

United States Centennial Commission.

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INTERNATIONAL EXHIBITION,  
1876.

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REPORTS AND AWARDS

GROUP XIII.

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EDITED BY

FRANCIS A. WALKER,

CHIEF OF THE BUREAU OF AWARDS.

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PHILADELPHIA:  
J. B. LIPPINCOTT & CO.

1877.

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United States Centennial Commission.

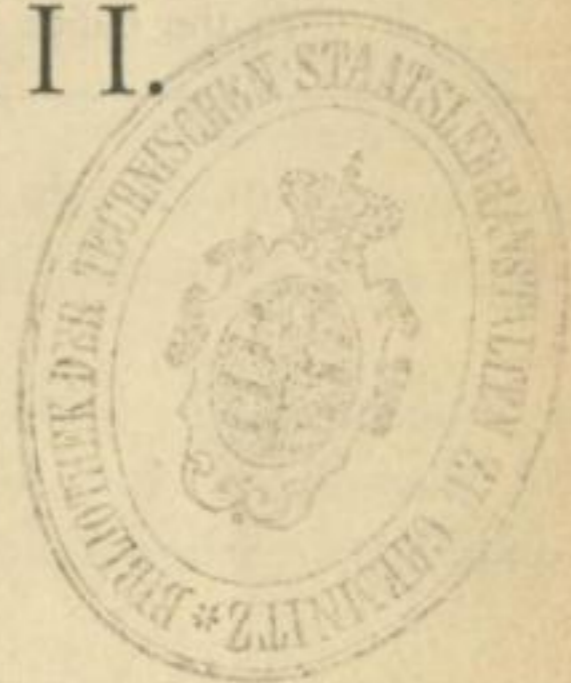
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# SYSTEM OF AWARDS.

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[*Extract from Circular of April 8, 1876.*]

Awards shall be based upon written reports attested by the signatures of their authors.

The Judges will be selected for their known qualifications and character, and will be experts in departments to which they will be respectively assigned. The foreign members of this body will be appointed by the Commission of each country and in conformity with the distribution and allotment to each, which will be hereafter announced. The Judges from the United States will be appointed by the Centennial Commission.

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Reports and awards shall be based upon inherent and comparative merit. The elements of merit shall be held to include considerations relating to originality, invention, discovery, utility, quality, skill, workmanship, fitness for the purposes intended, adaptation to public wants, economy and cost.

Each report will be delivered to the Centennial Commission as soon as completed, for final award and publication.

Awards will be finally decreed by the United States Centennial Commission, in compliance with the Act of Congress, and will consist of a diploma with a uniform Bronze Medal, and a special report of the Judges on the subject of the Award.

Each exhibitor will have the right to produce and publish the report awarded to him, but the United States Centennial Commission reserves the right to publish and dispose of all reports in the manner it thinks best for public information, and also to embody and distribute the reports as records of the Exhibition.

## ORGANIZATION AND DUTIES OF THE JUDGES.

[*Extract from Circular of May 1, 1876.*]

Two hundred and fifty Judges have been appointed to make such reports, one-half of whom are foreigners and one-half citizens of the United States. They have been selected for their known qualifications and character, and are presumed to be experts in the Groups to which they have been respectively assigned. The foreign members of this body have been appointed

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by the Commission of each country, in conformity with the distribution and allotment to each, adopted by the United States Centennial Commission. The Judges from the United States have been appointed by the Centennial Commission.

To facilitate the examination by the Judges of the articles exhibited, they have been classified in Groups. To each of these Groups a competent number of Judges (Foreign and American) has been assigned by the United States Centennial Commission. Besides these, certain objects in the Departments of Agriculture and Horticulture, which will form temporary exhibitions, have been arranged in special Groups, and Judges will be assigned to them hereafter.

The Judges will meet for organization on May 24, at 12 M., at the Judges' Pavilion. They will enter upon the work of examination with as little delay as practicable, and will recommend awards without regard to the nationality of the exhibitor.

The Judges assigned to each Group will choose from among themselves a Chairman and a Secretary. They must keep regular minutes of their proceedings. Reports recommending awards shall be made and signed by a Judge in each Group, stating the grounds of the proposed award, and such reports shall be accepted, and the acceptance signed, by a majority of the Judges in such Group.

The reports of the Judges recommending awards based on the standards of merit referred to in the foregoing System of Awards, must be returned to the Chief of the Bureau of Awards not later than July 31, to be transmitted by him to the Centennial Commission.

Awards will be finally decreed by the United States Centennial Commission, in compliance with the Act of Congress of June 1, 1872, and will consist of a special report of the Judges on the subject of the Award, together with a Diploma and a uniform Bronze Medal.

Upon matters not submitted for competitive trial, and upon such others as may be named by the Commission, the Judges will prepare reports showing the progress made during the past hundred years.

Vacancies in the corps of Judges will be filled by the authority which made the original appointment.

No exhibitor can be a Judge in the Group in which he exhibits.

An exhibitor, who is not the manufacturer or producer of the article exhibited, shall not be entitled to an award.

The Chief of the Bureau of Awards will be the representative of the United States Centennial Commission in its relations to the Judges. Upon request, he will decide all questions which may arise during their proceedings in regard to the interpretation and application of the rules adopted by the Commission relating to awards, subject to an appeal to the Commission.

A. T. GOSHORN,  
*Director-General.*



[*Extract from Director-General's Address to Judges, May 24, 1876.*]

“The method of initiating awards which we have adopted differs in some respects from that pursued in previous exhibitions. In place of the anonymous verdict of a jury, we have substituted the written opinion of a Judge. On this basis awards will carry the weight and guarantees due to individual personal character, ability, and attainments, and to this extent their reliability and value will be increased. It is not expected that you will shower awards indiscriminately upon the products in this vast collection. You may possibly find a large proportion in no way raised above the dead level, nor deserving of particular notice. The standard above which particular merit worthy of distinction begins is for you to determine. In this regard I have only to express the desire of the Centennial Commission, that you should do this with absolute freedom, and when you meet with a product which you consider worthy of an award, we desire you to say, in as few words as you may deem suitable, why you think so.

“This, gentlemen, is all we ask of you in the Departments of Awards. Opinions thus expressed will indicate the inherent and comparative merits, qualities, and adaptations of the products,—information which the public most desires.

“Elaborate general reports and voluminous essays, though of great value as sources of general information, give little aid in determining the reliable or intrinsic merits of particular, individual products.

“The regulations which have been published divide the work of awards into three parts:

“1st. The individual work of the Judges.

“2d. The collective work of the groups of Judges.

“3d. The final decisions of the United States Centennial Commission in conformity with the acts of Congress.

“Each award will thus pass three ordeals, which, doubtless, will be ample and satisfactory.”

## GROUP XIII.

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### JUDGES.

#### AMERICAN.

JAMES M. WILLCOX, Philadelphia, Pa.

C. O. CHAPIN, Springfield, Mass.

WM. FAXON, Hartford, Conn.

EDWARD CONLEY, Cincinnati, Ohio.

H. T. BRIAN, Washington, D. C.

#### FOREIGN.

SYDNEY H. WATERLOW, Bart., M.P.,  
Great Britain.

G. W. SEITZ, Wandsbeck, near Hamburg,  
Germany.

## GROUP XIII.

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### PAPER INDUSTRY, STATIONERY, PRINTING, AND BOOK- MAKING.

CLASS 258.—Stationery for the desk, stationers' articles, pens, pencils, inkstands, and other apparatus of writing and drawing.

CLASS 259.—Writing paper and envelopes, blank-book paper, bond paper, tracing paper, drawing paper, tracing linen, tissue paper, etc., etc.

CLASS 260.—Printing papers for books, newspapers, etc.

Wrapping paper of all grades; cartridge and manila paper; paper bags.

CLASS 261.—Blank books, sets of account books, specimens of ruling and binding, including blanks, bill heads, etc.; book-binding.

CLASS 262.—Cards,—playing cards, cardboard, binders' board, pasteboard, paper or cardboard boxes.

CLASS 263.—Building paper, pasteboard for walls, cane fibre felt, papier maché, and material for construction, car wheels, ornaments, etc.

CLASS 264.—Wall papers, enameled and colored papers, imitations of leather, wood, etc.

### MACHINES AND APPARATUS FOR TYPE-SETTING, PRINTING, STAMP- ING, EMBOSSING, AND FOR MAKING BOOKS AND PAPER WORKING.

CLASS 540.—Printing presses.

CLASS 541.—Type-casting machines, apparatus of stereotyping.

CLASS 542.—Types, and type-setting machines. Type-writing machines.

CLASS 543.—Printers' furniture.

CLASS 544.—Book-binding machines.

CLASS 545.—Paper-folding machines.

CLASS 546.—Paper and card cutting machines.

CLASS 547.—Envelope machines.

CLASS 525.—Paper making machinery and processes.

# GROUP XIII

## PAPER INDUSTRY, PRINTING, AND BOOK-MAKING

1. Paper and Pulp - Manufacture of paper and pulp from wood, including the processes of pulping, bleaching, and papermaking. This section covers the raw materials, the chemical and mechanical processes, and the various types of paper produced.

2. Printing - The art and process of reproducing text and images on a surface, typically paper. This includes the design, typesetting, and the use of various printing technologies such as letterpress, lithography, and offset printing.

3. Bookbinding - The process of assembling and binding individual pages into a book. This section discusses the different styles of binding, the materials used, and the techniques involved in creating a durable and aesthetically pleasing book.

4. Stationery and Office Supplies - The production and distribution of various items used in the office and home, such as stationery, envelopes, and office equipment. This section covers the materials and processes used in the manufacture of these products.

5. Textiles and Fibers - The production of fibers and textiles, including the spinning of yarns and the weaving of fabrics. This section discusses the different types of fibers, the processes of spinning and weaving, and the various uses of textiles.

GENERAL REPORT  
OF THE  
JUDGES OF GROUP XIII.

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PHILADELPHIA, 1876.

PROF. FRANCIS A. WALKER, *Chief of Bureau of Awards:*

SIR,—I herewith transmit the report of the Judges on Paper Industry, Stationery, Printing, and Book-making.

Respectfully yours,

JAMES M. WILLCOX, *President of Group XIII.,  
Judges of the International Exhibition.*

## GROUP XIII.

PAPER INDUSTRY, STATIONERY, PRINTING, AND  
BOOK-MAKING.

On entering upon our duties in the examination of the various classes of objects allotted to the Judges of Group XIII., a cursory glance over the entire Exhibition greatly impressed us with the magnitude of the work before us. No less than sixteen classes confronted us, some of which included many hundreds of objects; and the entire examination must, of necessity, extend over many thousands. The exhibits in Class 258, embracing stationers' articles, were very numerous and from many parts of the world; and, although very interesting, they brought to light little that was entirely new. Perhaps there is little room for absolute novelty in this class; but the ingenuity and skill displayed in perfecting the various articles that composed it were very apparent. Of fancy note-papers, envelopes, cards, etc., there was an endless variety, gotten up almost invariably in good taste, and made of the best material. The gold and steel pen manufacture seems nearly to have reached perfection; and the same may be said of every variety of brush, crayon, and pencil. The best pencils are still brought from abroad; but one line of articles made from American graphite was of great excellence, and bids fair to equal, in a short time, the best heretofore imported. The ink-stand has not yet reached perfection, and this fact seemed to be realized by manufacturers, who in their efforts have displayed an almost endless variety, and who pressed upon us with assiduity the superior claims of quite a number. India-rubber enters largely into this class, but the Exhibition has shown no very recent important extension of its uses for stationers' articles.

Within the past hundred years the manufacture of paper has been so much improved as to have undergone a complete revolution. Even during a considerable portion of the present century the bleaching of colored stock was impracticable; white paper was made from stock that came white into the mill; and the "beating" was accomplished by

pounding in a mortar. All paper was made by hand, upon "moulds," in separate sheets; and white paper was quite costly. A hundred years ago only "laid" paper was known,—paper made upon moulds laid with parallel strands of coarse brass wire. Woven metallic wire-cloth was not manufactured for paper-makers' use. About ninety years ago woven wire moulds were first introduced, and paper made upon them was called "vellum." In all books and instruments of writing a hundred years old parallel water-marks made in the paper by the coarse laid wires are distinctly visible. The wire-cloth was the first step towards manufacturing by machinery. The "Foudrinier" machine has taken the place of hands, and now runs out a web of paper six or seven feet wide at the rate of thirty or more yards per minute. The coarsest and deepest-dyed stock comes, in its roughest state, to the paper-mill, and is there made clean and white. Stacks of straw and logs of wood are reduced to fine white fibre; the pulp is sized before it is formed into sheets; and, with a few "roll" beating engines and one Foudrinier machine, a paper-mill now turns out daily as much paper as could be made by twelve ordinary mills, with as many vats, a hundred years ago.

Class 269, embracing all varieties of the finer qualities and styles of paper, was well represented, and the exhibits were very gratifying. In this class a marked difference was observed between the American papers taken generally, and those taken generally from abroad. A keener competition in the manufacture of fine paper has, for some years, existed here than elsewhere, resulting in a greater perfecting of some qualities of paper; and a greater refinement in the various styles of presenting them to the market is quite apparent in the displays of American manufacturers. Among these qualities are, conspicuously, heavy letter and note, cap, and ledger papers; above all the last. These papers, as produced by leading American manufacturers, were found to be made invariably of the best and best-mixed stock, of unexceptionable colors in white and blue, of generous thickness, and sized with animal sizing in the sheet. The low rate of postage in the United States has, no doubt, encouraged the production of thick writing-papers pleasant to use; and the enormous American demand for large blank-books has stimulated the competitive manufacturers of these to demand of the paper-makers the best quality of ledger paper that can be made. This demand is admirably supplied, and the exhibits of American paper of this character called forth expressions of admiration from many foreign visitors. The foreign papers generally, on their side, displayed some points of excellence over the American. Owing to higher rates of postage in

other countries, their writing-papers have been for many years made exceedingly light; and European manufacturers have, almost universally, attained to greater perfection in very light papers. The Exhibition has not indicated any important departure from the old rule of very thin letter paper that has so long obtained in Europe. In Great Britain, France, and Germany, particularly, great skill and science have been directed to producing the best grades of paper from inferior stock, and manufacturers there have thus cheapened the cost of good paper. In the colors and tints of their fancy papers they have reached great perfection, and in these points they excel American manufacturers. The Russian papers were found to be of excellent stock, which seems to abound in that country, and the Russian exhibits were good. The Italian papers in the Exhibition were nearly all hand-made, of good stock, good color and texture, very strong and serviceable, but of lower finish than most others. Some of these were of remarkable size for hand-made paper, and showed great skill in hand-manufacturing. The exhibit of Spanish papers was large and varied and contained much excellent paper. Their cigarette papers were remarkable for fineness, strength, and other qualities that show a thorough knowledge upon the part of the manufacturers of the taste to which they have to cater. Nearly every Spanish exhibit contained specimens of cigarette paper; and it is worthy of remark that nearly every paper exhibit from the Continent of Europe, from Spain to Russia, contained excellent paper of this kind.

The only specimens of photographic paper shown came from France and Germany. This paper is difficult to perfect, and its points of excellence have not been much studied by American manufacturers. It is necessary that it be perfectly free from particles of iron and steel, no matter how minute, as these would be developed into stains by the regular treatment it has to undergo in the photographer's laboratory; and the American plan of beating the stock with a steel-armed roll upon a steel bed-plate, precludes the possibility of having the paper absolutely free from liability to iron-stain. When any one of our mills shall adopt the expensive European plan of using brass exclusively instead of iron or steel, there need be no serious difficulty in manufacturing the best of photographic paper. A feature in which nearly all European manufacturers excel is in pulp- or engine-sizing. In this they leave American manufacturers far behind. It is noticeable that, whereas the latter size all their best and medium writing-papers in the sheet with glue sizing, the former produce a very hard-sized paper by the cheaper process of pulp-sizing. This process should receive greater attention in our country, and there is no good



reason why the medium grades of American writing-paper should not be produced in mills that do not possess drying lofts, as in older countries.

In confirmation of my views regarding American blank-books and paper, I am glad to be able to present those of Mr. Gustav W. Seitz, of Hamburg, Germany, one of my associate Judges, and a gentleman of great experience and accurate judgment. These have been given me in the form of a letter; and, as the whole communication is in reference to the work of our group, I transcribe it entire.

“PHILADELPHIA, July 24, 1876.

“JAMES M. WILLCOX, ESQ., *President of Group XIII.,  
International Exhibition, Philadelphia:*

“DEAR SIR,—In compliance with your request to name such articles observed by me as were worthy of special notice on account of their excellence, I beg to state the following regarding American exhibits. The binding of books, as well as the manufacture of blank-books, is, as to solidity and execution, decidedly the best that I have seen in the Exhibition. The same judgment applies also to plain and illustrated printing, which, in beauty and clearness, by using the best materials (paper and ink), can compete with anything displayed. It is quite natural to make mention here of the imprinting machines, which, being mostly constructed in a very ingenious way, aid very largely to accomplish such work.

“The patterns and castings of the types also are elegant and worthy of being copied; and, all considered, I can well assert that the graphic arts in the United States are at the height of the times. It is, of course, not my intention, in giving this testimony, to undervalue the merits of my own and other nations; yet it is true that no department is as well represented, comparatively, as the American. It is an agreeable surprise to me to become acquainted with the above-noted facts, which so clearly show the progress made by America in the graphic arts, and I shall not fail to make them known in Germany, being confident that many will be benefited thereby.

“I remain, dear sir,

“Yours very respectfully and sincerely,

“GUSTAV W. SEITZ.”

One feature, as I have stated, in which the European manufacturers of paper excel, is the variety and excellence of their colors in fancy papers. A longer experience in this line, and a necessity to cater to a greater public taste for fancy papers, have placed them

quite in advance of our manufacturers in this art; yet a great advance has been made here within a few years, and some of the American exhibits made a very handsome show of colors.

Very little bank-note paper was found; the most noticeable exhibit being that of a Massachusetts house of long standing and excellent reputation. In this character of paper American manufacturers have long held pre-eminence. This fact is probably explained by a comparison of the circumstances attending the issue of the respective paper currencies of Europe and the United States. In the former, until within a few years, no small notes were used, and the notes of large denominations circulated only among the wealthier classes. They were consequently little handled, were kept clean, and circulated but a short time, being generally retired when once redeemed at their place of issue. It was not important that the paper for them should possess wearing qualities in a high degree. In our country, on the contrary, we are accustomed to notes of small denominations; and for a very long period, among all classes of people, paper has generally been the material of currency, in denominations of one dollar and upwards; and notes have been repeatedly issued, to save cost of new ones, long after they became unfit for public use. The frequency of counterfeiting in our country rendered necessary costly engraving and printing, and American bank-notes are, compared with most others, very expensive; hence a reluctance on the part of our banks to frequently renew them. These circumstances explain the demand, on the part of the banks, that their paper should wear as long as possible; and the demand has been well met upon the part of our manufacturers. The exhibit of its special currency-paper, shown by the United States Treasury Department, in the Government Building, was entered simply as a contribution to the Government's general exhibit, and not for competition. Its special feature is a localized colored fibre, so incorporated into the sheets as to appear only in a fixed part of each note when printed, and not elsewhere. This paper has been in use since 1869, is essentially American in discovery and manufacture, and is now used exclusively by the Government, for the bonds of the Funded Loan, the National-Bank notes, and United States Treasury notes of all denominations. One interesting exhibit of paper of bank-note character turned up unexpectedly in the Mexican department. This paper was indifferently well sized and woven, but was of remarkable strength and pliability. It was manufactured from the leaf-filaments of the maguey plant (*Agava Americana*), of which a specimen, growing in a flower-pot, was brought from Mexico for exhibition. The provincial name of the plant is *Quiote*, and it is described as one

of the most characteristic and common plants of Mexico, growing throughout the low valleys, where it has long been cultivated for its juice, which is made into a fermented drink. On the mountains it grows wild, and the largest plants found are near Llanos de Apan, between Vera Cruz and the city of Mexico. Somewhat resembling a cactus, and possessing spines, it spreads its long, fleshy leaves to a diameter of six to eight feet, from the centre of which rises a straight stem ten feet high, tipped with yellow flowers. It is propagated by transplanting suckers that spring up from the roots and grow vigorously. When the filaments are prepared for paper stock the leaves are hackled green, the flesh easily separating and leaving behind a good handful of fibre. I have described this plant somewhat minutely, since, from the best information I can gain, it promises to be, in the future, of great utility in paper-making, especially as I learn that it can be cultivated at a very low cost.

Of printing-papers (Class 260) the display was not great, and there seemed to be but little inducement to bring them from abroad for exhibition. Those shown from there were of a more natural color than the American book-papers, which, to meet a taste on the part of our publishers that is not to be commended, are bleached to such an extent, and supplemented with a delicate tinging of blue and red, as to become of too dazzling a whiteness to be either pleasant or harmless to the eyes. Some displays, however, of a more natural or creamy tint, seemed to promise a prevalence of better and healthier taste in the future. The cost of printing-paper is as low as it was twenty years ago, and of some classes lower. At that time the supply of raw material was getting scarce, and it seemed probable that paper would become higher every year. The necessity of the case, however, stimulated invention and developed the use of, first straw, and then wood, as partial components of printing-paper. The perfecting of wood-fibre has advanced farther than that of straw; its admixture has become common in both news- and book-paper; and to this is due, principally, the present low prices of these papers in the market.

There were several very interesting exhibits of wood-fibre pulp for paper-makers' use, some prepared merely mechanically, by grinding the fibre from the block, and some by a disintegrating chemical process. That prepared in the latter way (which is by hard boiling in alkali under high pressure) is much superior, having greater length, strength, and flexibility, and being much more free from natural gum and all else that is not pure cellulose. The wood-pulp exhibited from the United States was principally from poplar; that from Sweden and

Norway (the most important European exhibits) principally from pine. The latter, though less pure, had greater strength, and was the strongest that I had ever seen, which leads me to believe that the pine of those countries possesses unusual toughness of fibre, and is peculiarly well adapted to the manufacture of paper-pulp. Other interesting exhibits were made of raw materials for paper, among which was the maguey plant, from Mexico, already described, esparto and other grasses from Spain, banana-leaves and "halfa" from Egypt, and quite a series from Victoria, Australia. Halfa is a species of swamp-rush resembling esparto, growing abundantly in Egypt, and the paper made from it was fair in quality and color. That made from banana-leaves was of a pleasing buff, natural color, and was handsome when printed and bound.

In the Victoria department were many specimens of paper, made from various fibres, rather crudely prepared, some of which, I am satisfied, could be well utilized in the manufacture of finer papers. I deem this matter to be of considerable importance, and cannot so well do it justice as by transcribing in full the following letter to the Commissioners from Victoria, from the Curator of the Melbourne Botanical Gardens, explanatory of the exhibits of paper-fibres and various dyes. It is as follows:

"GENTLEMEN,—I have the honor to furnish, as you request, a description of the fibres, gums, resins, dyes, woods, carpological specimens, etc., prepared and sent by me to the Melbourne Exhibition and which you have been pleased to forward to Philadelphia.

"As regards the fibres, papers, and woods, it must be admitted that they far exceed in number those sent from this establishment to former Exhibitions. The whole of the exhibits described were prepared by myself and two assistants, with but crude appliances at our command, and within eight weeks prior to the opening of the Exhibition. The greater portion of the necessaries forming the laboratory which once belonged to this department had been transferred to another branch; thus I have had to make the best of the few opportunities afforded me for preparing in so short a time the present collection. The fibres, some forty in number, were produced in a very primitive way; the branches or leaves of the plants being merely steeped in water, and afterwards combed by hand. The quality and quantity, however, of each kind thus prepared will, I trust, serve the purpose of testing their commercial value at Philadelphia.

"Many new discoveries in the way of fibre-yielding material are shown, not only of Victorian native products, but those of the other

colonies acclimatized here, and of exotics also hitherto esteemed only for ornamental purposes in gardening.

“Had time permitted, my collection of exhibits would have been far greater. I should have been able to collect and test the value of many plants which I know exist on the borders of Gippsland, and even nearer to Melbourne,—I mean the Macedon and Dandenong Ranges. It is almost needless for me to say that the colony of Victoria affords great facilities, both as regards soil and climate, for the cultivation of the valuable commodities which constitute fibre and paper material. For instance, the Chinese grass-cloth plant, *Bæhmeria nivea*, the New Zealand flax, *Phormium tenax*, the *Fourcroya gigantea*, the *Agaves*, the *Lagunaria Pattersoni*,—cowitch-tree of Norfolk Island; the *Yuccas aloifolia*, *filamentosa*, and *gloriosa*; the *Abutilons* and *Hibiscus*, of India, China, and America; the *Sparmannia Africana*, and a host of other foreign plants all thrive as well, and in some instances better, in this colony than in their native homes.

“The samples of *Sparmannia* sent to the Melbourne Exhibition have been prepared from both the living and dried barks of the shrub. I have never read of its ever having been discovered that this plant contained a fibre of any value. Hitherto I had only known it to be interesting as an ornamental shrub, or the plant in whose blossoms the great Linnæus first discovered the sexual system in botany. My introspection of its fibrous nature, as with others now exhibited, was only gained by mere accident in a hurried attempt to collect and prepare a variety of fibres for your Exhibition; but if even one of them prove to be of commercial value—and I believe many of them will, because of their textures and the quickness of their growth—the object I have in view will be gained, as they will be a boon to the colonists. The *Sparmannia*, like the grass-cloth plant of China, as soon as cut, shoots up, even in a poor soil, with wonderful vigor. The canes, if I may call them such, are often as thick as one's thumb, and they average in height from six to eight feet. In good soil two crops may be safely reckoned upon in the year.

“The plants of Queensland, from which fibres have been prepared, have all been grown here, and were introduced by the late Mr. Dal-lachy and the Baron von Müller, my predecessors in the directorship of these Gardens. Judging from the growth of the *Hibiscus heterophyllus*, *Sida retusa* (Queensland hemp), *Pipturus propinquus*, or Queensland grass-cloth plant, *Brachychiton acerifolium*, ‘the flame-tree,’ *Sterculia rupestris*, ‘the bottle-tree,’ and the samples of fibre now produced from them, the harvest to be gained by their cultivation in Victoria would be as great as in the sister colony. It may

appear strange to many that plants like these and others described, indigenous to a warmer clime, should thrive as well, and even better, in this cooler one, yet there are ample proofs that such is the fact. The growth of the flame-tree, for instance (*Sterculia* or *Brachychiton acerifolium* of Queensland and New South Wales), is more rapid in Victoria than in either of the colonies mentioned, and the *bast* furnished by this tree is, I consider, superior to *Cuba bast*. This, of course, remains to be proved by those in Philadelphia, who are better able to judge of its merits, and of others which I have described in my list. But it is more singular still to observe that plants which grow side by side with these in warmer latitudes, will not grow here at all, but merely exist. *Laportia gigas* is the great stinging-tree, of which I have sent samples of fibre from plants which never attain in this garden more than four feet in height,—being cut down by frost every winter,—yet I have seen it beside the flame-tree in the brushlands of Queensland and New South Wales attaining a height of seventy-five feet, and with a trunk more than five feet in diameter.

