biblioteche e degli Archivi*, vol. XXI (1910), 137-144; "Relazione sulla conferenza internazionale di San Gallo," *Bollettino Ufficiale del Ministero della Pubblica Istruzione*, vol. XXXVII (1909). Franz Ehrle: "Della conservazione e del restauro dei manoscritti antichi," *Rivista delle Biblioteche e degli Archivi*, IX (1898), 5 et seq.; "Per il restauro dei manoscritti," *Rivista delle Biblioteche e degli Archivi*, vol. XXII (1911), 71-74. Fabroni, "Lettera al Bibliotecario di Modena intorno al restauro dei libri," *Nuovo Giornale dei Letterati* (Pisa, 1806), vol. IV, and *Giornale Pisano dei Letterati* (Pisa, 1806), vol. V. Alfonso Gallo: "Malattie dei libri," *Accademie e Biblioteche d'Italia*, vol. III (1930); *Le malattie del libro, le cure ed i restauri* (Milan, 1935); "I manoscritti superstiti dell'incendio della Biblioteca nazionale di Torino," *Accademie e Biblioteche d'Italia*, vol. III (1929); "Il restauro dei manoscritti e dei documenti antichi," *Accademie e Biblioteche d'Italia* (Rome, 1928), vol. I. Piero Giacosa, "Relazione dei lavori intrapresi al Laboratorio di Materia Medica per il ricupero e restauro dei Codici appartenenti alla Biblioteca di Torino," *Atti della R. Accademia delle Scienze di Torino*, XXXIX (1904), 1070-1078. Gortani, *L'incendio della Biblioteca nazionale di Torino* (Turin-Genoa, 1904). Icilio Guareschi: *Della pergamena, con osservazioni ed esperienze sul ricupero e sul restauro di codici danneggiati negli incendi e notizie storiche* (Turin: Unione tipografico-editrice, 1905); "Osservazioni ed esperienze sul ricupero e sul restauro dei codici danneggiati dall'incendio della Biblioteca nazionale di Torino," *Memorie della R. Accad. delle Scienze di Torino*, 2nd series, LIV (1904), 423-458. Leti: "Studi sulla carta. Sfoldatura del foglio," and "Studi sulla carta e in particolare sulla carta bruciata," *Accademie e Biblioteche d'Italia*, vol. V (1923). Maurizio Mastrorilli, *Considerazioni critiche sul restauro degli antichi manoscritti* (Naples: Fr. Giannini & figli, 1912). Mario Morgana, *Restauro dei libri antichi* (Milan, 1932). Augusto Piccini, "La Conferenza internazionale per la conservazione degli antichi codici," *Archivio storico italiano*, 5th series (Florence, 1899), XXIII, 324-329. Sibilìa, "Le Malattie crittogamiche dei libri," *Accademie e Biblioteche d'Italia*, vol. IX (1935). Testi: "Malattie e restauri dei libri," *Accademie e Biblioteche d'Italia*, vol. VII (1933); "Storia e tecnica del restauro dei libri e dei manoscritti," *La Chimica* (Rome, 1935), vol. XI. Torri, "I restauri dei codici della Biblioteca di Torino," *MOYΣEION*, Vol. I (1923). Giovanni Vittani, "D'un metodo per far rivivere gl'inchiostri studiato a Milano nel 1792-1793," *Il libro e la Stampa*, VI (1912-1913), 161-176. Pier Ignazio Vottero, *Conservazione e restauro dei documenti* (Pisa, 1912).