“ The *Pipturus propinquus*, *Sterculia rupestris*, *Sida retusa*, and many others, grow as quickly here as in Queensland. Quite as good results, therefore, might be expected by cultivating these plants; but need we go farther than our own colony of Victoria for quality or quantity of fibre or paper material, when our forests teem with valuable plants suitable for their manufacture? If we only instance the *Pimelias*, *Dianellas*, *Plagianthus*, *Caladiums*, *Lepidosperma*, or ‘mat-grass,’ *Commersonia*, *Brachychiton populneum*, *Urtica incisa*, *Cyperus*, *Typha*, *Scirpus*, *Carex*, *Isolepis*, and the rushes *Juncus vaginatus*, *maritima*, and *pauciflora* (and there are scores of other indigenous plants equally valuable), rags need no longer be collected for paper-making, nor introductions from other countries for cordage. With sixty millions of acres of good land included between the parallels 30° and 39° south latitude, we can, without cultivation, reap abundant harvests of paper material, even from various species of *Eucalypti*, *Xerotes*, *Melaleuca*, *Cyperus*, and others, and, indeed, from some of the grasses which are plentiful in their midst. Our native vegetable resources are great, and should therefore be thoroughly searched up. My thirty crude samples of paper, which are sent in frames, were prepared under great difficulties, and they were only made to prove what can be done with some of our native plants. Many of them are new, but the indefatigable Mr. Ramsden, of the Victorian Paper-Mills, has devoted his attention particularly to the manufacture of paper from Victorian plants, and he will, no doubt, be able to add

to his collection long before the colony has been thoroughly explored.

"The dyes, forwarded in bottles, are not so numerous as they would have been had time permitted me to send out collectors; but the samples of silk, calico, and woolen material stained with them show a variety of beautiful colors, the value of which will, no doubt, be proved at Philadelphia.

"I regret to have to say that my collection of woods could not be properly seasoned. Some of them were polished within a week after they were cut from the tree, consequently many of the specimens have split from end to end.

"I have the honor to be, gentlemen,

"Your obedient servant,

"WILLIAM R. GUILFOYLE,

*"Director of Botanical Gardens, Melbourne."*

The display of blank- and account-books (Class 261) was remarkably good. From Europe were specimens of books made up of very strong and excellent paper, principally hand-made, with most solid covers sheathed with metal over the wearing parts, closed with lock and key, and in every respect admirable. These were few, and the foreign display was confined almost entirely to France, Italy, Germany, and Russia, doing much credit to all. The American blank-book manufacturers, especially, but not exclusively, those nearest the Exhibition, in this city, made very large and handsome exhibits. On the merits of these I prefer to give the judgment of Mr. G. W. Seitz, of Germany, my associate Judge, who writes: "The binding of books, as well as the manufacture of blank-books, is, as to solidity and execution, decidedly the best that I have seen in the Exhibition."

The manufacture of papers belonging to Class 263, building-papers, has vastly increased within a few years, and many new applications of them have been made. The quality also has improved by the admixture of hemp and manila in much larger quantities. These papers are used natural or saturated with bitumen, and are sometimes printed in either water- or oil-colors. They cover roofs and floors, line inside walls, protect outside walls, line cisterns, underlie carpets, displace mattings and oil-cloth, dispense with lathing and plastering, and find a number of uses that increase every year. This increase is good evidence of their economy and utility; and the exhibits were, in the

order of their quality and magnitude, 1st, from the United States; 2d, Sweden; 3d, Japan; 4th, France. The Japanese papers of this character were the strongest and best shown, being made principally of mulberry-bark, and enameled with oil-colors and varnish in the most perfect and durable manner. These were floor-papers only, and the various other species of building-papers shown by other countries were not exhibited by Japan. Very little Japanese paper is made from rags, or linen or cotton fibre; but most of it is made, in a primitive way, of materials obtained from plants which are specially cultivated for the manufacture of paper and for no other purpose. The most important of these plants is the *Kodzu*; then come the *Gampi*, the *Mitsumata*, the *Kuwa*, or mulberry-tree, the *Hi-no-ki*, a species of wild-cherry, and several others unknown to us. It is the bark only of these shrubs and trees that is used, and not the woody fibres. The better qualities of paper are made in workshops arranged for that special purpose; but most of the paper of Japan is home-made by farmers, at times when their fields do not require their whole attention. Such paper as we are daily accustomed to see is manufactured from rags, and only in the regular paper-mills recently built at Tokio, and which are provided with foreign machinery.

Of Class 264, embracing wall- and other ornamental papers, there was an excellent display; and it is much to be regretted that France, which notably excels in the manufacture of these kinds of paper, sent none of her best wall-papers to the Exhibition. But one notable exhibit came from Great Britain, and it might well serve for a suggestive model to our designers of decorative paper. Sweden showed specimens from several of her principal manufacturers, among which rich and bright designs in velvet and colors were numerous. Warm tints predominated, and the patterns, not suitable for American taste, indicated the climate of the country from which they came, and would seem to accord well with a refined taste modified by the protracted winters of the far North. Italy presented a very beautiful book of patterns, from Naples, that was in keeping with the well-known Italian artistic taste. The ancient frescoes upon the recently uncovered walls of Pompeii were there reproduced with accuracy; and the finest minutiae of all the designs had received great care and pains. These papers were well worth the study of our producers of paper decorations, and might aid in forming a true and high artistic taste. What principally distinguishes the European wall-papers generally from those of this country is that the former are mostly made up of specific designs, each very complete in itself, that court inspection and study, the general effect being subordinate to the particular ex-



cellence of the parts; while with the American papers the general effect is principal, the shades and designs more blending, and the finished details of the finest papers of Europe generally wanting. This general effect aimed at by our manufacturers is not too much at the expense of minutiae for the prices that they are able to obtain; and it is certainly admirably produced according to their aim. Any other style would not meet their market, and their efforts are naturally put forth to perfect the styles that will sell. There are exceptions to this rule, and in one of the principal American exhibits there were perfect and cheap copies of very fine foreign designs. Nothing is here meant in disparagement of American designs, for differences in taste may well exist, are frequently radical, and are due to the unalterable characteristics of a people. The American machinery for printing wall-paper has reached great perfection, and more than twenty colors are sometimes printed from as many cylinders during one continuous operation. Very handsome specimens of decorative paper were to be seen in the German department, and Russia presented quite a number, some of which were peculiar and quite attractive.

From the Netherlands came imitations, on paper, of fine and variegated marbles, of ornamental woods, and of inlaying of woods of various textures and colors, that were very perfect, and quite superior to anything of the kind found elsewhere. Correct Flemish taste and patient Flemish labor were conspicuous in these elaborate imitations. Suspended from the walls of the office of the Commissioners from Belgium were admirable imitations, in heavy embossed paper, of the old leather hangings of Malines and Cordova. So perfect were they, that close inspection only could satisfy one that remnants of these famous leather decorations were not before him.

Of ornamental papers, for book-binders' use, a very fine exhibit came from New York, and two exhibitors, from Austria and Bavaria severally, presented books of patterns of marbled and other fancy papers that seemed absolutely perfect of their kind. If these could be purchased and retained in the United States they might, in the future, contribute largely to the perfecting of the products of our book-binderies.

In paper-making machinery there were few exhibits, and all American. In this branch of manufacturing Americans are not excelled, and this may partly account for the absence of foreign exhibits in it. Machinery of this kind, too, is heavy, and expensive to handle, and could not naturally be expected from abroad when no hope of prospective remuneration is entertained. An entire paper-machine was in operation in Machinery Hall, erected and run at great expense by

the builder. This was critically examined by practical judges and deemed to be excellent in all its details. It contained some important improvements, and manifested an ambitious and intelligent desire in the builder to accomplish real progress. The demand in this country for highly-finished book-paper has wrought great improvements in the apparatus for super-calendering in the web; and the several such exhibits would seem to indicate that nothing much more complete need reasonably be looked for. One most important improvement in calendering machinery is of the last ten years, and consists of a stack of from eight to twelve small rolls, not of ordinary cast-iron, as of old, but of chilled iron with a surface as hard as steel. Three exhibits of these were brought from Wilmington, Delaware, in which each roll had been separately ground and polished so accurately that the faintest glimmer of light could not pass between any two rolls when put together. So great is the accuracy obtained by the new process of singly polishing, that any two rolls of all these exhibits might be placed together and touch each other throughout their entire lengths.

The envelope-machines were equally interesting and satisfactory, and a most important addition has been made to these within a few years. Formerly the "blanks" for folding were run out by hand, and the flaps that are finally closed were gummed by a brush and dried. This was to allow the machine to make up and press together the envelopes without an adhering of the last flap when folded. The latest improvement permits the whole envelope, including the last flap, to be gummed by machinery at one process, after which it is carried some minutes through the air to dry the last flap before folding it down previously to counting and banding. This is perfectly well accomplished, and considerable labor is saved thereby. One machine cut the envelopes automatically from narrow rolls, with a minimum waste of paper, and a cheapening of the product seemed to be effected to a considerable extent by this plan. Envelopes made by the machine exhibited were very perfect, and made with great economy, and it is probable that there is little room for further improvement in that direction.

One of the most important parts of our labors was the examination of articles included in Class 540, which embraces all kinds of printing-presses. This was a study of the "art preservative of all arts," and all progress made in it ought to be viewed as important to the progress of mankind. A great number of presses for various purposes, including roller-presses for bank-note work, were exhibited, many of which were kept in pretty constant operation. Most of these were

American, and the most notable foreign presses were from England, France, and Germany, all of the very best character. The immense issues of the principal newspapers of the large cities of Europe and America, and the few short hours in which they have to be printed, have demanded new facilities and greater rapidity of printing than was possible by feeding sheet by sheet. Within a few years only this demand has been supplied, and presses now take the paper in large, continuous rolls, pass it rapidly between cylinders covered with circular stereotyped plates, print both sides in quick succession, divide the broad web into two running narrow ones, cross-cut them precisely in the middle of the margins, fold each sheet neatly twice, and deposit all in rows at the rate of over twenty thousand newspapers per hour. A printing-press of this character deserves to rank among the great feats of the mechanic arts, and the three exhibited drew for many months crowds of observers, and were universally recognized as being among the wonders of the Exhibition. These three were the Walter press from England, exhibited by Mr. Walter of the *London Times*, the Hoe press from New York, exhibited by R. Hoe & Co., and the Bullock press from Philadelphia, exhibited by the Bullock Press Co. The latter company boldly placed in competition a press of unusual width, and printed two sheets at a time of the *New York Herald*, on a roll of paper sixty-three inches wide. The web of double width was then rapidly slit in two, and cross-cut into separated sheets. The Hoe press was also double, and printed two sheets at a time of the *Philadelphia Times*, on a roll of paper fifty-two inches wide, which it then slit and cross-cut, after which it carried the separated sheets forward for an additional operation. This was the folding; and the process was effected by two folders, one on each side, folding each sheet twice, and delivering it with absolute exactness, without a single fault. The Walter press was narrower, and printed a single sheet of the *New York Times* on a roll of paper thirty-six inches wide, which it cross-cut and delivered flat. Its speed was greater than those of the wider presses, and the work of each was admirably done. The following is a summary of the competitive trial:

#### WALTER PRESS.

Printed the *New York Times*, size 36 by 46 $\frac{5}{8}$ .

Web of paper 36 inches wide.

Number of copies printed in an hour 10,455.

Number of running yards printed in an hour 13,486.

Number of square yards printed in an hour 13,486.

## HOE PRESS.

Printed the Philadelphia *Times*, size 26 by 37½.

Web of paper 52 inches wide.

Number of copies printed in an hour 21,810.

Number of running yards printed in an hour 11,359.

Number of square yards printed in an hour 16,401.

Slit the web, after printing, into two sheets, and folded each sheet twice.

## BULLOCK PRESS.

Printed the New York *Herald*, size 31½ by 45⅜.

Web of paper 63 inches wide.

Number of copies printed in an hour 14,856.

Number of running yards printed in an hour 9388.

Number of square yards printed in an hour 16,372.

Slit the web, after printing, into two sheets.

For further particulars of this remarkable trial of merit I refer to the following letter of Sir Sydney H. Waterlow, Bart., M.P., of London, one of my associate Judges, a gentleman eminently well qualified to judge of the merits of printing-presses, and who gave to those of the Exhibition a special and careful examination. The letter contains also very valuable general observations upon the printing-presses of various kinds exhibited, that should be publicly presented to that part of the community interested in such information.

“INTERNATIONAL EXHIBITION, PHILADELPHIA, July 11, 1876.

“TO THE PRESIDENT OF THE UNITED STATES CENTENNIAL COMMISSION:

“SIR,—The exhibition of printing-presses in Machinery Hall and elsewhere is perhaps one of the most remarkable features of the International Exhibition. It is impossible to examine them without being struck with the extraordinary excellence and completeness which characterize these exhibits. No description of printing-press is unrepresented, and many different varieties are represented by several examples and sizes from the same manufacturer.

“There are nearly sixty exhibitors, showing more than one hundred exhibits in this class, and it is a matter for congratulation that scarcely one of them is without its own excellences and special usefulness. That some are better than others is a matter of necessity; but it is for the opportunity of making comparisons between one article and another of the same class that International Exhibitions have their great value. Of the large and more powerful presses, no such collective display has ever before been witnessed, one firm alone showing

no less than a dozen of their large and well-known cylinder-presses for the different branches of printing.

“For fast newspaper-presses, some of them at work every day, the Exhibition has never been equaled, especially the Hoe, Walter, and Bullock presses, while the number of small job-presses, worked either by hand or power, is as encouraging as it is surprising.

“The exhibition of presses may be classified into five main divisions:

“1st. Web presses for printing newspapers very rapidly.

“2d. Large presses for fine illustrated work, requiring thoroughly efficient rolling and a slow, steady impression.

“3d. Presses for printing newspapers from cut sheets, with either double or single cylinders.

“4th. Presses for small newspapers, book-work, pamphlet- and jobbing-work.

“5th. Small job and amateur presses.

“In the first division—web newspaper-presses—there are five competitors: the Bullock double press; the Hoe double press, with folder attached; the Hoe single press, with accumulator; the Walter single press; and the Campbell press. It is no exaggeration to say that no such collection of fast printing-presses was ever before brought together. Differing materially in construction, and in the various arrangements for cutting, etc., they one and all possess such marked excellences as to render them very valuable specimens of working machinery, and to entitle them to great commendation. These presses have been tested in every conceivable way, as to their general capacity, number of revolutions per hour, steadiness in running, damping, cutting off, character of work done, strength of web, time lost in putting on last plate, changing rolls, etc. In nearly every test all the presses exhibited a high standard of excellence.

“In a run of one hour, which was by far the most critical test to which the presses were subjected, the Bullock double press printed 14,856 copies of the *New York Herald*, making 7428 impressions; the Hoe double press, with folder attached, printed 21,810 copies of the *Philadelphia Times*, making 10,905 impressions; the Walter press printed 10,455 copies of the *New York Times* from a single set of plates, making 10,455 impressions in an hour.

“In order to arrive at the exact relative speed of each press, it is only necessary to multiply the number of copies printed during the test hour by the length of each sheet as it leaves the press, and so find out the actual length of paper actually run through the press and printed during the hour. The Hoe double press printed 21,810 copies of the *Philadelphia Times*, or 10,905 copies to one set of plates.

The length of the sheet as it left the press was  $37\frac{1}{2}$  inches. The Hoe double press therefore ran 11,359 yards of paper. The Bullock double press ran 14,856 copies of the New York *Herald*, or 7428 copies from one set of plates. The length of the *Herald* is  $45\frac{1}{2}$  inches. The Bullock double press therefore ran 9388 yards of paper. The Walter single press ran 10,455 copies of the New York *Times* over one set of plates. The length of the *Times* is  $46\frac{1}{2}$  inches. The Walter single press therefore ran 13,504 yards of paper.

“During the test hour the Hoe lost  $14\frac{1}{4}$  minutes in changing paper-rolls, snapping the web of paper, and melting the composition rollers. The Bullock lost  $8\frac{3}{4}$  minutes changing the rolls of paper, snapping the web, etc. The Walter press lost  $6\frac{1}{2}$  minutes changing the rolls of paper and a break in the web. The working of the folder on the Hoe double press was very smooth and regular; the open arrangement of the folder afforded great facility for the rapid removal of a jam; and the papers were all smoothly and regularly folded. The folders worked with precision, and without a hitch throughout the test. The cutting arrangements on the three presses are probably of equal excellence.

“On the 11th of July a trial was made of the Hoe single press with the accumulator. This form of delivery has been in use most successfully for many years, and the trial proved abundantly that the confidence which the printers of daily and weekly papers having a very large circulation have given to this machine has not been misplaced. The test continued for 36 minutes. During this time the machine produced 6200 papers. Allowing for three stoppages, delaying  $6\frac{1}{2}$  minutes, the speed while running rather exceeded the rate of 12,500 impressions per hour.

“The second division consisted of large presses for fine cut work, etc. Those exhibited by Messrs. Potter & Co., R. Hoe & Co., and Messrs. Cottrell & Babcock are unexceptionably fine. Several are in practical operation, and the character of the work printed is very fairly represented by sheets of the splendid illustrations of Messrs. D. Appleton & Co.’s *Picturesque Europe* and other similar works. The printing of such delicate work, requiring as it does the greatest accuracy of adjustment and extreme regularity of working of the press, can only be executed on presses of the highest class, design, and construction.

“In the French section three excellent presses exhibited by P. Aluzet & Co., of Paris, although not in practical operation, nevertheless received a most careful examination from the Judges in the group. The presses are exceedingly well designed and constructed, and are entitled to more than ordinary commendation.

"Among the exhibits of the third and fourth divisions will be found the presses manufactured in larger numbers and more in use than any others for ordinary purposes in the printing trade: double and single cylinder-presses for printing newspapers from cut sheets, at a high rate of speed; presses for ordinary book- and pamphlet-work, prospectuses, circulars, posting bills, and all the various kinds of printed books and forms required by railway companies, banks, and commercial firms. These presses are on the whole most creditable to the manufacturers exhibiting them, having been carefully constructed and well adapted to the different classes of work. Great progress has been made during the last ten years in presses of this description, resulting in greater efficiency and greater saving of labor.

"Division fifth: small job and amateur presses. The display of these presses in every variety of form, shape, and size, by a large number of manufacturers, is the strongest indication of the growing interest taken in the details of the art of printing by a constantly increasing number of persons not engaged in the printing business. Very many of these presses have been especially and very successfully designed to give facilities to amateurs to indulge in the very interesting amusement of printing. These amateur presses are not only well designed but low in price.

"The great variety of small job-presses has also proved most useful in general printing-offices, when worked by an adept, turning out excellent work either plain or in colors, and enabling master-printers to employ their boys and apprentices with great advantage and saving in cost of labor. Great care has been bestowed in the arrangements for giving perfect rolling and distribution in most of these presses, and much praise is due to the several makers for the creditable manner in which they have been turned out.

"A most careful examination has been made by the Judges in Group XIII. of all the various classes of printing-presses; and, as some evidence of this, and for detailed explanations of the special merits of particular presses, I refer to the large number of reports in this class sent in by the individual Judges of the group.

"I cannot conclude these few remarks without congratulating the authorities of the Centennial Exhibition on the very extensive and admirable display of printing-presses, never, I venture to think, excelled at any previous Exhibition in the civilized world.

"I remain respectfully yours,

"SYDNEY H. WATERLOW,

"*Judge for Great Britain in Group XIII.*"

The following communication received from Mr. William Faxon, one of my associate Judges, contains a very interesting history of the printing-press during the past hundred years, and I am happy to place it before you as a most valuable part of this general report:

“THE PRINTING-PRESS.—IMPROVEMENTS DURING THE CENTURY.

“Scarcely any branch of the industrial arts has received more important improvements during the past hundred years than the printing-press, and almost at a glance these improvements have been made apparent to the hundreds of thousands who have visited the Exhibition, by the admirably arranged exhibits of Messrs. Hoe & Co. and the Campbell Printing-Press Co., in each of which is shown a “Ramage” press over a century old, as well as the beautifully-constructed and rapidly-working presses of the present day. The one carries us back to the commencement of the period we are celebrating, while the other embodies the latest and greatest triumphs of inventive thought and genius.

“The construction of a printing-press followed close upon the invention of printing by blocks and movable types; but it was originally little more than upright posts connected by cross-beams, through one of which a screw worked to give the impression, with a rude arrangement for running the type under the platen. Improvements were made from time to time, the most notable of which was in 1620, by Blaeuw, of Holland; but the screw-and-lever press, with modifications of the original plan,—yet substantially as seen in our Exhibition,—was the only press in use until early in the present century, when important improvements were made in England, by Earl Stanhope, quickly followed by those of Clymer, of Philadelphia, and other inventors in this country and in Europe. The screw was discarded, and combinations of levers and toggle-joints were introduced, which, with various modifications, are in use at the present time.

“The hand-press, with the aid of two men, was capable of printing only about two hundred and fifty sheets an hour upon one side, and, as the increasing circulation of newspapers demanded greater rapidity, attention was directed near the close of the last century to the construction of power- or machine-presses. Wm. Nicholson, of England, in 1790, invented the first press of this description. The type was to be placed upon a cylinder, and the impression given by contact with another cylinder, as is now done in the most approved presses. Though not a success, it is indisputable that Mr. Nichol-



son's invention embodied many of the principles embraced in the latest constructed machinery.

"From this time on improvements were constantly being devised, but it was not until 1813 that a moderately successful machine-press was constructed. On the 28th of November, 1814, one was actually brought into use in the office of the London *Times*, the paper of that date informing its readers that they were for the first time perusing a paper printed by steam upon a machine-press. This press was invented by two Saxons, König and Bauer, and gave about eighteen hundred impressions per hour. In the course of a year or two a press which printed upon both sides of the sheet was devised, and, though only moderately successful as to speed,—throwing off but about one thousand perfected sheets per hour,—its work was well done; the machine was highly prized, and it was in use for many years.

"It is not our purpose to follow in detail to the present time the various improvements in the printing-press. We have indicated the origin of and the essential ideas embraced in the several early inventions. The names of Napier, of Cowper, and of Applegarth in England, of Richard M. Hoe and Isaac Adams in this country, are prominently identified with important and essential changes extending down to our own day. The latest and crowning triumph of invention for the rapid printing of newspapers is the web perfecting press, which, with the same manual labor required a century since to produce two hundred and fifty impressions or one hundred and twenty-five perfected papers of small size per hour, now prints, in the same time, from twelve to fifteen thousand mammoth sheets upon both sides; and the presses upon which the work was and is done, standing side by side in our Exhibition, testify more impressively than words can do to the vastness and the value of improvements made during the century. The wonderful creations of the Messrs. Hoe, of Mr. Walter, of the Bullock, and of the Campbell Companies, which have daily exhibited their powers to admiring thousands, would seem to leave little in addition to be desired in the future.

"But it is not alone in the rapid production of newspapers that improvements in presses have achieved wonderful success. The increasing taste for books, elegant in their typography both in letter-press and in illustration, has led to the invention of presses specially adapted to meet these requirements. At the commencement of the century books and papers were alike the product of the same press, and it was only by greater care in the printing and in the use of better materials that the typographical appearance of a book excelled

that of a newspaper. Presses are now constructed with all necessary arrangements for producing the finest book and cut work; the strongest ink is distributed with the greatest thoroughness; the rollers are made to pass over the forms any required number of times; and a firm, square, solid impression is given, so that the printed page has an appearance of elegance and perfectness until recently quite unknown.

“The smaller job- and card-presses are also an entirely new creation within the century; they are of infinite variety, are adapted for general and special work, and fill an important place in typographic art.

“Such has been the progress of improvements in the printing-press during the last hundred years,—marvelous as it seems and perfect as the machinery of the present day appears to us, seeming almost to be endowed with life, thought, and reason. It is not too much to believe, particularly when we consider the inventive genius of the age and the requirements of advancing civilization, that the next hundred years will witness improvements as great or greater than the last, and quite in harmony, too, with the progressive spirit of the times.

“WILLIAM FAXON.”

I much regret not being able, at this late day (September 15), to see the Campbell web-press in practical operation. At several appointed times we met to see this press operating, but were always disappointed in our expectations. Great simplicity and originality are shown in its general plan; and there is a reaching after effects through almost invariably new devices. The press on exhibition shows, perhaps, the highest aims yet held by the inventor; and I am far from uttering any words in disparagement of it simply because the builder has not yet been able to overcome all the difficulties that stand in the way of perfect success. What we have seen is unquestionably a work of genius, and I cannot resist the belief that it will yet attain a marked success.

The Exhibition was rich in specimens of beautiful typography, but nothing absolutely new was noticeable except a plan for cheaply and rapidly composing titles and scripts, in letters and designs of the highest and most elaborate art. This was submitted by the Bureau of Engraving and Printing, in the U. S. Treasury Department, as an invention of Mr. G. W. Casilear, in charge of the engraving division. It is a plan only feasible in large and first-class establishments, where the highest art and skill can be commanded for the execution of original letters and designs, to be repeated; but it enables such establishments, by laying in a large store of the most perfect originals, to compose the titles and scripts of bonds, checks, certificates, bill-heads, etc., by cheaply transferring and combining these originals, instead of

separately engraving every design and script that they may have to produce in the course of a large and miscellaneous business.

Several "protective" papers were submitted for our inspection and report, viz., the "National safety paper," the "Commercial safety paper," and a paper printed with Francis L. Loutrel's sensitive ink. These are specially designed to prevent the alteration of checks and other evidences of value, and are all based upon the same idea, viz., a sensitive coloring that will be destroyed by any agent, chemical or mechanical, that discharges or erases the writing upon the paper, thus affording evidence of any tampering with the instrument. The papers of each party, written upon, were submitted to a rival; and, according to the best judgment of the examiners, all were fairly altered. I have always held that such devices are so many steps in the right direction, as tending to multiply and complicate the difficulties to be overcome by the forger and counterfeiter; yet, on the other hand, it is rationally maintained that any device publicly claimed to afford certain protection and sometimes failing to give it positively misleads the public, by causing men to rely upon a false security. Certain it is that men who practice fraud by raising checks are skillful experts, and may be safely matched against men of science in honorable callings; yet the latter find in no safety-paper submitted absolute defense against alteration. Of this fact we were assured by Dr. Charles M. Cresson, of this city, who stated to us, in the presence of representatives of several protective papers, that he had found none able to prevent him from altering a writing without changing the paper. It is not to be supposed that invention in this direction is exhausted, and that a partial failure, a failure to be simply perfect, is a total failure. The best that has been accomplished is very creditable, and narrows down the number of forgers to chemical experts; and enough is accomplished to promise more in the future.

The administration of the Exhibition can be congratulated upon the number and quality of the articles submitted to our group of Judges. They were indeed too numerous and important to have full justice done them by our best efforts. Our reports recommending awards for merit are not few, and attest our desire to be as just as possible to those many men of uncommon intelligence and earnestness who have expended so much time, money, and pains to contribute their productions as a part of the American Centennial Exhibition. Where we have erred in our judgment, it is probable that we have erred upon the side of liberality.

PAPER-MAKING MACHINERY AND FIBRES.

BY EDWARD CONLEY.

I have the honor to submit the following report in reference to a portion of the exhibits in Group XIII., together with a review of the fibres available for paper-making, classed in other groups.

Previous to the invention of modern paper, many different substances, all of them natural productions, were used for recording. Stone, clay, and waxen tablets, bark and leaves of trees, entrails of animals, parchment, papyrus paper, etc., were employed, each people making use of the substances most convenient to them. Papyrus paper and parchment, however, were most generally used by all the civilized nations until gradually superseded by modern paper. It is impossible to fix a certain date for the invention of this most useful article, but paper made from pulp was first in use among the Chinese, probably at a very early period in the Christian era. Thence, after a long lapse of time, it passed into Tartary, where, we are told, there was a paper-manufactory at Samarcand in 648. By the conquest of Tartary in 704, the Arabs became acquainted with paper-manufacture, and through them it was introduced into Europe at the time of their conquest of Spain. It was also introduced into Eastern Europe through the Greeks of Constantinople, whose knowledge of it was obtained direct from Tartary. This is what is known as cotton paper, which gradually took the place of parchment and papyrus, until in its turn it was superseded by linen paper, or paper made from rags. Many attempts have been made to fix a date for this important improvement, but without success. When or where linen paper was first made it is impossible to tell; we only know that it came into use about the middle of the fourteenth century, and in the fifteenth was used almost exclusively. It is a striking and significant fact that the use of linen paper should have become general just at the time of the invention of printing, as there is no fabric so well suited to meet all the demands of the press as this. The invention of printing naturally gave an impetus to paper-making, and from that time we find the paper-making interest continually increasing. The press and the paper-mill, those two powerful agents in the advancement of civilization, have gone hand in hand, progressing always towards greater perfection. It is, however, during the last hundred years, which have been so fruitful in improvements of all kinds with every race of civilized man, that the greatest progress has been made. In fact, from the time of the invention of modern paper, which is an aqueous de-

posit of vegetable fibre reduced to a liquid state, up to the close of the last century the progress in paper-manufacture was very slow. Since then the improvements have been so numerous, both in processes and machinery, that they far surpass all that had been made during the centuries of its previous existence.

A hundred years ago the process of paper-making was so different in its details from the present time that it might almost seem a different art. Then all the paper was hand-made, as machines for making paper were not invented for some years afterwards; and the little machinery used for grinding the pulp would now scarcely be deemed worthy of the name. The stock consisted of rags, which were converted into different kinds of paper, according to their texture and color, bleaching paper-pulp being then an unpracticed art. The great increase in the uses of paper, which grew up with the advancing state of civilization, produced a demand for a more abundant and less expensive material. By the aid of chemistry this demand has been met, and the use of alkalies has made it possible to employ many fibres for paper stock that previously were of no practical utility. By their means fibrous substances can be thoroughly disintegrated, and subsequently subjected to the modern bleaching process. Now the wood from our forests, the straw from our grain-fields, old paper from our waste-baskets, and even jute from far-away India, are staple materials upon which paper-manufacturers depend to keep their mills running. The rags, also, are subjected to processes at that time unpracticed, if not unknown, and those that formerly would have been thought unfit for making the lower grades of paper now become stock for the finer. Not only in the processes, but also in the machinery for paper-manufacture, the improvement has been almost without parallel. From the time of the invention of the paper-machine, about the beginning of the present century, which may be truly said to have revolutionized the art of paper-making, the inventions and improvements in the machinery used in its manufacture have been so numerous that it would be a work of great time to enumerate them.

#### PAPER-MAKING MACHINERY.

A sketch of the improvements made in paper-manufacture seems to be properly introduced by the invention of the Fourdrinier machine, for it is to this that the great change is mainly due. This was invented in France, in 1798, by Louis Robert, an employee in the paper-manufactory of Francis Didot. The credit of making the invention of practical utility, however, is due to the Messrs. Fourdrinier, of London, from whom the machine takes its name. These gentlemen,

at that time extensive stationers and paper-manufacturers, greatly improved the original machine, and in 1803 bought up all the patents that had been issued in reference to it. They still continued to improve the machine until, in 1806, it was so far perfected that the cost of manufacturing paper was reduced from sixteen shillings to three shillings and ninepence the hundred-weight. Previous to the invention of this machine, paper was made in sheets limited in size by the size of the mould; now it can be made over nine feet in width, and of any length, as the pulp passes over an endless web, and, moreover, with a great saving of time and money. When paper-machines were first introduced they encountered the same violent opposition that followed the introduction of machinery in general. Several machines were destroyed during the first twenty-five years after their successful introduction by workmen who had been trained to make paper by hand, and supposed that the use of machinery would take their vocation from them. Even to the present time the prejudice in favor of hand-made paper exists among some consumers, who imagine that it is stronger and better than machine-made paper. An examination of both kinds shows that the contrary is true, and that the most even, strongest, and best papers are those manufactured on machines.

The invention of the Fourdrinier machine was followed by that of the cylinder-machine. This was invented, in 1809, by John Dickinson, an English manufacturer, who is said to have been led to the invention by a desire to compete with a mill near his own in which a Fourdrinier was in operation. The cylinder-machine is well adapted to the manufacture of the coarser grades of paper, and especially to making pasteboards for the use of bookbinders and box-makers. When used for the manufacture of pasteboard, several cylinders are worked in connection, by which means a sheet of pasteboard containing two or three thicknesses of paper may be made by one operation.

Since their first introduction machines have been very much improved; especially within the last sixty years, by the addition of several attachments. Among these may be named the pulp-dresser, for screening the pulp and freeing it from all foreign matter; the dryers or steam-cylinders, for drying the paper as it is made; and the paper-cutter, for cutting the web of paper into any desirable size.

Another adjunct of the paper-mill, known as the super-calenders, has been introduced within the last fifty years. These are used for glazing fine papers, and consist of four iron- and four paper-rolls in one stack, through which the paper passes from one to three times. In the United States these have in a great measure taken the place of

the plating-machines used in other countries. Ledger, flat, writing, and fine papers of all kinds, except the first grade of plate-paper, are glazed upon these machines. Within the last few years the use of chilled iron calender-rolls has become very general. They are attached to the machine, and glaze the paper as it is made. To a certain extent these have proved successful, particularly for newspaper and the lower grades of book-paper. For the finer grades they are neither so good nor so economical as the super-calenders. When the paper is glazed as it comes from the machine, it must pass through one or more stacks of calenders, containing from seven to eleven rolls each, in order to get a high finish. The percentage of waste in this mode of glazing is sometimes very great, and materially increases the cost of production. Moreover, when the paper is glazed by one operation it must receive an enormous pressure, which gives it a greasy appearance, and, from the non-elasticity of the chilled roll, the least lump is crushed flat until it becomes a dark, transparent spot. If the paper is only partially glazed as it comes from the machine, and is then passed two or three times through a stack of super-calenders, it receives the pressure gradually, and owing to the elasticity of the paper-calender is not crushed, being in consequence much stronger and cleaner looking. For these reasons the use of the super-calenders is preferable to that of the chilled rolls where a high finish is desired.

In the mechanical preparation of paper stock many minor improvements have been made, such as cutting the rags by machinery, boiling the stock in close rotary or stationary boilers under pressure, and the use of the revolving washing-cylinder for removing the dirty water from the washing-engine. Notwithstanding all modern improvements, the pulp for the finest paper exhibited was prepared in the old beating-engine, substantially the same machine as that invented in Holland in 1750. This engine did not come into general use for many years after its invention, probably not over a hundred years ago, and during all this time its principle has remained unchanged. It is true that in the United States two patent finishing-engines, the Jordan and the Kingsland, have been put into successful operation within the last twenty-five years in many book- and news-mills, and are doing good service in brushing out and finishing the pulp for the machine, yet the preparatory process of washing and reducing to half stuff is still done by the old Holland engine. The Gould Patent Beating-Engine, exhibited by the Holyoke Machine Company, is of the same class as the two above mentioned, but is constructed on quite a different principle. It has been in operation about three

years, and as yet has been used only for reducing half stuff to pulp, but it approaches more nearly to a substitute for the old Hollander than either of the others. In its gearing and washing facilities it can still be improved, but it may be classed in the line of progress.

The paper-machine exhibited by the Gavit Paper-Machine Works of Philadelphia, which was in almost constant operation during the Exhibition, is strong and well built. It contains many improvements, and can claim to be in the front rank of first-class paper-machinery.

One very important discovery was made about a hundred years ago,—1774,—the use of chlorine gas as a bleaching agent. It was many years before its use became general, the first patent being issued in 1795. This has been of very great benefit to paper-manufacturers. By means of it the range of materials for paper stock has been largely increased, as it enables a good white pulp to be obtained from many substances that otherwise could not be used.

#### CAUSTIC ALKALIES.

It has been, however, within the last thirty years that one of the most important of all changes in paper-manufacture has been made,—the use of caustic alkalies for subduing various vegetable fibres, as straw, wood, esparto, jute, and many others of like kind. The great increase in the demand for paper has for many years past made the question of material a very serious one for paper-manufacturers. The supply of rags, or materials partially reduced in other manufactures, was not sufficient to meet the demand, and it became necessary to find some raw fibre that could be used wholly or in part, while some agent was needed that would thoroughly disintegrate without destroying them. The use of caustic alkalies has accomplished this, and has already largely increased the supply of paper material. As the fibres of different countries become better known, it would seem to place an almost unlimited supply at the disposal of the paper-manufacturer of the future. In fact, it is yearly becoming more evident that it is upon such agents as are necessary for subduing raw fibre the manufacturer must eventually depend for a supply of material. From 1858 to 1866, inclusive, there were issued in England alone 139 patents “for the use of alkalies for cleansing, disintegrating, scouring, neutralizing, etc.” In the patents issued from the United States Patent Office during the same time, caustic alkali is used almost exclusively for the purpose of disintegration, nor have more recent investigations found any agent to take its place.

In the United States, straw-pulp, prepared by caustic alkalies, is used to a very great extent, even in fine grades of book-paper. Three



years ago the consumption of straw for white paper was over one hundred and fifty tons per day, producing between fifty and sixty tons of straw pulp. Owing to the depression in the paper trade, and the cheapness of other stock, not more than one-half as much is used at the present time. In connection with the use of straw and similar substances, it may be well to mention a mill that has been invented by Lahousse, of France, for disintegrating and bleaching these substances. The mill itself consists of a pair of sandstones, dressed and run like a pair of mill-burrs. The straw is first boiled under pressure in caustic alkali, and after being cleansed by washing is mixed with the bleaching liquor. A continuous stream of this pulp is then fed to the mill, the stones running at the rate of two hundred and fifty revolutions a minute. While passing through the mill, a double object is accomplished: the knots and joints in the straw are thoroughly disintegrated, and the pulp mixed with the bleaching liquor, and at the same time the friction of the stones raises the temperature to about ninety-eight degrees Fahr., at which temperature the chlorine gas is set free, and acts most advantageously upon the stock. It is the most effective machine of its kind in use. At present over sixty mills on the continent have it in active operation.

A large amount of chemically-prepared wood-pulp is also used in the United States. About ten years ago a stock company was organized which built the American Wood Paper Pulp Works at Manayunk, now a part of Philadelphia, for the manufacture of chemically-prepared wood-pulp. The works are the largest of their kind in the world, and cost \$500,000. They have been in successful operation from the start, and produce fifteen tons of dry white pulp per day. Mr. Bloomfield H. Moore, of Philadelphia, who leased these works and uses their products, exhibited a beautiful line of book- and plate-papers, largely composed of this pulp. These papers have a fine finish, and take an elegant impression. Several other mills in the country manufacture chemically-prepared wood-pulp. The aggregate amount produced daily in the United States is not less than thirty tons.

In the last few years several improvements have been introduced in the manufacture of wood- and straw-pulp, two of which are worthy of special mention:

1st. A complete circulation of the caustic liquor through the stock while boiling under pressure, also heating the liquor up to a high temperature, and expanding it before percolating the stock. This imparts the heat to the stock, and softens the intercellulose while passing through it. At the same time a separation of the non-fibrous substance from the stock is effected by the current or circulating

liquor. The operation of this apparatus is as follows: An upright boiler is filled with stock, and a sufficient amount of caustic liquor is added. A cock is opened, and the liquor is allowed to flow through a perforated false bottom in the boiler into a centrifugal pump, which forces the liquor through a coil of pipe in a steam-drum, and then in at the top of the boiler and through the stock; the steam and hot water in the drum heat and expand the liquor, while the pump keeps up a complete circulation during the boiling.

2d. The other improvement mentioned operates as follows: Attached to the bottom of a stationary boiler is a disintegrator or grinding-machine, constructed on the same plan as a Jordan engine. The stock from the boiler passes into this disintegrator while under pressure, where it is crushed, and all particles of the fibre are brought into contact with the hot liquor. From the disintegrator the stock passes into a pump which forces it into the top of the boiler. By this means a complete circulation is kept up, and the stock, passing through the disintegrator, is thoroughly crushed and separated, enabling the liquor to act directly upon the intercellulose without weakening the fibre.

In 1853, Richard A. Brooman obtained in England a patent for the reduction of wood to a fibrous pulp by mechanical agents. In his specifications he says: "The machinery consists of a millstone or millstones, or metal rollers, cylinders or rasps, with roughened surfaces, which are caused to act upon blocks or pieces of wood, held in a frame always in the direction of the grain thereof," a current of water being directed on to the reducing agent "before its contact with the wood." Henry Voelter, a German, improved this machine and introduced its product, which is known as mechanically-prepared wood-pulp, into Europe and America. Other machines have since been invented for the same purpose and applied in this country. During the last ten years this kind of paper stock has come into general use both in America and in Europe for the lower grades of book- and news-paper. It has greatly cheapened the production of paper, and answers the public wants for every-day purposes. It is much to be regretted, however, that the natural saps contained in the wood—it being used in its green state—are very detrimental to the durability of the paper, particularly when it is excluded from the air between the covers of a book. Books and newspapers printed upon such paper will in time mould and decay; hence books intended to record the world's progress for the use of future generations, or even newspapers that are filed away in libraries, should not be printed on such paper.

The improvement in the use of imperfections or old printed and written paper has been very great in the last fifteen years, probably more than in the sixty years from the time when Matthias Koops first practically used them for making white papers in 1801. It is mainly to Americans that the world is indebted for the utilization of this waste product. During our civil war paper stock became so dear that American manufacturers were forced to work over old paper in order to keep their mills running. This was done by boiling the old papers in a solution of alkali, to destroy the ink, and then piling them up to drain for several days preparatory to washing out the ink. They were then repulped, bleached, and mixed with other stock. There are at least one hundred and fifty tons of this stock used in the United States per day.

As before said, it has for many years been a serious question with paper-manufacturers how they shall procure sufficient suitable material to meet the continually-increasing demand of the trade. European manufacturers are beginning to feel a need that the manufacturers of the United States have long felt, namely, a sufficient quantity of linen rags. In the United States the abundance and cheapness of cotton goods have prevented the use of linen to any great extent, especially as only a very small amount is manufactured in the country. Of late years the same is becoming the case in Europe. Even in flax-growing districts, the high price of labor has made it more profitable for the working-classes to buy the cotton goods manufactured by England, Russia, and the United States than to wear the home-spun linen, as was formerly the custom. In consequence of this, a comparatively small amount of linen is worn by the lower orders, and only the finer grades are made to any great extent. Moreover, the great improvement in machinery has made it possible to manufacture a better cloth from inferior material, as the paper-maker finds to his sorrow when the various processes of the mill have taken away all adventitious aids to improvement. It is in consequence of this need for more abundant and better stock that so many experiments have been made with different substances. Here let me say that it would be wise for such experimenters first to find out if others have not already gone over the ground. Many spend time and money in perfecting processes of which the utility or inutility has been proven long before by other persons.

In view of this great and growing need, it is encouraging to know with what a lavish hand nature has scattered her treasures of fibrous substances, so bountifully indeed that it would seem, with chemistry and mechanical skill aiding us, no demand could ever possibly equal

the supply. In all tropical countries, both of the Eastern and Western Hemispheres, the number and variety of fibrous plants are truly wonderful. In fact, all tropical plants are fibrous to a greater or less extent. More wonderful still is the small use that has been made of these plants, when the demand for them has been yearly increasing, not only for paper-manufacturers, but for manufacturers of textile materials. In many of these countries, large quantities are yearly gathered, and after serving some local purpose are thrown away as useless.

#### THE FIBRE EXHIBITS.

A slight glance at the fibre plants exhibited by different countries may not be uninteresting, even if they can be used directly only for textile purposes. Indirectly they will increase the paper-maker's supply of material, for after having gone through the previous process of manufacture for a textile fabric they are available for paper stock.

To give a detailed account of the fibres of each country is unnecessary, as many of them are common to several countries, sometimes in both the Eastern and the Western Hemisphere. In Mexico, Central America, the West Indies, and the northern countries of South America, the majority of fibrous plants, if not exactly the same, belong to the same great families. Those most fruitful in fibres are the Agaves, sometimes called Aloes, a sub-tribe of the order Amyrillideæ; the Bromelias, or pineapples, of the order Bromeliaceæ; the Musa, or bananas and plantains; and the Palm family, with a few varieties of the orders Liliaceæ and Malvaceæ.

The Agaves are indigenous to the American continent and islands from Virginia to Paraguay, but they flourish so abundantly in Central and South America, Mexico, and the West Indies, that it would seem an almost unlimited supply of fibre might be obtained from them. Of this family the most valuable varieties are the *Agave Americana*, *Agave Mexicana*, and *Agave Sisilana*. The *Agave Americana* grows with great abundance in all parts of tropical America, and has been introduced with success into various countries of the Old World. The fibre-producing properties of this plant are too well known to need much comment here, and it is only necessary to add that the better we become acquainted with it the more apparent its value becomes. It has long been used as a paper material, and is well adapted to the manufacture of cigarette-paper, as the fibre is very strong and burns with very little smell. Samples of this fibre were exhibited from Mexico, Brazil, Jamaica, Bermuda, and the Bahama

islands, and also from Egypt, Hindostan, and Australia, showing the wide range of country in which it may be cultivated.

The *Agave Mexicana* is indigenous to Mexico, where it is cultivated for the manufacture of pulque, a fermented liquor made from its juice. It is by many confounded with *Agave Americana*, but is an entirely distinct plant. It is especially interesting for the fibre obtained from its leaves, which is used for a variety of purposes. The State Government of Hidalgo, Mexico, exhibited a most interesting case containing specimens of this fibre and the different articles manufactured from the plant. There were ropes and cordage, fine woven goods, nets, bottles of the clear, golden-hued pulque, and other products, as gum, honey, sugar, etc. Especially deserving of mention was the paper, both on account of the quality of the goods and the cheapness of the material. This paper is remarkable for its strength; in fact, it is so much esteemed for its toughness and durability that in 1830 a law was passed by the Mexican Congress requiring that all laws should be recorded upon it, and that it should be used for legal documents. Paper made from the *Agave Mexicana*, worthy of particular mention for its elasticity and strength, was also exhibited from the Belem mill of Messrs. Benfield, Braker, & Co., situated in the District of Mexico. In ancient times the native Mexicans used the leaves of this plant for paper in the same way as the Egyptians did the papyrus. The abundance and cheapness of this fibre certainly commend it to more particular attention. As the fibre is really the waste product, it could be procured at very small cost.

The *Agave Sisilana* is the plant popularly known as Sisal hemp, the cultivation of which was introduced into Florida, where it flourished for several years. It is a native of Yucatan, Mexico, where it is called Henequen. Its cultivation and utilization are yearly increasing, and its fibre is especially valuable for ship-cables, as it possesses the property of resisting the action of sea-water. Large quantities are exported to England for this purpose. It is also used as a paper material, but is not so well suited to this purpose as some others of the *Agave* family on account of the harshness of the fibre. Some very fine specimens of this fibre were exhibited by the State Government of Yucatan.

The whole family of *Agaves* are rich in fibre for paper-making, are produced in large quantities in their native countries,—sometimes in situations where nothing else will grow,—are easily gathered at small cost, and there seems no reason why they should not be utilized for the manufacture of various kinds of paper. The great trouble in

their native habitats has been a want of skill in separating the fibre, as well as a proper appreciation of their real value.

Next to the Agavès may be ranked the Bromelias, or pineapples, well known for their silky fibres. The order to which these belong, Bromeliaceæ, is peculiar to tropical America, but their cultivation has been successfully introduced into several parts of the Old World. It is from one species that the beautiful textile material known in commerce as piña is manufactured. Of this family, one of the most useful varieties as a fibre-producing plant is the *Bromelia sylvestris*, known in Mexico as the istle, and in Central America as the pita. It is self-propagating, and in the latter country it increases to such an extent in the forests that it is often a serious hindrance to the passage through them. Bromelias grow also in South America and the various West India islands, from some of which specimens were exhibited. The State Government of Oaxaca, Mexico, exhibited a variety of fibres obtained from different species, one of which was over three yards in length. Some of these were remarkable for their strength, and were produced in every degree of fineness. Like the Agaves, one great bar to their use has been the want of proper machinery for separating the fibre. Many who have tried these fibres say that they are equal to flax. They are sometimes used by the natives for the manufacture of paper, for mats, cordage, ropes, etc. From all that can be learned of their properties, they seem well worthy the attention of paper-makers as a staple paper material.

The different varieties of the Musa, or bananas and plantains, which are indigenous to the continent and islands of tropical America, also furnish a good, strong fibre in great abundance. In reference to these plants it must be remembered that the tree is invariably cut down when the fruit is gathered, and almost as invariably allowed to rot away. It is the fibre of the Musa family that is said to be the nearest approach to hemp or flax, and both writing- and wrapping-paper of good quality were manufactured from it several years ago in Demerara, British Guiana. Here, too, the want of proper machinery has prevented the use of the plants to any great extent. They are of rapid growth, very prolific, and easily cultivated, and the fibrous material is the part that is generally thrown away to waste. Samples of this fibre were exhibited from the British West Indian possessions.

In Central America, the northern countries of South America, and the West India islands many varieties of the palm-tree family are found. They all produce valuable fibre, which by the use of proper machinery might be available for textile purposes. Hooker says of

this family, that "all palms yield textile fibres, useful especially for the manufacture of paper." From the *Attalea funifera*, it is said that nearly all the cordage used on the Amazon River is obtained. A few specimens of this fibre were exhibited from Brazil, as were also samples of different varieties of palm from some of the West India islands. These palm fibres are very valuable to the natives, and are used by them for a great variety of purposes. The species are almost innumerable, there being "over twenty-three varieties producing fruit, cordage, fibre, oil, and even spirits."

The order Malvaceæ produces most valuable fibres in both hemispheres. It is to this family that the well-known Indian hemp belongs, which grows abundantly in tropical America as well as in India. One variety, known as the Mohant-tree, *Hibiscus arboreus*, produces a white fibre apparently well adapted for paper-making. It grows abundantly along the coasts of Central America. Another variety, known in the United States as the okra, is thought to be capable of producing valuable fibre under favorable circumstances. In Cuba this grows freely in all kinds of soil. Samples of this okra fibre were exhibited from Jamaica. The Society of Natural History of the City of Mexico exhibited specimens of mallow fibre, or wild silk as it is sometimes called. Several varieties grow in Mexico, and are noted for their soft and silky, yet tough fibres. They can probably be utilized for a textile material, and hence, indirectly, for paper stock.

The order Liliaceæ includes a large range of plants, many of which are cultivated only for ornament, but to it belong many valuable fibre-producing plants, among which may be named the different species of Yuccas. In America, several varieties of Yucca are found, some of them even as far north as the Missouri River, in the United States. These are known by several local names, as Adam's needles, Spanish bayonet, bears' grass, etc. No effort has ever been made in this country to utilize them for textile purposes, but it would seem well worth a trial. They grow in the poorest soils, and could be raised in many parts of the United States. In other countries, good ropes have been made from the coarser fibres, and a fine cloth resembling linen from the selected ones. The only sample of this fibre exhibited from America was from Jamaica, from which a specimen of the *Yucca aloifolia* was sent.

Of course the fibrous plants belonging to these orders are not, by any means, all that are found in America, but these have been referred to as being the most valuable. The exhibit of fibres from Jamaica was very fine, and included, in addition to those already mentioned, *Bæhmeria nivea*, or China grass, which has been successfully natu-

ralized; *Agave Sisilana*; *Ananassa sativa* and *Bromelia penguin*, both varieties of the pineapple family; two varieties of the *Musa* family; the naturalized Indian plants *Calatropis gigantea*, or yercum, and *Sansevieria Zeylanica*, or bow-string hemp, of which a description is given in the East Indian exhibit; two varieties of *Pandanaceæ*, or screw pine; palm fibres obtained from the leaf-stalks of *Caryota urens*; coir from the husk of the cocoanut; horsehair-like fibre from the sheaths of the *Arenga saccharifera*; and several varieties of mallow, some of which grow wild in profusion.

From the Argentine Republic, several samples of "caraguata," or "chaguar" fibre were sent. For many purposes it is said to be equal to hemp or flax. It grows in almost inexhaustible quantities, and yet has never been exported for a textile material. In the same country a species of cactus that grows very abundantly is said to furnish an excellent raw material for paper-manufacture; also a kind of grass very much resembling the esparto of the Eastern World.

Among the fibres exhibited from Brazil were several specimens prepared by Mr. S. L. da C. Leite, of the Province of Minas Geraes, two of which were especially remarkable. One, the fibre of a plant belonging to the order *Asclepiadaceæ*, or milk-weed family, is noticeable for its admirable whiteness and unusual tenacity. The plant grows spontaneously in the country, and has also been successfully cultivated. It has been already woven into textile fabrics, but its value as a paper material remains to be tried. It is said to resemble jute. The other was a specimen of natural paper produced from a species of fig-tree, *Ficus speciosus*. The trunk leaves are soaked in water and then passed between iron rollers, and, coming out very thin, are used for writing-paper without other preparation. Mr. Leite also exhibited fibres from a reed belonging to the order *Malpighiaceæ*, which is peculiar to southern tropical America, and one variety of palm fibre. There were also sent from the various Brazilian Provinces several other specimens of fibre. Among these may be mentioned as belonging especially to southern tropical America, *Bertholetia excelsa*, a variety of the order *Myrtaceæ*; two species of *Xilopia*, known locally as white and red embira; and a third, *Xilopia sericea*, noted for its wide, long fibres, which are highly esteemed for various fabrics; *Cecropia pellata*, used for woven fabrics, and belonging to the *Urticeæ*; *Copaiifera*, well known for its medicinal gum, but also valuable for fibre; and *Bilbergia tinctoria*, a species of *Bromeliaceæ*, so called from the yellow dye extracted from it. There were very few specimens of palm fibre, of which there are so many varieties in Brazil. Of these the most valuable were the *Attalea funifera*, already



mentioned, and *Bactris*, also called tecun, said to be finer and more tenacious than hemp.

In many parts of tropical America fibrous plants of the Eastern Hemisphere have been naturalized, and seem to flourish as well as in their native habitats. It would seem that the great demand for textile substances might be met near home, if only advantage were taken of the materials so bountifully supplied. It might be said to American manufacturers, as was several years ago said to those of England, that "there is no want of material in every way adapted to the manufacture of paper, and paper-makers would soon find it to their interest to turn their attention to some of it instead of spending their time in futile attempts to induce foreign countries to supply them with rags."

In closing the list of fibres in the exhibit from the Western Hemisphere, mention must be made of a sample of asbestos fibre, prepared by J. S. Rosenthal, of Philadelphia. This mineral is well known for its long, silky fibres, which have the power of completely resisting the action of heat. In consequence of this latter property many attempts have been made to use asbestos as a material for the manufacture of fire-proof paper, but never very successfully, on account of the difficulty of separating the foreign matters. Mr. Rosenthal has invented a method of disintegrating asbestos fibre which seems more successful than any preceding one. The asbestos is put into wooden tanks lined with lead; it is then covered with water, and the chemicals are added. After the introduction of steam it is boiled from four to six hours. When disintegrated it is passed through a pair of rolls, the top one covered with rubber and a rubber apron running on the lower one, by means of which the water is driven from the fibre. It is then dried and manufactured into board on a machine especially constructed for the purpose. Mr. Rosenthal exhibited specimens of board made from this fibre from one-eighth to three-fourths of an inch in thickness. This board is used in packing steam-joints, covering steam-boilers, and in the manufacture of asbestos packing for steam-engines. He also exhibited some samples of paper made from the asbestos fibre, which, while not possessing sufficient strength or smoothness for writing-paper, showed great progress toward the production of a fire-proof paper.

Passing from the Western to the Eastern world, we come to countries where it would seem that centuries of occupation had scarcely left anything to be discovered, and yet here, too, there is much to be learned in regard to utilizing the material so abundantly furnished.

In the Eastern Hemisphere, the plants belonging to the orders

Urticeæ, Malvaceæ, Liliaceæ, and Tiliaceæ are more valuable for their fibre than in the Western Hemisphere; and some varieties of the orders Pandanaceæ, Leguminosæ, and others, of which there are so few specimens in the New World, are valuable additions to fibrous plants. Here we find valuable specimens of the Musa and Palm-tree families. In the Egyptian exhibit especially were several specimens of fibre from the different varieties of palm. The date-palm is indigenous to Egypt, and flourishes both on the borders of the desert and in the cultivated ground. Textile fibres are obtained from the leaflets, spathe, flower-stalk, trunk, and root. There were several samples of fibre prepared from different varieties of bananas, and also from different water-reeds growing in the numerous canals of the Nile in Lower Egypt. From one of these latter, *Cyperus dives*, called diss by the Arabs, it is said an abundance of good paper material can be obtained. The well-known cat-tail, *Typha latifolia*, also grows in great profusion, and some good specimens of its fibre were exhibited.

India has long been celebrated as a country where almost every variety of fibrous substance is produced, and an enumeration of these would be like the rehearsal of an oft-told tale. But with all that has been said and written of them, their real value as textile materials is scarcely realized even now, though of late years some have come into more general use. The exhibit of fibres from the British East India possessions contained over forty different specimens, belonging to nearly all the fibre-producing families, most of them native to the country, some naturalized. Of the order Urticeæ, or the nettle family, there were several specimens, beginning with the well-known China grass or Rhea fibre, and including several specimens native to the country. Among these may be named the Neilgherry nettle, *Urtica heterophylla*; puyba fibre, *Bæhmeria puoya*, sometimes called puya flax; and Kangra hemp, *Cannabis sativa*. Of this family of plants there is an almost unlimited supply in India, many varieties growing in great profusion along the base of the Himalaya Mountains from Assam to Sutledge. A proper mode of treatment seems to be all that is necessary to render them of great value as textile and paper-making materials. Of the order Malvaceæ we find barriala from Bengal, *Sida rhomboida*, which very much resembles jute in appearance, and for some purposes is said to be superior; the "brown hemp" of Bombay, *Hibiscus cannabinus*, which is used for cordage, sackcloth, and paper; Indian mallow, *Abutilon Indicum*; and Roselle, *Hibiscus sabdariffa*. The varieties of this family differ very much in appearance, but nearly all of them are valuable for their fibre-producing qualities, and, as they grow in great abundance, are worthy of atten-

tion. From the order Liliaceæ were specimens of *Sansevieria Zeylanica*, familiarly known as bow-string hemp, which grows wild under the bushes in the jungles, is very abundant and very strong; and the *Yucca gloriosa*, Adam's needle, which has already been mentioned among American fibres. One specimen of the order Asclepiadaceæ, *Calotropis gigantea*, Yercumnar, also a jungle plant, is said to be one of the most tenacious fibres known, and is much used in Bengal and Madras for the manufacture of strong cloths, cambrics, and lawns. This fibre grows very abundantly without any special care. It is known sometimes as mudar silk cotton. Of the fibres of leguminous plants exhibited, two are especially worthy of mention,—one the Sunn hemp, *Crotalaria juncea*, said to be a valuable substitute for Russian hemp; and Jubbulpore hemp, *Crotalaria tenuifolia*. The former is a well-known article of commerce, the latter only lately coming into use, and employed for the manufacture of rope.

In addition to these fibres were several varieties of palm fibres, musa fibres, agaves, bromelias, screw pines, and different species of mat-grass and flax; but only one of special interest to paper-makers remains to be mentioned, namely, jute, *Corchorus olitorius*, which belongs to the order Tiliaceæ, or the lime-tree family. This fibre has for many years been an article of commerce, and attention is called to it from the fact that it is capable of being used by paper-makers for a much greater variety and finer grade of paper than at present. Under proper treatment a fine white fibre can be obtained from it at less cost than from the materials generally used for the manufacture of the finer grades of paper. Jute-culture has been introduced into America within the last few years. It is cultivated with great advantage in the neighborhood of cotton-fields, as it requires the same soil and climate. It is said that when the cotton-fields are belted with jute it serves as a protection against the ravages of the caterpillar.

Many of the fibres in the Indian exhibit have never been tried as paper materials, and at present could be made use of only indirectly; but the great trouble has been want of proper treatment. In order to utilize them to their full extent, it is necessary to disintegrate them thoroughly, and at the same time keep unimpaired the strength of the fibre and its capability of being properly bleached. This once accomplished, the want of material need never trouble the manufacturer.

One of the most complete exhibits of paper fibres made was a collection of samples prepared by the director of the Botanical Gardens at Melbourne, Victoria, Australia. In this collection sixty-nine fibrous plants were represented, some by the raw fibre, some by paper manufactured from them, and others by both the fibre and the paper.

Two-thirds of the plants were natives of Australia; the other third had been naturalized. There were about forty specimens of paper.

First on the list of native Australian fibres comes a variety of the well-known order Urticeæ, or nettle family, the grass-cloth-tree of Queensland, *Pipturus propinquus*. From the bark of this tree a good fibre is obtained, which is used in the manufacture of paper. Accompanying the fibre was a sample of the paper made from it. Another variety of the order Urticeæ is the tree-nettle of Queensland, *Laportea gigas*. The fibre exhibited was prepared from the bark of this tree, which sometimes attains a height of eighty or one hundred feet. The wood of this tree is also fibrous and might be used in the manufacture of paper. The natives use the fibre obtained from the bark and roots for fishing-lines and nets. From still another variety of this family, the native nettle, *Urtica incisa*, a very good sample of paper was made. The pulp obtained from this plant is of a very fine texture, becomes a beautiful white color when bleached, and seems well suited to the manufacture of paper. There were also samples of paper and fibre from the paper mulberry, *Broussonetia papyrifera*, and China grass, *Bæhmeria nivea*, both members of the order Urticeæ, but too well known to need further comment here.

From plants of the order Malvaceæ were several specimens. First of these may be mentioned *Langunaria Patersoni*, the cowitch-tree of Norfolk Island, which is also indigenous to Queensland. The fibre obtained from the bark is fine, strong, and glossy, and can be used in the manufacture of a good grade of paper, as the sample accompanying it showed. From the bark of the Queensland hemp, *Sida retusa*, was a sample of good, strong fibre, suitable for the manufacture of paper, twine, etc. There was also a sample from the bark of Victorian hemp, *Sida pulchella*, a small shrubby tree, growing abundantly on various rivers in Victoria. It yields a fine bast, from which a strong fibre is obtained, suitable for paper and various purposes. From the hollyhock-tree of Queensland and New South Wales, *Hibiscus splendens*, were samples both of fibre and paper. This is an ornamental shrub, or small tree, but its bark is very rich in fibre suitable for paper and other purposes. Native to the same districts is the *Hibiscus heterophyllus*, from whose bark a quantity of good fibre is obtained suitable for the manufacture of paper, as was seen from the specimens exhibited. In addition to these native fibres were several specimens of the same order from South American plants naturalized. Among these were *Abutilon venosum*, *Abutilon mollis*, *Abutilon Bedfordianum*, and *Abutilon striatum*. The bark of all of these plants yields a quantity of fine fibre, which is said to be a good paper material.

From New Zealand was one specimen of the same family obtained from the bark of the ribbon-tree or lace-bark, *Plagianthus betulinus*. The bark of this tree is of a lace-like texture, and the fibre is very strong.

The largest number of Australian paper-fibre specimens was obtained from plants of the order Cyperaceæ. Many of these are familiarly known as rushes, or sedges, and are usually found near water-courses or lagoons. Among these may be mentioned the following: *Scirpus fluviatilis*, a species of club-rush of prolific growth, yielding an abundant supply of material for writing-, printing-, and packing-paper; a sample of this paper was also exhibited. *Carex appressa*, a sedge grass, which is also found in great abundance. The fibre is of strong, coarse texture, judging from the sample of paper, but with proper treatment it might be used for a finer grade of paper. *Cyperus lucidus*, the shining gallingall rush, which, like the plant mentioned above, grows very plentifully near water-courses, and can be readily gathered in paying quantities. It yields a large proportion of fibre of good quality, from which a strong packing-paper is made, as shown by the sample; but it might also be used for finer paper, if properly prepared. *Carex pseudo-cyperus* is often found growing with *Carex appressa*, but not in sufficient quantities to be practically available, although it is a good paper material, as the sample exhibited showed. *Gahnia psittacorum* is a kind of sword-grass, the leaves of which often attain a length of twelve feet. The paper made from this plant proves its value as a paper material, and the quantities in which it grows and the ease with which it is gathered make it practically available. *Cyperus vaginatus* grows in large quantities in sub-alpine situations. The paper exhibited was prepared from the stems and leaves, which yield a pulp suitable for writing-, printing-, and packing-paper. Paper was also exhibited manufactured from the stems and leaves of another species of sword-grass, *Lepidosperma elatius*. This plant attains its greatest perfection near water-courses in sub-alpine situations, where the leaves sometimes grow to be nine feet in length. It can be obtained in large quantities, and yields a strong fibre. The coast sword-rush, *Lepidosperma gladiatum*, grows very abundantly in barren, sandy soil, all along the coast-line. This is said to furnish one of the best fibres for paper-making that is found in Australia. Samples of paper made from this fibre attracted much attention in previous Exhibitions, and were also shown in the present one. Somewhat similar to this is the *Lepidosperma flexuosa*, slender sword-rush, known as mat-grass. It grows very plentifully in low-lying, swampy ground, and furnishes a strong fibre for paper-making. The

fibre prepared from *Cladium radula*, black reed or cutting grass, is strong, of good quality, and suitable for a paper material. This grass grows in great abundance in rich land, and can be obtained in any quantity.

Several fibres were exhibited obtained from plants belonging to the order Myrtaceæ. One of the most singular of these plants is the *Eucalyptus obliqua*, or stringy-bark-tree, as it is called by the colonists. The bark of this tree yields an extraordinary amount of fibre, and as it grows to an immense height and size, the diameter being sometimes ten feet or more, an almost unlimited supply can be obtained from it. The fibre is too harsh to use alone in paper-making, as the sample showed, but is of value when mixed with other material. The same may be said of the *Eucalyptus fissilis*, the messmate of the settlers. The paper prepared from the bark of the *Melaleuca ericifolia*, swamp-tea-tree, is very soft, and well suited for blotting-paper, on account of its absorbent qualities. This bark is easily obtained, and can be had in considerable quantities. These qualities belong to nearly all the varieties of Melaleucas. Paper from two other varieties, *Melaleuca genistifolia* and *Melaleuca squarosa*, was also exhibited.

From the order Sterculiaceæ the following valuable fibres were exhibited: From the bark of *Sterculia acerifolia*, the flame-tree of New South Wales, both fibre and bast. The bark on this tree is fully two inches in thickness, and the bast obtained from it is of a very fine, lace-like texture. The fibre is prepared by a very simple steeping process. From *Sterculia diversifolia*, the Victorian bottle-tree, a bast is obtained in large quantities, somewhat similar to the preceding, but coarser and darker in color. It is prepared in the same manner, as is also the fibre obtained from the bark of *Sterculia lucida*, a tree very much resembling the first named. The fibre from all of these barks is a good paper material. From the Queensland bottle-tree, *Sterculia rupestris*, a strong fibre is obtained suitable for paper-making. Another of the same family, *Commersonia Fraseri*, tie-plant, a tall-growing shrub, produces a bark that is extensively used by the settlers as a tying material. The fibre is fine, and can be obtained in large quantities. *Sterculia fatida*, also a native of the Indian and Malayan peninsulas, produces a good, strong fibre. In addition to the native fibres belonging to this family was an African one naturalized, *Dombeya Natalensis*, which produces a fibre suitable for paper-manufacture.

Of the order Gramineæ the three following specimens were exhibited: *Ehrharta tenacissima*, a wiry grass found growing on the uplands in large quantities, and furnishing material suitable for packing- and writing-paper; *Poa australis*, a rigid, erect-growing grass,

found principally near streams and in marshy places, and producing a good, strong fibre; and the *Arundo conspicua*, the Phune grass of New Zealand, from the leaves and stalks of which a good paper material is obtained. Paper also was exhibited made from these grasses.

From stems of plants of the order Juncagineæ, locally called rushes, four specimens were exhibited. *Isolepus nodosa*, a rush growing plentifully on river-banks and in marshy places; *Juncus maritimus*, the sea-coast rush, as its name indicates, found along the sea-coast and in salt-marshes; *Juncus vaginatus*, small-sheathed rush, and a larger variety of the same plant found along water-courses. All yield good paper material, particularly the last named, from which a large percentage of fibre is obtained.

Belonging to the order Liliaceæ, only two native fibres were exhibited. *Dianella latifolia* grows along the banks of creeks. In favorable situations its leaves, from which the fibre is obtained, grow to a length of six feet. Its growth is abundant and the yield of fibre large. *Dianella longifolia* somewhat resembles the former, but cannot be obtained in sufficient quantities to make its use profitable. Of naturalized fibres of this order were three varieties of *Yucca* from America, all noticeable for their strength. From the leaves of the famous dragon-tree of Teneriffe, *Dracæna Draco*, a strong, flexible fibre was exhibited, but as this tree grows very slowly, the fibre is not of practical use. This tree is remarkable for its prodigious longevity and immense size. The dragon-tree of Orotava is supposed to be the oldest plant on the globe, and its trunk is so large that ten men holding hands can scarcely reach around it. But the most valuable fibre plant of this order is *Phormium tenax*, or New Zealand flax, which very much resembles in appearance the *Yuccas* of America. This plant, as its name indicates, is a native of New Zealand, but its cultivation has been successfully introduced into Australia and a few other countries. Like its American relatives, the *Yuccas* already mentioned, it seems to flourish in almost any kind of soil, sandy, swampy, or rocky. Although not immediately productive, an almost unlimited supply of fibre can be obtained after a few years. A good paper material is obtained from it by a very simple process, but to obtain the finer fibres uninjured a more complicated process is necessary. The fibre is very strong, and produces a paper noticeable for its whiteness. This fibre is yearly coming into more general use for paper-making and textile purposes.

From the order Amaryllideæ three specimens were exhibited,—two from America, *Agave Americana* and *Fourcroya gigantea*. The

third, *Doryanthes excelsa*, spear lily, is a native of East Australia, and somewhat resembles the last-mentioned plant. Its leaves are one mass of strong fibre, which furnishes a good paper material.

In addition to these were specimens belonging to various orders, nearly all the plants being natives of Australia. From the native bulrush, *Typha angustifolia*, an abundant supply of material is obtained suitable for packing-paper, and apparently capable under favorable treatment of being made into the finer grades of paper. Fibre from the Jaggery palm, *Caryota urens*, which grows on the northeast coast of Australia, as well as in India, and also from *Pandanus utilis*, or screw pine. Paper from *Juncus pauciflorus*, which yields pulp suitable for fine paper, and also from a species of swamp moss. This latter material can be had in enormous quantities, as it completely covers the surface of the lagoons, and is easily gathered. It furnishes material from which a strong packing-paper is made. From *Xerotes longifolia*, the tussock grass of the colonists, a good packing-paper is also made. This grass grows abundantly, attains considerable length, and furnishes a large percentage of fibre. From the bark of *Pimelia axiflora*, the Currijong of the natives, were specimens of both fibre and paper. This plant is peculiar to extra-tropical Australia, and grows abundantly as underwood in the forests. It has a smooth, brown bark, very tough, and yielding a large amount of fibre suitable for paper of fine quality. Allied to this, but a native of South Africa, is *Dais cotinifolia*, from which also a specimen of paper was shown. The bark yields a good paper material of fine texture and white color. The plants of this order, Thymeleæ, all possess tenacious fibres. Of fibres naturalized from New Zealand were specimens of paper from *Pittosporum crassifolium*, and fibre from the leaves of a species of astelia. There were also fibres from two or three other naturalized plants, among which may be specially mentioned those prepared from the bark of *Sparmania Africana*. This fibre is of a fine silky texture and a beautiful silvery-white color. It is very easily prepared and suitable for textile fabrics, and hence indirectly available for paper stock. The plant produces two crops of canes a year, and they yield a large proportion of fibre.

In addition to the fibres exhibited from Victoria, there were also some from Queensland and New South Wales, but as they very much resembled those already mentioned, it is not necessary to give a further description of them.

In the Netherlands exhibit was quite a good display of fibres from their East Indian possessions, the most of them from the Botanical Museum at Biutenzorg, in the island of Java. These included dif-



ferent varieties of the Musæ, Malvaceæ, Urticeæ, Tiliaceæ, Sterculiaceæ, and others, all of which have been so fully described in the Indian and Australian exhibits that they do not need further mention here. These islands, like all this part of the world, are rich in fibrous plants, that need only to be known and properly treated to be valuable as textile materials.

The exhibit of fibres from China and Japan was small, both in number and variety. From China were several specimens of China grass and hemp, coir obtained from the outer covering of the coconut, and one specimen of pineapple hemp. The Japanese exhibit contained only specimens of jute, musa, and China grass, and two other varieties of nettle.

Spain exhibited several fibres, two of which, although well known, are worthy of especial mention. One, esparto grass, is a native of Spain; the other, *Musa textilis* or Manila hemp, is produced in its dependencies, the Philippine Islands. Esparto grass, known botanically as *Macrochloa tenacissima*, belongs to the order Gramineæ. It is found in Spain on all the lands facing and bordering the Mediterranean, where this wild grass or sedge is almost the only plant produced in the barren soil, but it gradually disappears as the fertile interior is reached. It has been long used by the natives for the manufacture of mats, baskets, etc., quite a trade being carried on in these articles. About fifteen years ago the scarcity of paper material in England induced paper-manufacturers to make the experiment of using esparto. As it proved a success, its use as paper stock has continued ever since, and now large quantities are consumed in England, France, and Belgium for this purpose. When used as paper material almost any quality can be employed, and hence only the wild grass has been manufactured into paper. Of late years the plant has been cultivated, which greatly improves it as a textile material; and it is now used in the manufacture of dress cloth, for some kinds of which it is said to be better adapted than cotton or flax. This cultivated esparto is much more valuable than the wild, which latter is rapidly decreasing in quantity from a careless method of gathering, and consequently it is yearly becoming less available for paper stock. A variety known as alfa grass, *Ligeum Spartium*, is indigenous to the opposite coast of Africa, but it is inferior in quality to the Spanish esparto.

The *Musa textilis*, from which the Manila hemp or Abaca of commerce is obtained, is the most valuable of all the musa family for its fibre-producing properties. In many respects its appearance differs entirely from other members of the musa family. The fibre is round,

silky-looking, and nearly white. It is also very long; one thread exhibited measured twelve feet eight inches. It is obtained from the petioles of the leaves, and is of different degrees of fineness, the fibre from the interior being much finer than the exterior fibre. Unlike other plants of this family, the *Musa textilis* is not allowed to blossom, as the fibre is much weakened in the process. The finer fibres are used for the manufacture of the most delicate tissues, the coarser for ropes, cordage, etc. In the manufacture of strong paper this fibre is one of the best substitutes for linen that has been found. The cultivation of the plant has been successfully introduced in some of the West India islands, and in India and the islands of the Indian Ocean it is said to grow as well as in its native islands. It is now one of the leading fibres of commerce, and the plants are cultivated on at least four hundred of the Philippine Islands. The whole of this Manila hemp produce is exported, the largest quantity to England, and some to the United States and Germany. Many samples of this fibre were on exhibition, not only from the Philippine Islands, but also from India, Mauritius, West Indies, etc.

There were also exhibited from Spain, fibres of palm, palmetto, junco, and nea, but the two latter of these have not yet been applied to paper stock.

In the Portuguese exhibit there was quite a fine display of flax and hemp, including many varieties in different stages of preparation. The fibres are too well known to claim attention here. From the African and Indian possessions of Portugal were several fibres that are almost unknown to commerce, and others that have been in use for some time. Among these latter may be mentioned pineapple filaments from Angola and Mozambique, Africa; banana fibre from Angola, where the plants grow spontaneously and in great abundance; and fibres from the leaves of the Dendem palm-tree from Cape Verd and Mozambique, Africa, and also from India. Among the plants that belong principally, if not entirely, to Africa, three may be especially mentioned. From the ife-tree, *Sansevieria Angolensis*, a native of Angola, a fibre is obtained which is used in the manufacture of cables and ropes. It is prepared very much in the same manner as flax. This tree belongs to the order Liliaceæ of the sub-tribe Alvineæ, which plants principally inhabit South Africa. Another fibre of tropical Africa is *Adansonia digitata*, baobab, called in Angola, whence the specimen was sent, imbondiero. This tree is remarkable for its size, and especially for the enormous thickness of the trunk, "the circumference being sometimes one hundred feet." It was formerly supposed that this tree grew very slowly and was very long lived, but the con-

trary is now known to be the fact. The fibre is obtained from the bark, is very strong, and is used for the manufacture of rope and also of coarse cloths, from which bags are made. From a plant of the order Asclepiadaceæ, called by the natives mundono, fibre is obtained that is used in Angola for the manufacture of a cloth which is a substitute for linen. From another plant, quiboca, a native of Angola, a fibre is obtained that very much resembles flax fibre in appearance. This plant frequently attains a height of over nine feet. The fibre is used for the manufacture of cloth and other articles. There were also several other fibres from Angola, among which those obtained from the following plants are worthy of mention: white and yellow quibori, quizunzo, quifuche, quifnei, and diolo. There were also quite a number from the Portuguese Indian possessions.

The exhibit of fibre in the British section was very large and complete, including as it did both East and West Indies and Australia, of which mention has already been made. Also included in this section was the exhibit of fibres from the Botanical Gardens in the island of Mauritius. The specimens numbered about fifty, and many of them well deserved mention. The specimens belonging to the musa family were more numerous than those of any other, and consisted of nine varieties. Some of these have already been described in other exhibits, as the musa textiles, *Musa paradisiaca*, and others; but *Strelitzia regina*, *Heliconia gigantæa*, and *Urania* (Ravenala) *Madagascariensis*, are new. *Strelitzia regina* is a native of South Africa, and *Heliconia gigantæa* of tropical America. *Ravenala Madagascariensis* is said to be the finest species of this family. Its popular name of travelers' tree is due to the reservoir of the leaf-sheaths, in which a limpid and fresh water collects, which may be obtained by pressing the base of the petiole. The pulpy aril of the seed, remarkable for its magnificent blue color, yields an abundant volatile oil. Like all of this family, the petioles of the leaves of these plants are formed of very tenacious fibres.

From the order Sterculiaceæ, in which so many of the Australian fibre plants were included, were several species, of which the following may be especially mentioned. *Theobroma cacao* is peculiar to America, but is cultivated in Asia and Africa. It is especially valuable for its seeds, from which are obtained a fixed and solid oil, called cacao butter, and other valuable products. There were also fibres from *Pterospermum acerifolium*, *Guazuma ulmifolia*, and *Melochia liliacefolia*, the last named belonging to South Africa.

Of palm fibres there were specimens from *Livistona mauritiana*, *Latania aurea*, *Sagus ruffia*, and *Sagus saccherifera*, the last two famil-

ially known as sago palms. There were four specimens of the genus *Sansevieria*, order Liliaceæ, *S. zebrina*, *S. Zeylanica*, *S. latifolia*, and *S. cylindrica*, all of which abound in extremely fine textile fibres. Of the order Pandaneæ there was only one specimen, *Pandanus utilis*. This is somewhat singular, as the number of species of this order in Mauritius, where they are called vacaos, is a remarkable botanical feature of the island. Of the genus *Ficus*, familiarly known as figs, there were four samples, all of which produce tenacious fibres similar to the Urticeæ. From the order Arvideæ were three specimens, *Colocasia antiquorum*, and two varieties of *Caladium*. The first named is a native of India, but from time immemorial has been cultivated by the Egyptians, and has spread all over the tropics. The varieties of *Colocasia* and *Caladium* are cultivated as ornamental plants for the size and elegance of the leaves. Of the genus *Dracæna* were two varieties, one belonging specially to Mauritius. Of the order Malvaceæ four varieties, and of Agaves from America three varieties, *A. Americana*, *A. Mexicana*, and *Fourcroya gigantea*.

Of miscellaneous plants the following may be mentioned: *Cordia myxa*, an Asiatic tree cultivated in very ancient times by the Egyptians for its medicinal properties; *Alpinia magnifica*, a plant which grows very abundantly in tropical Africa; *Ixora corylifolia*, of the order Rubiaceæ; and *Carludovica palmata*. This last-named plant belongs to the order Cyclantheæ, which grows exclusively in tropical America. *Carludovica* flourishes in the damp forests of Ecuador, Peru, and the United States of Colombia, South America. From the leaves a much-valued straw is obtained, which is used in the manufacture of Guayaquil or Panama hats. Many of these fibres have never been used as paper materials, but it would seem that some of them are worthy of a trial, especially those that are already extensively cultivated for other purposes. There was also a specimen of the well-known fibre plant *Bahmeria nivea*, and also of a species of mulberry, *Morus tartarica*.

One exhibit of paper stock from England proper is deserving of mention. This was a case from the Ford Works Company, containing samples of esparto, rice-straw, maize, New Zealand flax, refuse sugarcane, and bamboo. The samples were presented in different stages of preparation,—first in the natural state, then brown stock, then bleached half stuff, and finally in paper. The samples of paper were all clean and of good color. Among these samples those of the bamboo were especially noticeable. This has been used as a paper material for time out of mind by the Chinese and Japanese, but has never been utilized to any great extent by European manufacturers. If this

could be done it would furnish an almost unlimited supply of material. The *Bambusa vulgaris* is more generally distributed than any other variety, being found in abundance in both hemispheres. In India it grows in such profusion that it frequently forms impenetrable jungles, and in South America and the West Indies its cultivation has been successfully introduced. It is said that there are over one hundred and seventy varieties of bamboo, many of them familiarly known as canes, and wherever heat and moisture exist some species is generally found. In the United States some varieties are found in great abundance in what are locally known as cane-brakes, which are most frequent in the Southern States along river-banks and in swampy ground. Pulp manufactured from these canes has been in use for several years, three separate companies having been formed specially for its manufacture.

In the Belgian exhibit was a case of assorted paper stock sent by John Pfeffer. This consisted of eighty-four different grades, ranging from the finest white linen rags to samples of waste made up of old iron, broken glass, and old shoes. This exhibit showed a very good classification of paper stock. The exhibitor also claims that he is able to disinfect the stock by means of chemicals, so as to prevent any smell or danger from contagious diseases.

#### THE PAPER EXHIBITS.

It is to be regretted that the display of paper from the United States was not more complete. But very few of the numerous and extensive mills of the country were represented, and these were almost all Eastern establishments. This shows a very reprehensible indifference on the part of our manufacturers in regard to their present reputation and future business interest. However, the display, though small in quantity, was excellent in quality; in fact, the superiority of the leading exhibits was so marked that it seemed to leave nothing to be desired, and the excellence was so uniform that it is almost impossible to make any comparative report on standard American papers.

The exhibit of bond, ledger, and blank-book papers, of superfine linen for note-, letter-, and cap-papers, some of the latter in many tints, was superb, and not equaled by similar exhibits from other countries. The chromo, steel-plate, wood-cut, and book papers exhibited were very fine, and all that could be desired. The amount of blotting-paper displayed was small, but the quality was of the highest order. Of news-paper proper there was no exhibit, which is especially to be regretted, as the United States is a very large producer and consumer

of this grade of paper. Likewise, there was no exhibit of Manila paper proper, but the two or three exhibits of building-paper made from Manila stock were very good. Wrapping-paper was scarcely represented at all, and the display of card-board, Bristol-board, book-binders' and box-makers' board was very meagre, but of good quality. The two exhibits of tissue-paper were also of very good quality. Among the exhibits the following may be especially mentioned :

PORTER & BAINBRIDGE, *New York, N. Y.*

A large assortment of card stock of every description, and also a large variety of papers and envelopes of both foreign and domestic make.

RHODE ISLAND CARD-BOARD COMPANY, *Pawtucket, R. I.*

A variety of differently colored card-board, which was of good quality, possessing both hardness and elasticity.

W. O. DAVEY, *Fersey City, N. J.*

A lot of tar or binders' boards of excellent quality, the only display of the kind brought to my notice.

ZENAS CRANE, JR., *Dalton, Mass.*

White and tinted Bristol-boards of very good quality.

THE ANDROSCOGGIN PULP COMPANY, *Portland, Me.*

A good sample of wood-pulp, and also boxes made from the wood-pulp board. The boxes were not entered for competition, but were good of the kind.

CASE BROTHERS, *South Manchester, Conn.*

Press-boards, which were hard, strong, and of excellent quality, with the one exception that they were lumpy. A little more care in the preparation of the stock would have produced a No. 1 board.

MOUNT HOLLY PAPER COMPANY, *Mount Holly Springs, Pa.*

A small but very creditable display of ruled papers.

OWEN PAPER COMPANY, *Housatonic, Mass.*

One of the largest displays of writing-paper in the Exhibition, including a large line of their foreign correspondence, fancy rep, and drawing-paper. The papers were excellent in every point except sizing, which might have been better.

PARSONS PAPER COMPANY, *Holyoke, Mass.*

A good display of colored writing- and envelope-paper, which looked very well.

CRANE BROTHERS, *Westfield, Mass.*

Bank-ledger and record paper of excellent quality; also Japanese paper baskets and paper belting. These baskets are very good of their kind, and the belting can be used in a dry place. It is cheap and well made, and probably will do all that is claimed for it.

MEGARGEE BROTHERS, *Philadelphia, Pa.*

A good engine-sized paper, second quality, envelope-papers in all colors and shades, granite cover-papers, plate-papers, and assorted colored mediums.

JESSUP & MOORE, *Philadelphia, Pa.*

A very good line of copper-plate, lithograph, wood-cut, and super-calendered book-papers, all of which contained wood cellulose or chemically-prepared wood-pulp. They also exhibited printed samples of these papers, which looked very fine.

NASHUA CARD AND GLAZED PAPER COMPANY, *Nashua, N. H.*

Cut cards, a small lot of card-board stock, in sheets, and four or five rolls in colored stock. They also sent in a fine line of card-boards for examination, but as the goods were not on exhibition they could not be passed upon.

HURLBUT PAPER COMPANY, *South Lee, Mass.*

Several reams of flat and folded papers, very plain looking but of good quality.

WHITING PAPER COMPANY, *Holyoke, Mass.*

The finest paper display in the Exhibition. They exhibited about one hundred and seventy-five different styles of paper, put up in two hundred different styles of wrappers. Included in their display was a ream of the largest sheets of animal-sized, loft-dried paper ever made. It was six by eighteen feet, and from one ream of this paper five hundred thousand sheets of note-paper could be made.

JOSEPH PARKER, SON, & Co., *New Haven, Conn.*

About one hundred reams of their Treasury blotting-papers. These papers were the best of their kind on exhibition. They were tough,

possessed the necessary absorbing qualities in a high degree, and were of the first quality in every respect.

SEYMOUR PAPER COMPANY, *Windsor Locks, Conn.*

A large variety of cover and other colored papers, all of good quality.

BYRON WESTON, *Dalton, Mass.*

An elegant exhibit of first-class ledger-paper. There was no better paper in the Exhibition as to texture, strength, and finish.

CRANE & CO., *Dalton, Mass.*

Bank-note, bond, and parchment papers of excellent quality, strong, flexible, and well sized.

SOUTHWORTH COMPANY, *Mittineague, Mass.*

A beautiful display of clean and well-made paper, consisting of bank-ledger and different kinds of writing-papers. They were the cleanest and best-woven papers in the Exhibition.

L. L. BROWN PAPER COMPANY, *South Adams, Mass.*

A fine exhibit of ledger-papers. They were not as well woven as some others, though exceedingly well sized.

H. V. BUTLER, JR., & CO., *Paterson, N. J.*

A variety of papers, among which their silk copying-paper was noticed as being very fine. They also exhibited in rolls animal-sized paper, which enables map publishers and others to use large sheets of paper without pasting them together.

TILESTON & HOLLINGSWORTH, *Boston, Mass.*

A fine line of chromo, steel-plate, wood-cut, and calendered plate-papers, the finest of their kind on exhibition.

CHAPIN & GOULD, *Springfield, Mass.*, and CARSON & BROWN PAPER COMPANY, *Dalton, Mass.*

A creditable display of their lines of goods, but no specialties.

DENNISON & CO., *Boston, Mass., and New York, N. Y.*

Among other articles, a very fine tissue-paper, called Excelsior colored tissue.

In addition to these, the Haldeman Paper Company, Lockland, Ohio, exhibited a large line of roofing-papers; George P. Tangeman & Co., Hamilton, Ohio, four rolls of carpet-paper; T. Seymour Scott & Bro.,



Philadelphia, carpet- and building-paper; Joseph Stelwagon & Son, Philadelphia, roofing- and felt-papers; James Guie & Sons, Downingtown, Pennsylvania, exhibited paper-wrappers of excellent quality.

The exhibits from foreign countries were not as full as was desirable. England was very poorly represented, there being only three exhibits made. One of these—that of Robert Fletcher & Son—contained the finest colored tissue in the Exhibition.

The display from France was also small. She excelled, however, in photograph-papers and cheap engine-sized writing-papers.

The display from Germany consisted chiefly of a low grade of paper made from wood-pulp, both chemically and mechanically prepared.

The Austrian exhibit was limited in quantity. It contained but one exhibit of writing-paper; the display of cigarette-paper was very good.

The best display of any foreign nation was that of Spain. Including a variety of paper, it excelled especially in cigarette-papers.

From Russia there was a good exhibit, especially of writing-paper, which was strong and well made.

Italy displayed some good samples of hand-made paper. It possessed strength, but lacked finish, and did not indicate any great degree of progress.

Sweden displayed the finest lot of wrapping-paper in the Exhibition, and also some very good samples of wood-pulp, both chemically and mechanically prepared.

The Mexican exhibit contained some very good paper made from native fibres. As mentioned above, that made from Agave fibre was the strongest paper in the Exhibition. Egypt also exhibited specimens of paper made from native fibres, which were of very fair quality.

The exhibit of papers from both China and Japan was very creditable. Their papers, however, are adapted to their own peculiar uses, and are so different from those of Europe that they can scarcely be compared with them.

There were also exhibits of paper from some other countries, but these were not of sufficient superiority to merit particular mention.

In concluding this report I desire to say that I have hardly done more than to outline the paper and paper-making exhibits, with the classes of fibres which can be utilized directly or indirectly in the production of paper. The field is wide and affords much room for study and investigation, which it is to be hoped will be given to it by men who are devoted to these interests, and I shall be glad if, in this review of the exhibits, I have been able to direct more earnest attention to a subject of so great importance.

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# REPORTS ON AWARDS.

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## GROUP XIII.

1. **A. W. Faber, Stein, near Nuremberg, Bavaria, Germany.**

LEAD PENCILS, ARTISTS' PENCILS, AND COLORED PENCILS.

*Report.*—Commended for excellence of quality and workmanship, and uniformity in the various grades.

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2. **Schwanhäusser (formerly Grossberger & Kurz), Nuremberg, Germany.**

LEAD PENCILS, COLORED AND ARTISTS' PENCILS, AND CRAYONS.

*Report.*—Commended for the fine quality, beauty of finish, cheapness, and great variety of both lead and crayon pencils.

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3. **Poure, Gillot, O'Kelly, & Co., Boulogne-sur-Mer, France.**

STEEL PENS AND PEN-HOLDERS.

*Report.*—Commended for good quality and reasonable prices.

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4. **Leroy W. Fairchild & Co., New York, N. Y., U. S.**

GOLD PENS, GOLD PENCIL CASES, AND PEN-HOLDERS.

*Report.*—Commended for beauty of design, carefulness of finish, and excellence of workmanship; with special reference to the cases inlaid with pearl and precious stones.

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5. **Aikin, Lambert, & Co., New York, N. Y., U. S.**

GOLD PENS, CASES, AND PEN-HOLDERS.

*Report.*—Commended for solidity of construction, novelty and beauty of design, especially for the arrangement of the movement in the pencil and pen cases, by which the pencil is carried forward and the pen retired by one action.

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6. **Mabie, Todd, & Bard, New York, N. Y., U. S.**

GOLD PENS, CASES, PENCILS, AND HOLDERS.

*Report.*—Commended for general excellence, quality of workmanship, and elegant designs highly finished.

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7. **John Foley, New York, N. Y., U. S.**

GOLD PENS, PENCIL CASES, AND PEN-HOLDERS.

*Report.*—Commended for firmness, careful manufacture, and durability, with solidity of material.

## 8. John Holland, Cincinnati, Ohio, U. S.

GOLD PENS.

*Report.*—Commended for superior elasticity and general excellence of gold pens, combined with economy.

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## 9. Esterbrook Steel Pen Manufacturing Co., Camden, N. J., U. S.

STEEL PENS.

*Report.*—Commended for excellent and uniform quality, great variety, and low price.

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## 10. The Joseph Dixon Crucible Co., Jersey City, N. J., U. S.

LEAD PENCILS.

*Report.*—Commended for the superior quality of pencils from American graphite; their smoothness, durability, and uniformity in various grades.

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## 11. Eagle Pencil Co., New York, N. Y., U. S.

LEAD AND OTHER PENCILS.

*Report.*—Commended for aquarelle pencils as a substitute for water-colors; for cheapness and good quality of lead pencils.

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## 12. Bender &amp; Phillips, Hohokus, N. J., U. S.

SHEET WAX.

*Report.*—Commended for strength and pliability.

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## 13. Daniel M. Somers, Brooklyn, N. Y., U. S.

PEN-HOLDERS.

*Report.*—Commended for novelty in many of the designs, good workmanship, superior finish and reasonable price.

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## 14. Eberhard Faber, New York, N. Y., U. S.

STATIONERS' RUBBER GOODS.

*Report.*—Commended for the superior quality of the elastic bands, ink-erasers, rubber heads, and other vulcanized rubber goods for stationers' use.

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## 15. Geo. F. Hawkes, New York, N. Y., U. S.

GOLD PEN AND FOUNTAIN HOLDER.

*Report.*—Commended for ingenuity, and carefulness of construction of the patent fountain holders.

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## 16. Janentzky &amp; Co., Philadelphia, Pa., U. S.

ARTISTS' MATERIALS.

*Report.*—Commended for general excellence of artists' supplies; brilliancy of colors, judicious selection and adaptation of materials, and carefulness in manufacture.

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## 17. Nicholas Muller's Sons, New York, N. Y., U. S.

BRONZE INKSTANDS.

*Report.*—Commended for novelty and beauty of design and elegant finish.

## 18. G. K. Cooke &amp; Co., New York, N. Y., U. S.

## REVOLVING HAND-STAMP.

*Report.*—Commended for rapidity of action, neatness of construction, and general adaptability, of rotary hand-stamps for bankers, railway companies, and commercial houses.

## 19. Brower Brothers, New York, N. Y., U. S.

## INKSTANDS.

*Report.*—Commended for originality, utility, and general advantages, of the Euroid inkstand; especially adapted for use in the library, the hall, the desk, or the counting-house; stands very solid, not easily upset; economical; protects ink from atmospheric action.

## 20. Wm. A. Amberg, New York, N. Y., U. S.

## CABINET LETTER-FILE AND SELF-INDEXING FILES AND BINDERS.

*Report.*—It is an excellent arrangement for classifying and binding letters and commercial papers, without folding, whereby they may be conveniently referred to without being indexed or numbered.

## 21. Geo. W. McGill, New York, N. Y., U. S.

## PAPER FASTENERS.

*Report.*—Commended for their fitness and convenience for the purposes designed, and their adaptability to public wants, and for great variety for many purposes.

## 22. E. W. Woodruff, Washington, D. C., U. S.

## FILE HOLDERS.

*Report.*—The file is so constructed that it is capable of holding a variable number of letters or papers. It is easy of access and convenient for reference. It is also capable of being changed into any size and placed in a cabinet or upon shelves.

## 23. H. Pensel &amp; Co. (successor), Ludwigstadt, Bavaria, Germany.

## SLATES FOR SCHOOLS AND COUNTING-ROOMS.

*Report.*—Commended for softness, smoothness, and general finish.

## 24. G. F. C. Beisbarth Son, Nuremberg, Bavaria, Germany.

## PENCILS AND ARTISTS' BRUSHES.

*Report.*—Commended for superior quality and finish, carefulness of manufacture, and large and varied assortment.

## 25. Marcus Ward &amp; Co., London, England.

## STATIONERY FOR THE DESK, WRITING-PAPERS, AND ENVELOPES.

*Report.*—Commended for the general excellence of the articles exhibited.

## 26. Samuel Darling, Providence, R. I., U. S.

## FOUNTAIN INKSTAND WITH PEN-GAUGE DIPPING-CUP.

*Report.*—This inkstand is made of glass, porcelain, bronze, or other material, in any desired form, and the ink is contained in an elastic vulcanized rubber fountain, the amount of ink in the dipping-cup being regulated by a thumb-screw. As there is never any air in the ink reservoir, the ink is not liable to thicken, but is at all times fresh. This inkstand has been used by the committee, and has given great satisfaction.

27. The Hart, Bliven, & Mead Manufacturing Co., New York, N. Y., and Kensington, Conn., U. S.

## STATIONERY HARDWARE.

*Report.*—Commended for good quality, beauty of design, and fine finish. The ink-stands, pen-racks, and paper-files are cheap, being of imitation bronze.

28. William Lyons, Manchester, England.

## SEALING WAX.

*Report.*—Commended for superior quality, purity, hardness in hot climate, and freedom from blister when exposed to the sun.

29. Parkhurst & Gridley, Newark, N. J., U. S.

## GENERAL SHAWL AND BOOK STRAP.

*Report.*—An entirely new article, that wholly dispenses with the use of buckles and tuck straps, by the use of studs and protecting caps.

30. Alexander Pirie & Sons, Aberdeen, Scotland.

## PAPERS.

*Report.*—The writing, enameled, rep, and other fancy papers of this celebrated house are very handsome in appearance, and are well sized.

The colors are exceptionally fine, and are not excelled by any in the Exhibition.

31. Samuel Raynor & Co., New York, N. Y., U. S.

## ENVELOPES OF EVERY VARIETY OF QUALITY, FORM, AND SHAPE.

*Report.*—Commended for the greatest variety of envelopes in quality, form, and shape, more than twelve hundred different sorts being manufactured by the exhibitors; produced from paper manufactured from jute, rope, manilla, wood, rag, linen; also parchment, and cloth lined. All well made and well gummed.

32. Joseph Parker, Son, & Co., New Haven, Conn., U. S.

## "COMMERCIAL" AND "TREASURY" BLOTTING-PAPER.

*Report.*—This exhibit contains blotting-paper of two qualities, "commercial" and "treasury," white and of various colors, and of various thicknesses from light to the heaviest manufactured. The "treasury" grade, in cleanliness or freedom from fibre-dust, in toughness, in pliability, and in absorbent quality, surpasses all other blotting-paper brought to our notice in the Exhibition. The colors are varied and excellent, the absorbent capacity extraordinary and conducive to economy in use.

33. Byron Weston, Dalton, Mass., U. S.

## LEDGER AND RECORD PAPERS.

*Report.*—This exhibit of pearl and white, vellum and laid, ledger and record papers, is one of remarkable excellence. The colors are excellent, the assorting careful, the fibre long and tough, and the paper thoroughly sized. The finish is all that can be desired.

34. Southworth Co., Mittineague, Mass., U. S.

## PAPER.

*Report.*—This exhibit contains ledger, letter, and various writing papers, all of the best quality in every respect, and remarkably free from imperfection of any kind; all of which show great skill and care in manufacturing.

## 35. Crane &amp; Co., Dalton, Mass., U. S.

PAPER.

*Report.*—This exhibit contains bank-note, bond, and parchment papers. The bond papers are strong, flexible, and well sized. The bank-note paper, being the only exhibit made by a manufacturer and claimed to be for bank-note purposes, cannot be reported on as regards comparative merits. It is, however, entitled to a premium for its intrinsic merits, which are all that are required in a genuine bank-note paper.

## 36. Crane Brothers, Westfield, Mass., U. S.

PAPER.

*Report.*—This exhibit contains ledger, flat cap, and letter papers, all of which are thoroughly sized and of sufficient strength. Their other qualities are excellent.

## 37. Whiting Paper Co., Holyoke, Mass., U. S.

LEDGER AND FANCY AND COLORED WRITING PAPERS.

*Report.*—The ledger papers are of unusual length and strength of fibre, insuring toughness; they are strongly sized and of even finish and good color. The colored and fancy marked papers are of handsome colors, delicate tints, and tasteful designs and finish. The whole exhibit, in its fullness and variety, shows a thorough knowledge of the details appertaining to paper-making and the public wants of that character.

## 38. Megargee Brothers, Philadelphia, Pa., U. S.

PLATE, ENVELOPE, WRITING, AND COLORED PAPERS.

*Report.*—This exhibit is notable and meritorious mainly for the variety and excellence of the colors and qualities of its medium and cheaper grades of paper. The granite papers especially are remarkable for their variety and beauty. The books and printed specimens submitted, showing the adaptability of the papers of this exhibit to the purposes for which they were intended, are entirely satisfactory.

## 39. L. L. Brown Paper Co., South Adams, Mass., U. S.

PAPER.

*Report.*—This exhibit contains bond, ledger, and bank-folio papers, both wove and laid. The bond is good and well sized. The other papers are all remarkable for good qualities; the ledger papers possessing unusual strength and beauty, and a sizing that resists the severest tests of erasure and re-writing.

## 40. Munich-Dauchau Machine Paper Co., Munich, Germany.

PAPER.

*Report.*—A very extensive exhibit of almost every needed variety of paper, at very low prices.

## 41. J. H. Munktell, Grycksbo, Falun, Sweden.

PAPER.

*Report.*—This exhibit contains good writing paper, and excellent drawing and ledger papers which appear to be of the best quality.

## 42. M. Mayer, Coblenz, Germany.

## ENVELOPES.

*Report.*—The envelopes in this exhibit are of good material and excellent workmanship, and are presented in a great variety of styles, adapted both to general and special purposes.

## 43. Juan Romani &amp; Purgdengolas, Capellades, Barcelona, Spain.

## PAPER.

*Report.*—This is an exhibit of hand-made papers, containing light and heavy cap and letter and record paper. All of these are remarkable for good color, strength, and sizing, and are amongst the best papers of the kind brought to our notice in the Exhibition.

## 44. Hurlbut Paper Co., South Lee, Mass., U. S.

## FINE PAPER.

*Report.*—This exhibit contains writing and blank-book papers and cardboard, all excellent, of good color and finish, strong, and well sized. These qualities denote superior knowledge and skill in manufacture.

## 45. Blanchet Brothers &amp; Kleber, Paris, France.

## PHOTOGRAPHIC AND WRITING PAPER.

*Report.*—This exhibit contains, as a specialty, photographic paper, which is of the best quality, and free, to all appearances, from metallic and other imperfections, the freedom from which is essential to good photographic paper. Many paper manufacturers have failed in their photographic paper on account of the difficulty of avoiding such imperfections, and the overcoming of this difficulty is evidence of science, skill, and care. There is shown, also, engine-sized writing paper of very superior quality.

## 46. Eichmann &amp; Co., Arnau-on-the-Elbe, Austria.

## PAPER.

*Report.*—This exhibit comprises letter, note, drawing, fancy colored, card, cover, and a variety of other papers. The variety is very great, and all the papers are uniformly good.

## 47. John Epstein, Soczewka, Warsaw, Russia.

## PAPER.

*Report.*—Writing, plate, and blotting paper, each of excellent quality of its kind.

## 48. Mirskowski Paper Mill Co., Wieruszew, Calisz, Russia.

## PAPER.

*Report.*—A large variety of papers, including book, writing, and cigarette paper, all attesting the ability of the establishment to meet the public wants.

## 49. Vargoonin Brothers, St. Petersburg, Russia.

## PAPER.

*Report.*—This exhibit contains a large variety of papers, the chief of which are drawing, cap writing, letter, note, white and cream tinted book, plate, and cigarette. The papers are very good, of good colors, and well sized, and are remarkable for the excellence of the stock of which they are composed.



## 50. Capdevila &amp; Co., Barcelona, Spain.

PAPER.

*Report.*—This exhibit contains letter, note, folio, ledger, cardboard, and cigarette papers. These are all of good color, strength, sizing, and finish; and the exhibit, as a whole, is exceptionally good.

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## 51. Cristobal Vila &amp; Son, Capellades, Barcelona, Spain.

PAPER.

*Report.*—This is an exhibit of cigarette paper, and contains specimens variously flavored, as with balsam, liquorice, water-cresses, etc. The natural aroma and flavor of these are very perfectly preserved.

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## 52. Blanes Brothers, Alcoy, Alicante, Spain.

PAPER.

*Report.*—This exhibit contains cigarette paper, part apparently of pure linen stock, and part of linen and straw mixed. Both styles are excellent.

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## 53. José Mora Gavarro, Bocairente, Valencia, Spain.

PAPER.

*Report.*—There are three grades of cigarette paper, all exceptionally good.

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## 54. Rafael Comas Delgado, Onteniente, Valencia, Spain.

PAPER.

*Report.*—This exhibit contains a large variety of cigarette papers, all of which are light, strong, and apparently pure. The exhibit is exceptionally good.

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## 55. Widow and Son of Ferrer, Alcoy, Alicante, Spain.

PAPER.

*Report.*—There are three grades of cigarette paper, all excellent. They are light, strong, and apparently pure.

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## 56. Pedro Rius &amp; Co., Barcelona, Spain.

PAPER.

*Report.*—This is an exhibit of cigarette paper, remarkable for strength. The other qualities are very good.

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## 57. Robert Fletcher &amp; Son, Kersley Paper Works, Stoneclough, near Manchester, England.

WHITE AND COLORED AND TISSUE PAPER.

*Report.*—This exhibit of colored tissue and silvered papers is truly admirable and surpasses any other of its kind in the Exhibition. The paper is good, and the colors fine, varied, and remarkably well graduated. The tasteful arrangement of this display challenges the visitor's admiration.

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## 58. Charles J. Cohen, Philadelphia, Pa., U. S.

OILED PAPER, AND PORCUPINE QUILLS.

*Report.*—Commended for excellence of the quality, careful manufacture, and economy of oiled paper for copying-presses. Careful selection and preparation of the porcupine quills.

## 59. Benfield, Brecker, &amp; Co., City of Mexico, Mexico.

PAPER.

*Report.*—An exceedingly tough and strong paper, retaining in a most remarkable degree the original strength of the fibrous material from which it is made.

## 60. Ostersetzer Brothers, Vienna, Austria.

LACE PAPER.

*Report.*—Bouquet-holders of lace paper, tastefully arranged and well adapted for the purpose intended.

## 61. Imperial Maritime Customs, China.

PITH PAPER.

*Report.*—This is the only exhibit found of pith paper for fine artistic work. It is perfectly clear and even in thickness, and is perfect of its kind.

## 62. National Museum of Egypt, Cairo, Egypt.

WRITING AND PRINTING PAPER.

*Report.*—The manufacture of machine-made paper is new in Egypt, and denotes material progress among the Egyptians. The National Museum exhibits paper of natural color made from banana leaves, and also a fair paper made from "halfa," a species of swamp rush. These are both new raw materials in actual paper manufacture, and reported to us as cheaper than rags as paper stock. The writing papers exhibited are of common quality, but are well manufactured. I think the National Museum entitled to an award for an excellent beginning in paper manufacture in Egypt.

## 63. Ivanhoe Manufacturing Co., Paterson, N. J., U. S.

PAPER.

*Report.*—This exhibit contains thin super-calendered book paper, both white and toned; white and colored folios, known as French folios; and copying paper. The thin book papers are among the best on exhibition; the French folios remarkable for all the desirable qualities in such papers, viz., beauty, finish, strength, and good sizing; and the copying paper, of remarkably good color and finish, being the best white paper of its kind exhibited.

## 64. Seymour Paper Co., Windsor Locks, Conn., U. S.

PAPER.

*Report.*—This exhibit contains colored cover-paper of three different grades, each excellent in its degree; blotting paper of good quality; granite and marble papers remarkably strong and well finished; and book and chromo papers well adapted to fine printing with type and cuts. The books and printed specimens presented afford good evidence of the excellence of the papers. An award is merited for the general excellence of the exhibit.

## 65. Tileston &amp; Hollingsworth, Boston, Mass., U. S.

PLATE AND CHROMO PAPER.

*Report.*—This exhibit contains steel-plate, chromo, and wood-cut papers, calendered and super-calendered. Even the thickest of these, which are the most difficult to manufacture, leave nothing to be desired. It is but just to say of the entire exhibit that it is exceptionally superior in every respect.

## 66. Jessup &amp; Moore, Philadelphia, Pa., U. S.

## PAPER.

*Report.*—This exhibit comprises copper-plate, lithograph, atlas, book, and news papers; also specimens of chemically prepared wood pulp. The latter is the best prepared, the most free from all that is not pure cellulose, and the most valuable article of its kind on exhibition. The super-calendered book papers, comprising several beautifully tinted and unlike any other exhibited, are much to be admired. The copper-plate, lithograph, and atlas papers are proved to be excellent by the books and specimens submitted for examination. The first quality of super-calendered white book paper is very meritorious.

## 67. Joint Stock Co. of I. R. Chartered Paper Manufactory, Schlöglmühl, Vienna, Austria.

## PAPER.

*Report.*—It is a roll of newspaper reeled for a perfecting press. The paper is remarkably well sized, is hard, of good quality, and is admirably well reeled for good press work.

## 68. Fialkowski Brothers &amp; Twerdy, Bielitz, Austria.

## PAPER.

*Report.*—This exhibit is of ordinary printing and cover papers, and is remarkable for the great variety and excellence of its colors.

The prices attached are low for the grades of paper.

## 69. Jas. Guie &amp; Sons, Downingtown, Pa., U. S.

## PAPER WRAPPERS.

*Report.*—This exhibit is of large and heavy wrappers for paper-makers' use. The wrappers are made of excellent stock, long, strong, and pliable, and are admirably adapted to the purpose for which they are intended.

## 70. John Pfeffer &amp; Co., Ghent, Belgium.

## PAPER STOCK.

*Report.*—Commended for a system of grading and classification of rags for paper stock.

## 71. Canada Paper Co., Montreal, Canada.

## PAPER.

*Report.*—This is an exhibit of printing, envelope, blotting, and wrapping papers; all of good quality in their respective classes.

## 72. Sundry Provinces of Japan.

## PAPERS.

*Report.*—This exhibit is of great interest, as it presents a number and variety of papers not commonly known, many of which have remarkable intrinsic merit. Among these are—

1st. A paper imitation of grained morocco. This is a true imitation, being scarcely distinguishable from the genuine morocco. It is varnished in the most superior manner, equally well grained, flexible as morocco, and nearly as strong. The fibre is very strong and lengthy, and is described as being of the inner mulberry bark.

2d. Wall papers of various designs, some of which are faced with mica to afford lustre. This description of paper has been long used in Japan.

3d. Carpet paper, oiled and gilt to imitate leather flooring. These are remarkable for

strength, quality, design, and excellence of workmanship, and promise to be very serviceable. Transparent papers of great excellence, some of which are imitation of tortoise-shell.

4th. Writing papers to be written on with the usual Japanese brush, as this is universally employed instead of the pen.

5th. A variety of gilt and fancy papers, plain and embossed, all showing taste and care.

6th. Paper handkerchiefs and napkins, designed to be once used and discarded; they are soft and pleasant to feel, and seem adapted to answer well their purposes.

7th. Book paper for printing.

The whole exhibit is certainly very meritorious, and worthy of a complete description, such as would be too lengthy for this paper of recommendation.

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73. Owen Paper Co., Housatonic, Mass., U. S.

PAPER.

*Report.*—This exhibit comprises ledger, bond, exchange cap, policy, letter, and tinted papers, and is one of remarkable beauty and variety; its series of tinted writing papers being the richest in variety in the Exhibition. The parchment letter paper and exchange cap are very superior and well sized, and the papers generally need but a little stronger sizing to make them in all respects equal to any exhibited.

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74. A. Reed & Co., Philadelphia, Pa., U. S.

ORNAMENTAL BOOK-BINDING.

*Report.*—An exhibit of beautifully bound books, in a great variety of styles, all at reasonable prices.

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75. I. R. Beckett & R. Cervi, Cambridge, Mass., U. S.

BOOK-BINDING.

*Report.*—This is a unique and altogether praiseworthy exhibit, being the work of two journeymen, done out of working hours. The binding is all exquisite, and evinces not only a desire to improve on the part of the exhibitors, but an ability to originate and complete designs without outside aid. The exhibit furnishes an example worthy of imitation by workmen, of encouragement by employers, and of hearty recognition by the Centennial Commission.

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76. Oldach & Mergenthaler, Philadelphia, Pa., U. S.

BOOK-BINDING.

*Report.*—Commended for book-binding of general uniform excellence, at a moderate price.

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77. Gustav Fritzsche, Leipsic, Germany.

BOOK-BINDING.

*Report.*—In relation to the purposes intended, good quality combined with economy.

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78. Geo. W. Martin, Topeka, Kansas, U. S.

BOOK-BINDING, SPECIMEN OF RULING AND BINDING.

*Report.*—A seven-quire medium book, prepared for show. The cut is tastefully printed, and binding and ruling faultless.

## 79. American Baptist Publication Society, Philadelphia, Pa., U. S.

## BOOK-BINDING.

*Report.*—A large display of books in elegant bindings of the richest material, crushed levant, pearl, inlaid, velvet, etc.

The juvenile books are specially commendable for their durable cloth binding, general excellence of printing, and moderate cost.

## 80. D. Appleton &amp; Co., Philadelphia, Pa., and New York, N. Y., U. S.

## BOOK-BINDING.

*Report.*—Commended for the general excellence and elegance of the entire exhibit, which is the product of their own printing-office and bindery. The progress in the art of book-making is well illustrated in this exhibit by comparing the first book issued by the founder of this house in 1831 (a copy being shown) with the splendid exhibition now made of the educated taste and skill of the printer and binder, in the display of superbly printed illustrated books in crushed levant, vellum, and other fine bindings.

The school books in half vellum and the scientific books in superior style are a marked feature in this exhibit.

## 81. American Tract Society, New York, N. Y., U. S.

## BOOK-BINDING.

*Report.*—The specialty of this exhibit is the display of Bibles in flexible backs, which are the best brought to our notice in the Exhibition.

The leather used is of American manufacture, and is remarkable for its resistance to tensile force exerted to tear or crack it.

## 82. William Mann, Philadelphia, Pa., U. S.

## COPYING PAPER AND BLANK BOOKS.

*Report.*—The copying paper is of an exceedingly sensitive and impressible nature, capable of receiving and retaining fifteen distinct copies of one written original, and the blank books are of first-class excellence in every respect.

## 83. W. W. Harding, Philadelphia, Pa., U. S.

## BIBLES AND ALBUMS—PAPER-MAKING, PRINTING, AND BOOK-BINDING.

*Report.*—The Bibles shown in this exhibit are the product of the paper mill, printing-office, and book-bindery of the exhibitor, and the work in each department is first-class of its kind, and the prices reasonable. The photograph albums, with a so-called "chain back," are a notable feature of this exhibit.

## 84. Ignatius Kohler, Philadelphia, Pa., U. S.

## BOOK-BINDING.

*Report.*—Remarkable specimens of hand-tooled book-binders' work.

## 85. J. B. Lippincott &amp; Co., Philadelphia, Pa., U. S.

## BOOK-BINDING AND PRINTING.

*Report.*—This exhibit is remarkable for its wide range in book-making, apparently covering the entire field, including blank books of great merit, school, law, medical, theological, and miscellaneous books, furnishing examples of almost every desirable style of printing and binding, and showing in both the typography and binding great fertility in designing and consummate art in the execution of printers' and binders' work.

## 86. Wm. F. Murphy's Sons, Philadelphia, Pa., U. S.

BLANK BOOKS.

*Report.*—It is evident that the most careful attention is paid to the minutest detail in the work shown in this exhibit, resulting in the highest degree of excellence, while the prices are moderate, thereby appreciating and meeting the demands of the public.

## 87. H. O. Houghton &amp; Co., Riverside Press, Cambridge, Mass., U. S.

BOOK-BINDING AND PRINTING.

*Report.*—Commended for an exceedingly rich and varied display of elegantly printed and bound books. In every style good taste predominates; and in the illuminated vellum books book-binding and decorating are elevated from a trade to a place among the fine arts.

## 88. Leusinger &amp; Sons, Rio de Janeiro, Brazil.

BLANK BOOKS, ALBUMS, PRINTED AND BOUND BOOKS, AND COMMERCIAL PRINTING.

*Report.*—A good variety of well printed and bound books, showing an educated familiarity with the details of book-making in all its branches.

## 89. J. Seckler, San Paulo, Brazil.

BLANK BOOKS AND PRINTING.

*Report.*—Well-executed work and admirably suited to the public wants.

## 90. Francis &amp; Loutrel, New York, N. Y., U. S.

BLANK BOOKS.

*Report.*—Commended for well-made substantial blank books, with improved moulded backs.

## 91. Moss &amp; Co., Philadelphia, Pa., U. S.

BLANK BOOKS AND BOOK-BINDING.

*Report.*—Blank books, of both plain and more elaborate style of manufacture; all well done and at a moderate cost. Printed books in a variety of elegant bindings.

## 92. Sanford &amp; Co., Cleveland, Ohio, U. S.

BLANK BOOKS.

*Report.*—The books in this exhibit show the greatest skill and care in ruling, being the most perfect specimens of fancy ruling brought to our notice. The binding is elaborate and substantial.

## 93. Thomas Richards, Sydney, New South Wales, Australia.

BLANK BOOKS—BOOK-BINDING AND PRINTING.

*Report.*—The entire work is of a creditable and praiseworthy character.

## 94. John D. Mets, Dubuque, Iowa, U. S.

BLANK BOOKS, WITH PATENT ENDS AND SIDES.

*Report.*—Admirably made book, aside from the patent improvement as claimed.

## 95. Scribner, Armstrong, &amp; Co., New York, N. Y., U. S.

## BOOKS.

*Report.*—All the leading styles of the best classes of book-making are here represented; and the elegance of the typography of such books as "Bryant's History" and "The Myths of the Rhine" places this exhibit among the most praiseworthy in the Exhibition.

## 96. Porter &amp; Coates, Philadelphia, Pa., U. S.

## BOOKS.

*Report.*—Commended for the originality of design in styles of binding; the great beauty of the printing of the illustrated books; and the general excellence of the mechanical execution of the entire collection, the binding being specially noteworthy as combining beauty with durability.

## 97. Miller's Bible and Publishing House, Philadelphia, Pa., U. S.

## BIBLES.

*Report.*—Commended as an exhibition of superbly bound Bibles, showing great taste and skill in the highest styles of the book-binder's art.

## 98. Allen, Lane, &amp; Scott, and J. W. Lauderbach, Philadelphia, Pa., U. S.

## AN ILLUSTRATED BOOK, "A CENTURY AFTER."

*Report.*—The engraving and printing of this beautiful book were done in the offices of the firm, and are first-class in quality, bearing witness to the proficiency of the members of the firm in the branch of book-making which each represents.

## 99. J. M. Stoddart &amp; Co., Philadelphia, Pa., U. S.

## BOOKS.

*Report.*—Commended because that, in the combination of steel-plate printing and letter-press, as shown in the "Gallery of Famous Poets" and the "Gallery of Famous Women," books of rare typographical beauty are produced, the printing, binding, and paper being apparently faultless. Great credit is also due to the publishers for furnishing, in such handsome styles and at moderate prices, such valuable books as "The Encyclopædia Britannica" and Hogarth's works.

## 100. François Vitè, Berlin, Germany.

## PHOTOGRAPH ALBUMS.

*Report.*—Commended for elegant and substantial work at very moderate prices.

## 101. J. C. König &amp; Ebhardt, Hanover, Germany.

## ACCOUNT BOOKS.

*Report.*—Well-executed work at cheap prices.

## 102. Koch, Sons, &amp; Co., New York, N. Y., U. S.

## GUARD BOOKS AND SCRAP BOOKS.

*Report.*—Commended for improved arrangement in the manufacture of guards for scrap and other guard books.

## 103. A. J. Holman &amp; Co., Philadelphia, Pa., U. S.

## BOOK-BINDING OF BIBLES AND ALBUMS.

*Report.*—This exhibit is especially noteworthy for the beauty and variety of Bibles and photograph albums displayed. The printing of the Bibles is admirably done, and the binding of both Bibles and albums is varied with good taste to meet the wants of customers; the prices of all being extremely reasonable.

## 104. Lindsay &amp; Blakiston, Philadelphia, Pa., U. S.

## BOOKS.

*Report.*—Commended for an admirably well printed and bound collection of medical books, which, in style of manufacture and price, are adapted to the wants of the customers for whom they are designed.

## 105. The American Bible Society, New York, N. Y., U. S.

## BIBLES AND TESTAMENTS.

*Report.*—This exhibit displays thirteen sizes of Bibles in various bindings, the printing of all of which is remarkably good, and the prices low, adapting them to the general wants of the public.

## 106. G. P. Putnam's Sons, New York, N. Y., U. S.

## BOOKS.

*Report.*—Commended for the taste and skill displayed in books, handsomely printed and illustrated, and in fine style of binding.

## 107. Harper Brothers, New York, N. Y., U. S.

## BOOKS.

*Report.*—Commended for the extensive display of books adapted in style and price to the wants of the public; the exceptional typographical excellence of many of the illustrated books; the wood-cut printing of the picture papers, and the map printing of the school geographies.

## 108. H. Dessain, Malines, Belgium.

## BOOKS.

*Report.*—This exhibit is entirely of religious books, many of which display great merit in styles of type, and combination of type and colored inks.

The best features of antique books of this character are well produced, and the bindings are tasteful and good.

## 109. Library Club, Paris, France.

## BOOKS AND PAPER.

*Report.*—This is a collective exhibit made by the Library Club, and contains books, electrotyped and stereotyped plates, a complete set of printers' furniture, and samples of various styles of papers from several of the principal manufacturers of France, representing in all nearly fifty producers of books and of the different elements that enter into the completed book. The club displays a combination of excellent book and plate paper, choice types, rich illuminations, excellent bindings, and superfine security papers elaborately water-marked.



## 110. The Methodist Book Concern, New York, N. Y., and Cincinnati, Ohio, U. S.

BOOKS.

*Report.*—A large exhibit of very finely printed and bound books, consisting of Bibles, hymn books, and religious publications.

## 111. Netherlands Booksellers' Association, Amsterdam, Netherlands.

BOOKS.

*Report.*—This is a collective exhibit of books contributed by various book publishers of the Netherlands. There is no departure from styles of paper, type, and binding in use thirty years ago in that country, but the exhibit as a whole is, in regard to those features, good.

## 112. Government Exhibits of Egypt.

BOOKS IN MANY LANGUAGES.

*Report.*—Commended for the general excellence of the typography.

## 113. Duchet &amp; Co., Paris, France.

BOOKS.

*Report.*—This exhibit is principally of large volumes of illustrated art; paper excellent and durable; binding mainly in half calf, simple, strong, and proper; and type, of older style, clear and according to good taste.

## 114. Dunod, Paris, France.

BOOKS.

*Report.*—The general character of the books is fair, and the paper not fine but good and strong, and the exhibit contains a few books excellent in all mechanical respects.

## 115. A. Ballue, Paris, France.

BOOKS.

*Report.*—This is an exhibit of large illustrated works in all-leather binding; the plate paper is both good and strong, and the binding, though plain, is tasteful, strong, and suitable for its purpose.

## 116. Ch. Delagrave, Paris, France.

BOOKS.

*Report.*—This exhibit is chiefly of educational books, paper generally not fine but strong and durable, and the type clear; binding plain, durable, and well suited for its purpose.

## 117. Librairie Morel, Paris, France.

BOOKS.

*Report.*—This exhibit of books contains mostly illustrations of art and architecture, bound in half leather. The paper and type are excellent, and the binding simple, strong, and in good taste. One very large volume in particular, illustrations of Arabic life and art, size forty-nine by sixty-two centimetres, is exceptionally meritorious.



## 118. J. Baudry, Paris, France.

## BOOKS.

*Report.*—This exhibit is chiefly of large volumes in half calf. The books are of excellent paper, well printed with clear and handsome type, and are tastefully and substantially bound.

## 119. Alfred Rothe, Caracas, Venezuela.

## BLANK BOOKS.

*Report.*—The blank books are made of excellent paper, are admirably well ruled, and bound in the most substantial manner.

## 120. F. T. de Aldrey, Caracas, Venezuela.

## PRINTED BOOKS.

*Report.*—Well selected type and paper, some of the binding quite rich and tasteful, and generally strong, serviceable, and in good style.

## 121. G. &amp; C. Merriam, Springfield, Mass., U. S.

## BOOKS.

*Report.*—Commended for a unique collection of Noah Webster's works, showing the progress in the art of book-making in this country for a period of three-quarters of a century as illustrated by the works of one author. The marked advance is shown by comparing the Webster's dictionary published in 1816 with the elegant quarto edition, in superb binding and of exceptional typographical elegance, here exhibited.

## 122. J. R. Osgood &amp; Co., Boston, Mass., U. S.

## BOOKS.

*Report.*—Exquisite taste in all the details of book-making marks the display in this exhibit, from the "large paper" editions to the tiny miniature volumes of the "vest pocket series," all being among the best of their kind. A notable feature is the display of the works of American authors, in the highest style of American book-making.

## 123. Brewer &amp; Tileston, Boston, Mass., U. S.

## READING BOOKS.

*Report.*—The reading books (Hillard's Franklin series) are most beautifully printed; the wood-cuts artistic in design; and the books, in the perfection of their typography and wood-cut printing, are well calculated to educate the pupil in matters of taste and art.

## 124. Mrs. H. G. Miller, Springfield, Mass., U. S.

## SAMPLES OF JOB PRINTING.

*Report.*—A meritorious exhibit of job printing, consisting of cards, bill-heads, and circulars.

## 125. A. Mourès, Alexandria, Egypt.

## TYPE FOUNDING, AND PRINTING IN VARIOUS LANGUAGES.

*Report.*—Every item in the exhibit is of the highest degree of excellence in its class.

## 126. Lallement Brothers, Lisbon, Portugal.

## SPECIMENS OF PRINTING.

*Report.*—Commended for a fine lot of printing in colors on satin; also for a quantity of circulars and bill-heads on paper. Typographical appearance and arrangement very fine.

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## 127. Louis Perrault &amp; Co., Montreal, Quebec, Canada.

## COMMERCIAL PRINTING.

*Report.*—Commended for great variety and good quality of the work exhibited and its adaptation to public wants.

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## 128. James Beal, Queensland, Australia.

## BLANK BOOKS, PRINTING, AND BINDING.

*Report.*—The blank books are well made, and the printing and binding are in the highest degree creditable.

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## 129. C. G. Naumann, Leipsic, Germany.

## COMMERCIAL PRINTING.

*Report.*—Commended for large variety, adaptability to the purposes intended, and cheapness in price.

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## 130. W. Drugulin, Leipsic, Germany.

## BOOK PRINTING AND TYPE CASTING.

*Report.*—Commended for a rich assortment of type in two hundred and twenty-four different languages, and for well-printed books.

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## 131. Ludwig Lott, Vienna, Austria.

## CHROMO-XYLOGRAPHIC PRINTING.

*Report.*—Valuable original miniatures of the fourteenth and fifteenth centuries, belonging to monasteries in Austria, are here reproduced by color printing from wood engravings in a most artistic manner. Among graphic artists there are but few who undertake work of this character; and since this exhibit shows remarkably true and elegant copies of fine originals, it is well entitled to award.

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## 132. Bradley &amp; Ruloffsen, San Francisco, Cal., U. S.

## PHOTOGRAPHS AND DESIGNS.

*Report.*—Photographs, clear in the design and of delicate modeling. Artistic attitudes are prominent merits.

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## 133. Sadic Bey, Cairo, Egypt.

## PHOTOGRAPHY.

*Report.*—Commended for a photographic copy of the Koran, in size of 4 by 2½ centimetres, with gold margin, taken from a very valuable original belonging to the Khedive of Egypt. The skill and workmanship shown in the execution are very meritorious.

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## 134. Ousey Effendi, Cairo, Egypt.

## SCHOOL BOOKS, AND BOOKS FOR THE BLIND.

*Report.*—Commended for the general excellence of the printing in each of the departments represented.

## 135. Lortic, Paris, France.

BOOKS.

*Report.*—This exhibit is principally a collection of rare or antique books of great value, all of which are exquisitely bound; commended for the richness and beauty of the bindings.

## 136. Thos. Kelly, New York, N. Y., U. S.

BOOKS.

*Report.*—Commended for an exhibit of Bibles and prayer books well and tastefully bound and printed in clear and beautiful type.

## 137. Louis Dreka, Philadelphia, Pa., U. S.

INVITATION CARDS AND STATIONERY.

*Report.*—Commended for tasteful designing and excellent workmanship on steel and copper plate, invitation and card engraving and printing; also for dictionary or word-book portfolio and blotter, which is convenient and well adapted for purpose designed.

## 138. Government Printing-Office, Tokio, Japan.

ENGRAVED COPPER PLATES.

*Report.*—This is an interesting exhibit of copper-plate engraving by native artisans. It is a new industry in Japan, and the samples exhibited, many of them for notes and bonds, are exceedingly creditable.

## 139. Tiffany &amp; Co., New York, N. Y., U. S.

WEDDING STATIONERY.

*Report.*—Commended for tasteful and elegant designs of monograms and superior execution in workmanship.

## 140. W. H. Hoskins, Philadelphia, Pa., U. S.

ENGRAVED STATIONERY.

*Report.*—Commended for designing, engraving, and lithographing of commercial work.

## 141. Narciso Ramirez, Barcelona, Spain.

PLAYING CARDS.

*Report.*—A good, cheap, and well-made playing card.

## 142. Patrocínio Maffei, Cadiz, Spain.

PLAYING CARDS.

*Report.*—Commended for cheapness and durability.

## 143. Fulladosa &amp; Co., Barcelona, Spain.

PLAYING CARDS.

*Report.*—Commended for superiority in their fast colors.

## 144. Charles Goodall &amp; Son, London, England.

PLAYING AND CHRISTMAS CARDS.

*Report.*—Commended for a large variety of styles of decoration on the backs of his cards; all executed in good taste and design.

## 145. W. O. Davey &amp; Sons, Jersey City, N. J., U. S.

BINDERS', TRUNK, AND BOX BOARDS.

*Report.*—These boards are first-class, being hard, smooth, and tough.

## 146. H. G. D. Cramer, Ootmarsum, Netherlands.

PASTEBOARD.

*Report.*—The boards are very strong and tough. One sample is three-quarters of an inch thick, and very hard. They are all cheap and well made.

## 147. Saint Croix River Mills, Saint Croix, Nova Scotia.

BINDERS' PASTEBOARD.

*Report.*—Commended for the good quality of binders' board, at a low price.

## 148. Coromina &amp; Antiga, San Juan las Fonts, Gerona, Spain.

STRAW BOARDS.

*Report.*—Commended for a strong and well-made straw board, for book-binders' and box-makers' use.

## 149. Segundo de Olea, Cadiz, Spain.

PLAYING CARDS.

*Report.*—Commended for great variety of styles and designs, and beauty of printing.

## 150. A. Dougherty, New York, N. Y., U. S.

PLAYING CARDS.

*Report.*—Commended for strength and superior quality of stock from which they are made, producing a card not liable to split or thicken; also for perfection in the workmanship, especially in cutting the cards to a uniform and exact size, not obtained by any other exhibit.

## 151. Cornell &amp; Shelton, Birmingham, Conn., U. S.

FOLDING PAPER BOXES.

*Report.*—Strong self-fastening, folding boxes, suitable for packing tacks, screws, rivets, brass chains, etc.

## 152. Rhode Island Cardboard Co., Pawtucket, R. I., U. S.

CARDBOARD.

*Report.*—These boards are of excellent quality, possessing stiffness, elasticity, and finish.

## 153. Dennison &amp; Co., Boston, Mass., U. S.

JEWELERS' FINDINGS, TAGS, AND SURGICAL COTTON.

*Report.*—Commended for a fine display of a full and excellent line of jewelers' findings, such as colored cotton, cards for jewelry, tags, sealing wax, twine, watch-bags, labels, tissue paper, and boxes. Also for patent shipping tags of superior quality and strength, being so constructed, with a patented eyelet, that they may be used with security.

## 154. Howlett, Onderdonk, &amp; Co., Philadelphia, Pa., U. S.

## MACHINE-MADE PAPER BAGS.

*Report.*—Commended for convenient shape, uniformity of manufacture, good workmanship, and economy in cost.

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## 155. Jean Baptiste Poissonniez, Brussels, Belgium.

## CASES FOR JEWELERS, CONFECTIONERS, AND CARDS OF SAMPLES.

*Report.*—Commended for a fine line of jewelry and druggists' boxes, glove boxes, India shawl boxes and confectioners' boxes. They are very tasteful in design and well made. These goods are very cheap.

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## 156. N. M. Kerr &amp; Co., Philadelphia, Pa., U. S.

## WEDDING AND JEWELERS' PAPER BOXES.

*Report.*—Wedding and jewelers' boxes are the specialties. The boxes indicate perfection in cutting and fitting of lids, also in fine workmanship. In combination of colors and style of printing they display good taste.

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## 157. Bennet Osborn, Newark, N. J., U. S.

## PAPER BOXES.

*Report.*—Commended for originality, utility, fitness for the purposes intended, and adaptation to public want.

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## 158. Porter &amp; Bainbridge, New York, N. Y., U. S.

## VISITING AND WEDDING CARDS AND PAPETERIES.

*Report.*—It is a very large and excellent exhibit of blank, visiting, and wedding cards, among which are the following varieties: gilt and silver edged, round cornered, black cards, crystal cards, wooden and silver cards for wedding stationery, *ladies' postal cards*, or cards d'élite, rep cards, and a variety of plaid cards. They are all well made and of good stock. There is also a close imitation of hand-made paper for papeterie stationery. It is a complete exhibit.

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## 159. McNeil, Irving, &amp; Rich, Elwood, N. J., U. S.

## BUILDING AND CARPET PAPER.

*Report.*—This exhibit is mainly of water-proof building paper. It is thoroughly sized to resist the action of water, and appears to be the strongest and most durable of the natural or untarred building papers exhibited. It is certainly well adapted to a great variety of useful purposes.

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## 160. George P. Tangemann &amp; Co., Hamilton, Ohio, U. S.

## ROOFING AND CARPET PAPER.

*Report.*—Commended for superior strength in roofing paper; also smoothness, elasticity, and durability in carpet paper.

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## 161. Barrett, Arnold, &amp; Kimball, Chicago, Ill., U. S.

## ORNAMENTAL ALUMINOUS BUILDING PAPER.

*Report.*—It is designed to supersede in a great measure lathing and plastering of interior walls, and it enables cheaply built houses to take on a cheap and sightly finish. On account of its substantial thickness it promises to be very durable. It is useful and cheap, and meets a need felt in the community.

## 162. Munksjö Paper Mills, Jönköping, Sweden.

## BUILDING PAPER.

*Report.*—It is of excellent quality, handsomely prepared, and is one of the best exhibits of the kind shown.

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## 163. Crane Brothers, Westfield, Mass., U. S.

## PAPER BASKETS.

*Report.*—This is an exhibit of paper baskets made from manilla paper. They are light and water-proof, and well adapted for use in cotton, wool, silk, carpet, and paper mills.

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## 164. E. Waters &amp; Sons, Troy, N. Y., U. S.

## PAPER CANS FOR KEROSENE OIL.

*Report.*—This exhibit shows praiseworthy progress in the manufacture of paper utensils for special and general purposes.

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## 165. French Paper Ware Co., Springfield, N. J., U. S.

## PAPER WARE.

*Report.*—This exhibit contains water-pails, wash-bowls, slop-jars, flower-pots, and spittoons made from manilla paper pulp. They are strong, light, tough, and of good finish.

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## 166. Anthony Goth, Bethlehem, Pa., U. S.

## OIL-PAINTED WALL PAPER.

*Report.*—This exhibit contains oil-painted wall and cornice papers, to be used as substitute for hand painting. The oil not striking through, the paper is not made brittle by its use. The designs are tasteful, the solid colors good, and the paper can be washed.

The exhibit has merit.

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## 167. C. A. Kaberg, Stockholm, Sweden.

## WALL PAPER.

*Report.*—This exhibit comprises a great variety of designs, and of qualities of paper; the lowest in price being remarkably cheap, and the highest very rich in design and manufacture.

The velvet papers merit special attention.

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## 168. F. H. Frolich &amp; Son, Christiania, Norway.

## PAPER HANGINGS AND BORDERS.

*Report.*—This exhibit comprises an unusually large number of designs, the details of which are well executed. Commended for the variety of designs, the richness of many of the papers, and the reasonable prices.

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## 169. Ernesto Lefebvre, Count of Balsorano, Naples, Italy.

## WALL PAPER.

*Report.*—This is one of the most interesting exhibits of decorative paper made, and is remarkable both for its elegant styles and low prices. Among the articles shown are specimens of very rich velvet paper, of good imitations of the ancient frescoes of Pompeii, and of sundry artistic designs of pure and classic taste. The entire exhibit has great merit.

## 170. Howell &amp; Brothers, Philadelphia, Pa., U. S.

DECORATIVE PAPER.

*Report.*—The exhibit made is remarkable for the variety and excellence of its standard, medium and lower grades of papers, and for the low wholesale prices furnished by the exhibitors.

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## 171. Howell &amp; Bourke, Philadelphia, Pa., U. S.

DECORATIVE PAPER.

*Report.*—The fresco decorative papers of this exhibit are exceptionally good.

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## 172. Westerburg, Jefferson, &amp; Co., New York, N. Y., U. S.

DECORATIVE PAPER.

*Report.*—This exhibit is specially notable for the variety and richness of its fresco and gilt papers.

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## 173. Frederick Beck &amp; Co., New York, N. Y., U. S.

PAPER.

*Report.*—The exhibit is remarkable for the variety and excellence of its higher grades of papers, which are amongst the highest and most tasteful produced. Its mica-coated papers are a specialty, and deserve high commendation. The prices furnished are very reasonable.

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## 174. C. Herting, Einbeck, Hanover, Germany.

DECORATIVE PAPER.

*Report.*—Commended for excellent design and finish, and imitation of lustre of mother of pearl. The diamond-powder finish is an invention of the exhibitor, and has been brought to great perfection in this exhibit.

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## 175. Jeffrey &amp; Co., London, England.

DECORATIVE PAPER.

*Report.*—They exhibit several specimens of work of art in paper decoration, which display the highest and purest taste. Such productions deserve special recognition, and tend to elevate paper as a decorative article.

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## 176. Louis Dejonge &amp; Co., New York, N. Y., U. S.

FANCY PAPERS AND BOOK-BINDERS' CLOTHS.

*Report.*—This exhibit contains many specimens of very superior colored, fancy, silvered, glazed, enameled, and embossed papers, and is among the largest, richest, and best shown. The book-binders' cloths are also numerous and excellent.

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## 177. Alois Dessauer, Aschaffenburg, Germany.

FANCY PAPERS.

*Report.*—This exhibit of marbled and other fancy papers is of the first order, and contains a remarkably rich variety. The imitations of fine marbles are truly admirable, and the whole exhibit is entitled to the highest praise.



## 178. W. Knepper's Nephew, Vienna, Austria.

## FANCY PAPER.

*Report.*—This exhibit of marbled and other fancy papers is of the first order, rich in variety and admirable in execution.

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## 179. R. T. Hazzard, Philadelphia, Pa., U. S.

## WALL PAPER DECORATIONS.

*Report.*—This exhibit illustrates a system of wall and ceiling decoration, imitating cheaply, in paper, stencil and fresco painting.

The designs are so arranged and printed that they can be combined, divided, subdivided, and recombined in a great variety of complex ornaments, and in this manner a few printing blocks can be made to produce as many effects as are ordinarily produced by a great number. There is decided economy in the system, and the colors and designs are very good.

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## 180. Leo Haenle, Munich, Germany.

## GOLD AND SILVER PAPER.

*Report.*—This exhibit contains plain and embossed, genuine and imitation gold and silver, and also tinted papers. These are used principally for covering fine boxes and mounting fine pictures, and are of the highest quality. One feature of great merit in this exhibit consists in the extraordinary length of faultless sheets.

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## 181. F. Daye &amp; Co., Schaerbeek, near Brussels, Belgium.

## IMITATION OF EMBOSSED LEATHER.

*Report.*—This exhibit shows in paper board, embossed and colored, beautiful and accurate imitations of the celebrated old leather hangings of Malines and Cordova. It revives a taste long lost, and is a valuable contribution to art.

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## 182. Eduard Sieger, Vienna, Austria.

## IMITATIONS OF INLAYING ON PAPER.

*Report.*—The inlaying of ebony with ivory, and inlaying of ivory with ebony, are most tastefully and artistically imitated. Also the taste and execution in job printing, plain and fancy, of this exhibit are very superior.

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## 183. R. Kerkhoven, Utrecht, Netherlands.

## WOOD AND MARBLE PAINTING.

*Report.*—It has decidedly superior merit.

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## 184. M. Van der Burgh, Schiedam, Netherlands.

## IMITATIONS OF MARBLE AND WOOD.

*Report.*—They are most excellent imitations, of unusual merit.

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## 185. C. T. F. Rijperman, Velzen, Netherlands.

## WOOD PAINTING.

*Report.*—It has decidedly superior merit.

## 186. I. P. Dobbe, The Hague, Netherlands.

## WOOD AND MARBLE PAINTING.

*Report.*—It has decidedly superior merit.

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## 187. A. R. &amp; P. Van der Burgh Brothers, Rotterdam, Netherlands.

## IMITATIONS OF MARBLE AND WOOD.

*Report.*—The imitations of various woods, of inlaying of woods, and of many varieties of marble, are of extraordinary merit; and the artistic taste displayed is fully equal to the execution.

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## 188. John Dickson &amp; Co., Philadelphia, Pa., U. S.

## VULCANIZED RUBBER ENGRAVINGS.

*Report.*—Commended for originality, durability, and cheapness. The designs, which are drawn upon ordinary lithographic stones previously covered with asphaltum varnish, do not require a specially educated artist, but can be made by any one skilled in drawing. The completed sketch, after being etched with nitric acid, is covered with prepared rubber of the proper thickness, which is subjected to pressure and vulcanized, an operation requiring but a few hours, when the plate is ready to be blocked and used in the same manner as an ordinary electrotype. The process is specially adapted for the production of work with fine lines.

A plate from which one hundred thousand impressions had been taken was shown, and it seemed in good condition for many thousands more.

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## 189. F. Tuchfarber &amp; Co., Cincinnati, Ohio, U. S.

## ENAMELED IRON SHOW CARDS.

*Report.*—The execution displays artistic excellence, and the colors are brilliant and transparent. These articles, so admirably meeting public demand, are in every respect the best of their kind in the Exhibition.

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## 190. A. Dunlop Gordon, Philadelphia, Pa., U. S.

## BUILDING AND MANILLA CONCRETE FELTS.

*Report.*—This exhibit is principally of manilla paper, prepared or tarred, for various building purposes, and lining of floors, walls, tanks, etc.; is equal in strength to any, and smoother than any, prepared paper exhibited; and it is suitable for more purposes than common building paper.

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## 191. Benj. O. Woods &amp; Co., Boston, Mass., U. S.

## AMATEUR PRINTING PRESSES.

*Report.*—Commended for compactness, strength, ease with which the form can be adjusted and its position changed, and the general adaptation of the press for amateur work.

The "Novelty" press is made in several sizes, works well, is easily understood, and is not liable to get out of order.

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## 192. Greenwood &amp; Batley, Albion Works, Leeds, England.

## JOB PRINTING PRESS.

*Report.*—Commended for general excellence as a machine for doing fine work.

The "Sun" machine is strongly built; the platen moves squarely up to the bed; there is great strength of impression, and a very large ink distribution; a combination of great utility.

## 193. William Shaw, London, England.

## CARD PRESS.

*Report.*—Commended for compactness, simplicity, and great speed.

This press has an automatic feed, adjustable to any thickness of card, and prints seven thousand per hour.

All its arrangements appear to be well planned and efficient.

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## 194. Degener &amp; Weiler, New York, N. Y., U. S.

## JOB PRINTING PRESSES.

*Report.*—Commended as very simple in construction and strong. The form of type is very accessible for corrections or alterations, and the platen easily reached when making ready.

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## 195. Golding &amp; Co., Boston, Mass., U. S.

## SMALL JOB PRESSES.

*Report.*—Commended for simplicity, compactness, rapidity of operation, and ease of running. The series of "Pearl" presses are well made, easily adjusted to work a single line or a full form; are self-inkers, with a good distribution; work nicely, and are well adapted for general use.

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## 196. Boston &amp; Fairhaven Iron Works, Fairhaven, Mass., U. S.

## NEWSPAPER AND JOB PRINTING PRESS.

*Report.*—Commended for strength and durability, simplicity of construction, ease of adjusting rollers and ink-fountain, adaptability for newspaper and job work, and general excellence. The "Improved Fairhaven" press does excellent work, has a speed of one thousand per hour. The bed is moved by a lever and connecting rod, which holds it firmly in position.

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## 197. C. C. Child, Boston, Mass., U. S.

## COUNTRY NEWSPAPER AND JOB PRESS.

*Report.*—Commended for compactness, ease of running, facility for changing and making forms ready, excellence of ink distribution, and general adaptation to the wants of a country newspaper and job office.

The "Acme" country newspaper and job press runs exceedingly light and easy; is simple in construction; has an excellent ink distribution; does good work; and has a speed of eight hundred impressions per hour by hand and twelve hundred by steam power.

It has many small arrangements of convenience and utility.

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## 198. Gustav L. Jaeger, New York, N. Y., U. S.

## MACHINE FOR PASTING AND COMBINING PAPER OR TEXTILE FABRICS IN SHEETS.

*Report.*—A very compact machine for making two sheet pasteboards, or combining paper with textile fabric for paper-collar work, or cloth-lined paper for envelopes, etc. The design and arrangement very practical, and indicating great care in construction. Although the exhibitor was unable to secure the space necessary for showing the drying cylinders in operation, I have no hesitation in recommending the whole machine for award.

## 199. A. &amp; B. Newbury, Coxsackie, N. Y., U. S.

## JOB PRINTING PRESSES.

*Report.*—A very strong press, working by hand with very little power: the bed, remaining stationary and holding the form in a vertical position, is easily reached by the operator.

The machine is provided with an excellent movement for throwing off the impression in order to work up the colors.

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## 200. Merritt Gally, New York, N. Y., U. S.

## UNIVERSAL JOB PRINTING PRESSES ONE-HALF SHEET AND ONE-EIGHTH SHEET MEDIUM.

*Report.*—These presses combine the advantages of both the cylinder and platen motion. The direct action of the platen, with a full rest for laying on the paper, coupled with the perfect control of the operator over the inking, enables these presses to turn out very good work. They are so strongly made that they can be used for embossing cameo dies in color.

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## 201. George P. Gordon, New York, N. Y., U. S.

## JOB PRINTING PRESSES.

*Report.*—Commended as simple in construction, with good rest on impression, and full time for laying on the paper. Excellent distribution insured by division of inking table in two circles revolving in opposite directions.

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## 202. Bullock Printing Press Co., Philadelphia, Pa., U. S.

## ROTARY PERFECTING WEB PRINTING PRESS.

*Report.*—The press is low and compact, so as to be well under the eye and control of the operator. It is easy of access for the adjustment of forms and rollers. It has no delivery tapes to choke up in case of accident. The web is near the floor, is easily put in place, and unequal tension is taken up on it before reaching the press, by a simple balanced equalizing bar.

The Bullock was the first successful web printing press made in America.

The press on exhibition uses two sets of stereotype plates on long cylinders, and prints from a web twice as wide as the printed sheet.

At a competitive trial (Machinery Hall, June 28, 1876) it printed fourteen thousand eight hundred and fifty-six copies of the New York Herald, or seven thousand four hundred and twenty-eight impressions, in one hour, including eight and three-quarter minutes lost time by reason of stoppages from accident and to renew the web. Quality of work good; number of sheets spoiled, forty-six. Force to operate press, two men, with two boys to take away sheets. The press was examined after running and was found in good order. These machines are built to print either a four, eight, or sixteen page paper. The web of paper was sixty-three inches wide, size of the printed papers forty-five and three-eighth inches by thirty-one and one-half inches ( $45\frac{3}{8} \times 31\frac{1}{2}$ ).

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## 203. Cottrell &amp; Babcock, New York, N. Y., U. S.

## STOP-CYLINDER PRINTING PRESS.

*Report.*—An exceedingly well made machine, finished with great care, and well designed for securing the accurate working of all the bearings. Very full and perfect distribution with the strongest ink. Well adapted for printing the finest illustrated works.

## 204. C. Potter, Jr. &amp; Co., New York, N. Y., U. S.

## STOP-CYLINDER PRINTING PRESS.

*Report.*—Designed and constructed with great care and with special regard to strength where most needed; very perfect rolling and distribution, with a firm, strong, steady impression.

This machine has a new movement called the "trip-at-will," giving the operator absolute control over the machine and preventing the spoiling of paper.

The movement for automatically rolling the form three or four times for each impression is an advantage.

The machine has many minor improvements, calculated to insure the production of illustrated works in the best style.

## 205. R. Hoe &amp; Co., New York, N. Y., U. S.

## FAST PRESSES FOR PRINTING NEWSPAPERS FROM THE WEB.

*Report.*—Two of these presses are exhibited by the manufacturers. They may both be described as perfecting presses for printing newspapers from the web, one having an accumulating cylinder and fly delivery, the other working with a folder in place of the accumulator. With the exception of the difference in delivery, the machines are identical.

They are so constructed as to give to the operator thorough control and freedom of access to all the working parts, when putting on the plates, adjusting the rollers, replacing the web in case of a stoppage from faulty manufacture of the paper, accidental tear, or other similar causes. The position of the web of paper immediately over the printing cylinder gives great facility of feed, and enables the machine to print a thinner and lower quality of paper, as it provides for a minimum strain on the web.

A competitive trial of this machine was held in Machinery Hall on June 29, with the following result:

The machine worked with a double set of plates, and produced ten thousand nine hundred impressions, or twenty-one thousand eight hundred copies. The time lost amounted to fourteen minutes fifteen seconds, viz., seven minutes thirty seconds from stoppages caused by defects in the rolls of paper, five minutes forty-five seconds occupied in putting on two fresh rolls of paper, and one minute removing a form roller that had melted. The machine was frequently timed, and worked when running at an average speed of fourteen thousand four hundred impressions, or twenty-eight thousand eight hundred copies, per hour. A lower rate of speed would probably have reduced the lost time and the number of waste copies. The papers were well printed, although the machine worked for some time with only one form roller. At the conclusion of the trial the bearings of the press were cool and in good order. The folding apparatus worked admirably during the whole trial, never making a faulty fold or tripping, and delivered the newspapers in excellent condition. It is a most valuable addition to the machine.

## 206. Globe Manufacturing Co., Palmyra, N. Y., U. S.

## PRINTING PRESSES.

*Report.*—A variety of small printing presses, known as the "Peerless Presses." These presses work very lightly by hand, are well constructed, and, having a stop motion by which the form can be rolled twice or three times on each impression, circulars with fine wood-cuts can be printed by them.

## 207. John Walter, London, England.

## PRINTING PRESS.

*Report.*—This press is what is known as a web perfecting press, taking the paper from a web or roll and delivering the printed sheets. The idea of a web perfecting press is not a novel one, presses upon this principle having been projected nearly half a century since. The development of the principle is what claims attention.

It is simply and strongly constructed, with little liability to get out of order, and so arranged that the forms can be easily and quickly got ready after the last plate has been received from the stereotyper.

On the 28th of June the press was run one hour, with the following result. Prior to the commencement of the trial, the press had all the plates on but the last one and the rollers in. In three-fourths of a minute the last plate was securely put in place, and in one minute additional the first perfect sheet was delivered. The press was stopped twice to put on new rolls of paper, requiring in one case two minutes and in the other two minutes and five seconds, and, in consequence of clogging of the sheets, the press was stopped two and one-quarter minutes: total stoppage six minutes twenty-two seconds. The press printed the New York Times, and the register showed a total of ten thousand four hundred and fifty-five impressions.

The running was timed repeatedly, and found to be two hundred per minute, and for the first fifteen minutes, during which there was no stoppage, the register showed exactly three thousand impressions.

The size of the form was thirty-four and one-quarter by forty-four inches, and the web of the paper was thirty-six inches in width. Twenty copies were spoiled, and all at the time the paper jammed at the head of the delivery frame.

The papers were well printed, and the press worked very satisfactorily. At the conclusion of the trial the journals of the press were examined, and were not in the least heated. The rollers (evidently not recently made) were in good condition, and not at all softened.

## 208. R. Hoe &amp; Co., New York, N. Y., U. S.

## PRINTERS' PRESSES AND MATERIALS.

*Report.*—In addition to the Newspaper Web Perfecting Presses referred to in another report, the exhibitors have sent in for competition ten large printing presses, two lithographic printing presses, proof presses, imposing tables, composing frames, and a great variety of other articles required for the use of printers. The presses, whether for newspapers printed from sheets, for first-class illustrated work, for general book work, or for jobbing and commercial printers' use, are all well designed, strong, and finished in a superior style. The general materials for use in printing-offices are of the most modern patterns, well finished by skillful workmen.

## 209. Campbell Printing Press and Manufacturing Co., New York, N. Y., U. S.

## PRINTING PRESSES.

*Report.*—The art, book, news, and country presses are well made and adapted to the work for which they are intended, and capable of doing good work.

## 210. Ferd. Lotz, Offenbach-on-the-Main, Germany.

## LITHOGRAPHIC ENGRAVING MACHINE.

*Report.*—An excellent machine, well and carefully constructed, suitable for use on stone, steel, or copper; has numerous adjustments for different classes of work, and can engrave either a simple straight line pattern or a complicated piece of geometric work. It has also a clever adjustment for relief work, which can be made to produce the design either smaller or larger than the original die.

## 211. A. Vital, Paris, France.

## LITHOGRAPHIC MACHINE ROLLERS MADE OF LEATHER.

*Report.*—Made with very great care and accuracy; the seams joined with great skill.

## 212. P. Alauzet, Paris, France.

## LITHOGRAPHIC PRINTING MACHINE.

*Report.*—Well designed and constructed for the execution of first-class work, and especially useful for color work requiring the most accurate registering.

## 213. Ch. Derriey, Paris, France.

## MACHINE FOR NUMBERING CONSECUTIVELY BONDS WITH COUPONS.

*Report.*—This machine combines, in one frame, forty-two type numbering machines, with figures suitable for numbering consecutively, at one operation, the body and the counterpart of an ordinary bond and each of the coupons attached to it. The spaces can be arranged to number either a larger or a smaller number of coupons, as may be required. The frame is placed on a printing press adapted to the machine, and the great merit of the invention is found in the simple arrangement by which all the figures of the numbering cylinders change consecutively at each revolution of the press.

## 214. J. &amp; E. Waldron, New Brunswick, N. J., U. S.

## WALL PAPER PRINTING MACHINE AND TURN-AROUND DRYING MACHINE.

*Report.*—A good practical machine, thoroughly well designed and effectively carried out in all its details. The arrangement for supplying the color by a continuous web of sieve cloth answers well; the machines generally will no doubt do public service by tending to reduce the price of ordinary paper hangings.

## 215. W. O. Hickok, Harrisburg, Pa., U. S.

## PAPER RULING MACHINES.

*Report.*—This paper ruling machine is cheap, simple, and easy of operation. It requires no high degree of skill to operate it. The paper ruled by it is uniform and free from offset. The work may be done at high speed. The machine has improvements in the striker, which enable it to register column rules from different head-lines with exactness. It is well known as a standard machine in American binderies and blank-book factories.

## 216. Chas. Eneu Johnson, Philadelphia, Pa., U. S.

## AUTOMATIC FEEDER FOR PRINTING MACHINES.

*Report.*—This feeder may be attached to any printing machine, and will feed a sheet of double super royal at the rate of one thousand per hour, and smaller sizes at greater speed.

The perforating point or cutter, by which only one sheet of paper can be picked up at once, is an ingenious contrivance.

The apparatus is inexpensive.

## 217. Rose &amp; MacDonnell, Philadelphia, Pa., U. S.

## PRINTERS' ROLLERS.

*Report.*—The composition is carefully prepared and well adapted for the purpose intended; cast in blocks for easy transmission to country printers; rollers in exhibit thoroughly well cast.

## 218. E. H. Barney, Springfield, Mass., U. S.

## BANK PERFORATING STAMP.

*Report.*—Commended as a simple, well-made, and ingenious machine for perforating checks, bonds, certificates of stock, etc., to prevent alteration. It is easily and quickly adjusted for any required amount, and is not liable to get out of order.

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## 219. Fry's Engraving Establishment, Philadelphia, Pa., U. S.

## ENGRAVED DIES, STAMPS, AND TOOLS.

*Report.*—This is an exhibit of engraved dies for the ornamentation of books, and of stamps and tools used by book-binders. The brass dies exhibited show superiority of workmanship and design.

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## 220. M. S. Nordström, Stockholm, Sweden.

## CORK-MARKING STAMPS.

*Report.*—Commended for novelty and cheapness.

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## 221. Maclachlan, Hopkins, &amp; Co., New York, N. Y., U. S.

## PAGING AND NUMBERING MACHINES.

*Report.*—Commended for simplicity, ease of running, facility for adjusting different sizes of figures, and general adaptation for the work for which they are designed. The double-head machine is arranged to number both a check and its counterpart at one blow, or it will at the same time number two coupons. The cylinders on the paging machine are with great facility changed to print large or small figures; and both machines are conveniently arranged for disposing of sheets of paper after they are numbered.

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## 222. W. A. Kelsey &amp; Co., Meriden, Conn., U. S.

## AMATEUR PRINTING PRESSES.

*Report.*—Commended for simplicity and effectiveness and novelty in the chase. The "Excelsior" is an amateur press, is strongly made, and works well. The patent chase has a bottom which enables the amateur to easily arrange his form to work evenly, and avoids much of the risk of accidentally disarranging the type.

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## 223. Bauer's Type Foundry, Frankfort-on-the-Main, Germany.

## TYPE FOUNDING AND CUTTING.

*Report.*—Commended for original and tasteful designs and excellent workmanship.

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## 224. Charles S. Westcott, New York, N. Y., U. S.

## MACHINE FOR CASTING, DRESSING, AND COMPOSING TYPES IN ONE COMBINED OPERATION.

*Report.*—A very bold and clever invention, especially when we remember how many mechanical devices have been tried, at considerable expense, for years past, in attempting to construct composing machines.

This machine deserves special praise for the ingenious and skillful manner in which the matrix for the particular type required is brought into position for casting. The types are well finished, considering all the difficulties to be overcome, and reach their place in the galley-stick smoothly and easily.



## 225. National Printing-Office, Lisbon, Portugal.

## SPECIMENS OF TYPE AND TYPOGRAPHY.

*Report.*—The specimen-book of types, borders, etc., is very fine. The typographical appearance of the books of this exhibit is exceedingly creditable.

## 226. Heinrich Flinsch, Frankfort-on-the-Main, Germany.

## TYPE.

*Report.*—Commended for the large assortment of original punches of every description, eighty-eight thousand and ninety-seven original punches and one hundred and fifty-two thousand seven hundred and thirty-seven matrices belonging to the establishment.

## 227. George Bruce's Son &amp; Co., New York, N. Y., U. S.

## PRINTING TYPES.

*Report.*—Commended as book and newspaper type of great hardness; for beauty of design, especially in kerned and ornamental type for imitating engraving. Besides the type shown, a specimen-book embracing a large variety of plain and ornamental types bore testimony to the good taste of the firm in their general manufacture.

## 228. The Wm. H. Page Wood Type Co., Greeneville, Conn., U. S.

## WOOD TYPE.

*Report.*—Commended for superior workmanship and artistic designs. The wood type and borders are beautifully cut in hard and durable wood, and the specimen-book shows great variety in design.

## 229. M. Alissof, St. Petersburg, Russia.

## TYPE-WRITER; NEW METHOD FOR PRINTING MUSIC BY PHOTO-LITHOGRAPHY.

*Report.*—This machine is called a "type-writer," but should perhaps be more properly termed a type-printer, the impressions of the letters being equal to ordinary book-printing, the types being worked by rollers, as in ordinary printing presses.

The machine produces excellent work, and may be advantageously used for making clear, regular, and well-finished copies of bad manuscripts, letters, or other documents, with transfer ink, and transferring to a lithographic stone or a zinc plate. The machine contains two hundred and forty characters, or nearly five times as many as the type-writer now in use. It has been beautifully and carefully constructed, and deserves great commendation. The new method of preparing clichés or stereotypes for printing music by photo-lithography is a most ingenious invention, and doubtless calculated to lead to a much more economical production of songs, copies of music for singing-classes, choirs, and bands.

## 230. Mackellar, Smiths, &amp; Jordan, Philadelphia, Pa., U. S.

## TYPE-FOUNDING MACHINERY, TYPES, AND PRINTING MATERIAL.

*Report.*—Commended for accurate and excellent work in large variety. Originality is not claimed for the type-casting machine, but only such improvements as experience has shown to be necessary to secure the quickest and best results. The types, rules, slotted corners, etc., exhibited show accurate workmanship and special adaptation to printers' requirements. Their specimen-book shows a great variety of tasteful styles of types and borders.

## 231. V. Grottenthaler, Philadelphia, Pa., U. S.

BOXWOOD FOR ENGRAVERS' USE.

*Report.*—This is an exhibit of boxwood for engravers' use; is in large blocks or in sections with screws. The wood is well selected and well put together. The short screws with ears, with which the blocks are put together, is an improvement and an ingenious device.

## 232. W. H. Windsor, Little Rock, Arkansas, U. S.

PRINTERS' (FORM) FRAME.

*Report.*—One of the best principles to close types in a very easy way.

## 233. Standard Machinery Co., Mystic River, Conn., U. S.

MACHINE FOR ROUNDING AND BACKING BOOKS.

*Report.*—This machine does by power what is often considered the hardest work of the bindery. The operator has merely to feed the book to the machine, when it is clamped, rounded, and automatically released, ready for the cover. As skilled labor may be dispensed with, the economy of using this machine is considerable.

## 234. Novelty Paper Box Co., Philadelphia, Pa., U. S.

WIRE STITCHING MACHINES FOR BOOKS AND PAMPHLETS.

*Report.*—Two machines for stitching pamphlets or books with wire instead of thread. A great novelty in pamphlet binding has been introduced by these clever machines, at once rapid and economical. They can be worked by a novice at the rate of twenty-two per minute, completing the work with great neatness and strength. The patent wire-stitched books display great durability and flexibility, with great economy in production.

## 235. Chambers Brothers, Philadelphia, Pa., U. S.

BOOK, NEWSPAPER, AND PERIODICAL FOLDER, PASTER, AND TRIMMER.

*Report.*—The newspaper folder is well made and thoroughly well designed and adapted for printers having a newspaper with a moderate circulation.

The periodical folder can be worked at a speed of one thousand per hour, and does the work very efficiently.

## 236. Wm. Braidwood, New York, N. Y., U. S.

PERFORATING MACHINE FOR CHECKS, STAMPS, ETC.

*Report.*—Commended as a perforating machine worked with pins on circular cutter, and cones for stopping at any point. Very fast, and well adapted for stop or through work.

## 237. S. C. Forsaith &amp; Co., Manchester, N. H., U. S.

NEWSPAPER FOLDING MACHINE.

*Report.*—Commended for simplicity of its parts, freedom from tapes and belts, and efficiency at a speed of three thousand per hour.

## 238. Wm. Braidwood, New York, N. Y., U. S.

PAPER FOLDING MACHINE FOR BLANK BOOKS.

*Report.*—This convenient machine or tool for the binding effects the folding of a small number of sheets at one stroke, for blank books and the like, with a speed and certainty only attainable after long practice by hand folders; it is a simple and cheap labor-saving device. It increases the solidity of blank books.

## 239. Mary H. Semple, Lowell, Mass., U. S.

## BOOK TRIMMING MACHINE.

*Report.*—The machine was a novelty embodying many useful features when first introduced, and, although long on the market, is still unsurpassed in some of them. The table movement is very ingenious, adapting the machine to the work of trimming a large or small number of books to any desired size within limits.

## 240. Charles W. Packer, Philadelphia, Pa., U. S.

## MACHINES FOR CUTTING CARDBOARD.

*Report.*—Commended for the general adaptation of the machine for the work designed. The machine is for the use of paper-box makers, cuts circular or oval with facility, and is easily adjusted for different sizes.

## 241. C. C. Child, Boston, Mass., U. S.

## PAPER CUTTING MACHINE.

*Report.*—The machine seems to be peculiarly adapted to perform the miscellaneous work of a bindery. It is self-clamping. The clamp moves with the knife, so that no time is lost. The pressure of the clamp is automatically regulated by the knife, so that no power is thrown away, and the paper is not injured by excessive pressure. The gauge is new and exact, and may be quickly adjusted from the front of the machine. The knife can be instantly stopped during any portion of the cut. The wooden cylinder on which the knife cuts can be quickly changed to give a new cutting surface. The machine is neat, strong, compact, and well finished.

## 242. Brown &amp; Carver, Philadelphia, Pa., U. S.

## PAPER CUTTER AND ROTARY CARD CUTTER.

*Report.*—The operating parts of the paper cutter are well fitted and strongly built. The gauge is very accurate, and is adapted to be set close to the knife so as to cut the smallest sheets.

The card cutter will do very rapid work. A plurality of rotating disks on rotating parallel shafts cut past each other with the effect of a shear cut.

## 243. George H. Sanborn, New York, N. Y., U. S.

## PAPER CUTTING MACHINES.

*Report.*—These machines are well adapted for heavy work, the larger sizes especially for the use of paper-makers. The friction self-clamping device seems to be sufficiently powerful to secure any reasonable amount of paper. The lever movement, by which slow cut and quick return are secured, is strong and reliable. The stamping and embossing press exhibited in the Campbell Building is strong and well built, and specially adapted for the work intended.

## 244. E. R. &amp; T. W. Sheridan, New York, N. Y., U. S.

## BOOK SAWING MACHINE.

*Report.*—The simple expedient of adapting circular saws to cut to a regulated depth in the backs of folded sheets, so as to sink the twine on which the book is sewed, is a device of much practical utility.

## 245. Holyoke Machine Co., Holyoke, Mass., U. S.

GEORGE W. HAMMOND'S PATENT STOP CUTTER AND A STACK OF SUPER CALENDERS.

*Report.*—Commended for an improved method of cutting either wet or dry paper square, thereby saving both time and paper. The machine is built in a substantial and workman-like manner. A stack of super calenders, having strength and beauty of finish, is a noteworthy feature of this exhibit.

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## 246. Cleveland Paper Box Machine Co., Cleveland, Ohio, U. S.

MACHINE FOR MAKING PAPER BOXES.

*Report.*—A strongly built, efficient, and rapidly working machine.

This machine makes paper boxes and covers, and also boxes and covers combined, for use as a substitute for the ordinary paper and twine method of putting up packages; does the work well and cheaply.

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## 247. Clague, Randall, &amp; Co., Rochester, N. Y., U. S.

MACHINE FOR COVERING PAMPHLETS AUTOMATICALLY.

*Report.*—A well-constructed machine; will cover a pamphlet of one sheet only, or twenty sheets thick, at the rate of one thousand to twelve hundred per hour. Boy feeds the covers. Has a very ingenious automatic needle arrangement for feeding pamphlets. Work well finished, and delivered ready for trimming.

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## 248. W. E. &amp; E. D. Lockwood, Philadelphia, Pa., U. S.

AUTOMATIC ENVELOPE MACHINE.

*Report.*—It deserves great commendation for originality of design and construction. It is the only machine exhibited that cuts the envelopes from the web of paper. It produces the envelopes complete and ready for use at the rate of one hundred and twenty per minute, on an improved economic principle. An automatic seed-bag-envelope machine was also exhibited, working at the rate of seventy-five per minute, with good result.

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## 249. Samuel Raynor &amp; Co., New York, N. Y., U. S.

ENVELOPE GUMMING AND FOLDING MACHINE.

*Report.*—This machine has been well designed and carefully constructed; is very extensively used for the manufacture of envelopes of all ordinary sizes. The arrangement by which the flap of the envelope is gummed by a rolling cylinder is a valuable improvement, securing greater certainty and more regularity in the gumming. The machine requires very little power to drive it, and the attendant has perfect control over all the working parts.

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## 250. I. Morton Poole &amp; Co., Wilmington, Del., U. S.

PAPER MANUFACTURING MACHINE.

*Report.*—This exhibit contains a stack of calendering rolls, intended to be part of a complete paper machine. These rolls are of cast iron chilled at the surface in casting and thereby made hard like tempered steel. They are separately ground according to a highly improved plan, and are so true that when placed together they appear to bear upon each other throughout their entire length. Chilled iron calenders of this character are a modern and important improvement for all first-class paper machines.

## 251. Lobdell Car Wheel Co., Wilmington, Del., U. S.

## PAPER MAKING MACHINERY.

*Report.*—This exhibit contains a stack of calendering rolls, intended to be part of a complete paper machine. These rolls are of cast iron chilled at the surface in casting and thereby made hard like tempered steel. They are separately ground according to a highly improved plan, and are so true that when placed together they bear upon each other throughout their entire length. This exhibit has the exceptional merit that the rolls are not only ground true, but cast, by the exhibitor.

## 252. Howell &amp; Brothers, Philadelphia, Pa., U. S.

HANGING-UP MACHINE, CUTTING-OFF AND ROLLING MACHINE, HARDENING MACHINE,  
ATTACHED TO WALDRON'S WALL-PAPER PRINTING MACHINE.

*Report.*—These three machines are admirable adjuncts to the wall-paper printing machine, rendering it much more complete and its product more easily marketable.

The paper hangings exhibited show much merit in the harmony and combination of the colors used.

## 253. Holyoke Machine Co., Holyoke, Mass., U. S.

## GOULD'S PATENT BEATING ENGINE.

*Report.*—Commended for economy of space, economy in cost, saving of labor, strength, and durability; and is peculiar in that the stuff requires no stirring by the engineer.

## 254. J. R. Osgood &amp; Co., Boston, Mass., U. S.

## HELIOTYPOGRAPHY.

*Report.*—This exhibit is of a special process of transferring from an ordinary negative a design upon a plate of sensitized gelatine, in such a manner that the said plate can be rapidly printed from, as from a stone. The process renders practicable admirable and cheap printing of copies both from nature and from fine artistic work.

## 255. United States Soapstone Manufacturing Co., Cincinnati, Ohio, U. S.

## SOAPSTONE PRODUCTS.

*Report.*—Commended for a very meritorious display of soapstone stationery articles for school and general trade purposes.

## 256. Chamberlin, Whitmore, &amp; Co., New York, N. Y., U. S.

## ENVELOPES, WEDDING STATIONERY, AND VISITING CARDS.

*Report.*—Commended as being all in the highest order of merit.

## 257. Pusey, Jones, &amp; Co., Wilmington, Del., U. S.

## PAPER MANUFACTURING MACHINERY.

*Report.*—This exhibit contains an expanding pulley for nicely regulating the speed of parts of a paper machine, and which is an important improvement. The plan is simple and effective. Also a stack of calendering rolls, intended to be part of a complete paper machine. These rolls are of cast iron chilled in casting and thereby made hard like tempered steel. They are separately ground according to a highly improved plan, and are so true that when placed together they appear to bear upon each other throughout their entire length. Chilled iron calenders of this character are a modern and important improvement for all first-class paper machines.

## 258. Gavit Paper Machine Works, Philadelphia, Pa., U. S.

## PAPER MAKING MACHINERY.

*Report.*—Commended for the patent cone pulley paper cutter, which enables the machine to run at a high rate of speed; the open press roll stands being very convenient in putting on and taking off felts; also the improved deckle frame, whereby the deckles may be removed from the machine more conveniently and with less liability to injure the wire cloth; also an improvement known as the one-arm pulp dresser. Commended for convenience, strength, durability, and ability to meet the demand for running a paper machine at a high rate of speed; also for a stack of web super calenders which combines strength, finish, and economy in cost.

## 259. Alois Winkler, Vienna, Austria.

## METALLIC LETTERS AND SIGNS.

*Report.*—The metallic letters and titles inlaid with mother of pearl, gold, and colored, are tasteful and durable, and therefore useful for making show-cards, titles, etc.

## 260. United States Stamped Envelope Works, Hartford, Conn., U. S.

## MACHINE FOR GUMMING, EMBOSSING, FOLDING, AND COUNTING ENVELOPES.

*Report.*—This machine has been constructed with great care and finish. The work is completed in an excellent and perfect manner. It is the only machine in the Exhibition which completes the envelope with an embossed colored die at one operation.

## 261. Socios de la Peña, Bilbao, Spain.

## CIGARETTE PAPERS.

*Report.*—It is an exhibit of cigarette papers manufactured from both linen and straw, of various qualities, from common to superfine; plain, medicated, and tobacco-flavored, and finished both with and without sizing. These papers are notable for their strength and pliability, and, by reason of their variety, combine the qualities required by the various markets of the world.

## 262. Bureau of Engraving and Printing, United States Treasury Department, Washington, D. C., U. S.

## ENGRAVING, PRINTING, AND COMPOSITION.

*Report.*—This exhibit embraces:

1. Specimens of engraving of letters, vignettes, counters, and other designs of bank note character, suitable for bonds, bank notes, stamps, checks, and other securities.
2. Specimens showing the character of the printing of the same.
3. Illustrations of a new process for cheaply composing plates for the printing of securities, checks, cards, bill heads, in a style much superior to that commonly adopted, and at a comparatively trifling cost.

The specimens of engraving exhibited are according to the highest present standard of art in design and execution, and are worthy of the national institution within which they have been elaborated.

The printing is perfectly done, and bears witness to the employment of the best skill and materials, and of highly improved machinery and process.

The whole exhibit is highly meritorious.

SUPPLEMENT TO GROUP XIII

REPORTS

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## SIGNING JUDGES OF GROUP XIII.

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The numbers annexed to the names of the Judges indicate the reports written by them respectively.

WM. FAXON, 1, 2, 3, 9, 10, 11, 12, 13, 14, 23, 24, 25, 26, 138, 188, 191, 192, 193, 195, 196, 197, 207, 218, 220, 221, 222, 227, 228, 230, 237, 240, 246.

SYDNEY H. WATERLOW, 4, 5, 6, 7, 8, 15, 16, 17, 18, 19, 28, 31, 37, 58, 194, 198, 199, 200, 201, 203, 204, 205, 206, 208, 210, 211, 212, 213, 214, 216, 217, 224, 229, 234, 235, 236, 247, 248, 249, 252, 260.

EDWARD CONLEY, 20, 21, 22, 27, 29, 60, 70, 71, 102, 137, 139, 140, 141, 142, 143, 145, 146, 148, 149, 152, 154, 158, 163, 164, 165, 245, 253, 258.

JAMES M. WILLCOX, 30, 32, 33, 34, 35, 36, 38, 39, 41, 43, 44, 45, 46, 49, 50, 51, 52, 53, 54, 55, 56, 57, 61, 62, 63, 64, 65, 66, 67, 68, 69, 72, 73, 108, 109, 111, 113, 114, 115, 116, 117, 118, 119, 120, 135, 159, 161, 162, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 183, 184, 185, 186, 187, 190, 250, 251, 254, 257, 261, 262.

C. O. CHAPIN, 40, 42, 47, 48, 59, 74, 75, 76, 77, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 112, 121, 122, 123, 125, 127, 128, 130, 134, 147, 223, 226, 255, 256.

GUSTAV SEITZ, 78, 129, 131, 132, 133, 144, 150, 151, 153, 155, 156, 157, 160, 182, 189, 232, 259.

H. T. BRIAN, 110, 124, 126, 136, 202, 209, 215, 219, 225, 231, 233, 238, 239, 241, 242, 243, 244.

# SUPPLEMENT TO GROUP XIII.

## REPORTS OF JUDGES ON APPEALS.

### JUDGES.

JOHN FRITZ, Bethlehem, Pa.  
EDWARD CONLEY, Cincinnati, Ohio.  
CHARLES STAPLES, JR., Portland, Me.  
BENJ. F. BRITTON, New York City.  
H. H. SMITH, Philadelphia, Pa.

COLEMAN SELLERS, Philadelphia, Pa.  
JAMES L. CLAGHORN, Philadelphia, Pa.  
HENRY K. OLIVER, Salem, Mass.  
M. WILKINS, Harrisburg, Oregon.  
S. F. BAIRD, Washington, D. C.

#### 1. A. M. Collins, Son, & Co., Philadelphia, Pa., U. S.

CARD MOUNTS IN VARIOUS STYLES FOR PHOTOGRAPHS.

*Report.*—Bevel-edge cards for "Glace" pictures; card mounts with border lines and scroll-work; illuminated back of carte de visite mounts; all tasteful in design, of good quality and superior workmanship.

#### 2. Samuel Loag, Philadelphia, Pa., U. S.

SAMPLES OF FINE COLOR PRINTING.

*Report.*—Commended for a fine display of printing in colors; illuminated title-pages of books, rich in design and well printed; register clean; colors fine.

#### 3. J. M. Armstrong, Philadelphia, Pa., U. S.

MUSIC TYPOGRAPHY.

*Report.*—Commended for clean cut and clearness of type-work in all the varieties of the exhibit.

#### 4. Lehman & Bolton, Philadelphia, Pa., U. S.

COMMERCIAL LITHOGRAPHY.

*Report.*—Commended for originality of design and fine workmanship.

#### 5. C. A. Dixon & Co., Philadelphia, Pa., U. S.

COLLEGE STATIONERY.

*Report.*—Commended for good design and workmanship on "college commencement invitations."



## 6. The Wells &amp; Hope Company, Philadelphia, Pa., U. S.

CHROMO-LITHOGRAPHIC IRON SHOW CARDS.

*Report.*—Commended for durability and workmanship, fitness for the purposes intended, and adaptation to public wants.

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## 7. Chas. Bormet &amp; Co., Geneva, Switzerland.

WOOD TYPE.

*Report.*—Commended for good design and workmanship.

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## 8. George Waterston &amp; Son, Edinburgh, Scotland.

SEALING WAX.

*Report.*—Commended for superior adhesiveness, color, and hardness in hot climates; also for minimum waste in melting in a flame.

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## 9. S. F. Gratz, Birmingham, England.

REVOLVING BRASS WHEEL NUMBERING AND DATING STAMPS.

*Report.*—Commended for ingenuity, utility, and ease of manipulation. This stamp can be used for various purposes; and is so arranged as to be interchangeable, with little chance of losing the parts or disarranging them.

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## 10. Stephenson, Blake, &amp; Co., Sheffield and London, England.

SPECIMEN SHEETS OF PRINTING TYPE.

*Report.*—Commended for great variety of "book faces" good. Old-style book face very good.

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## 11. Munkedal Manufacturing Co., Uddevalla, Sweden.

PAPER.

*Report.*—Cheap papers in different colors; well adapted for cheap wall paper.

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## 12. Malmö Wood Pulp Manufacturing Co., Delary, Sweden.

CHEMICALLY PREPARED WOOD PULP.

*Report.*—Commended for bright color and strong fibre for paper pulp.

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## 13. Chr. Christophersen, Christiania, Norway.

CHEMICALLY PREPARED WOOD PULP.

*Report.*—A good quality of ground wood pulp.

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## 14. A. O. Hamborg, Christiania, Norway.

GROUND WOOD PULP.

*Report.*—A good quality of wood pulp, mechanically prepared.

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## 15. Bravo &amp; Co., Chili.

PAPER.

*Report.*—This is an exhibit of wrapping and colored poster papers, well made and of good strong texture.

## 16. J. Franaszek, Warsaw, Russia.

PAPER HANGINGS.

*Report.*—Commended for cheapness and variety in styles.

## 17. J. K. Frenkel &amp; Sons, Tammerfors, Russia.

PAPER.

*Report.*—This is an exhibit of writing paper of good strong texture and well sized.

## 18. Prado Paper-Mill Co., Thomar, Portugal.

PAPER.

*Report.*—Writing and wrapping paper, of good quality; the writing paper well sized.

## 19. Samuel Ramsden, Melbourne, Victoria, Australia.

PAPER.

*Report.*—News and wrapping paper, of good quality, made of native fibres.

## 20. Nynäs Pasteboard Factory, Mavida, Sweden.

PASTEBOARD (WOOD).

*Report.*—A stiff and smooth pasteboard, made from wood pulp.

## 21. C. G. Mineur, Stockholm, Sweden.

WALL PAPER—IMITATION OF LEATHER, AND DECORATIVE CARVINGS IN WOOD PULP.

*Report.*—Imitations of leather in embossed paper, painted and gilded to imitate antique embossed leather. Strong and well executed, with rich design. Also paper-pulp ornaments. Commended for cheapness and general adaptability to the uses intended. They are much lighter than plaster ornaments, which they resemble, and are readily applied in decorations.

## 22. Sten Lewenhaupt, Wermbohl, Sweden.

CHEMICALLY PREPARED WOOD PULP.

*Report.*—A good, long, and strong fibre for paper stock.

## 23. Potsdamer &amp; Co., Philadelphia, Pa., U. S.

COMMERCIAL LITHOGRAPHY.

*Report.*—Commended for beauty of design and excellence in Spencerian scrip and bank work.

## SIGNING JUDGES OF SUPPLEMENT TO GROUP XIII.

The figures annexed to the names of the Judges indicate the reports written by them respectively.

COLEMAN SELLERS, 1, 2, 6, 9, 10, 21.

H. K. OLIVER, 3.

EDWARD CONLEY, 4, 5, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23.

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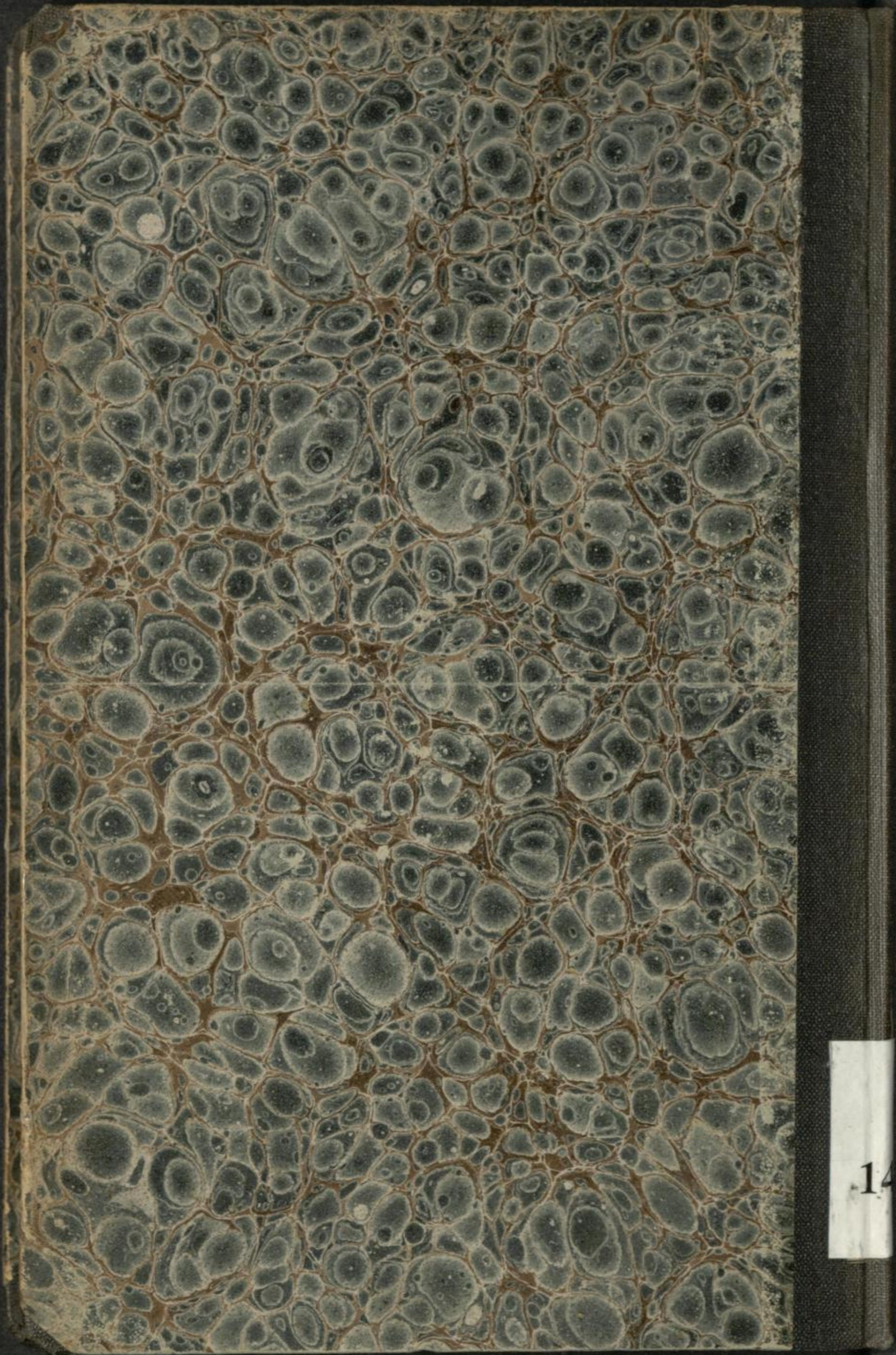












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